500 RADIO WRINKLES

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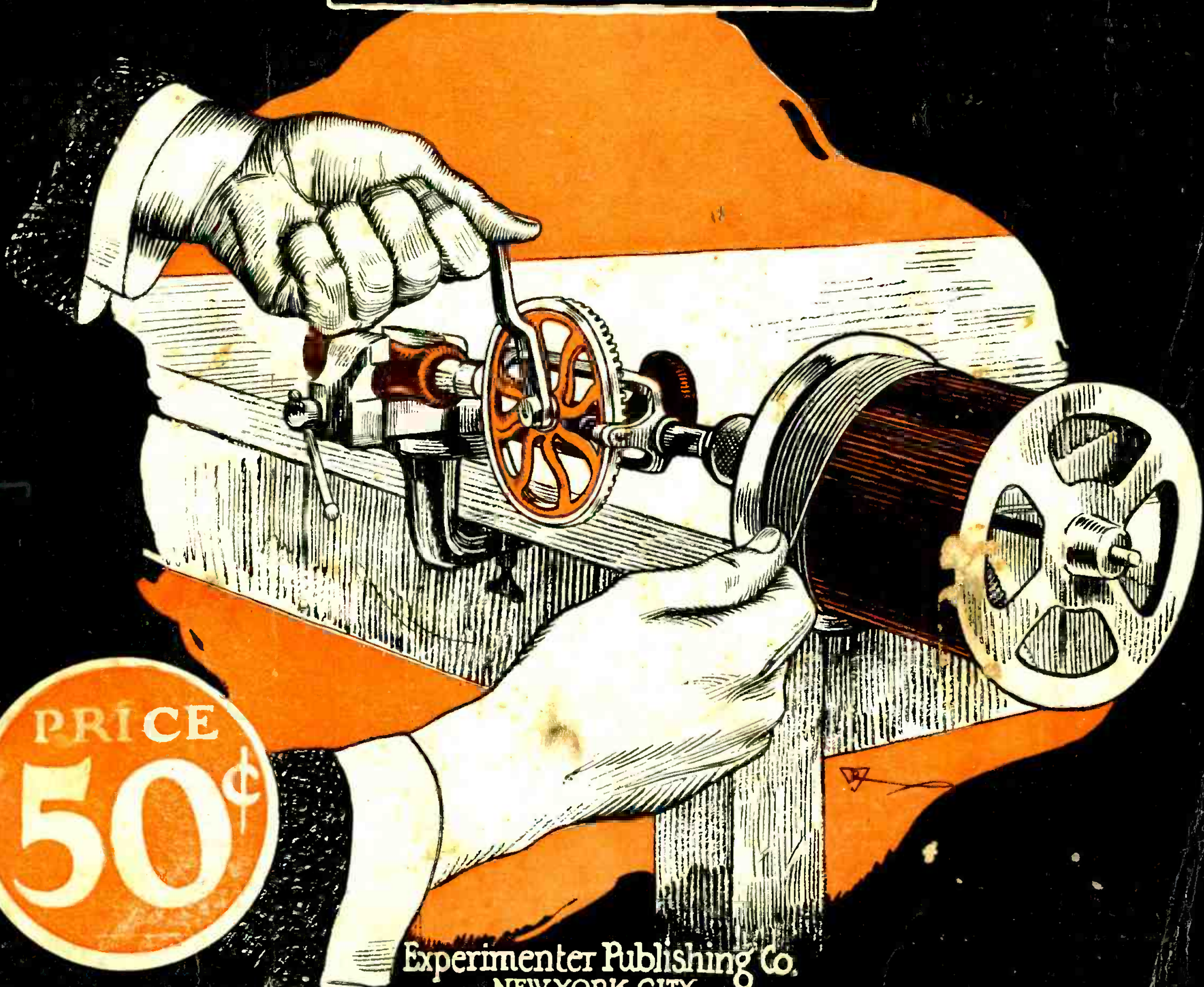
RADIO NEWS



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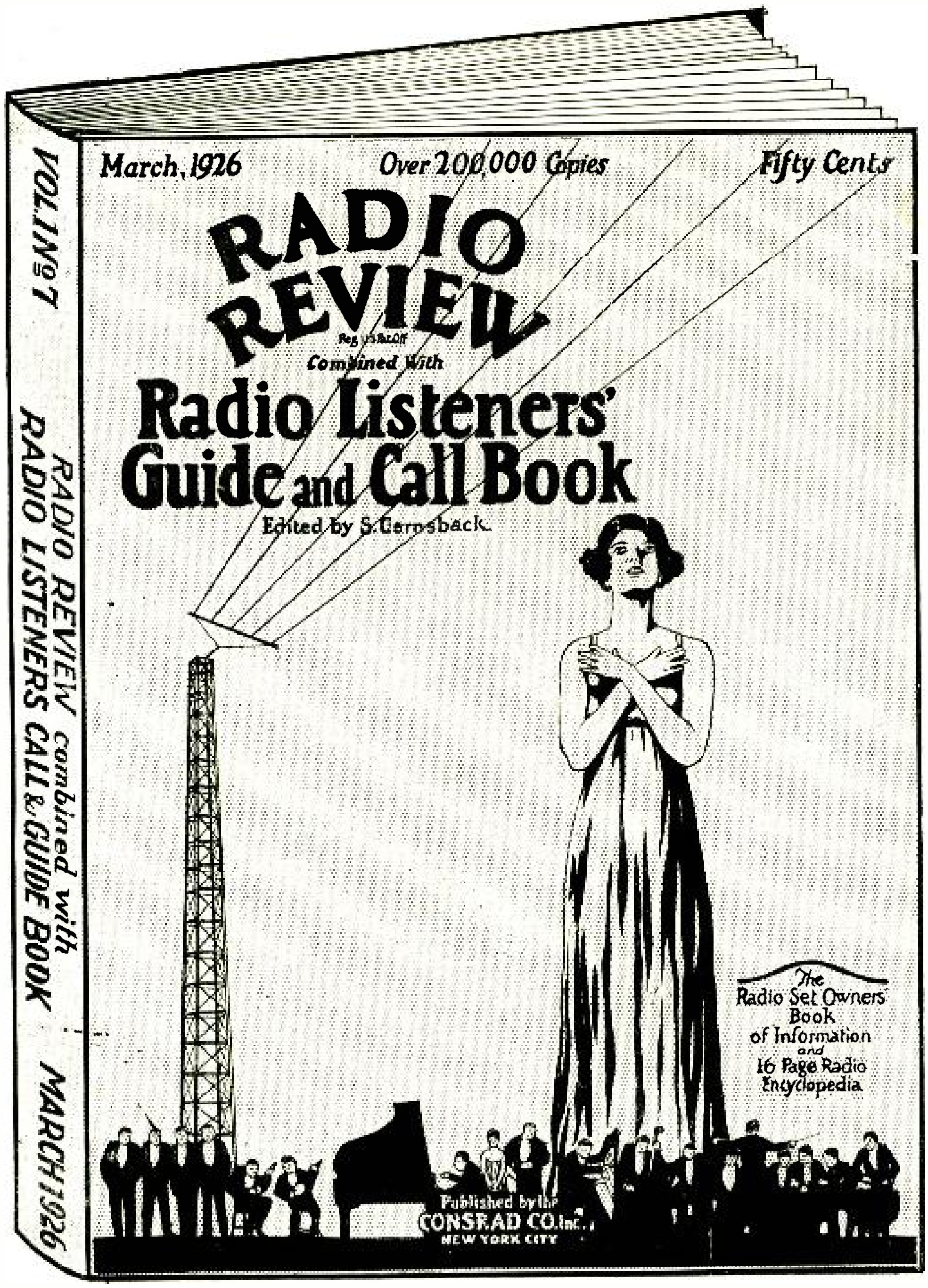

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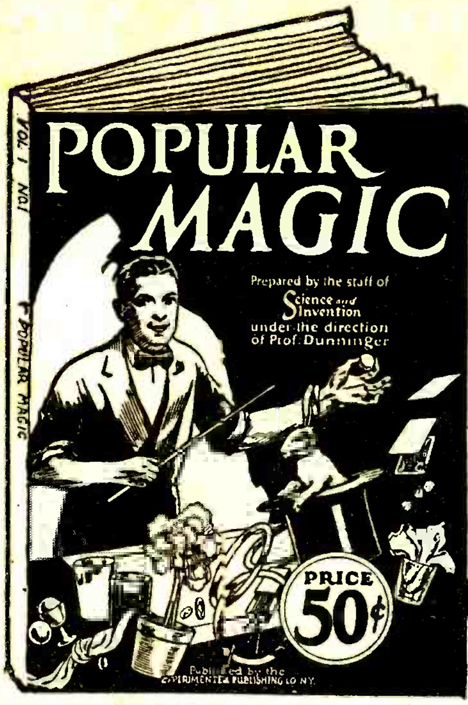

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500 Radio Wrinkles

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RADIO NEWS

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500 Radio Wrinkles

by the

Most Eminent Radio Experts

Edited by

LEON L. ADELMAN

Associate Editor Radio News

A Complete Collection and Assortment of Invaluable Hints for the Radio Enthusiast

VOL. No. I

EXPERIMENTER PUBLISHING CO., Inc.

53 PARK PLACE

NEW YORK

500 Radio Wrinkles

INTRODUCTION

THE last quarter century in our civilization has witnessed the most rapid and prolific advances ever made. The arts and sciences have undergone the most amazing development. No stone has been left unturned in man's eagerness for progress. His conquest in the search for truth has borne rich rewards. Of the wonderful discoveries, the art of radio has experienced and enjoyed the fruits of research to a greater degree than any of the other arts or sciences.

With this development has come a large variety of radio apparatus and radio circuits. Indeed, the beginner or layman is often confused when confronted with the problem of choosing the necessary materials he may need. And often too, he is handicapped because he cannot afford the prices asked. Thus, he is placed in a complex dilemma from which the avenues of escape appear to be only that he must give up the thought of building his radio set and must wait for a more auspicious time.

It is to this vast class of radio enthusiasts that this book containing invaluable advice, information and time and money-saving hints is offered.

Arranged in the 15 most important classifications, the wrinkles contain radio's essence in every angle. All subjects are covered in simple, clear and concise language. There are no superfluous words which might confuse or bewilder the reader. Each subject has been treated with the view in mind that the completed book may serve the enviable purpose of a well-defined treatise on radio as well as a storehouse of unlimited helpful hints and aids.

Thus, the scope of the book includes the needs of the advanced radio technician as much as it does those of the beginner. Its value will be enhanced as time goes on and its contents will be recognized as indispensable by an appreciative army of radio enthusiasts.

By ordinary care and discrimination, the reader will become adept at choosing those wrinkles which will afford him the greatest returns.

Editor.

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ANTENNAE

Here are some excellent stunts and aids to employ when you are about to erect or rebuild the antenna. All of them are of practical utility.

HOW TO ERECT A ONE-MAN ANTENNA MAST

Instead of calling in a fire brigade or all of your wife's relations when you erect your antenna mast, by following this procedure, you will be able to do the job all by yourself.

For a mast 38 feet high the following material will be needed:

1 piece 1 x 2 inches, 16 feet long.
2 pieces 2 x 4 inches, 20 feet long.
1 piece 4 x 4 inches, 20 feet long.
2 iron bolts ½ x 8 inches.

Have the 4 x 4 tapered for 16 feet down to 2 x 2 at the small end, leaving the other 4 feet full size. If you wish to paint your mast, which is a good idea, have this material dressed.

Lay one of the 2 x 4's flat on the ground at the site where you wish your mast to be raised. Place the large end of the 4 x 4 in line with it with an overlap of 2 feet and lay the remaining 2 x 4 directly over the bottom piece. Through the three pieces of wood bore two holes of such a diameter that they will take the ½-inch bolts 18 or 20 inches apart. The bolts are then placed in the holes and tightened up.

Now spread the free ends of the 2 x 4's about two feet apart and nail 1 x 2 strips ladder-wise about 18 inches apart. Your mast should now resemble Fig. 1.

Now remove the bottom bolt, attach your antenna wire and permanent guy wires to the top of the mast and temporary guy wires or ropes to the top step of the "ladder." Then tie a piece of stout rope about 25 feet in length to an odd piece of 2 x 4 about 16 feet long and nail or lash the other end of it to the bottom end of the top part of the mast. This is a counterpoise or lever and is removed when the job is completed.

Now stand in the center over the remaining bolt, which acts as a hinge, and lift the assembly as high as you can in this way. This should take the form of Fig. 2.

Now take the top of the mast, which is resting on the ground, and carry it toward the base until it is almost straight up. Place the end of the mast on the ground and guy the base with temporary stays in this position. You now have the top of the mast and the temporary counterpoise balanced as in Fig. 3.

The top half of the mast is then raised to its correct position by pulling on the rope, which is dangling at the end of the counterpoise. Tie the counterpoise close to the ladder at the bottom of the mast and peg down loosely your permanent guy wires from the mast's top, to assist in sustaining your person when you place the remaining bolt in its proper hole. When this is done, remove the counterpoise and tighten your permanent guy wires until your mast is perpendicular or better yet, leaning backward 2 or 3 inches at the top, thus allowing for the weight of the antenna to pull the mast to plumb.

If you have painted this outfit, you will have a mast that will not be a continual eye-sore and that can be easily lowered for changing wires for experimental purposes, as well as the pleasure that will be yours for doing a difficult job in an easy way.

Contributed by R. Williams.

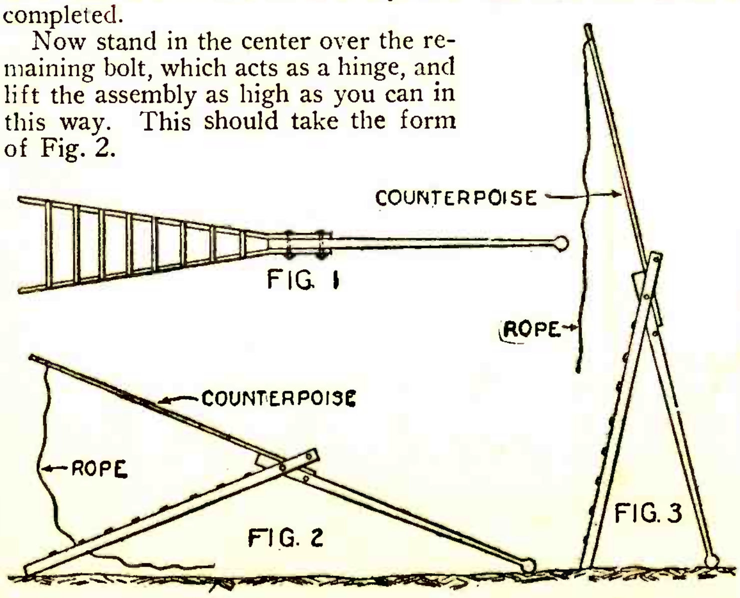


Fig. 1 shows the antenna mast as it appears flat on the ground when the 2 x 4's are spread by the cross-pieces. Fig. 2 shows the position of the mast, after the removal of one of the bolts and the middle raised. Fig. 3 is the position just before the mast is raised to its final position by pulling on the rope.

A PORCELAIN INSULATOR

I present herewith an interesting wrinkle consisting of four cleat porcelain insulators connected together to form one efficient insulator.

The arrangement, as shown in the cut, is quite simple. Four ordinary porcelain cleats are arranged so that the outer holes on the center two are in line with each other and separated by the two outside or end cleats. Two brass machine screws about two inches long clamp the unit firmly together. Care should be taken not to crack the cleats while tightening the bolts. The insulator is used in the regular manner as either antenna or guide wire insulator.

An efficient insulator made from four cleats. If glazed porcelain ones are used it is best, as these provide better insulation.

It should be well, though it is not necessary, to boil the cleats in beeswax until all air bubbles are driven out of them. This is necessary only with unglazed cleats. The glazed cleats do not require this extra precaution.

As porcelain cleats may be obtained cheaply at any electric store the cost of these insulators will be quite low.

Contributed by Cyril V. Bell.

HOME-MADE ANTENNA INSULATOR

In this day and age of low loss receivers and high selectivity it is necessary to have an antenna of very few losses, or the resistance of the antenna will be so high as to make it impossible to tune the set sharply.

How to do this? The antenna must be constructed of wire that will not corrode readily, enameled wire being the best. However, the most important thing is to have the best insulation possible. The very best insulator for the antenna is air, but of course that is out of the question.

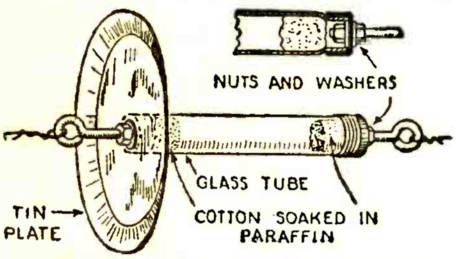
Doubtless, some one will think that because this insulator was designed for a transmitting antenna that it will not be good for the average broadcasting antenna. It is only necessary to remove the aluminum plate at the end of the insulator and you will have one of the very best insulators for a one-wire antenna. The plate is for use only when the insulator is used on a cage antenna with a transmitter.

The material that is necessary is as follows:

Long type toothbrush-holder with screw-cap at each end. This can be bought for about twenty cents.

If the insulator is for a transmitting antenna use a small aluminum plate. The other materials are odds and ends and can be found around the work shop.

Begin by removing the caps at the ends of the holder. Stuff small pieces of cotton in each end of the tube. Now it will be possible to pour in melted paraffin. Just enough should be poured in to seal the tube. This will prevent moisture from entering the tube and thus destroying the insulating power of the glass. Instead of paraffin, sealing



A pie-plate and a glass toothbrush holder are the essential materials for this antenna insulator.

wax, such as found on the top of dry cells, was used to seal the ends of the insulator used at this station. Now eye-hooks of about the same design as shown in the sketch and threaded on the end, should be constructed. When the eye-hook is attached to the cap it will be found necessary to place a big washer on the inside of the cap and a smaller one on the outside of the cap. This will prevent the ventilation holes on the cap from pulling out. It is a simple matter to place the aluminum plate at the end of the insulator. When the plate is used it should always be put at the end of the insulator which is hooked to the antenna.

When it is constructed, you will have a very fine insulator, which takes very little time to build, has a remarkable pulling strength and is very cheap.

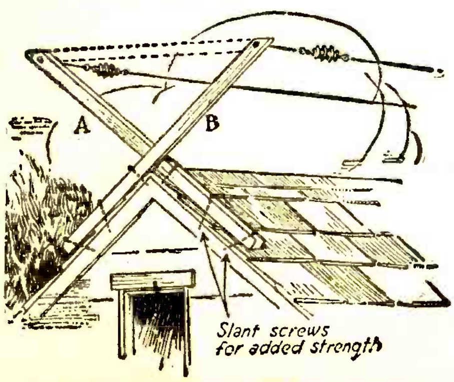
Contributed by C. H. Peck.

A SIMPLE AERIAL SUPPORT

The problem of erecting an aerial on the common slant roof is discouraging, to say the least, and is often one of the most bothersome factors in radio installation.

It takes time and often becomes an expensive item to erect a single pole mast on the ridgepole or at the peak of such a house. A special socket arrangement must be provided for the base of the pole and an elaborate system of guying must often be worked out. This necessitates an added expense in insulators and guy wire.

A simple and quickly worked out method of supporting an aerial is illustrated in the accompanying drawing. Any available stock may be used: wooden poles, two by fours, or even iron pipes.



An easily made antenna support constructed of two crossed sticks.

Screw the piece shown as A, flat to the roof allowing three or four feet, as a minimum, to project upward above the saddle board. This will extend the slant of the roof beyond the peak.

Attach the piece B in a similar manner on the other side of the roof. This will cross A at the ridgepole and extend upward in the opposite direction. The length projecting in the air will determine the space between the two aerial wires, if two strands only are desired.

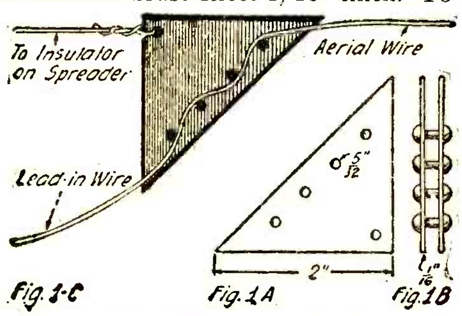
Connecting the two ends of the cross pieces as shown by the dotted lines will form a support for the transmitting aerial of as many strands as desired.

A cross arm bearing insulators will conduct the antenna safely by the chimney at the same time giving added support and distributing the strain.

Contributed by Willis H. Farnum.

AERIAL LEAD-IN CLAMPS

The purpose of this aerial-wire clamp is to eliminate splicing the lead-in wires to the aerial, thereby saving time and gaining efficiency; another advantage is that the aerial wires may be adjusted easily to the same length. The clamp is made of brass sheet 1/16" thick. To



This aerial clamp eliminates the necessity of splicing the lead-in wires to the aerial.

connect this clamp, cut out two pieces as shown in Fig. 1A. Drill holes as shown for 8/32" machine screws in both pieces of brass. Fig. 1B shows end view with plates and screws in place.

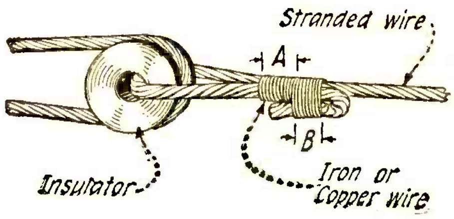
To assemble, insert 8/32" machine screws ½" long in holes of one of the plates. At the proper point on the aerial wire, weave the wire between the screws as shown in Fig. 1C, and put the other plate in place over this wire. Tighten two 8/32" nuts on each screw to hold the wire firmly. The clamp is then ready to fasten to the insulator or spread by means of a short piece of wire.

Contributed by Karl Noquist.

FASTENING STRANDED WIRE

There are quite a few listeners-in who use stranded wire for their aerials, or possibly for the guy wires. Those who have tried to fasten this kind of wire to insulators or other supports have found that it is a difficult thing to secure a satisfactory and neat job.

If the following scheme is followed out, a workmanlike fastening can be made that will not only look better, but will be stronger than usually found.



An excellent splice.

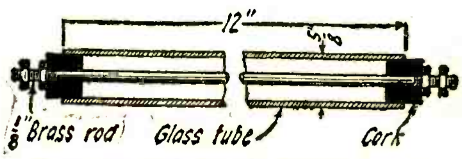
Bend the stranded wire through, or around the insulator, and pull about four inches through. Secure some copper wire, or galvanized iron wire, and begin winding, as shown at "A," very tightly and securely for about one-half to three-quarters of an inch. Then, bend the remaining end over, and continue the winding, as shown at BB; cut the extra binding wire off.

If desired, this joint may be soldered. A fastening will be obtained that will easily stand pull equal to the breaking point value of the stranded wire itself.

Contributed by Floyd French.

AN EFFICIENT LEAD-IN INSULATOR

A cheap and efficient antenna lead-in insulator may be constructed from a piece of ⅝-inch boiler glass tubing, two corks and a ⅛-inch brass rod. The glass tube, which should be 12 inches long, may be obtained from most any plumbing shop at a low price. For the best results, the corks may be dipped in hot paraffin to make them water proof. They are then forced tightly in the ends of the glass tube. The brass rod should be 14 inches long and should be threaded about one inch on each end. A hole large enough for the brass rod to pass through is bored through each cork and the rod inserted.



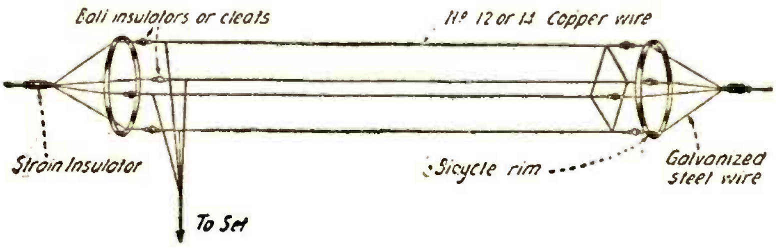
A very good lead-in insulator composed of a glass tube, two corks and a brass rod.

A nut is screwed on both ends of the rod and the lead-in insulator is complete. The insulator is passed through a hole bored in the wall, large enough for it to fit snugly and the antenna and receiver connected to their respective ends of the rod.

Contributed by
Harrison Schoolfeld, Jr.

CAGE ANTENNA

In constructing cage aerials, most amateurs experience difficulty in securing the hoops or spreaders. Although brass rod may be bent to the required shape, it is not always possible to procure same.



Bicycle rims are used for spreaders in this cage aerial.

I have successfully overcome this difficulty by employing discarded bicycle rims instead of the conventional brass rings.

The rims may be purchased in any sporting goods shop at a nominal sum. They should be varnished thoroughly before the cage is raised into position.

The details are clearly shown in the accompanying cut.

The insulators at the terminals of each wire are not essential. They may be used but I would not advise it. The only insulators necessary are those marked "strain." These insulators should be as perfect as possible.

Either stranded or No. 14 copper or copper-clad wire may be used.

The leads are taken off at a point convenient to the operating room and should be soldered at all joints. The lead-in may be a cage of smaller diameter, if desirable.

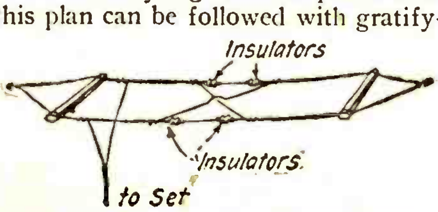
The cage type of aerial is rapidly finding favor among amateurs and is slowly replacing the simple single wire. It is efficient for either reception or transmission, and, if carefully constructed and erected on well designed masts, will stand up admirably under all weather conditions.

The hoops may also be placed at various points between the outer or main hoops in order to obtain a neat looking equipment. For stretches over one hundred feet it is advisable to employ four or more hoops.

Contributed by A. Havasy.

ELIMINATING INDUCTION HUM

If you are troubled by induction from a nearby high tension power line, this plan can be followed with gratifying results. The plan is used to eliminate induction from power lines when they run parallel to telephone wires, and when used with an antenna proves of great advantage. A two-wire antenna must be used and is arranged as shown in the diagram. It will be seen that the two wires cross each other in the middle of the span and end on the side of the spreaders opposite to that which they started. The wires must not come in contact with each other where they cross. They are kept apart by a long insulator. This arrangement will prove particularly useful where the antenna can only be erected in a position which brings it parallel to a power line. It will be found that about 90 per cent of all induction hum will be eliminated with this antenna. The reason for this is that the two fields of the two wires are assisting each other at one end and are opposing at the other, thus neutralizing any induction hum that otherwise might be heard.

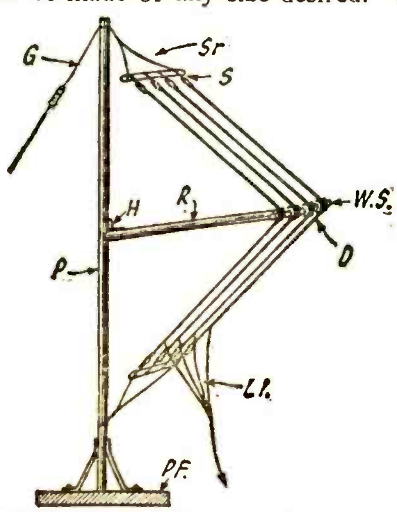


When the aerial is strung in this manner, electrical fields in opposite wires are neutralized.

Contributed by Otto E. Steinberger.

THE ELBOW ANTENNA

The portable aerial shown in the accompanying sketch supersedes the loop aerial and has a distinguished feature in that it can be placed in any position and be made of any size desired. On the top of a roof or from the side of a window it will adapt itself, and take very little room.



An aerial of this type proves very serviceable in locations where space is limited.

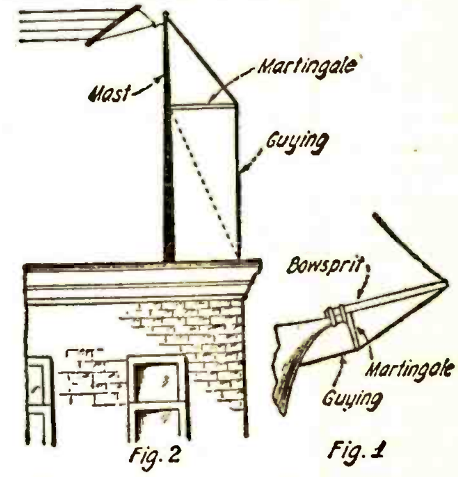
Referring to the sketch, the parts are G-guy wires, Sr-spreader, S-insulator, R-rod extending from the pole P to rod D which is held by a spring hinge to R. WS are wall insulators placed through the rod D whose duty it is to insulate the aerial wires from the rod. L-1 are the lead-in wires and PF a plate for fastening the pole in place. H is a common door hinge used so as to give free run to the aerial wires in case of heavy wind.

Contributed by Anthony A. Kiedis, Jr.

GUYING AERIAL MASTS

Having read Mr. Harry Lubke's article on guying aerial masts, I am contributing a plan of guying of the same nature, which would, I imagine, be more suitable for iron poles.

My idea deals chiefly with the use of iron pipe as a pole and was conceived while looking at a model of an old-time sailing ship. On such vessels the bowsprit was strengthened against the pull of the jibs by a "martingale" as per Fig. 1. Therefore in Fig 2 we have a modification of Fig. 1, which I believe would be a most satisfying method of guying an iron pipe aerial as well as those of wood.



This is a clever method of guying a thin iron mast.

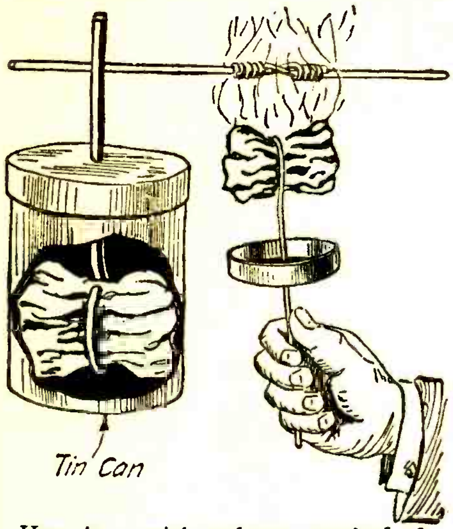
Contributed by John D. Garcia, Jr.

A TORCH FOR SOLDERING OUTSIDE JOINTS

The small alcohol torch would not stay lit in a high wind and the blow torch was out of order, so the following was improvised in order to solder the antenna joints on a recent installation.

First, a small baking powder can with a cover was secured and a hole was punched in the cover. Next a piece of cotton waste was rolled into a ball and a piece of stiff wire was twisted around it in the form of a handle. The handle was passed through the hole in the can top and the burr on the punching pressed down so that it firmly gripped the handle. The top should be in such a position that when the ball of waste is placed in the can, the top fits in place and excludes all air.

After preparing the joint to be soldered in the usual manner, the ball of waste is soaked in gasoline and set afire with a match. The blazing waste is held under the joint until the flux flows and then the joint is touched with a piece of wire solder. A further application of heat causes the solder to flow in the joint, which is then wiped clean.



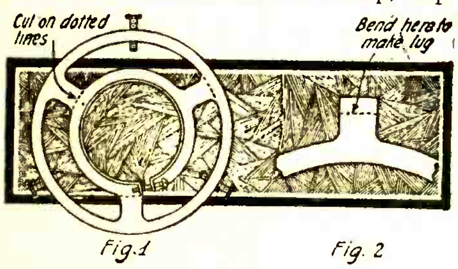
Here is a quick and easy method of soldering those outside joints.

When finished with the torch, put the ball of blazing waste into the can and the cover fitting into place will extinguish the flame.

Contributed by Jesse J. Hipple.

A SIMPLE GROUND CLAMP

A ground clamp which serves its purpose very well can be made from an ordinary electric light shade holder as shown in diagram No. 1. Cut off close to the inner circle all of the braces which connect the two circles, leaving one which is cut off close to the outer circle and then bent back on itself to form a soldering lug. The outer circle is then discarded. To attach, solder the ground wire in the lug, take the screw out of the clamp, slip



By altering the family light shade holder a good ground clamp results.

the clamp over the ground pipe, insert the screws and tighten. Be sure that the ground pipe is thoroughly cleaned and scraped.

Contributed by John Roblee.

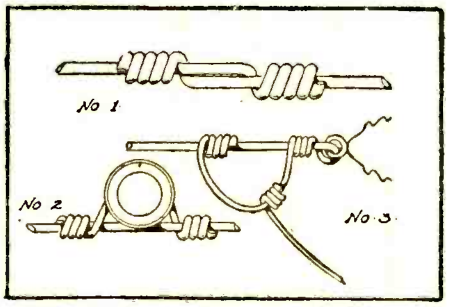
SPLICING AND SECURING RADIO WIRES

Twisting a couple of wires together is not alone sufficient to make a good electrical joint. The joint should be made with some pretense to strength as well and there is the right way to do it. The three diagrams in the accompanying sketch illustrate the main connections used in amateur radio work and are the proper ones for strength as well as conductivity of the feeble currents.

In No. 1 is shown the professional way of splicing two wires into a continuous length. It is known as the telephone splice. Lap the two ends several inches and then twist one wire bodily about the other. Soldering the twists at each end gives permanence of the union and makes a well jointed conductor.

Instead of wrapping a wire several times about an insulator, place it against one side and tie it with a yoke of wire wrapped half way around the insulator and then twisted at each end to the main wire. If wrapped about in several turns, these are apt to chafe through and break under stress of wind or storm. See No. 2.

The lead-in from the antenna is usually twisted about the antenna next to the insulator, which is a poor way to accomplish good results. Constant swaying of the antenna tends to bend the lead-in back and forth, which may result in its breaking off at a time when



Showing three good ways of splicing wires.

you desire to listen in. The best way (see diagram No. 3) is to bring the antenna through the insulator eye, wrap it around several times, as shown, drop it in a small loop and then wrap it around again about a foot from the eye. Then wrap the lead-in about the loop. Solder all three joints. This loop has just enough slack to take up the strain of swinging and snapping in a storm and makes a much more lasting and workmanlike job.

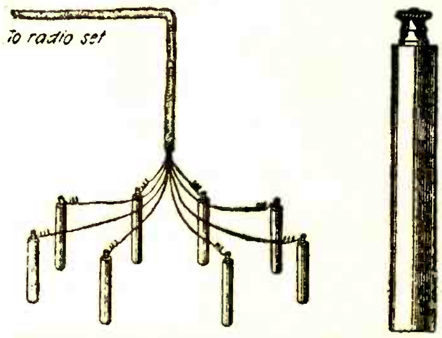
Contributed by L. B. Robbins.

AN EFFICIENT GROUND CONNECTION

The ground connection here described has the double advantage of efficiency and cheapness. The woven or twisted copper lightning rod of today is usually made up of about 32 No. 17 wires twisted in groups of four, first. When untwisted we have eight stranded wires. To the end of each attach the carbon from an old dry cell, by soldering, preferably. The eight terminals are then spread out in fan fashion, as shown, and buried in the earth.

If the ground is not strong a good way to place them is as follows:

Untwist the lightning rod for 6 or 7 feet. Then take a ¾-inch pipe and drive it down for a distance of 6 feet. Pull it out and the carbon can then be pushed in. By keeping the holes close together at the top, the ground can go down to the surface of the earth before



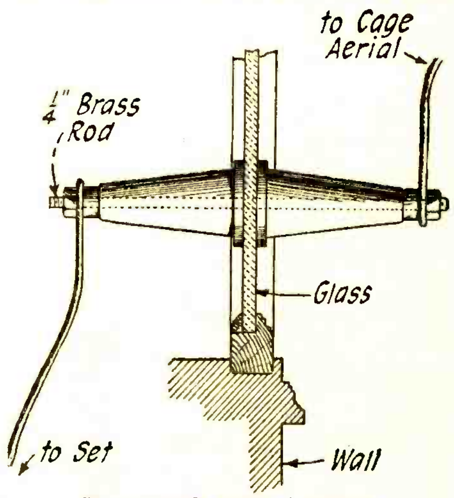
Carbon rods from dry cells make good grounds.

being spread, thus making a more solid job, less liable to be broken or pulled out of place.

Contributed by J. Horace Shaw.

HOME-MADE AERIAL INSULATOR

An efficient aerial insulator may be made at a very small cost, if constructed as shown in the accompanying diagram. In the center of a glass plate 12x12¼ inches, drill a hole to take a rod ¼ inch in diameter. Also drill the same size hole in the bottom of two jelly glasses. A drill may be made from an old three cornered file, ground down to suit. Rubber washers are cut to fit the tops and bottoms of the glasses. Now procure a brass



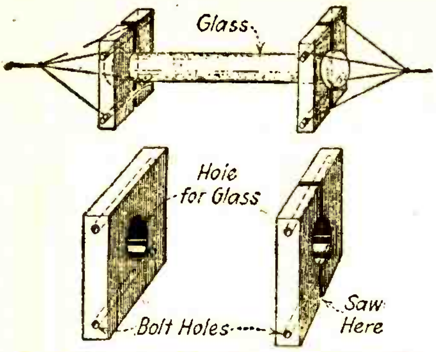
Home-made aerial insulator.

rod equal in length to the glasses and the thickness of the glass plate plus allowance for the necessary nuts and washers. The brass rod is placed through the plate glass and the jelly glasses, as illustrated in the drawing. This insulator will be found to be efficient and complies with the fire underwriters' code.

Contributed by L. C. Miller

GLASS ANTENNA INSULATOR

A cheap and efficient antenna insulator can be easily made as shown in the



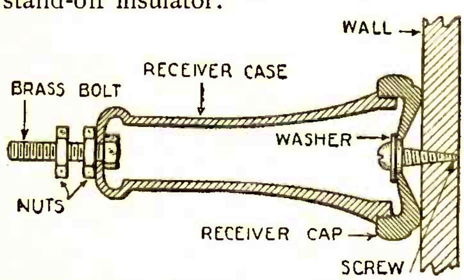
A good antenna insulator can be made with two blocks of wood and a glass towel rack.

sketch. Procure glass towel rods, which may be purchased at any plumbing establishment, about 15 inches in length. Two blocks of wood for each insulator 5 inches square and ¾ inch thick are drilled as follows: In the middle of the block a hole slightly smaller than the rod and through the block perpendicular to the large hole two holes large enough to take a ¼-inch bolt ¾ inch from the top and bottom of the block. The blocks are then sawed in half through the three holes. The glass rod is placed between the two halves of a block and fastened there by tightening the bolts through the small holes. The supporting wires of the antenna may be fastened to the bolts.

Contributed by Raymond Hadley.

INSULATOR MADE FROM TELEPHONE RECEIVER CASE

There are doubtless many fans who have in the junk box a discarded telephone receiver from their early days in radio. Maybe they have been tempted to throw it away, but refrained hoping that some day "it might come in handy." Well, here is a way to utilize it and incidentally save the price of a stand-off insulator.



A stand-off insulator is very easily made from a discarded telephone receiver.

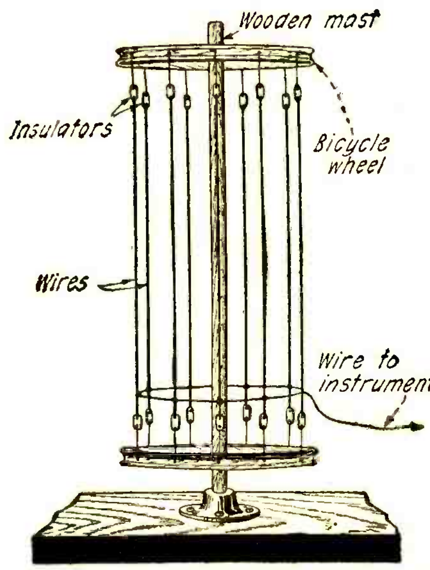
Through the hole in the cap of the receiver, from which the magnets and coils have been removed, place a wood screw large enough to support the rest of the receiver when it is attached as shown in the sketch. Between the head of the screw and the cap is placed a washer. Care must be taken in screwing the cap to the wall since, if the screw is driven in too tightly, the cap of the receiver will crack. In the other end of the receiver, through the hole that is used for the connecting wires, there is placed a bolt that will fit tightly. This bolt is fastened with a nut (again exercising care not to screw the nut on too tightly) and on the end of the bolt is placed another nut for fastening the wire that is to be insulated.

This insulator will be found to be useful and very efficient to the fan who is overhauling the antenna for the coming winter.

Contributed by G. A. Kappel.

AN UPRIGHT AERIAL

An upright aerial of the type shown in the drawing, is a worthwhile addition to any receiving or transmitting set, and is particularly convenient where but little space is afforded for



An aerial of this type is satisfactory for both reception and transmission purposes. It is very convenient where space is a factor.

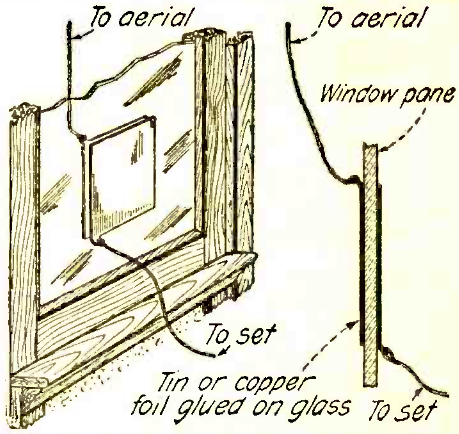
the erection of an antenna system. When used outside it cannot be knocked down by heavy storms, especially during the winter months when ice covers the wires and gives them additional weight. It is well known that a vertical aerial is the best type of collective agency that can be used in conjunction with a receiving set, and is also well adapted for transmission purposes. It has considerable capacity due to the fact that it is composed of a number of wires in close proximity to each other.

This type of aerial is very easily constructed, consisting simply of two bicycle wheels bolted at their centers to a wooden or bamboo pole of sufficient diameter to guarantee stability. The two bicycle wheels should be mounted about ten feet apart. The method of assembling is clearly shown in the accompanying illustration. Small insulators should be fastened at intervals along the peripheries of each wheel and the wires suspended between them. The lead-in, as shown, is taken from the lower portion of the aerial and led to the set. This type of aerial can of course be used very successfully in-doors.

Contributed by William E. King.

A CONVENIENT AERIAL LEAD-IN

This idea is for little Willie, whose mother won't let him bring his lead-in wire under the window because in summer the mosquitoes get in, and in



A clever stunt in the form of an aerial lead-in. The metal sheets to which the wires are connected act as a condenser.

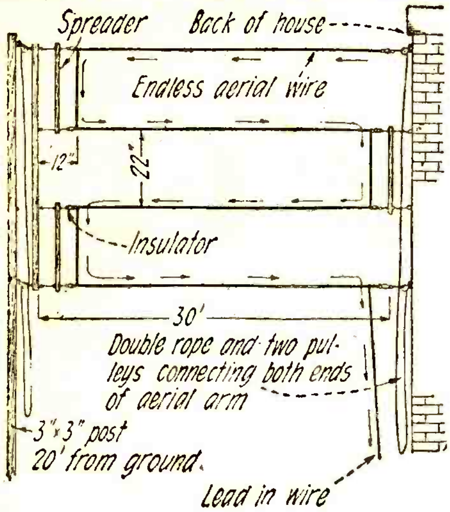
winter the cold gets in. The accompanying sketch illustrates the idea. On the outside of the upper pane of the window cement a piece of tin or copper foil of from 8 in. to 1 ft. square, and connect this to the aerial lead-in wire. On the inside of the window pane, and directly opposite the outer sheet of foil, cement another sheet of the same dimensions. A wire is led from this directly to the aerial binding post of the receiving set. These two sheets of foil, with the glass window pane between them, act as a condenser in series with the aerial. If it is necessary to have these two sheets smaller than the dimensions given, it is suggested that a variable condenser be connected in series with the inside sheet and the aerial binding post on the receiving set, as a small capacity tends to cut down the wave-length of the aerial proper. You hams who have transmitting sets will find this idea very convenient for use as a series antenna condenser.

Contributed by Frederick T. Swift, Jr.

A COMPACT AERIAL

I have an aerial erected in my back yard and it's such a "howling" success, I would not change it for a little bit. Have used it for two months and have been roof-gazing in that time on my travels along our elevated railroads and I have not seen any constructed along the same lines as mine.

I am sure none could be more successful and because of that fact and the originality of it (although some other fellow may have arrived at it the same as I), I am sending you a sketch of it.



The novel aerial built by Mr. Corry, of 1925 Fontaine St., Philadelphia. Excellent results are claimed.

I have tried to make the sketch as clear as possible. The usual rule for an aerial is to have a swinging horizontal arm at each end. I have a vertical arm at each end strapped to the mast. Using a pulley and rope at both the top and the bottom of each vertical arm, I am able to draw the entire aerial as tight as a fiddle. The top of the aerial is on a level with the roof of a two story house, and I do not experience the effect of a pocket.

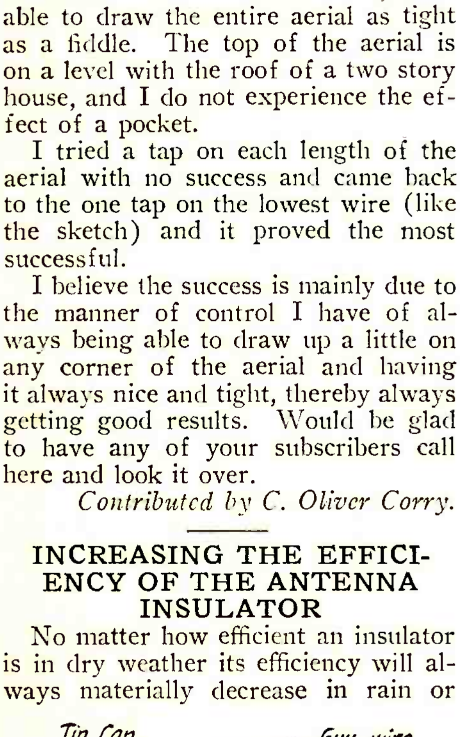
I tried a tap on each length of the aerial with no success and came back to the one tap on the lowest wire (like the sketch) and it proved the most successful.

I believe the success is mainly due to the manner of control I have of always being able to draw up a little on any corner of the aerial and having it always nice and tight, thereby always getting good results. Would be glad to have any of your subscribers call here and look it over.

Contributed by C. Oliver Corry.

INCREASING THE EFFICIENCY OF THE ANTENNA INSULATOR

No matter how efficient an insulator is in dry weather its efficiency will always materially decrease in rain or



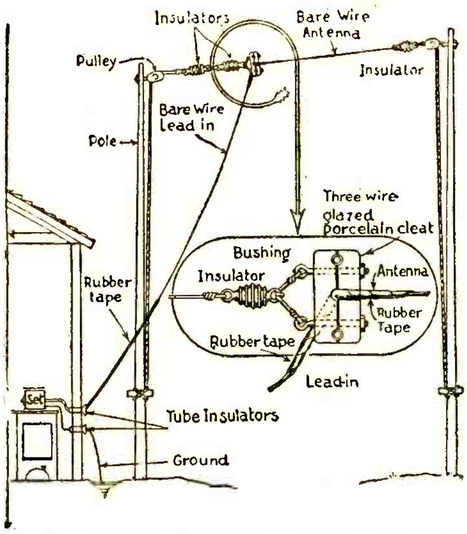
A protector for the outdoor aerial insulators.

snow. This is particularly the case of the common ball type insulator. For a number of years I have been using a scheme to protect the insulators on my antenna which has proved extremely efficient. This simply consists of covering the insulator with a tin can as shown in the illustration. This can should be of such size that there is at least ¾ of an inch clearance on either side of the insulator, and it should be placed so that the opening is at the lower end. A hole is bored through one end of the tin can large enough to pass the insulator eye through and this hole should afterwards be entirely closed with solder. The can should also be painted inside and out to prevent rust and corrosion. This type of covering will keep the insulator fairly dry in the most severe weather and those weak signals will still be picked up during heavy rain storms.

Contributed by Royle B. T. Snow.

AN ANTENNA CLAMP

Although few radio fans realize it, one of the places where there is possibility of extremely large losses is the connection between the antenna and the lead-in. This possible loss may be eliminated by having the antenna and lead-in all one piece of wire, as described below.



An antenna insulator of this type is both cheap and efficient.

The antenna clamp shown in the sketch is made from two porcelain clamps such as are used in house wiring. They should be of the "three-wire" variety, so that the antenna wire can be run through the middle groove and a bushing placed in the two outside grooves in order to prevent the cleats from breaking when pressure is applied to them after they have been placed in position. The antenna wire itself is insulated for about ten inches with heavy rubber friction tape at the point where it passes through the cleats and it is also insulated with the same tape for about twenty feet from the place where it enters the house. The drawing is self-explanatory, and if this system is followed, an efficient antenna should be the result.

Contributed by D. E. Phillips.

ELIMINATING THAT HUM FROM THE LIGHT CURRENT

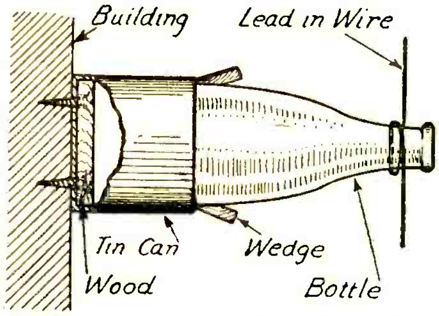
Being a radio fan and a constant reader of *Radio News,* my attention has been attracted several times to articles on induction due to the presence of electric feed wires being located near the antenna or the receiving set. In reading up several of these articles I find that they also render a few suggestions as to some possible means by which this induction hum can be eliminated. Almost always they first suggest that the antenna should be put at right angles to the feed wires. This method helps to a certain extent, but I have never been able to entirely eliminate the trouble by any of the plans that I have so far heard about. I am at present the owner of a two stage audio set and have had trouble with the induction from a light near the set. On local stations which come in loud it is not so noticeable but when I have the phones on my ears when bringing in out of town stations, they cannot be heard at all.

I have been experimenting to determine what would cut out this annoyance, but I could never completely remedy it. After experimenting with magnets and by-pass condensers and the like I finally gave it up as a hard task. One day, by accident, I found a very simple method by which I was able to eliminate the hum completely. I have a pair of Brandes phones which have on the back of each phone two small terminals where the cord is attached. I found that by putting my finger tip on one of these terminals it eliminated the hum perfectly without harming the signal strength in any manner. By test of touching each terminal as in the aforesaid manner you may ascertain which is the terminal with which you are going to work. If you find that none of the terminals respond to the test just reverse the connection of your headset at the output terminal of your set, and then give it another test and you will find it will work out all right. After you have located the right terminal, loosen the small bolt that holds your cord to that terminal and insert a piece of small gauged wire. This wire should be at least 8" to 10" long to give plenty of play to the phone, although the length has nothing to do with the efficiency of the plan. Then take off about 3" of the insulation from the other end of the wire. Put the phones to your ears again placing the wire behind your ear and you will find that your body will eliminate the undesirable sound that you heard before. I find that this little scheme works regardless as to how near the feed wire might be. I have had my antenna as close as one inch and running parallel to the light wires and I could not hear the slightest hum in my receivers.

Contributed by John Doe.

AN EFFICIENT "STAND-OFF" INSULATOR

Although the Fire Underwriters' regulations specify that all lead-in and ground wires should be supported at least five inches from the wall of any building, it is almost impossible to obtain an insulator designed for this purpose. A very efficient substitute may be made from an old ginger ale bottle and a tin can. The bottle should fit



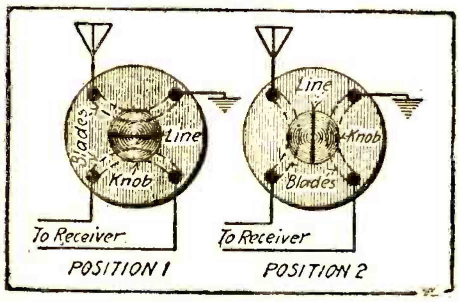
A tin can and a bottle makes a fine "stand-off insulator."

snugly inside the can. The can should be nailed or screwed to the outside of the building where the insulator is to be placed. In order to hold the can firmly, and to prevent its pulling away from the wall, it might be best to place a piece of wood, cut to the correct size, inside the can and nail or screw directly through it. The bottle should be inserted in the can and if it does not fit snugly, several small wooden wedges may be forced between it and the can to make it more secure. The lead-in wire may be secured to the bottle by a piece of wire wrapped around the bottle neck. Cork the bottle so that it will not collect water. This will make a serviceable and efficient extension insulator and will meet all the Fire Underwriters' requirements.

Contributed by Robert W. Burton.

AERIAL SWITCH

A double pole, double throw snap-switch, connected as shown, will save the expense of a regular aerial switch, when only a receiving set is used.



A snap switch connected as shown will serve as an excellent antenna switch.

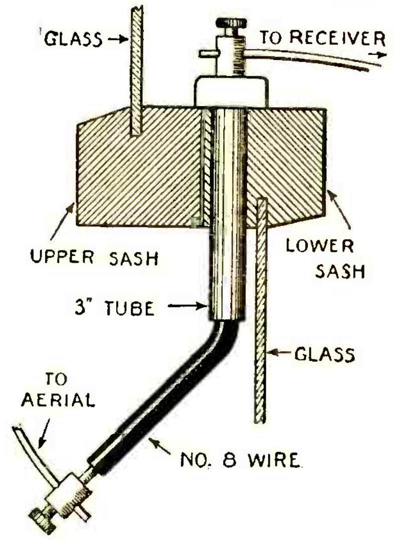
When the blades are in position 1 (as shown in the diagram) the aerial is grounded and the primary of the receiving set is short circuited. To receive, turn the blades to position 2.

These positions are indicated by a line drawn across the top of the switch knob with the point of a hot soldering iron.

Contributed by Robert Hertzberger.

NO RAIN TROUBLE WITH THIS LEAD-IN

There is no trouble from rain with the method given herewith for bringing a lead-in wire into the house. This lead-in is also very neat in appearance and easy to install. The only materials required are a porcelain tube 3 inches long of the kind commonly used in house wiring, a 1-foot length of No. 8 black rubber-covered wire, and two binding posts. Insert the wire in the tube, which it will fit snugly, and solder the binding posts to the two ends. Now drill a 5/8 of an inch hole



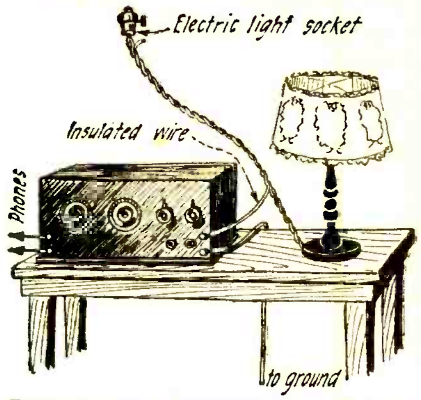
Drill a hole in the outside sash for the porcelain lead-in tube.

vertically in the top section of the lower sash, as shown in the sketch, so it will come outside the glass. The tube, with the wire enclosed, is inserted in this opening. The beauty of this arrangement is that the lead-in is kept clear of the building, while, at the same time, either sash can be raised or lowered as desired by bending the wire.

Contributed by J. D. McCrum.

EMPLOYING THE HOUSE LIGHTING CIRCUIT FOR AN AERIAL

The lighting circuit in your house can be used effectively as an aerial for receiving purposes by using one wire of the line. The accompanying illustration shows one simple method by which this can be done. A third wire is twisted around the lamp cord and one end of it is attached to the aerial binding post of the receiving set. The effect is the same as a direct connection, as the third wire forms a condenser. The rubber insulation on the wires acts as the dielectric and the two wires in close proximity to each other as the plates of the condenser. The capacity of the arrangement may be increased or decreased by twisting or untwisting more or less wire around the lamp cord. The correct amount of



By twisting a separate piece of insulated wire with the lamp cord and attaching its end to the aerial binding post of a receiving set, the lighting circuit can be used for an aerial.

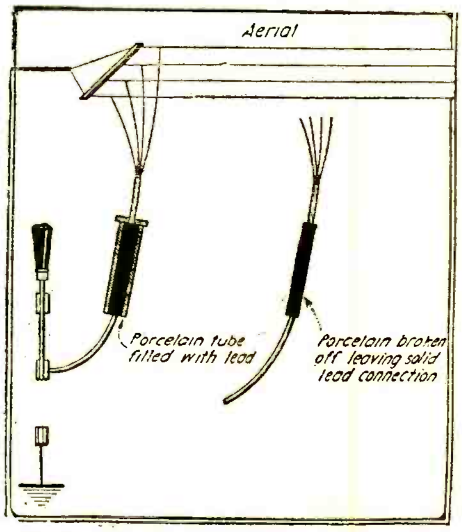
wire to use can only be determined by experiment.

Contributed by George E. Johnson.

A PERMANENT ANTENNA CONNECTION

Take a porcelain tube and run the lead-in wire through it until it reaches the place where the antenna is connected to the lead-in wire. Now stand the tube upright and pour melted solder in it. When the solder cools the tube can be broken with a few strokes of a hammer, leaving only the lead with the wires connected inside. This is a very desirable method of permanent connection, as the wires are not likely to be disconnected.

Contributed by Albert McGuirk.



If this idea is followed out you will experience no future trouble with loose or grinding lead-in contacts.

SHOULD GROUND HOUSE LIGHTING CIRCUITS

"Transformer secondaries should always be grounded when carrying less than 150 volts; grounding recommended up to 440 volts."

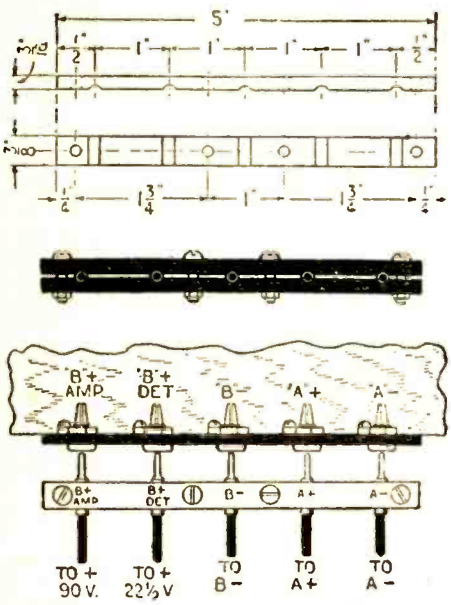
No. 32 or No. 34 B. & S., S. S. C. wire, which will give sufficient choking effect with a minimum of D. C. resistance so that the drop in voltage is small. The Bradleyohm is used to cut down the voltage to 22½ volts for use on the detector. In checking voltages obtained from the rectifier, only a high resistance voltmeter should be used; otherwise, the reading will be incorrect. The small watch case type should not be used, as it is too low in resistance.

Contributed by J. R. Benge.

A BATTERY CONNECTOR

In building a set it is usually a problem how and where to connect the batteries in as simple a manner as possible. In the accompanying sketches is shown a method for doing this that should appeal to every set constructor.

Two pieces of hard rubber or bakelite 5 x ⅜ x $\frac{3}{16}$ inches and a piece 2 x 6 x $\frac{3}{16}$ inches are prepared. The two pieces of bakelite are then hollowed out with a rat-tail file and drilled as shown in Fig. 1. Five cord tips such as used on headphone cords are placed between the rubber strips in the



A battery connector that will save many minutes of sorting and connecting wires.

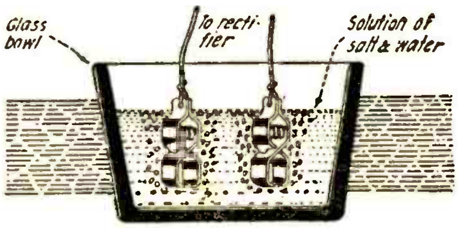
grooves, as shown in Fig. 2 and fastened together by bolts. Drill five holes in the remaining piece of bakelite to correspond with the phone tips in the pieces just prepared. These holes are of such a size that they will accommodate cord tipped jacks and these are now fastened to the strip. This strip is mounted on the baseboard and the connections from the instruments of the set are made as indicated in the sketches. The external battery connections are fastened to the tips with flexible wire and the assembly of the connector will be as in Fig. 3. This device permits instantaneous connection of the batteries to the set which is a very desirable feature.

Contributed by D. M. Clayton.

AN EASY METHOD OF CLEANING CHARGING CLIPS

Due to the increasing number of low-priced rectifiers being placed on the market, many amateurs are using them to keep their storage batteries in trim. Most of all charging outfits are furnished with spring clips to clamp on the battery terminals and after a few months of service these become coated with an objectionable white substance.

The writer found a very quick way to remove this substance from the clips satisfactorily. A bowl of water and a tablespoon of salt is all that is



Clean your test clips by this method.

necessary. The salt is dissolved in the water and the clips to be treated are immersed about ½ inch apart. Then the current is turned on in the same manner as if a battery was being charged and bubbles and a greenish liquid will come from the clips. The action of the current causes electrolysis and the white substance is changed chemically into the greenish liquid. If your clips are iron, as mine were, the greenish liquid will be ferric chloride which changes in a few minutes to ferrous chloride which is brown. Two or three minutes only will be necessary to finish the operation. Then the clips are dried thoroughly with a rag and they are ready for use.

Contributed by Harry Lubcke.

A PRACTICAL WAY TO USE A HOME BATTERY CHARGER WITH A RECEIVING SET

A simple, convenient and practical way to use a home battery charger of the vibrating type is to fix it in a permanent position. This will obviate the necessity of setting it up each time a charge is to be given to the battery. Also, the cords will not wear out prematurely through rough usage and damage to the charger is not so likely to occur.

The diagram shown above represents a layout that works perfectly. All that is necessary to do to charge the battery is to throw the switch blades in the "up" position. This will connect the charger to the battery and the alternating current supply at the same time.

The red lamp may be omitted but it serves a god purpose. It shows that the charger is connected to the battery. Of course the vibrator gives audible indication but sometimes a charger will get out of adjustment and stop vibrating. If the red lamp is burning and the charger not vibrating, the switch must be opened to prevent the battery from discharging. If the vibration ceases because of no line current the red lamp will be extinguished. The switch should be kept open until the line current is restored. If the lamp burns and there is no action on the charger it is probable that an adjustment is needed. Sometimes merely opening and closing the switch will start the charger vibrating again.

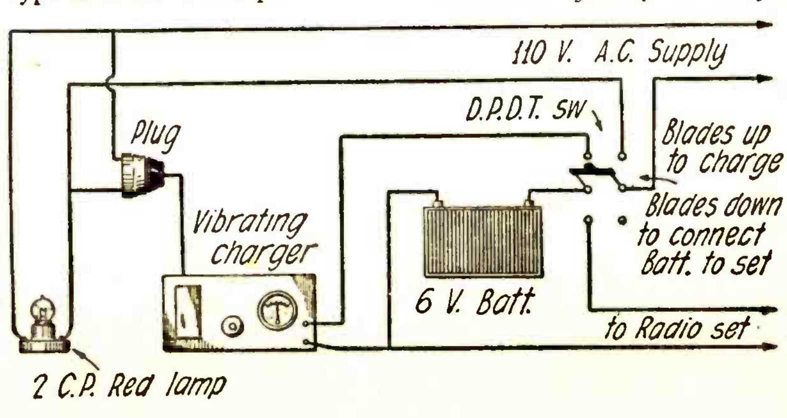
Contributed by Kenneth A. Schaaf.

A CHEAP "B" BATTERY

Amateurs can build a very economical high-tension battery using waxed-paper tubes with a cork at the bottom. Inside, put positive sacks from worn-out pocket dry cells, and a little strip of zinc with suitable connections. As exciting solution, dissolve two parts (in weight) of "agar agar" (a well-known sea-weed) in 100 parts of boiling water, add 20 parts of chloride of ammonium, stir up well and fill, when still hot, the paper tubes. The solution quickly becomes a soft jelly and you have a cell unbreakable, unspilling in any way, quite clean and very constant. With 36 cells in a cardboard box, you easily get 40 volts and 100 milliamperes, invaluable for portable radio sets.

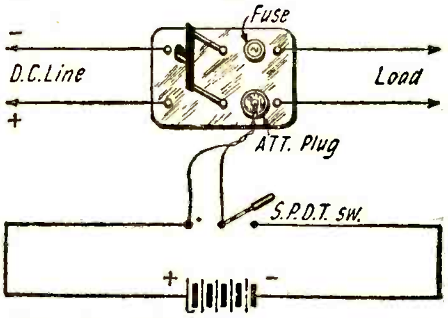
Contributed by Prof. M. Moye.

By using this circuit arrangement, it is a simple matter to place the battery on charge, or connect it to the receiving set, merely by throwing the D. P. D. T. switch.



A SIMPLE BATTERY CHARGING SCHEME

Wherever there is commercial direct current, it is a very simple matter to charge storage batteries. If the battery is charged directly from the line, a resistance must be used in series to cut down and control the current flow. This resistance usually takes the form of a bank of lamps. But why go to any extra expense to charge the battery? Why not charge it at the same time the house lights are used and thus save money? This is a very simple matter if the scheme shown in the diagram is followed. A fuse block and double pole switch are inserted between the house lights and the line.



By using this scheme your storage battery will always be fully charged.

One fuse is removed and an attachment plug is inserted in its place. The two wires from the plug are run to a S.P.D.T. switch, which is in turn connected to the battery. When the switch is thrown to the left, the battery is out of the circuit and when it is thrown to the right and any lights are being used, all of the current is flowing through the battery and charges it at the rate of current flow. The lights will be slightly dimmed as the battery uses part of the current that would ordinarily go to light the lamps. If one 100-watt lamp is being used, the battery is being charged at about one ampere. The battery will consume approximately eight watts, which is deducted from that consumed by the lamp and will consequently cause the lamp to be slightly dimmed, which, however, is no inconvenience, as it is hardly noticeable.

Contributed by D. E. Crabb.

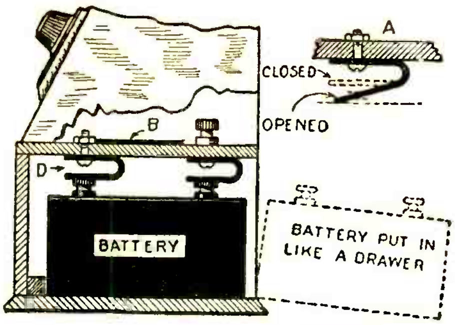
RADIO "B" BATTERY CABINET

This novel radio "B" battery cabinet is designed for the set owner who desires neatness and efficiency.

It is constructed to eliminate unsightly wires and makes the removal and replacement of "B" batteries a very simple matter, somewhat similar to the changing of the batteries in a flashlight.

The battery is inserted from the rear and pushed all the way in, contact being made by spring brass clips.

A connection is made for the 22½-volt in the front of the cabinet and is brought to the rear by a brass strip. Connections can be made by bus bar to the set from these posts. The cabinet shown in the sketch is designed to take a 7x18 panel, but a larger one can be made.



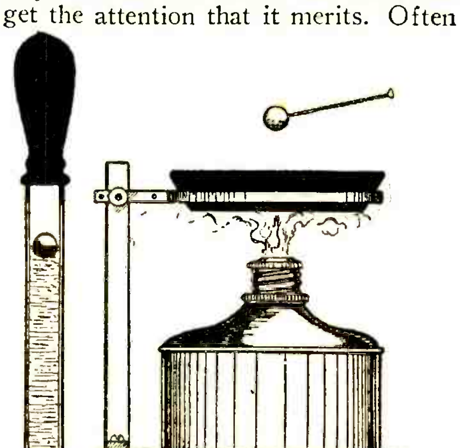
An excellent method for disposing of the "B" batteries.

The interior measurements for the battery compartments are as follows: Length of each compartment, 8¼ inches; depth, 6½ inches, and height, 4 inches. Spring contacts are 3x1 inch, bent in the center. Perfect connections can be made and the danger of short circuits and improper hooking up of the batteries is entirely eliminated.

Contributed by Joseph J. Dargo, Jr.

HOME-MADE BATTERY TESTER

One of the chief parts of a radio receiving equipment is the storage battery, and all too often this does not get the attention that it merits. Often



Small balls made of cork and sealing wax can be used for hydrometer floats.

it is allowed to remain in a discharged condition, which is very unwise. There are also several other difficulties which could be avoided if proper use was made of a hydrometer. Too often hydrometers are not replaced if broken, and yet there is a very simple method of repairing them and also for making new ones.

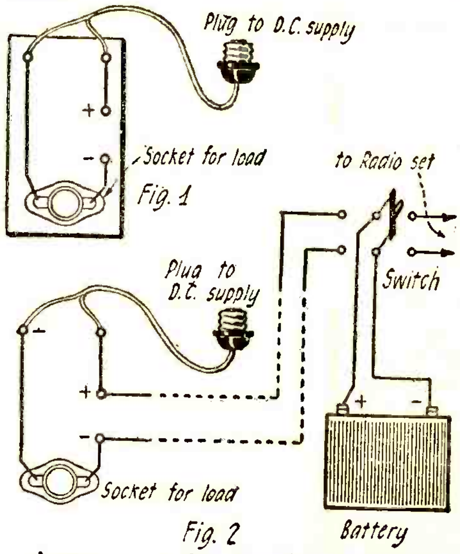
On the point of a pin place a piece of cork about the size of the head of a safety match and roll it in melted sealing wax until a generous amount is collected on the cork. When the wax has cooled, remove the pin and close the hole by holding the ball of wax over a flame. Then place the wax ball in either an old hydrometer tube or a large medicine dropper, and fill with solution from the charged battery. Sandpaper the wax ball until it just floats in the solution. Then prepare another ball of a different colored wax, but this time put the ball into a solution taken from the battery when it is in a *discharged* condition. These two balls are then placed in a hydrometer case, as mentioned above.

The method of testing with this hydrometer is to draw some of the battery solution up into the hydrometer, and if one of the balls, for instance, the red one, which can be used to indicate the discharged condition, floats and the other one sinks, the battery needs charging.

Contributed by Lyonel Goodenrath.

CHARGING BATTERIES FROM DIRECT CURRENT SOURCES

Where direct current is available, "A" batteries can be charged by the following method. Fig. 1 will serve to indicate the scheme. Lay out the arrangement as indicated, using a wooden base four inches by eight inches. The polarity of the battery binding posts should be clearly marked as explained later. The polarity of the attachment plug need not be marked, providing it is always attached to the same socket, and is not a reversible plug (one which can be plugged in in either of two directions). Such a panel will conveniently hang on a nail and may be used continually wherever and whenever a table lamp, floor lamp, vacuum cleaner or other device is desired.



Arrangement for charging a storage battery from the D.C. line

The only precaution which must be observed is to determine the proper polarity for the attachment plug, and to see that this does not change when the charger is used in some other location.

To determine the proper polarity, connect the circuit as indicated in Fig. 1, with battery in place and a lamp as a load, and turn on the current. Note the brilliancy of the lamp. Now turn off the current, reverse the battery connection and turn on the current again. Note the brilliancy of the lamp. The connection giving the darker lamp is the correct connection. The battery binding posts should now be marked with proper polarity. If the attachment plug is of the Edison screw plug type, no difficulty will be experienced in the future. However, if it is possible to "plug in" in the wrong direction (because of the type of plug), it is readily seen that the wrong connection may result. If you have one of these reversible plugs, mark it in some manner so that it will always be used correctly.

A simple polarity indicator can be made by adding a slight amount of salt to a glass of water. If the two electrodes are immersed in the solution, bubbles will rise from the *negative* electrode. This test should never be made without some sort of protective resistance, such as a lamp, in circuit.

Having determined the polarity of the leads to which the battery is to be attached, connect positive to positive and negative to negative.

It is interesting to note that an electric flat-iron, if not continually in use, usually becomes too hot if permanently connected to the line. With this device, it is quite likely that the iron will operate at the proper heat continuously and will, at the same time, supply a very reasonable charge for the battery. Ordinarily two or three hours per week of charging with the electric iron will suffice to keep the battery in good condition. The circuit arrangement shown in Fig. 2 will be found very convenient for those who prefer the permanent installation.

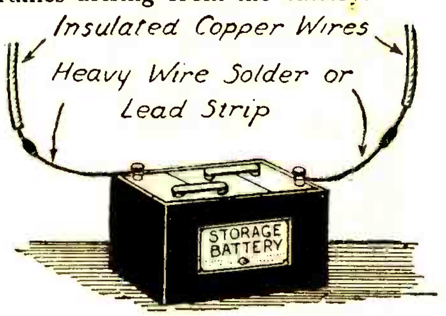
Contributed by W. P. Powers.

NON-CORROSIVE BATTERY LEADS

The fumes that arise from a lead plate storage battery when it is charging or discharging have a very troublesome property of corroding certain metals. One of the metals so affected is copper. Usually leads made of this material are used for connecting the storage "A" battery to the set. In such a case the wires soon start to corrode, especially at the point where they are fastened to the battery terminals. This corrosion takes the form of a soft, pasty, bluish mass, being most prominent at one terminal.

After this formation starts to build up, the connection between the wire and the battery terminal becomes bad and gives trouble. Usually it is necessary to entirely remove the wire and thoroughly clean the terminal.

All of this trouble can be remedied once and for all by soldering or clamping a piece of heavy, hard wire solder about a foot long to each of the terminals. The copper leads may then be soldered to the ends of the lead strips, as shown. Other materials than solder may be used for this purpose. Strips of lead, or in fact any lead that can be readily found and can be soldered or clamped tightly to the terminals will fill the bill. The most important point is to keep the copper leads away from the battery, using the non-corrosive metal where it will be exposed to the fumes arising from the battery.



Wire solder may be used to prevent corrosion on battery connections.

As an added precaution, coat the connections, the terminals of the battery and the connection strips with a thin film of vaseline or lubricating grease. This will prevent any possible corrosion of any impurities that happen to be present in the metals, and will tend to preserve the appearance of the battery.

Contributed by A. P. Peck.

HIGH AMPERAGE "B" BATTERY

A "B" storage battery which will hold its charge any length of time, that is if it is a home made one, is a novelty and for that reason I am going to describe the construction of a battery of relatively high amperage.

The only materials required are two shingling hatchets, or a heavy hammer

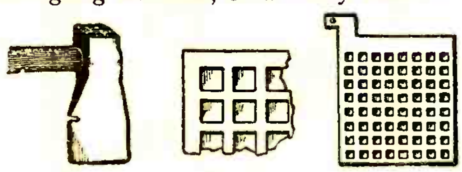
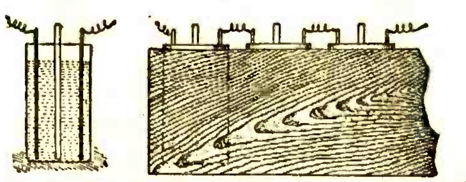


Fig. 1 *Fig. 2*



Single cell and complete battery of 22½ volts

A good storage "B" battery is described in the accompanying hint. This battery has a high capacity.

with a corrugated head and a corrugated or pitted plate of iron or steel or any metal harder than lead.

On the head of most shingling hatchets will be found a design very useful to battery making. It resembles a plate with small crosswise grooves cut, which, when they make an impression, the grooves, on the contrary stand out as small ridges as in Fig. 1, leaving small pits about 1/8" square.

If no shingling hatchet is procurable, cut cross-wise grooves with a file about 1/16" deep and about 1/8" apart on the head of a hammer (or on a block of metal suitable to hold in the hand) and with it strike the lead plate a heavy blow. Then cut another set of grooves exactly at right angles to the first set of grooves, forming a criss-cross pattern.

The plates should be sheet lead about 1/16" thick and of a size convenient to the jars or test tubes used for containers.

Now, put one hatchet or the pitted plate in a groove on your work-bench or in a vise with the rough side up, then place the strip of lead on the plate and hit it heavily wih the other hatchet or hammer. Upon examination a print will be found similar to Fig. 2.

The short ribs which run cross-wise give mechanical strength while the increased surface gives much more electrical capacity.

Continue the stamping until the whole surface to be immersed is printed.

After the battery is put together and the electrolyte is poured in, it should be charged. For a 22½-volt battery this should take about 30 minutes the first time, then it should be discharged as quickly as possible. When almost completely discharged the circuit for charging should be again connected but in a different direction from the first charge.

When this alternation of the direction of the current has gone on for about five times the plates will be found to be of a spongy consistency between the short ribs owing to the decomposition of the matter in the plates under the electrical action. After five changes the maximum of surface will have been obtained and the best results given. However, this alternation should not be continued longer as the ribs will begin to decompose and the mechanical strength will be so weakened that the plates will soon fall to pieces.

A battery of these cells may be constructed to deliver 150 to 300 volts for power amplifiers and low range transmitters. Although such a battery would involve considerable tedious work it would well repay the constructor by the efficient operation obtained.

Contributed by Frank W. Godsey, Jr.

SALVAGING WORN-OUT "B" BATTERIES

Here is a stunt which I heard of recently and which will be of benefit

(*Continued on page* 90)

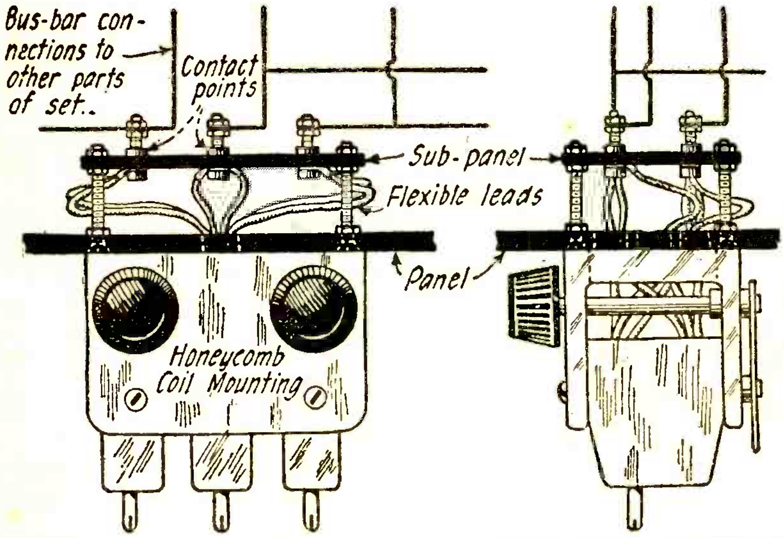
COIL MOUNTINGS

The choicest of hundreds of various methods which can be employed to mount all types of coils. Any one of them will serve to give fine results.

HONEYCOMB COIL SUB-PANEL

When building a three-coil honeycomb coil receiver, the wiring of the set is usually spoiled by the flexible leads that must be carried through the panel. These leads are fastened to various bus bar connections which go to the other instruments. This means that when the coils are moved the bus bar wires are pulled out of position. This is liable to cause a short circuit at some position, but the main point is that it makes a very untidy job. When I built my receiver I determined to wire it in a neater fashion and finally hit upon the idea of using a sub panel, as shown in the accompanying drawing. This sub panel is used with a standard honeycomb coil mounting and consists of a piece of hard rubber or bakelite 2¾ x 1¾ inches, mounted to the rear of the regular panel and about ¾ inch from it. On this are mounted six binding posts for the primary, secondary and tickler connections. The sub panel is fastened to the panel by means of four brass machine bolts of the required length. The flexible leads from the honeycomb coil mounting are passed through ¼-inch hole in the panel and fastened to their respective binding posts on the sub panel. The cost of the material needed is very little and is quite compensated for by the improved appearance of the wiring of the set.

Contributed by Henry M. Bosland.



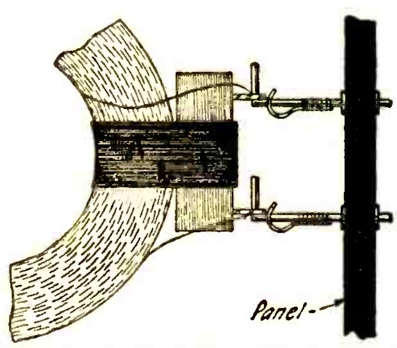
The constructional details of the honeycomb sub-panel are clearly shown here.

AN EASILY CONSTRUCTED HONEYCOMB COIL MOUNTING

Although many new tuners have been invented, the honeycomb coil still proves itself very efficient, adaptable to many circuits, and, at the same time, practically the only efficient tuner of universal wave-length. One of the principal objections to its more widespread use has been the rather great initial cost of buying the mounting and the many plugs required for the numerous coils. But here is a successful mounting that costs almost nothing and is not difficult in construction, the parts being obtainable at a hardware store for a few cents.

A single mounting consists of two right-angle brass hooks fastened directly to the panel of the set, one inch apart and one above the other, as shown in the illustrations. Three such pairs of hooks can be placed side by side, an inch apart, to constitute a triple coil mounting.

The "plug" consists of two small screw eyes screwed into a small block of wood, with a separation of one inch. The screw eyes should be of such a size that they will fit rather snugly over the hooks of the mounting. The leads of the coil are soldered to the screw eyes, the wire coming around the coil and to the nearest eye, so that the polarity of the various coils will be the same.



A very simple and practical mounting for honeycomb coils. The small springs fastened to the hooks insure good contact.

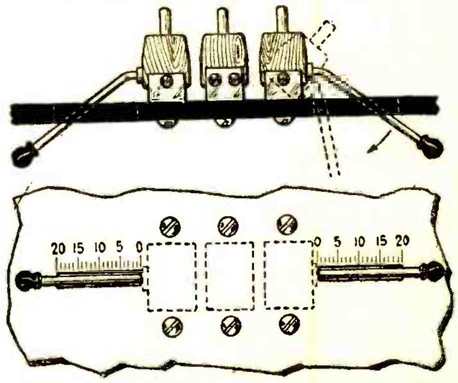
Connections from the set are, of course, made to the hooks of the mounting. If the screw eyes fit snugly, there will be a positive connection, but if they are a bit loose, it will be necessary to solder to the horizontal part of each of the hooks a piece of brass wire, bent in such a way as to bear against the screw eye when the plug is in place. This will insure a good connection to the coil. The plug can be easily fastened to a honeycomb coil with ordinary friction tape. Such a mounting will support the largest honeycomb coil, it is also useful, however, for spider web coils, which are, perhaps, more satisfactory for short wave-lengths. Two small screws through the edge of a spider web coil and into the plug will fasten them securely.

Such a tuner, using home-made honeycomb and spider web coils in the ordinary regenerative circuit, has proved very satisfactory for amateur and broadcast reception and for the reception of the long wave commercials.

Contributed by David R. Inglis.

A HONEYCOMB COIL MOUNTING

When designing a radio receiving set employing honeycomb coils, one usually desires to improve the appearance of the outfit where it is possible, as well as the over-all efficiency of operation. By placing the honeycomb coil mountings on the rear of the panel and extending long arms through slits cut in the panel, the coupling of the coils is just as easily controlled. The arms employed for moving the coils are usually supplied with the mountings; however, they can easily be constructed from lengths of brass rod, with small composition knobs on their ends, for manipulation, and the elimination of body-capacity effects.



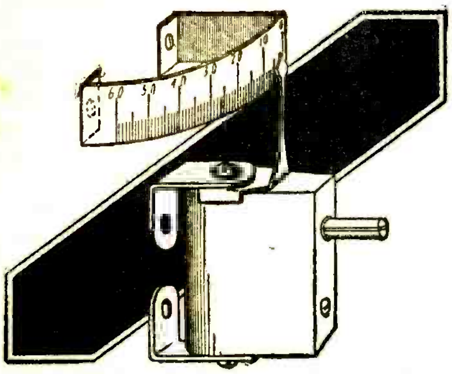
This illustrates the clever arrangement of the three-coil honeycomb-mounting on the rear of a panel, with the controls on the front.

Referring to the sketches above, it will be seen that the mountings are behind the panel. On each side is a slit, $\frac{3}{16}''$ wide and about 2″ long, through which the controlling arms pass. For further convenience, scales are marked on the panel directly above the slits. These can be either in degrees of coupling or marked in fractions of an inch.

Contributed by Belgrave F. Gostin.

H. C. COIL SCALE AND POINTER

A scale and pointer to indicate the degree of coupling on honeycomb coils is an exceedingly useful adjunct.



A scale for the honeycomb mounting requires very little material to make.

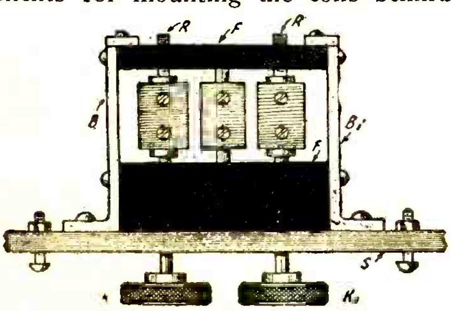
Most standard mountings do not provide this and, after tuning in a difficult C. W. station, there is no means of recording the degree of coupling that was found to be necessary.

This can quite easily be remedied by the simple arrangement indicated in the accompanying sketch. The scale may consist of an ordinary rule bent to the required shape, while any odd piece of brass may be cut to form a pointer. The latter is attached to the coil mount in the manner shown in the diagram.

Contributed by Wm. L. Bayham.

HONEYCOMB COIL MOUNTING

The honeycomb coil mounting shown in the diagram is very easily constructed and is one of the best arrangements for mounting the coils behind



The mounting for honeycomb coils often causes trouble to the amateur. Here is a back panel mounting that can be made easily.

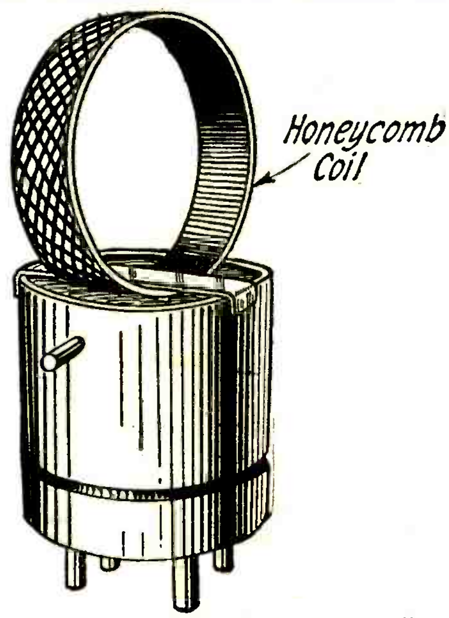
the panel. It is often undesirable to have the coils mounted on the face of the panel, especially when close adjustment of the coupling is required. In this arrangement a very fine adjustment can be obtained and at the same time no capacity from the operator's hand need affect the tuning. If desired, this capacity effect can be still further eliminated by shielding the panel.

The method of construction is fairly evident. The two pieces F. F. may be of wood, fibre or bakelite, with holes drilled and tapped to take the rods R. R., to which the two movable mountings are attached. B and B1 are strips of fairly heavy brass bent to the required shape and attached as indicated.

Contributed by Harry A. Tubbs.

USES FOR VACUUM TUBE BASES

Below is shown the method of mounting a honeycomb coil in an old vacuum tube base. First clean out the base of the insulating material. The coil is mounted on the base as shown, and the leads, soldered to two of the prongs, are fastened with a thin strip of insulation passing through the



A changeable mounting can be easily made by mounting a coil on a discarded electron tube base.

center of the coil and soldered to the base. By connecting two leads to the corresponding terminals of a socket an excellent mounting is provided.

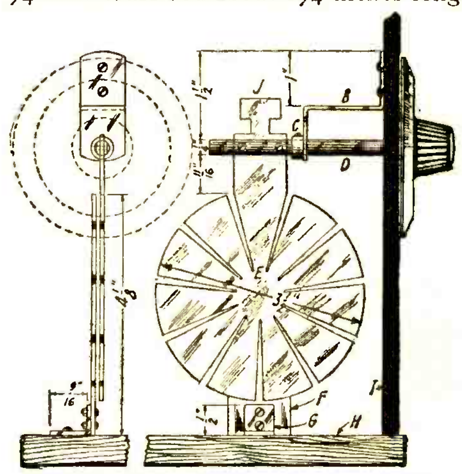
If desirable, four leads having different colored insulation are soldered to the four prongs of the base. The space around the wires is filled up with sealing wax. Leads are run to terminals of a socket, so that the base may be used as a battery switch.

Contributed by A. Malmros.

A SPIDER-WEB COIL MOUNTING

The following, together with the illustration, is a description of an excellent form of spider-web coil mounting. Probably the most impressive feature of this arrangement is its compactness, compared to other mountings. The construction is simplicity itself and the parts required are few.

Referring to the sketch: A is a knob and dial; B is a piece of brass or phosphor bronze bent so as to form a support for the coil and shaft; C is a bushing which serves to prevent shaft D from sliding. The shaft D is a ¼-inch brass rod about 3¾ inches long



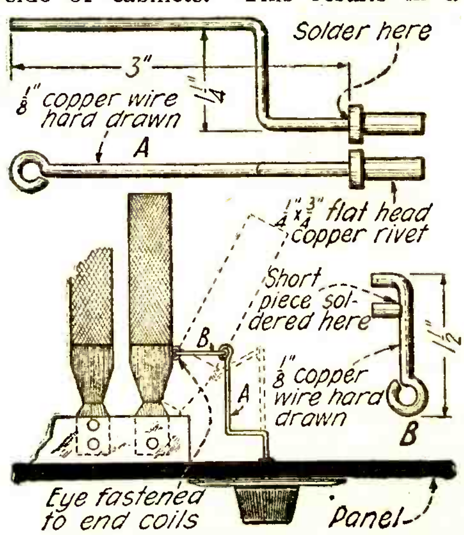
Details of the spider-web coil mounting. The coil forms can be made of any good insulating material.

with a slit near its end to take the end of the spider-web coil form E. F is the base of the second coil form which is attached to the baseboard, H, by a brass bracket, G. Since the spider-web coils are not heavy, no trouble should be experienced in balancing the movable coil. If the weight of the coil is too great a counter-balance may be attached to the upper end of the form, as shown at J.

Contributed by O. L. Van Dyke, Jr.

A DUO-LATERAL OR PANCAKE COIL MOUNTING

It is customary to mount duo-lateral and pancake coils on the front and outside of cabinets. This results in a



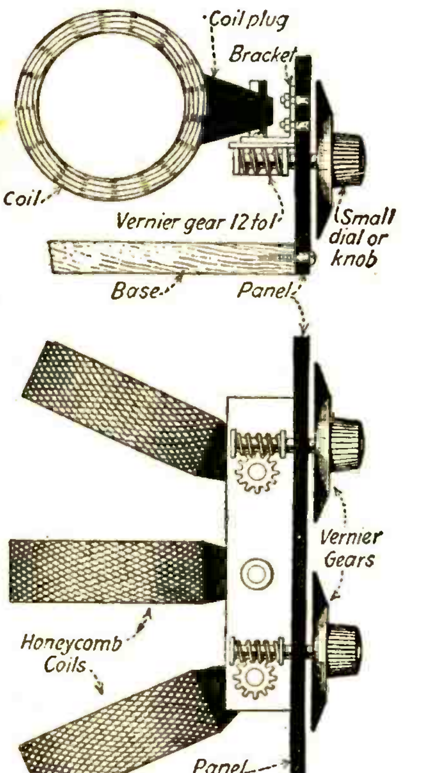
A clever arrangement for varying the coupling between inductances. It will stay put at any adjustment.

somewhat clumsy appearance of the apparatus and also leaves the coils continually exposed to the capacity effects of the body when tuning. By the simple arrangement shown, it is possible to place these coils inside the cabinet where they can be efficiently shielded in the same manner, and their exact position controlled and determined by dials mounted on the front panel. As the tops of practically all cabinets are hinged, coils can be changed so as to work on different wave-lengths with practically the same ease as when the old style mounting was used. The accompanying sketches, showing the manner of construction, are self-explanatory.

Contributed by A. A. St. Aubin.

HONEYCOMB COIL MOUNTING

One of the most difficult instruments to construct so that it will operate smoothly and have a fine control is a three-coil variable mounting. In the sketch is shown a mounting that any experimenter may make, which should be satisfactory.



A few odd worms and gears afford an excellent means for use in a coil mounting.

The vernier gears shown are taken from a discarded mandolin or may be purchased at a hardware store. The sub-panel that the gears are mounted upon is of bakelite or hard rubber and should be about four inches in length. The two brackets that hold this sub-panel to the panel of the set are made of brass strips ¼ inch wide and 1/16 inch thick.

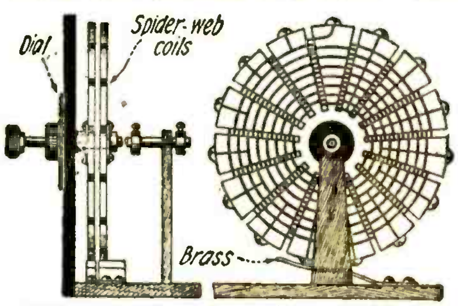
The first operation in the construction of this mounting is to drill the sub-panel as shown. Dimensions will not be given here as they depend upon the type of gears used and also the type of coils. However, a precaution might be mentioned. Be careful in drilling the sub-panel to keep the drill at right angles to the sub-panel so that the shafts of the gears will run true. As may be seen in the sketches, the worm parts of the gearing system are attached to the dials of the set.

The manner of attaching the coils to the gears may be done in any number of ways. The simplest is to drill a hole in the standard mounting that comes with the coils of such a size that they may be fastened securely to the vertical shafts of the gears. It will be found that this system of mounting honeycomb or spider-web coils is one of the best that has yet been tried.

Contributed by John Hayek.

A SPIDER-WEB COIL MOUNTING

The new mounting shown in the accompanying sketch makes use of two coils of spider-web construction and permits variation of their coupling. One of these coils, wired as usual, is fixed in the center of the wooden form and a tube attached to a knob. The



This mounting allows for a rapid adjustment of inductance and coupling.

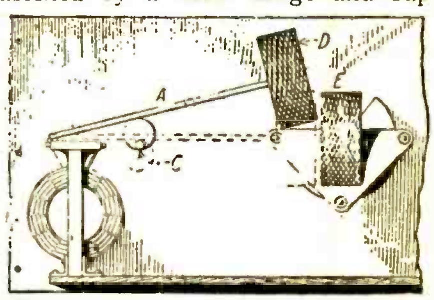
other is also fixed in the center on a shaft which can slide in the tube. This coil is attached to another knob as shown in the sketch. Each coil is tapped every several turns. Tapped points made of screws are fastened on the periphery of the coil. Brass strips under these give a good contact. Turning each coil changes its corresponding inductance; in pulling or pushing a little knob, the coupling may also be varied. Connections to the end of each coil are made of flexible wire. The two inductances can be coupled in series or used as primary and secondary of a loose coupler. The model employed in my receiving set had the following constructional details: Spider-web coil forms were made of thin, hard wood 8" in diameter; 15 slots were cut in the form and wound with 195 turns of No. 22 S. C. C. wire. Each coil is tapped every 13 turns so there is a tap on each slot. A disc of brass is then soldered on the axle of the movable coil and fastened to the form by four screws. The other coil is fixed on the tube in the same way. The large knob with the 360° dial as well as the small one, were made of hard wood. The stroke of the main shaft is limited by two collars placed on each side of the end support. Contact strips are made of brass and are fixed to the cabinet by screws. The contact strip corresponding to the movable coil is wider in order to keep contact through the total variation of the movable coil. This unit will give excellent results if correctly made.

Contributed by Robert Serrell.

A SIMPLIFIED COUPLING CONTROL

The receiver constructor is often confronted with the problem of an unsymmetrical panel layout in favor of proper instrument spacing and efficient wiring, a neatly arranged panel seldom giving apparatus arrangement to permit of best efficiency and short connecting leads. For best efficiency, inductance coils are mounted directly on the condenser by which they are tuned, being placed at right angles to the plates. Variable inductive coupling to such coils generally presents a difficult construction problem, which is quite simplified in the method illustrated.

A is a length of ¼-inch doweling, fastened by a small hinge and sup-



Easy way to mount honeycomb coils. A small cam allows a vernier coupling adjustment to be had.

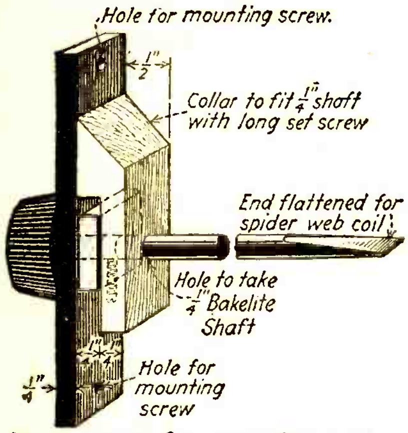
ported by a post on some one of the instruments, such as an audio transformer. C is the shaft back of the panel, upon which is secured a small cam at an off-centered point, 180 degrees rotation of the dial on shaft C giving maximum to minimum coupling between the two coils. The diameter of the cam used will vary with the length of A, also with the distance between the shaft C and the hinge; the longer the length of A, or the shorter the distance from C to the hinge, the smaller the cam must be. If D is the regenerative coil and the hinge is fastened to the first audio transformer, the wooden dowel can be replaced by a small brass rod and used as the connection between coil and transformer. Exact measurements of course must be determined in individual cases. If coupling changes obtained by rotation of the dial are too abrupt, this may be remedied by sliding coil D back on the dowel, giving greater spacing between D and E.

Although honeycomb coils are shown, the system is quite adaptable to other types and conditions, arrangements of which will be immediately suggested to mind.

Contributed by E. E. Griffin.

SPIDER-WEB COIL MOUNTING

One of the most difficult coils to mount as a rotor is a spider-web coil and the arrangement here is one that may be built with little trouble, and it should prove to be very satisfactory.



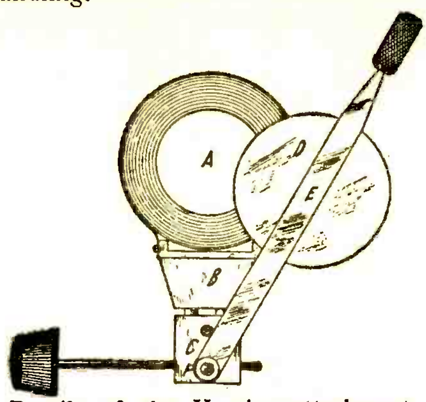
Arrangement for mounting spider-web coil rotors.

A piece of hard wood ¾-inch square and 3 inches long is cut and filed, as shown in the accompanying sketch. A hole to take a ¼-inch shaft is drilled through the middle section, and it might be well to add a caution here—be sure that the drill is held in a perpendicular position with respect to the face of the mounting. The shaft is a hard rubber or bakelite rod ¼ inch in diameter flattened at the end, so that it may be slipped through the turns of the spider-web coil. The collar shown may be one from a discarded dial and fitted with a set screw of such a length that it will strike against the side of the mounting, thus forming a stop and preventing the pig-tail connections of the rotor from being twisted off. With the bearing secured to the panel as shown and the set screw tightened to the shaft, the shaft may rotate through about 300 degrees, smoothly and with no end play. The mounting can be fastened to the panel with the two screws above and below the shaft.

Contributed by W. C. Hall.

A VERNIER ATTACHMENT FOR HONEYCOMB COILS

This wrinkle, as the diagram illustrates, consists of a metal disk attached to a lever made of brass or other suitable substance. A brass screw provided with a spring passes through one end of the lever into the coil socket as illustrated. The spring washer is necessary to insure smooth running and rigidness. The brass lever must be bent so as to clear the edges of the honeycomb coil. A small insulating knob is mounted on the other end of the lever for convenience in handling.



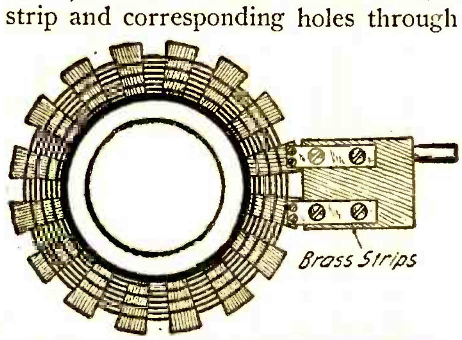
Details of the Vernier attachment. The parts are: A, honeycomb coil; B, coil plug; C, socket; D, copper disc; and E, the brass lever.

There are no particular dimensions necessary, but the disk should not be too large. The greater the diameter of the disk, of course, the greater will be the change in wave-length. Disks about two inches in diameter should be about right in the average case. The wave-length increases more rapidly as the disk approaches the center of the coil than when approaching the edge, so it is advisable to set the condenser first when the disk is near the edge, then a slight increase or decrease of wave-length is obtained by moving the disk in or out as required.

Contributed by E. H. Wood.

MOUNTING SPIDER-WEB COILS

So many amateurs have honeycomb coils and mountings that I conceived the idea of adapting the honeycomb coil mounting for use with home-made spider-web coils. This was accomplished by connecting the latter coils to the plug in the manner shown in the diagram. The coils must be wound on a bakelite or hard rubber form. Two pieces of brass to secure the form to the plug are cut in the shape indicated; two holes are drilled in the strip and corresponding holes through



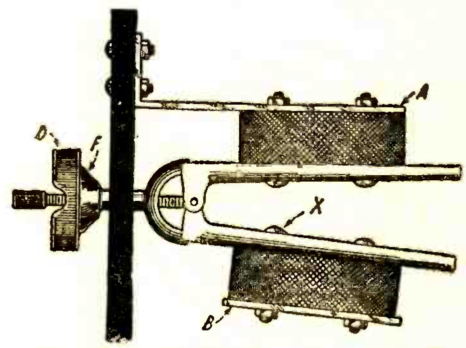
Spider-web coils can be connected on honeycomb coil plugs in this manner, and the same mounting used for either type of coil.

the honeycomb coil plug. In drilling these holes, care should be taken not to touch any of the metal points in the plug. The spider-web coil form is held to these brass strips by two bolts through the holes at the end of each strip. In mounting the coils the metal strips on the middle coil should be bent to bring it to the exact center and the other two coils are mounted with the side holding the coil plugs toward the center.

Contributed by Birrell Mitchell.

A PANEL HONEYCOMB MOUNTING

Much difficulty is generally experienced in providing a suitable holder



Here is a mighty clever scheme. A drawing compass is used to vary the coupling of unit inductance coils.

and coupling arrangement for honeycomb or duolateral coils. The problem is still more complicated if the coils are to be mounted in the rear of the instrument panel.

I have evolved a unique coupler for this purpose, which, under actual operating conditions, works very well. It consists, essentially, of a compass with the inductance coils affixed to each arm. Coupling variation is obtained by turning the knurled adjusting knob, which moves back and forth on the threaded rod.

A compass, obtainable in any stationery store, is drilled and countersunk at the four points, X, in the diagram, to pass 6/32 flatheaded machine screws. Two small stiff brass strips are cut to size and drilled for 6/32 machine screws. It would be well to nickel these strips if neat appearance is desired. Location of the holes will have to be computed after all material is at hand. The fixed coil and brass strip, A, are securely held to one arm by the two machine screws. Similarly, the upper or movable coil is attached to the other arm. It is necessary to drill a rather large hole in the panel to allow free movement of the shaft. The entire unit is then mounted as securely as possible to the rear of the instrument board. To obtain a good grip on the controlling knob it is necessary to fasten a suitable sized rubber or bakelite knob, D, to the knurled adjusting nut, E. The action is self-explanatory and an extremely smooth control is possible.

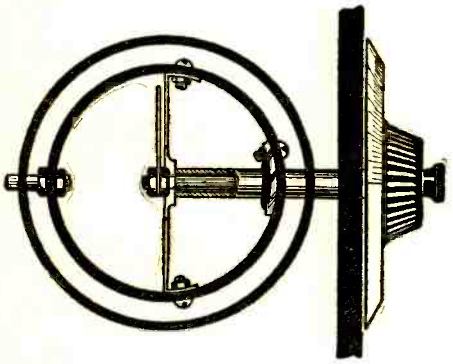
Contributed by D. Butterly.

CONDENSERS

A condenser for every purpose. Complete constructional details from which anyone can readily assemble and build neat and efficient condensers.

A VERNIER CONDENSER

After unsuccessfully experimenting with various types of "vernier" adjusters, I devised the condenser shown in the sketch. It is mounted *within* the rotor of a vario-coupler or a variometer, and connected across the rotor coil. The movable plate is of the conventional design, while the stationary plate is provided with lugs at each side for mounting. The shaft of the variometer is replaced by a short length of ¼-inch copper or brass tubing, held in place by an anchor plate to which it is securely soldered. The rotor plate is mounted on a brass or copper rod extending through the tube, and terminated by a small knob on the face of the dial knob, through which it passes.



A clever arrangement in the way of Verniers. This can be mounted within the rotor of a vario-coupler or variometer.

The sketch is practically self-explanatory. The idea can be easily adapted to any style of instrument, and has the special advantage of not requiring additional panel space.

Contributed by Kenneth Sloan.

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A variable condenser is an instrument that the experimenter usually has to buy, and it is rather an expensive proposition too, especially when several of them are required.

The condenser illustrated above is easily made, the only cost being that of one 3" or 4" dial and a sheet of mica. The idea is to make the rotary plate integral with the dial, and the stationary plate with the panel. It, therefore, takes up no space behind the panel, allowing for a more compact set with shorter leads.

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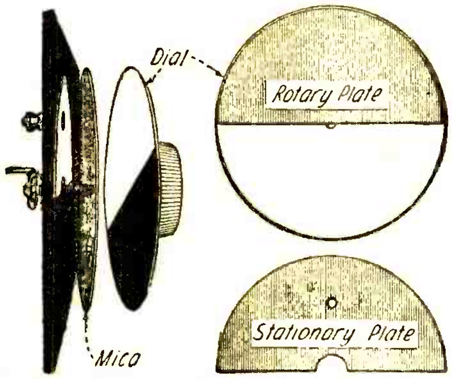
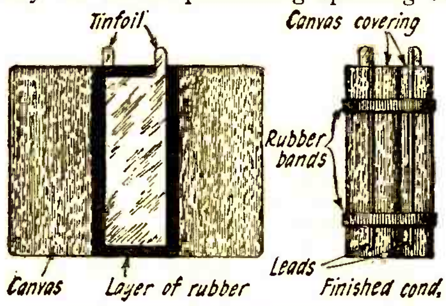


Here is an easily constructed variable condenser. A knob and dial, some tinfoil and a mica circle are the required materials.

Contributed by Horace B. Phelps.

A HIGH CAPACITY FIXED CONDENSER

The following is a method for making a condenser of considerable capacity for use in preventing sparking of vibrators in rectifiers, where not too high a voltage is employed. Get some scrap soft rubber such as rubber corks, tubing, or elastic bands and dissolve them in benzine (highly inflammable). The solution should have a consistency of thin mucilage. Take a piece of canvas slightly more than twice as large as the condenser in length, and in the center paint a thin layer of rubber. In a few minutes this will be dry. Then place a sheet of thin tinfoil on the layer, the size of the tinfoil being such as to leave a ¼-inch margin of rubber around, and a one-inch lead projecting. Paint another thin layer of rubber on the tinfoil and when dry, repeat the whole process, alternating the rubber and foil. When the height has reached about ½-inch, apply pressure to the condenser. A small screw press will prove very handy for this. Then proceed again with the rubber and tinfoil. When you think you have made enough layers, the thickness of the condenser being optional with the maker, fold the condenser up in the projecting ends of the canvas and place two rubber bands over the canvas to keep it in place. The connecting stubs are then carefully soldered each to a lead and the wire brought under the elastic bands so as to reduce pull on the foil projecting, as shown in the diagram. If the solution is made thicker, and also the layers of rubber, the condenser can be made to withstand higher voltages.

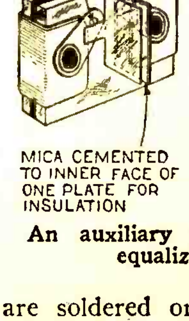


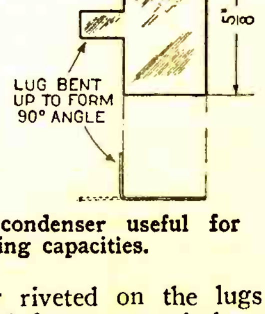
A condenser of any capacity can be made by using a rubber solution as the dielectric.

Contributed by B. Kellam.

METHOD OF EQUALIZING CAPACITIES

In the majority of intermediate frequency transformers in Super-Heterodyne receivers it is necessary to put a condenser across the secondary in order that all the transformers may be operating on exactly the same wavelength. No matter how well the secondaries of the transformers are matched when wired up in the circuit, the connections may again unbalance them. The small plates that are shown in the accompanying sketch act as a small condenser in parallel with the fixed condenser and may be adjusted so that the capacity of the larger condenser may be increased an infinitesimal amount. The small plates are cut from No. 20 brass or copper sheet and are soldered or riveted on the lugs which are provided on most of these





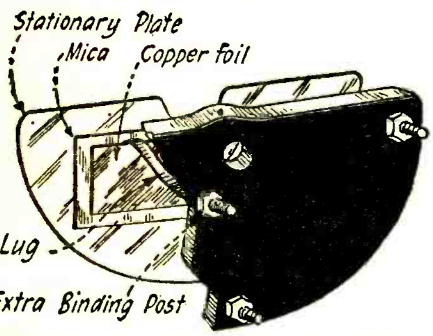
An auxiliary condenser useful for equalizing capacities.

small fixed condensers. A strip of thin mica is fastened to one plate with shellac for insulation. The capacity of this vernier condenser may be varied by pushing the plates nearer together or farther apart.

Contributed by R. E. McAdams.

A COMBINATION TUNING AND GRID CONDENSER

Herein is described a combination tuning and grid condenser which will save considerable space and at the same time increase the efficiency of any receiver in which it is used. Instructions for building radio sets almost invariably advise the builder to use short leads in wiring the instruments. This is particularly true in the grid circuits. The resistance of leads six inches or more in length is not high, but when we take into consideration the extremely low voltage induced in the secondary circuit, the value of short leads becomes apparent. In order to avoid body capacity effects, the grid condenser is usually connected to the stationary plates of the secondary condenser. Since the plate of the grid condenser is connected to the stationary plates, why not do away with one plate of the grid condenser entirely and substitute the stationary plates of the secondary condenser? A simple method of accomplishing this is to remove the end piece of the secondary condenser and fasten a clear piece of mica about .001 inch thick and one inch square to the outside stationary plate by means of shellac. A piece of tin or copper foil may then be placed over the mica to form the other plate of the grid condenser. This plate may be fastened to an extra binding post placed on the end piece of the condenser by means of a small lug. The grid connection is made directly to this binding post. The details of construction can clearly be seen in the accompanying sketch.



Circuit and construction of details of a combination tuning and grid condenser.

Contributed by O. Johnson.

A NOVEL VERNIER CONDENSER

A two-plate vernier condenser which is novel in every respect and which continues its originality right up to the point where it is mounted on the panel, describes the home-made device for which instructions are given in this article. The instrument described in the following paragraphs not only fills every need of the amateur for close tuning, but it is also so easy to make that there are no work-bench difficulties to discourage even the most unskilled of enthusiasts. When finished, the vernier condenser may be mounted in a vertical position on the base of the receiver and controlled by thumb from the face of the panel.

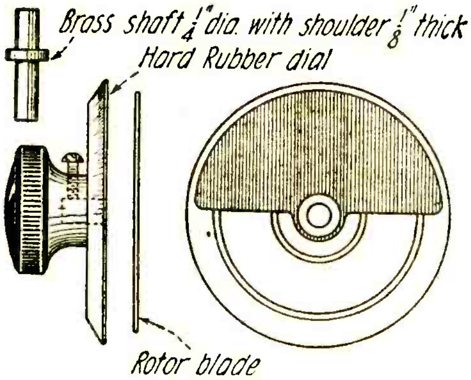


Fig. 1

Showing the method of mounting the rotary plate on the dial. This is accomplished by a brass shaft with a shoulder.

The rotor of this novel vernier condenser is made up in a jiffy from three familiar parts of other apparatus. These three are a dial, a spare condenser plate (or one cut from brass, copper or aluminum if no spare movable plates are available) and a ¼" brass rod with a shoulder. Put together in the order named, we have a rotor element for our condenser which is held together by the set screw in the knob of the dial. The single plate is pressed closely against the under side of the dial by the shoulder on the brass rod, as indicated on the assembly Fig. 1.

The brass rod need not be very long, in fact there is a limit to how much of it may be above the shoulder, that limit being set by the depth of the hole in the dial. The shoulder, as may be seen, plays the dual role of check nut and space washer, since it not only holds the spare rotary plate in place but also determines the thickness of the air dielectric between that plate and the stator.

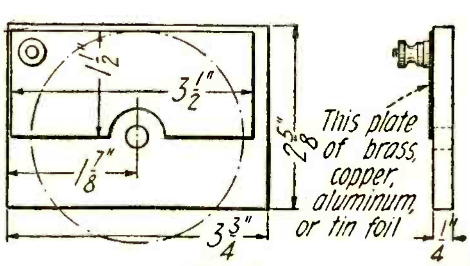


Fig. 2

Dimensions and details of the stationary plate and its mounting.

The stator, in this home-made instrument, is made by fastening a piece of sheet brass, copper or aluminum over the greater half of a piece of wood or bakelite, which has been drilled to take the brass rod now acting as the shaft of the rotary plate. Fig. 2 gives the dimensions for this half of the instrument. Using a three-inch dial and the usual size of condenser plate, the stator plate should be 1¼" by 3½". The bakelite should be about the size indicated in the sketch. In some cases where the writer has equipped a receiver with these vernier attachments, it has been advisable to omit the bakelite back altogether, mounting the fixed plate directly on the base of the receiver.

Whichever the case, the ¼" hole which is to take the rotor shaft should be drilled not more than 1" from the panel edge of the base. To illustrate the reason for this, a broken line circle showing the position of the 3" dial is drawn on Fig. 2. The rim of the dial overlaps the edge of the base ½". This overlap protrudes through a narrow slot in the panel, cut so that it is directly below the main condenser of which the smaller and home-made device is an auxiliary. With just enough of the dial showing to permit of thumb pressure, the capacity of the two plate vernier may be controlled from the outside of the panel. This method of control is illustrated in Fig. 3 which also shows the manner of mounting the home-made condenser after it is made.

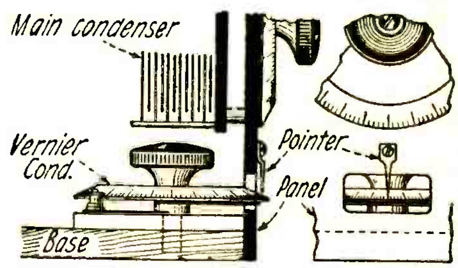


Fig. 3

Method of mounting the novel vernier condenser. It is adjusted from the front of the panel by the thumb or forefinger.

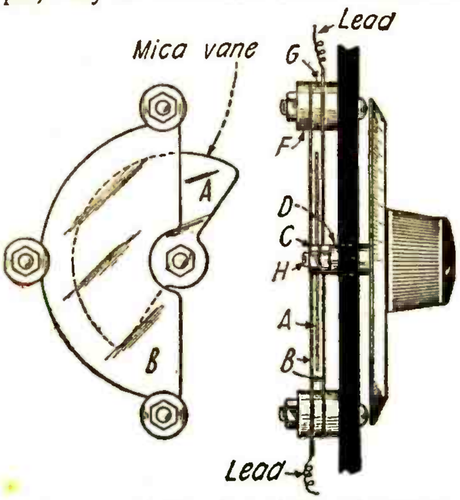
If a bakelite base is used, it is put close against the panel, and the hole continued down into the base of the receiver, deep enough to provide a firm bearing for the movable plate. Mark out the slot in the panel, drill it and then complete the job with a hack-saw blade or a file. A pointer is added—and presto, the work is done!

For the stator connection, put in a binding post as shown in the sketches; for the rotor, solder the wire on the head of the set screw which holds the rotor element of the instrument together. And if there is another word of caution one radio amateur ought to tell another when suggesting this vernier, it is this: drill that hole straight!

Contributed by Arthur S. Gordon.

A MICA VANE VERNIER CONDENSER

The vernier condenser about to be described has several features to recommend it to the amateur. It is simple, easy to construct from odds and



A rear and side view of the mica vane vernier condenser. The movable member changes the dielectric between the two stationary plates, thus increasing or decreasing the capacity very gradually.

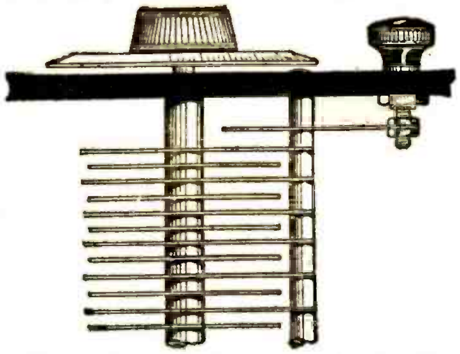
ends, and best of all, the effect of body capacity in tuning is entirely eliminated. The principle upon which it is based is rather novel in that the capacity is varied by changing the dielectric itself.

A glance at the accompanying drawing will suffice to explain its construction. Two condenser plates BB, which may be salvaged from a discarded condenser of the conventional type, are mounted on the rear of the panel as shown. F and G are fibre or bakelite washers, the separating washer G being about 1/16" thick. The rotating element A consists of a mica vane, cut to shape and punched for the shaft H. The vane is secured to the shaft by lock nuts, and the whole rotates in a short piece of brass tubing D, which is fitted into a suitable hole in the instrument panel. A dial completes the device. Leads to the set are taken from the two fixed plates, thus eliminating sliding contacts and at the same time rendering the shaft electrically "dead," so that here is no chance of body effect from this source. Since mica has a dielectric constant of about five times that of air, it can be readily seen that rotation of the dial produces a change in capacity amply sufficient for the purpose of sharp tuning. The writer has found the device quite satisfactory. The experimenter can easily adapt the details of construction to meet his own resources, and is assured of a worthwhile addition to his set.

Contributed by C. W. Halligan.

A SIMPLE VERNIER ATTACHMENT

Here is a vernier that can be added to the variable condenser of your set very easily. Drill a hole in the panel near the condenser and mount an old switch lever (I have used a long shank binding post) after breaking off the



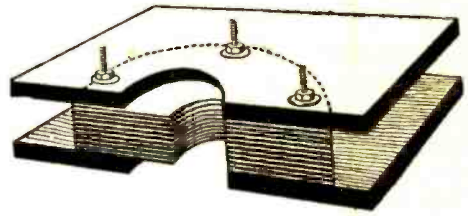
A vernier attachment made of an extra condenser plate controlled by a separate knob.

blade. Cut and drill a piece of aluminum (as per the sketch) and fasten it to the switch post so the plate will slide between the panel and the stationary plate of the condenser. Fasten a lead from the switch to the rotary plates of the condenser.

Contributed by R. J. Haris.

HOME-MADE STRAIGHT-LINE WAVE-LENGTH CONDENSERS

It is more or less a useless task to compare the advantages of a straight-line wave-length condenser with the average condenser that is on the market to-day, as they have been listed in many magazines. Many fans have purchased condensers of the old type and would like to have those of the

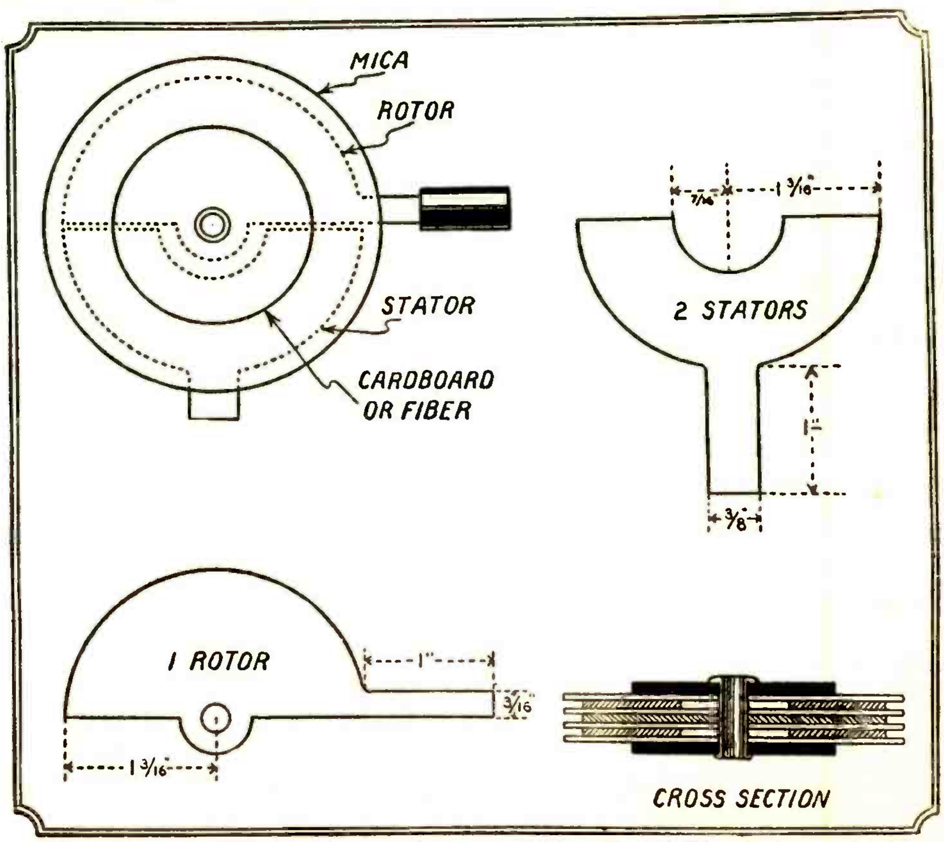


With little effort a straight-line wave-length condenser can be made from an ordinary condenser, by the above method.

straight-line variety, so here is a method of converting the condensers that have been around the work-bench to the new type.

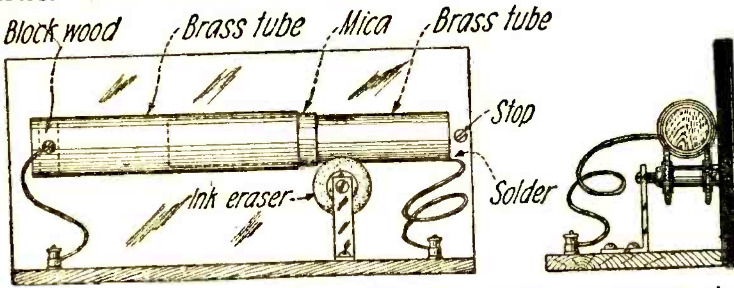
The end plates of the condenser are first removed and the rotor shaft carefully withdrawn, touching no plates on the rotor shaft and disturbing none of the adjustments. Then remove the stationary plates, noting the number of washers that are next to the end plates.

Two pieces of ¼-inch board are cut to 2½ by 5 inches. Using one of the plates as a template, lay out on one of the boards the outline of the plate with the mounting holes. Clamp the two pieces of wood together with the marked one on top, and drill three holes at the points where the mounting holes are outlined. These holes should be of such a size as will just accommo-



The details are shown above for making a small capacity condenser for tuning the intermediate stages of a super-heterodyne. The assembly cross-section is shown at the right.

smaller diameter than the other. A piece of mica slightly longer than the stationary brass tube is rolled into tubular form and used as the dielectric between the two metal tubes. The rollers which support the movable tube are disc erasers. The erasers are



An ingenious type of variable condenser. The erasers on the knob shaft act as rollers for the movable tube. Very smooth variation is obtained.

mounted on a shaft which is supported by a metal end piece. A piece of brass tubing from a certain rod is used as a spacer for the two erasers which in turn are made rigid by two set nuts. A small screw fastened to the rear side of the panel limits the extent of movement of the tube bearing upon the rollers. The stationary tube is fastened to the panel by a screw. A small insulating disc is placed in front of this screw so that there is no possible chance of the movable and stationary tubes becoming shorted. The flexible leads are brought to the binding posts shown in the rear of the panel base. This condenser has given very satisfactory results.

Contributed by Geo. F. Wise.

CONDENSERS FOR TUNING INTERMEDIATE STAGES

Experimenters have often found it necessary to use condensers in the intermediate stages of a super-heterodyne receiver to tune them to the same frequency. These condensers have presented a problem, mainly because of the lack of space. The condenser shown here is one that will take very little space and should prove efficient in operation.

The materials needed are four discs of 1/64-inch sheet mica, 2⅝ inches in diameter, having a 3/16-inch hole drilled in the center; two brass stator plates, 1/32-inch thick and cut to the size shown; one brass rotor plate of the same thickness, cut to the size shown; two cardboard washers 1/16-inch thick and 3⅛ inches in diameter, and an eyelet, 3/16-inch in diameter and about ¼-inch long.

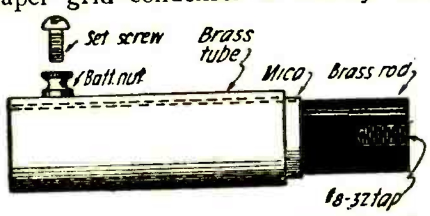
Shellac one side of each of the stators and place on each *concentrically* one of the mica discs. It is a good idea to bake these pieces in a *slow* oven, so that all the alcohol in the shellac will be driven out and the two plates will be firmly attached. The condenser is then assembled as follows: Over the eyelet are slipped the parts in this order—one of the cardboard discs, one of the mica discs, to which has been fastened a stator plate with the plate up, another plain mica disc, then the rotor plate, another plain mica disc, the other mica disc with its attached plate with the latter downward, and then the other cardboard disc. The eyelet is then expanded, holding the entire condenser tightly, with the exception of the central plate, which should revolve easily, yet remain in any position in which it is placed.

The lugs of the stators may be soldered together and bent and drilled for mounting in any convenient manner. There is a flexible wire soldered to the rotor. If necessary, the lug on the rotor may be covered with an insulating material to eliminate hand capacity effects.

Contributed by Chas. W. Haynes.

AN EXCELLENT GRID CONDENSER

The ordinary commercial type of paper grid condenser is usually con-



A very good idea in the way of variable grid condensers. The brass rod is threaded so that the condenser can be screwed directly onto the grid post on the tube socket.

structed in such a manner that one has to be very careful in tightening a binding post nut down upon it, for the reason that the contact eyelets are so easily torn loose. The average condenser of this type will stand only a very few changes from one hook-up to another. A much more substantial grid condenser may be constructed as follows:

Bore a 3-32″ hole into the end of a section of brass rod ¼″ in diameter and 2½″ long, and tap the hole with an 8-32″ thread. Now cut a piece of mica 2″ wide and just long enough to wrap around the rod with a narrow lap joint. This piece of mica should be very thin for best results, and when wrapped around the rod it should extend very slightly beyond the unthreaded end of the rod, leaving "pincer room" at the threaded end. Now procure a piece of thin brass tube with an inner bore just large enough to fit snugly about the brass rod and mica and on the side of it solder a common battery nut, which has an 8-32″ thread. When assembled, screw the condenser directly on to the grid post of your tube socket; connection to tuning circuit may then be made by means of a set-screw in the battery nut on the outer tube. Any desirable change in the capacity of this condenser may be made by sliding the tube back and forth on the rod.

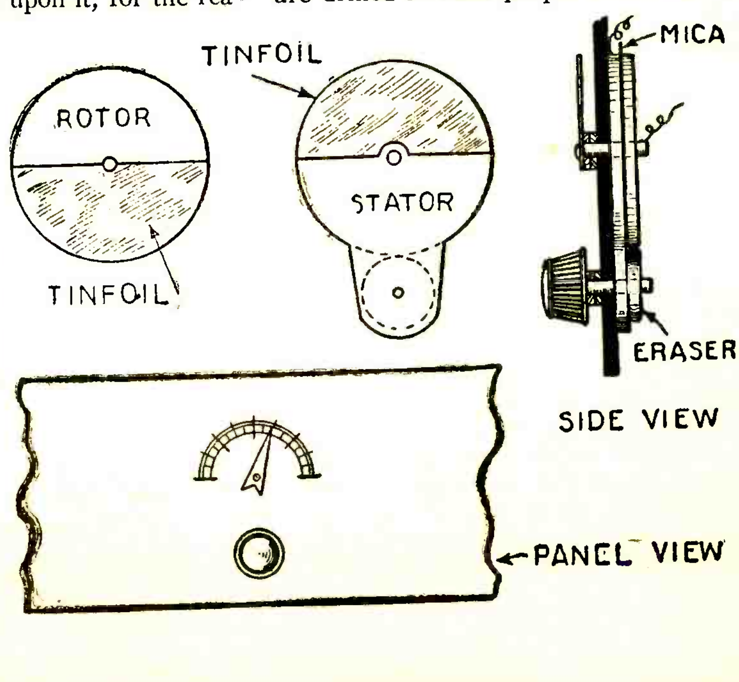
Contributed by Robert N. Auble.

VARIABLE CONDENSER

For the fan who desires an "up to the minute" receiver that has that "factory look," here's something that will help him get it.

Cut a circle approximately 3 inches in diameter, from flat, dry wood, thick cardboard or bakelite. In its center attach a shaft long enough to go through stator plate and panel and permit of fastening a pointer in front of panel. This is the rotor. One half of the circle is covered with tin or copper foil. The stator is similarly constructed except that it has an extension at the bottom for the vernier. Holes are drilled in their proper locations of

A variable condenser can be easily made by following the directions above and the diagrams on the right. As can be seen by the panel view the appearance of the control from the front will be an asset to the appearance of any receiver.



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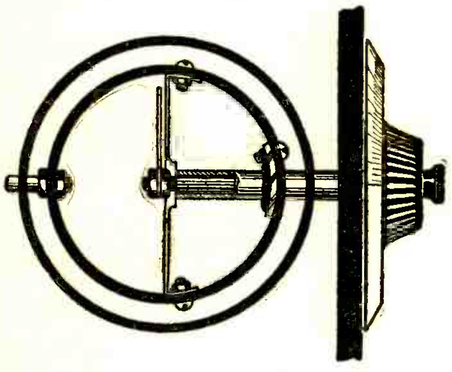

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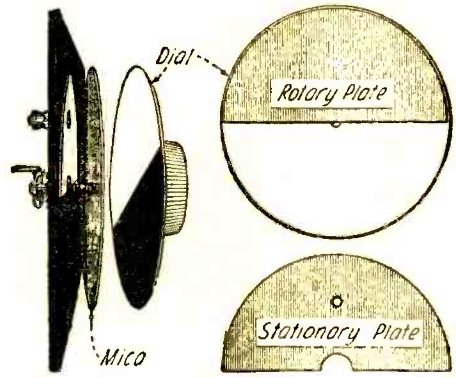

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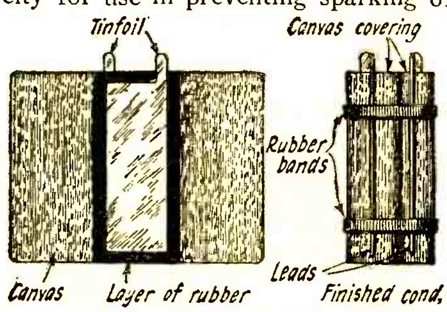
Contributed by Horace B. Phelps.

A HIGH CAPACITY FIXED CONDENSER

The following is a method for making a condenser of considerable capacity for use in preventing sparking of vibrators in rectifiers, where not too high a voltage is employed. Get some scrap soft rubber such as rubber corks, tubing, or elastic bands and dissolve them in benzine (highly inflammable). The solution should have a consistency of thin mucilage. Take a piece of canvas slightly more than twice as large as the condenser in length, and in the center paint a thin layer of rubber. In a few minutes this will be dry. Then place a sheet of thin tinfoil on the layer, the size of the tinfoil being such as to leave a ¼-inch margin of rubber around, and a one-inch lead projecting. Paint another thin layer of rubber on the tinfoil and when dry, repeat the whole process, alternating the rubber and foil. When the height has reached about ½-inch, apply pressure to the condenser. A small screw press will prove very handy for this. Then proceed again with the rubber and tinfoil. When you think you have made enough layers, the thickness of the condenser being optional with the maker, fold the condenser up in the projecting ends of the canvas and place two rubber bands over the canvas to keep it in place. The connecting stubs are then carefully soldered each to a lead and the wire brought under the elastic bands so as to reduce pull on the foil projecting, as shown in the diagram. If the solution is made thicker, and also the layers of rubber, the condenser can be made to withstand higher voltages.

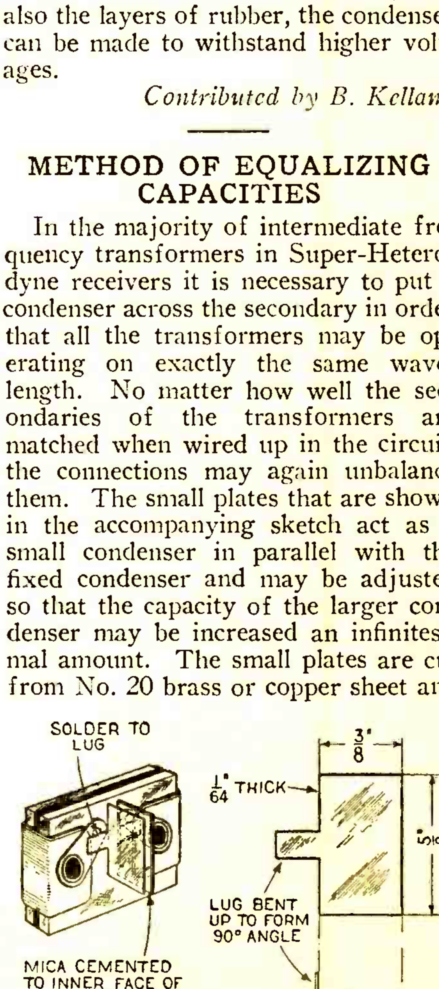


A condenser of any capacity can be made by using a rubber solution as the dielectric.

Contributed by B. Kellam.

METHOD OF EQUALIZING CAPACITIES

In the majority of intermediate frequency transformers in Super-Heterodyne receivers it is necessary to put a condenser across the secondary in order that all the transformers may be operating on exactly the same wavelength. No matter how well the secondaries of the transformers are matched when wired up in the circuit, the connections may again unbalance them. The small plates that are shown in the accompanying sketch act as a small condenser in parallel with the fixed condenser and may be adjusted so that the capacity of the larger condenser may be increased an infinitesimal amount. The small plates are cut from No. 20 brass or copper sheet and are soldered or riveted on the lugs which are provided on most of these



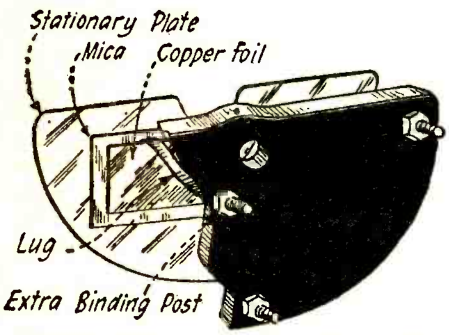
An auxiliary condenser useful for equalizing capacities.

small fixed condensers. A strip of thin mica is fastened to one plate with shellac for insulation. The capacity of this vernier condenser may be varied by pushing the plates nearer together or farther apart.

Contributed by R. E. McAdams.

A COMBINATION TUNING AND GRID CONDENSER

Herein is described a combination tuning and grid condenser which will save considerable space and at the same time increase the efficiency of any receiver in which it is used. Instructions for building radio sets almost invariably advise the builder to use short leads in wiring the instruments. This is particularly true in the grid circuits. The resistance of leads six inches or more in length is not high, but when we take into consideration the extremely low voltage induced in the secondary circuit, the value of short leads becomes apparent. In order to avoid body capacity effects, the grid condenser is usually connected to the stationary plates of the secondary condenser. Since the plate of the grid condenser is connected to the stationary plates, why not do away with one plate of the grid condenser entirely and substitute the stationary plates of the secondary condenser? A simple method of accomplishing this is to remove the end piece of the secondary condenser and fasten a clear piece of mica about .001 inch thick and one inch square to the outside stationary plate by means of shellac. A piece of tin or copper foil may then be placed over the mica to form the other plate of the grid condenser. This plate may be fastened to an extra binding post placed on the end piece of the condenser by means of a small lug. The grid connection is made directly to this binding post. The details of construction can clearly be seen in the accompanying sketch.



Circuit and construction of details of a combination tuning and grid condenser.

Contributed by O. Johnson.

A NOVEL VERNIER CONDENSER

A two-plate vernier condenser which is novel in every respect and which continues its originality right up to the point where it is mounted on the panel, describes the home-made device for which instructions are given in this article. The instrument described in the following paragraphs not only fills every need of the amateur for close tuning, but it is also so easy to make that there are no work-bench difficulties to discourage even the most unskilled of enthusiasts. When finished, the vernier condenser may be mounted in a vertical position on the base of the receiver and controlled by thumb from the face of the panel.

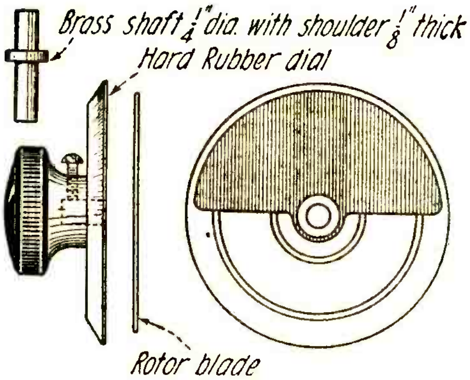


Fig. 1

Showing the method of mounting the rotary plate on the dial. This is accomplished by a brass shaft with a shoulder.

The rotor of this novel vernier condenser is made up in a jiffy from three familiar parts of other apparatus. These three are a dial, a spare condenser plate (or one cut from brass, copper or aluminum if no spare movable plates are available) and a ¼" brass rod with a shoulder. Put together in the order named, we have a rotor element for our condenser which is held together by the set screw in the knob of the dial. The single plate is pressed closely against the under side of the dial by the shoulder on the brass rod, as indicated on the assembly Fig. 1.

The brass rod need not be very long, in fact there is a limit to how much of it may be above the shoulder, that limit being set by the depth of the hole in the dial. The shoulder, as may be seen, plays the dual role of check nut and space washer, since it not only holds the spare rotary plate in place but also determines the thickness of the air dielectric between that plate and the stator.

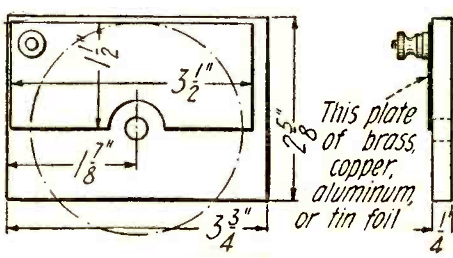


Fig. 2

Dimensions and details of the stationary plate and its mounting.

The stator, in this home-made instrument, is made by fastening a piece of sheet brass, copper or aluminum over the greater half of a piece of wood or bakelite, which has been drilled to take the brass rod now acting as the shaft of the rotary plate. Fig. 2 gives the dimensions for this half of the instrument. Using a three-inch dial and the usual size of condenser plate, the stator plate should be 1¼" by 3½". The bakelite should be about the size indicated in the sketch. In some cases where the writer has equipped a receiver with these vernier attachments, it has been advisable to omit the bakelite back altogether, mounting the fixed plate directly on the base of the receiver.

Whichever the case, the ¼" hole which is to take the rotor shaft should be drilled not more than 1" from the panel edge of the base. To illustrate the reason for this, a broken line circle showing the position of the 3" dial is drawn on Fig. 2. The rim of the dial overlaps the edge of the base ½". This overlap protrudes through a narrow slot in the panel, cut so that it is directly below the main condenser of which the smaller and home-made device is an auxiliary. With just enough of the dial showing to permit of thumb pressure, the capacity of the two plate vernier may be controlled from the outside of the panel. This method of control is illustrated in Fig. 3 which also shows the manner of mounting the home-made condenser after it is made.

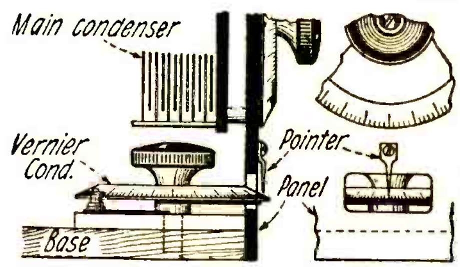


Fig. 3

Method of mounting the novel vernier condenser. It is adjusted from the front of the panel by the thumb or forefinger.

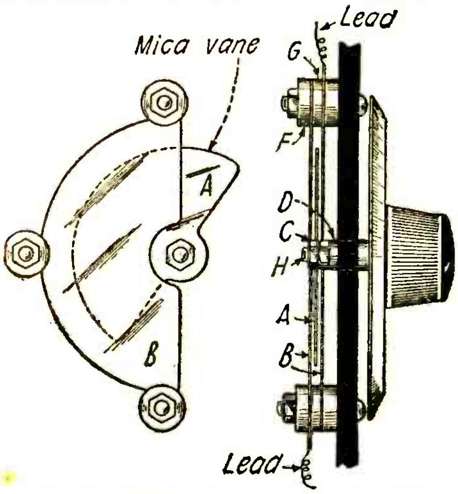
If a bakelite base is used, it is put close against the panel, and the hole continued down into the base of the receiver, deep enough to provide a firm bearing for the movable plate. Mark out the slot in the panel, drill it and then complete the job with a hack-saw blade or a file. A pointer is added—and presto, the work is done!

For the stator connection, put in a binding post as shown in the sketches; for the rotor, solder the wire on the head of the set screw which holds the rotor element of the instrument together. And if there is another word of caution one radio amateur ought to tell another when suggesting this vernier, it is this: drill that hole straight!

Contributed by Arthur S. Gordon.

A MICA VANE VERNIER CONDENSER

The vernier condenser about to be described has several features to recommend it to the amateur. It is simple, easy to construct from odds and



A rear and side view of the mica vane vernier condenser. The movable member changes the dielectric between the two stationary plates, thus increasing or decreasing the capacity very gradually.

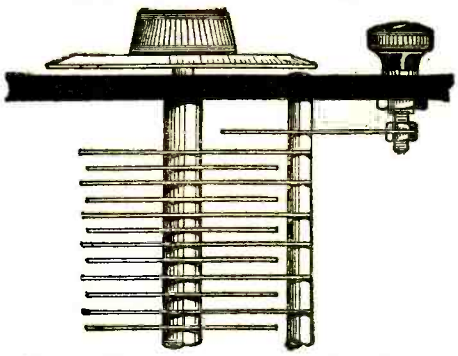
ends, and best of all, the effect of body capacity in tuning is entirely eliminated. The principle upon which it is based is rather novel in that the capacity is varied by changing the dielectric itself.

A glance at the accompanying drawing will suffice to explain its construction. Two condenser plates BB, which may be salvaged from a discarded condenser of the conventional type, are mounted on the rear of the panel as shown. F and G are fibre or bakelite washers, the separating washer G being about 1/16″ thick. The rotating element A consists of a mica vane, cut to shape and punched for the shaft H. The vane is secured to the shaft by lock nuts, and the whole rotates in a short piece of brass tubing D, which is fitted into a suitable hole in the instrument panel. A dial completes the device. Leads to the set are taken from the two fixed plates, thus eliminating sliding contacts and at the same time rendering the shaft electrically "dead," so that here is no chance of body effect from this source. Since mica has a dielectric constant of about five times that of air, it can be readily seen that rotation of the dial produces a change in capacity amply sufficient for the purpose of sharp tuning. The writer has found the device quite satisfactory. The experimenter can easily adapt the details of construction to meet his own resources, and is assured of a worthwhile addition to his set.

Contributed by C. W. Halligan.

A SIMPLE VERNIER ATTACHMENT

Here is a vernier that can be added to the variable condenser of your set very easily. Drill a hole in the panel near the condenser and mount an old switch lever (I have used a long shank binding post) after breaking off the



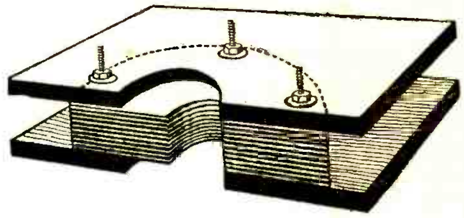
A vernier attachment made of an extra condenser plate controlled by a separate knob.

blade. Cut and drill a piece of aluminum (as per the sketch) and fasten it to the switch post so the plate will slide between the panel and the stationary plate of the condenser. Fasten a lead from the switch to the rotary plates of the condenser.

Contributed by R. J. Haris.

HOME-MADE STRAIGHT-LINE WAVE-LENGTH CONDENSERS

It is more or less a useless task to compare the advantages of a straight-line wave-length condenser with the average condenser that is on the market to-day, as they have been listed in many magazines. Many fans have purchased condensers of the old type and would like to have those of the

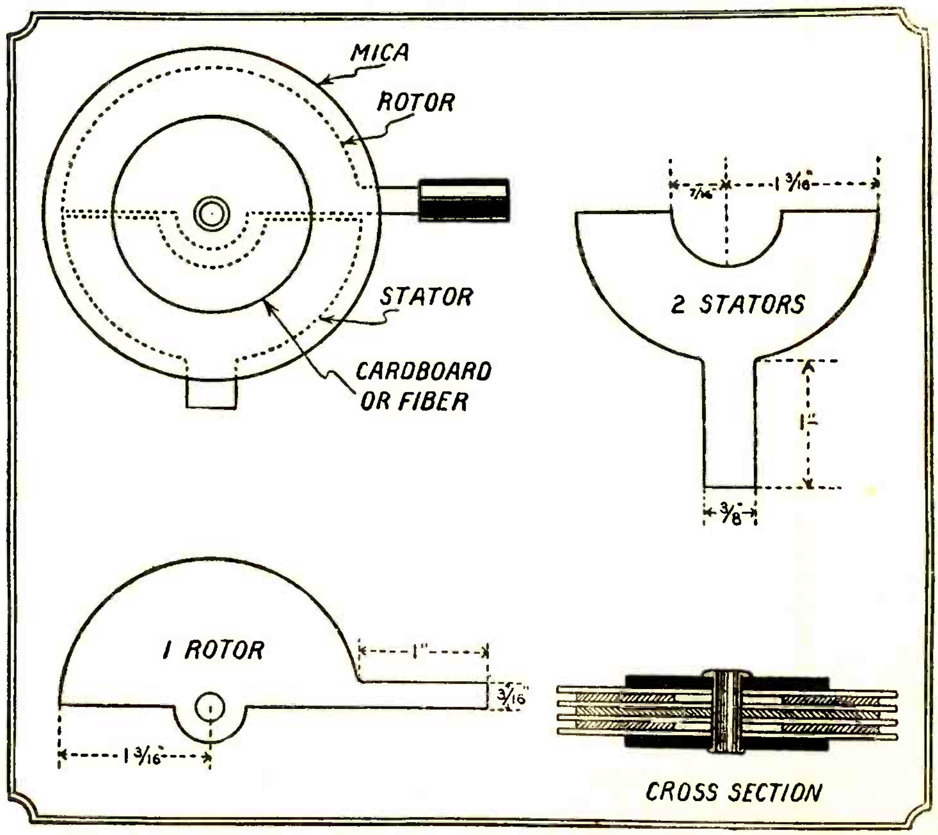


With little effort a straight-line wave-length condenser can be made from an ordinary condenser, by the above method.

straight-line variety, so here is a method of converting the condensers that have been around the work-bench to the new type.

The end plates of the condenser are first removed and the rotor shaft carefully withdrawn, touching no plates on the rotor shaft and disturbing none of the adjustments. Then remove the stationary plates, noting the number of washers that are next to the end plates.

Two pieces of ¼-inch board are cut to 2½ by 5 inches. Using one of the plates as a template, lay out on one of the boards the outline of the plate with the mounting holes. Clamp the two pieces of wood together with the marked one on top, and drill three holes at the points where the mounting holes are outlined. These holes should be of such a size as will just accommo-



The details are shown above for making a small capacity condenser for tuning the intermediate stages of a super-heterodyne. The assembly cross-section is shown at the right.

date a 6-32 machine screw, if that size screw will go through the holes in the plates. Screw in one of the boards three 6-32 bolts that are at least one inch long. In the top board ream out the three holes so there is just enough clearance for the bolts.

Next is drawn on the top board the curve indicated by the cut portion in the sketch. In the shape of this curve the builder must use his own judgment, as nearly every condenser will have a different curve. Place the stationary plates between the two boards and clamp them tightly by means of the bolts, taking care that all the edges of the plates are even. Then cut through the wood and plates, following the marked curve, with a coping saw. Before removing the plates from the clamp, file the edges smooth with a half-round file and smooth off the burrs with a piece of fine sandpaper.

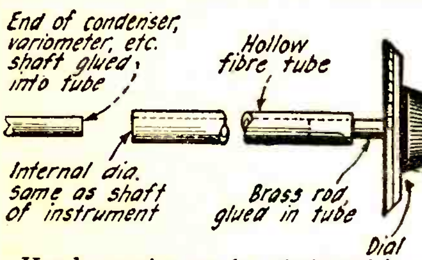
If the dials of the condensers read clockwise, the cut portion of the plates is placed on the *right* and *vice versa* if the dials read in the opposite direction. In assembling the condenser be sure that there are the same number of washers on the supporting screws as there were when the condenser was taken apart.

This conversion of condensers is not a great deal of trouble, and it will be found that the set can receive on lower wave-lengths than before. The tools necessary can be bought in the five-and-ten-cent store, so there is not much expense attached to the change in condensers.

Contributed by Fred W. Davey.

CURE FOR HAND CAPACITY

Hand capacity is not always eliminated by shielding the panel upon which the instruments are mounted, as many have found out. The reason for this lies in the fact that the usual variable condenser, vario-coupler and variometer uses the shaft as the connection



Hand capacity can be eliminated in a receiving set by insulating "live" shafts in the manner shown.

from the rotary element. In other words, the shafts of these instruments are a part of the circuit and therefore "alive."

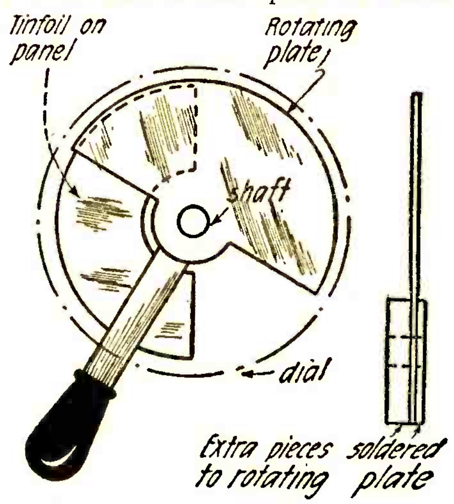
Now, you shield your panel, drill the necessary holes for these shafts and thereby place live portions of the circuit out in front of the metal shield, thus in the usual case defeating the purpose for which the shield is there. Hand capacity is the result of the condenser effect created by the shaft, the knob and dial and the hand of the operator.

A cure for this is illustrated in the accompanying sketch. Enough of the shaft of the instrument is cut off so that the portion left will not extend beyond the shielding when the instrument is mounted. To this is glued, or otherwise attached, an insulating tube of fibre, having an inside diameter equal to the outside diameter of the shaft so as to insure at least a tight fit. This tube extends through the panel to its surface, where the whole or a part of the removed piece of the instrument shaft is fitted into it, with enough left to take the knob and dial. It is, of course, much better to have the extension shaft made of insulating material. In either case, however, the connection is broken by the insulating tubing and no live part of the circuit extends past the shielding.

Contributed by A. J. Gmeiner.

A VERNIER CONDENSER

This Vernier condenser consists of a small semi-circular piece of tinfoil



This vernier attachment is mounted directly behind the knob and dial and is adjusted by means of the insulating knob.

glued to the panel front and connected to the stationary plates of the variable condenser. The rotating plate of the Vernier is a small circular piece of sheet brass with another piece of brass soldered to the center to make the whole ⅛" or a little more in thickness. Through this center is drilled a hole the size of the shaft. It should fit snugly on the shaft and be just tight enough so that it will not jar out of position. A composition handle is fastened to the movable plate and is long enough to extend out past the circumference of the dial. The space between the tinfoil and the movable plate should be about 1/32", but care must be taken that this arrangement does not short circuit the condenser. To prevent this, a small insulating washer can be placed on the condenser shaft so as to be between the stationary and movable plate on the Vernier.

Contributed by Richard C. Henderson.

SPREADING DIAL READINGS

To most of the fans experienced in tuning the old-style condensers with

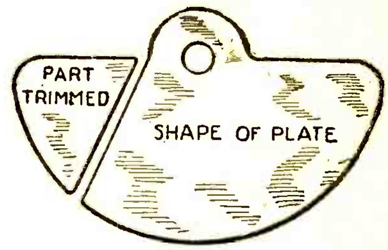
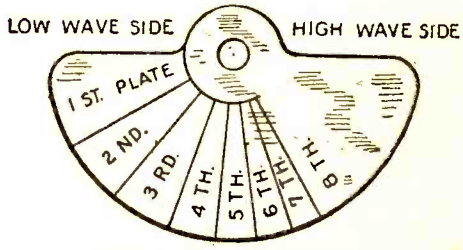


FIG. 1



ROTOR PLATES ASSEMBLY

FIG. 2

By trimming off a portion of the movable plates, a circular plate condenser may be converted into a straight-line wave-length type.

most of the station wave-lengths jammed in the first quarter of the dial, the arrival of the straight-line frequency condensers is a great relief. However, many set owners have two things to consider; there may be some of the old-style condensers on hand that are too good to throw away and the outlay of money for new condensers, even though they will facilitate tuning, may not always be possible. While the resulting condensers described below are not absolutely the straight-line frequency type, they will do the work in a most satisfactory manner and do not involve a great deal of labor in their construction.

To make an 11-plate condenser, that size being needed in a special circuit built by the writer, a 17-plate condenser was cut down. As will be seen later on, the extra number of plates are necessary, in order to give the desired capacity, to compensate for the material that is removed from the rotor plates. The rotor plates of the condenser were removed and taken off the shaft. Then, with a small pair of shears, a file and emery paper to finish off, pieces were trimmed in sizes as follows:

1st plate was left full size.
2nd plate sector removed equal to 15 dial divisions.
3rd plate sector removed equal to 27 dial divisions.
4th plate sector removed equal to 37 dial divisions.

5th plate sector removed equal to 45 dial divisions.
6th plate sector removed equal to 52 dial divisions.
7th plate sector removed equal to 58 dial divisions.
8th plate sector removed equal to 63 dial divisions.

It might be said here that more time and closer calculations might produce a truer curve, but the idea is the same and can be worked out for any size condenser for any curve.

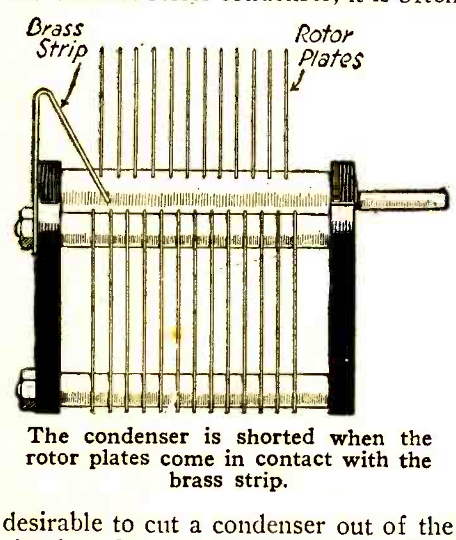
The rotor is then assembled and the units replaced. The edges of the high-wave side will be even, while on the low side the edges will fan out and mesh in the sequences of the above table. This gives an eccentric rotor in which the smallest capacities are on the low waves and load up progressively in inverse proportion to the frequencies producing the straight-line effect.

In tuning: From 0 to 15 is a 3-plate vernier condenser, from 15 to 27 is equivalent to a 15-plate condenser with only an 11-plate range, thus the kilocycles are spread out on the low waves and close together on the high, with fairly equal divisions over the whole range of the condenser, which remains the same total capacity of the old-style 11-plate condenser. It should be noted that great care must be taken in the preparation of the plates. *Do not bend them.* Also be sure, when replacing the plates, that the same number of washers are in the same positions.

Contributed by Chas. H. Stagg.

A CONDENSER CUT-OUT

In many cases, particularly that of the antenna series condenser, it is often



The condenser is shorted when the rotor plates come in contact with the brass strip.

desirable to cut a condenser out of the circuit. The arrangement described below is ideal for this purpose, as it makes unnecessary the use of an extra switch, or a change in the lead-in wiring.

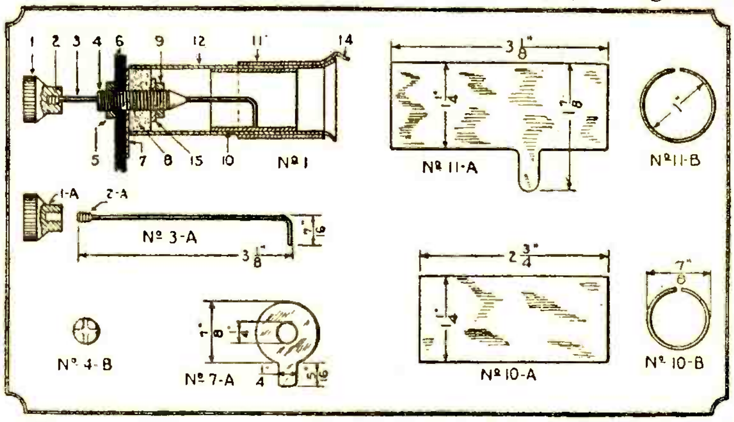
As shown in the drawing, it consists of a brass strip, pointed at one end, and fastened under the nut belonging to one of the rods which hold the stationary plates together. It may be placed on either the front or back end of the condenser, but must be on the left side. It should be carefully shaped so that it will make contact with the outside rotor plate when the dial is turned slightly below zero.

A condenser with this attachment should not be placed in any circuit where, when it is shorted, the "A" or "B" batteries will also be shorted.

Contributed by Homer E. Hogue.

HOME-MADE VERNIER CONDENSER

One of the handiest pieces of apparatus for the experimenter is a vernier condenser of fairly small capacity. The one described below will fill the bill and is easily made from pieces of apparatus that can be found in the well-known junk box.



On the left is a detailed drawing of the parts for the vernier condenser that is described above. The glass tube, inside of which slides one of the tubular plates, is the dielectric of the condenser. Each figure is explained in the text.

The materials necessary for the construction of this vernier condenser are as follows:

1 glass tube, the outside diameter of which is 1 inch, with a cork to fit. This tube should be 3¼ inches long.
1 strip of sheet copper, No. 26 B. & S. gauge, 7 x 1 7/8 inches.
1 brass bolt, ¼ x 1¼ inches; two nuts and washer to fit.
1 binding post with 5/32-inch bolt and insulated cap.
1 piece of No. 12 B. & S. gauge copper wire 4 inches long.

The end of the glass tube, 12 inches in length (see diagram) is flared out a little by holding the tube in a hot gas flame and revolving it while flaring out the end with the end of a file. The length of the tube is then cut to exactly 3 inches from the end of the flared part. This may be done by cutting a line around the tube with a file and gently tapping the tube until it breaks around the filed line. From the strip of sheet copper, cut a pattern as shown in 11-A. Bend this as shown in 11-B and slip over the glass tube in the position 11 in the diagram. Now bend the soldering lug, 14, over the flared end of the tube. This prevents the copper band from slipping and is also used to connect this plate of the condenser to the circuit. From the copper strip another pattern, as shown in 10-A, is cut and bent to shape as shown in 10-B. This is the sliding plate of the condenser and is placed inside the glass tube as shown at 10 in the diagram. The combination washer and soldering lug is also cut from the copper strip, as shown at 7-A.

A ¼-inch hole is drilled in the cork, 8, the length of which is 3/8 of an inch. A hole is drilled lengthwise through the ¼-inch brass bolt, 4, to accommodate the shaft, 3. The diameter of this hole is 5/64 of an inch. The end of the bolt is slotted ¼ inch deep, as shown in 4-B. This leaves four prongs, which are bent in the direction of the hole, the purpose being to insure good contact on the shaft, 3.

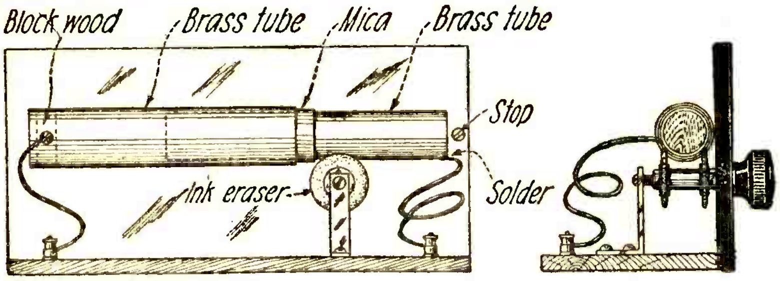
Cut a piece of No. 12 B. & S. copper wire 3 9/16 inches long and bend to the shape shown at 3-A. Slip the shaft, 3, through the bolt, 4. The bolt, 4, is screwed through the cork, 8, and the washer, 15, placed on the side of the bolt that is slotted. The nut, 9, is then run down on the bolt over this washer. Drill a 5/64-inch hole through the 5/32-inch bolt, 2. This bolt should be about ¼-inch long and is put on the shaft, 3, where it is soldered and the binding post nut, 1, is screwed on it. Do not solder on the bolt, 2, before putting the shaft through the other bolt. The shaft, 3, is now soldered to the copper band, 10.

The condenser is now ready to mount on the panel and this is done by drilling a ¼-inch hole in the panel and inserting the bolt, 4, and tightening the nut, 5. Caution should here be used as the cork will expand as the pressure is increased and may break the glass tube. The binding post top, 1, is then screwed on to the bolt, 2, and the condenser is now ready for operation. This is done by sliding the handle, 1, in and out. It should work very smoothly for best results.

Contributed by Edward Smith.

A TUBULAR VARIABLE CONDENSER

Following is a description of a condenser of very simple and cheap construction. The inner and outer tubes are made from casing taken from electric light fixtures, one being of slightly smaller diameter than the other. A piece of mica slightly longer than the stationary brass tube is rolled into tubular form and used as the dielectric between the two metal tubes. The rollers which support the movable tube are disc erasers. The erasers are



An ingenious type of variable condenser. The erasers on the knob shaft act as rollers for the movable tube. Very smooth variation is obtained.

mounted on a shaft which is supported by a metal end piece. A piece of brass tubing from a certain rod is used as a spacer for the two erasers which in turn are made rigid by two set nuts. A small screw fastened to the rear side of the panel limits the extent of movement of the tube bearing upon the rollers. The stationary tube is fastened to the panel by a screw. A small insulating disc is placed in front of this screw so that there is no possible chance of the movable and stationary tubes becoming shorted. The flexible leads are brought to the binding posts shown in the rear of the panel base. This condenser has given very satisfactory results.

Contributed by Geo. F. Wise.

CONDENSERS FOR TUNING INTERMEDIATE STAGES

Experimenters have often found it necessary to use condensers in the intermediate stages of a super-heterodyne receiver to tune them to the same frequency. These condensers have presented a problem, mainly because of the lack of space. The condenser shown here is one that will take very little space and should prove efficient in operation.

The materials needed are four discs of 1/64-inch sheet mica, 2⅝ inches in diameter, having a 3/16-inch hole drilled in the center; two brass stator plates, 1/32-inch thick and cut to the size shown; one brass rotor plate of the same thickness, cut to the size shown; two cardboard washers 1/16-inch thick and 3⅛ inches in diameter, and an eyelet, 3/16-inch in diameter and about ¼-inch long.

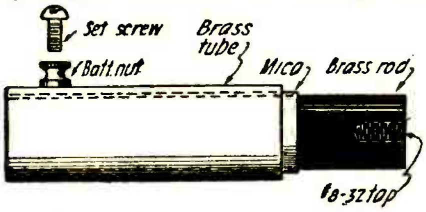
Shellac one side of each of the stators and place on each *concentrically* one of the mica discs. It is a good idea to bake these pieces in a *slow* oven, so that all the alcohol in the shellac will be driven out and the two plates will be firmly attached. The condenser is then assembled as follows: Over the eyelet are slipped the parts in this order—one of the cardboard discs, one of the mica discs, to which has been fastened a stator plate with the plate up, another plain mica disc, then the rotor plate, another plain mica disc, the other mica disc with its attached plate with the latter downward, and then the other cardboard disc. The eyelet is then expanded, holding the entire condenser tightly, with the exception of the central plate, which should revolve easily, yet remain in any position in which it is placed.

The lugs of the stators may be soldered together and bent and drilled for mounting in any convenient manner. There is a flexible wire soldered to the rotor. If necessary, the lug on the rotor may be covered with an insulating material to eliminate hand capacity effects.

Contributed by Chas. W. Haynes.

AN EXCELLENT GRID CONDENSER

The ordinary commercial type of paper grid condenser is usually con-



A very good idea in the way of variable grid condensers. The brass rod is threaded so that the condenser can be screwed directly onto the grid post on the tube socket.

structed in such a manner that one has to be very careful in tightening a binding post nut down upon it, for the reason that the contact eyelets are so easily torn loose. The average condenser of this type will stand only a very few changes from one hook-up to another. A much more substantial grid condenser may be constructed as follows:

Bore a 3-32" hole into the end of a section of brass rod ¼" in diameter and 2½" long, and tap the hole with an 8-32" thread. Now cut a piece of mica 2" wide and just long enough to wrap around the rod with a narrow lap joint. This piece of mica should be very thin for best results, and when wrapped around the rod it should extend very slightly beyond the unthreaded end of the rod, leaving "pincer room" at the threaded end. Now procure a piece of thin brass tube with an inner bore just large enough to fit snugly about the brass rod and mica and on the side of it solder a common battery nut, which has an 8-32" thread. When assembled, screw the condenser directly on to the grid post of your tube socket; connection to tuning circuit may then be made by means of a set-screw in the battery nut on the outer tube. Any desirable change in the capacity of this condenser may be made by sliding the tube back and forth on the rod.

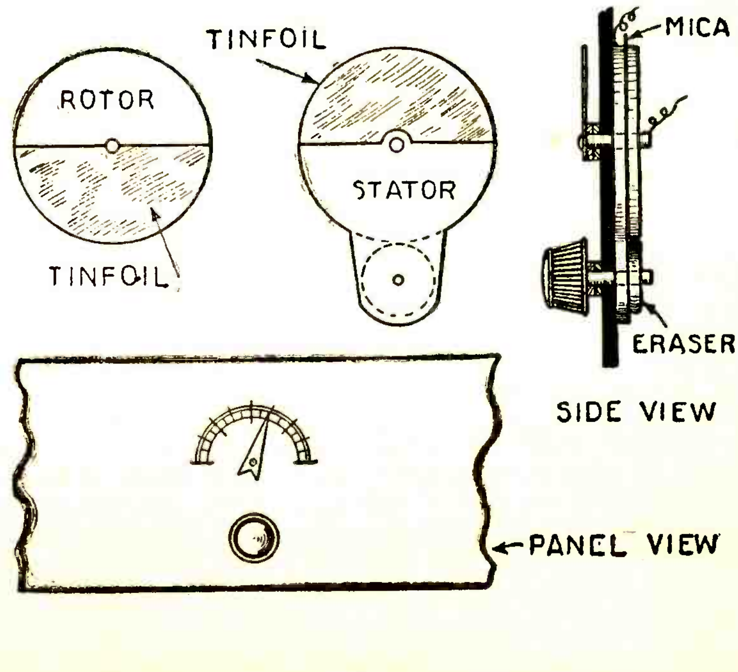
Contributed by Robert N. Auble.

VARIABLE CONDENSER

For the fan who desires an "up to the minute" receiver that has that "factory look," here's something that will help him get it.

Cut a circle approximately 3 inches in diameter, from flat, dry wood, thick cardboard or bakelite. In its center attach a shaft long enough to go through stator plate and panel and permit of fastening a pointer in front of panel. This is the rotor. One half of the circle is covered with tin or copper foil. The stator is similarly constructed except that it has an extension at the bottom for the vernier. Holes are drilled in their proper locations of

A variable condenser can be easily made by following the directions above and the diagrams on the right. As can be seen by the panel view the appearance of the control from the front will be an asset to the appearance of any receiver.



such a size as to fit the condenser and vernier shafts snugly. One half of the circle on this plate is also covered with tin or copper foil, except that a small space is left around the hole that the rotor shaft passes through. Now cut from a piece of mica, a disc slightly larger than the diameter of the condenser plates for a dielectric, which goes between the two plates and prevents shorting.

The vernier is made by soldering a suitable shaft to the center hole of a circular typewriter eraser, which is also long enough to pass through stator plate and panel and permit of fastening a knob thereto.

The rotor must be quite round and the hole for the vernier must be so drilled that the eraser will engage the rotor in its revolutions and will not slip.

The panel scale may be scratched on the panel with the aid of a sharp compass and rule and knife, and scratches filled in with white enamel, or a scale may be purchased for a few cents. The stator may be glued or otherwise fastened to the panel and holes drilled in the panel to correspond exactly with holes in the stator.

A pointer may be made from various materials and in various designs, as desired, which may be soldered or otherwise fastened to the rotor shaft. Washers should be placed between pointer and knob, and the panel, so that there will be no play of the two shafts. A study of the diagrams will indicate the condenser's construction. Leads may be attached in various ways. The rotor lead on mine is attached to condenser shaft, which makes connection with the tin foil on the rotor but not on stator. The thickness of the mica insulation used will depend upon the capacity of the condenser desired.

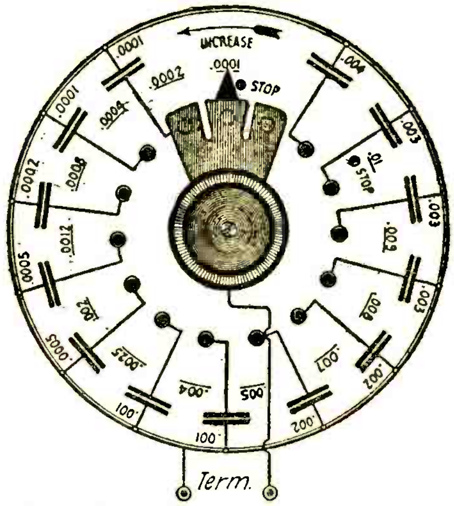
If permanence is desired, the bearing holes may be reinforced with short pieces of metal tubing just large enough to work over condenser and vernier shafts. A rubber band placed around the circumference of rotor disc may aid to keep vernier from slipping.

Contributed by E. Weber.

A SEMI-VARIABLE CONDENSER

Having had occasion to use different hook-ups, some calling for fixed condensers of several standard capacities, each one being different, I made 13 fixed condensers from waxed paper and lead foil in a flat shape, very compact, and all of the same length from end to end, providing for each one, a brass lug for each end for soldering purposes. These condensers I mounted in an unused corner of my cabinet, one snugly up against its neighbor, and assembled them one wire of each to a common lead wire to the center of the fan switch. The 13 ends thus left were brought to 13 contact points, completing the circuit for each condenser.

I laid off a small circle and divided it into 15 equal parts. A piece of heavy cardboard or a piece of thin wood is right for making a template. Then I selected 15 contacts, all of the same height and size, and spaced them in a complete circle on the panel, and drilled a hole in the center of this circle for the shaft. Any sort of knob can be used, the most satisfactory, being one with a threaded bushing for a ¼" rod, a set screw to hold the knob from coming loose being preferred. I then



A semi-variable condenser of novel construction. By connecting a low capacity variable condenser across the main terminals, variation may be obtained between the successive fixed capacities.

secured from a plumber a small remnant of nickeled tubing, called flush pipe, cut it open from end to end with tin shears, flattened it out with a wooden mallet to prevent dents, then with the most dependable tool in my outfit (the ice pick) laid out a fan switch to go under the knob and revolve with the knob and pointer. The large end of the fan is just wide enough to cover three contacts at a time, and by so doing engages the capacities of the three corresponding condensers in parallel. There being but 13 condensers, while there are 15 contacts, is explained by the necessity of keeping the fan from "jumping the track" as well as to engage one very small (.0001 mfd) unit at the last point where the fan hits the stop. Two stops are needed for this arrangement to avoid a duplication of capacities which is not desirable, especially as they would fall out of the regular step up or down in their proper values. The pointer was constructed of a thin strip of nickeled brass and as most of it is hidden by the fan it can be soldered directly under the fan or be made a part of the fan as desired.

By using condensers in the order named and of capacities as follows: .004, .003, .003, .003, .002, .002, .001, .001, .0005, .0005, .0002, .0001, .0001, a range is given from .01 to .0001. The range may be increased or decreased by selecting different combinations for the three contact fan switch or by using a four fan or a two fan switch or by having two switches on the same shaft but movably separate, the latter, of course, being more elastic as any two condensers could be combined. Only one stop would be needed, and 15 condensers could be used instead of 13.

By adding a 2 or 3 plate air gap condenser across the terminals of the bank of fixed condensers any adjustment could be brought into reach.

Contributed by E. J. Frankenfield.

VARIABLE CONDENSER MADE FROM PHOTO PLATE HOLDER

An old 5" x 7" photographic dry plate holder, which has been discarded in favor of the newer film holder, may be used in the construction of an efficient variable condenser involving a very small amount of work as detailed below.

Remove the thin hard rubber slides, as they will not be required. With a broken hack-saw blade cut a slot in the end of the holder midway between the two slots from which the slides were removed and of about the same thickness and width as these two slots. Through the new slot remove the black paper diaphragm which separated the photographic plates and on the other end of the holder cut an opening in the center about ½" x ⅛" to receive the connectors from the two inside fixed plates.

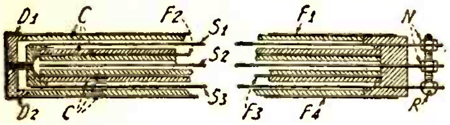
Procure a sheet of good straight zinc about 8" x 36" and cut into seven pieces, three of them being of the same dimensions as the hard rubber slides. These plates form the sliding element and are joined together at one end by the screw R and the five clamp nuts N.

The two inside fixed plates are the same size as the photographic plates and the two outside ones have the overall dimensions of the plate holder.

Cut six pieces of rather heavy straight cardboard the size of the inside fixed plates (5" x 7") and immerse them in melted paraffin. While still warm, put them quickly upon the fixed plates in proper position, scraping off surplus paraffin. They will adhere firmly, holding the plates straight and rigid. The outside fixed plates have cardboard on one side only and are fastened to the plate holder by small wood screws.

On one end of each of the inside fixed plates solder a piece of thin sheet brass about 3/8" x 1½", which, extending through the hole in the end of the holder, are bent and soldered to the outside fixed plates and to one another. The inside fixed plates are held in the holder by the small flanged locking bars which hold the glass plate in position. It is well to immerse the plate holder in hot paraffin before the slides are inserted, removing surplus material by holding near a gas jet.

This condenser will have considerable more capacity than the ordinary 43-plate rotary type, but this capacity may be easily reduced, if desired, by removing one or two of the plates, preferably the central sliding one.



F_1, F_2, F_3, F_4 - Fixed Plates. S_1, S_2, S_3 - Sliding Plates. C - Cardboard. D_1, D_2 - Fixed plate connectors.

A good idea. Use an old photographic plate holder as a variable condenser.

The plate holder may be set edgewise in the cabinet on insulating supports, requiring very little room, and the sliding element may be adjusted by a rubber or bakelite rod extending through the end of the cabinet, or, if finer adjustment is desired, a rack and pinion may be operated by a knob in front of the cabinet.

If greater capacity is required two or more such plate holders may be placed side by side, with great economy in space, and fine adjustments may be obtained by operating each holder, or even each plate, independently of the others.

Contributed by W. S. Mayers.

A VARIABLE CONDENSER

I present in this article, a new variable condenser. The principal feature of this is the small sum for which it can be made, the small space it takes on a panel and the comparatively steady variation of capacity obtained. The parts required for its construction are as follows:

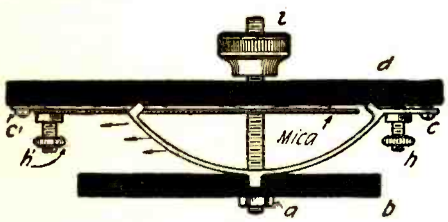


Fig. 1

Constructional details of the variable condenser. The capacity is varied by turning the knob.

2 pieces of hard rubber measuring 1" x 2" and 2/3" x 1½", respectively (when mounted on a panel, only one piece is required).
1 piece of mica,
2 brass plates (see Fig. 2),
2 binding posts,
4 screws,
1 insulating knob.

The knob has a sharp ring into which is screwed a large threaded rod (i) about 2" long as shown in Fig. 1. This rod extends through the entire instrument and is permanently fastened to insulating block (b) by the nut (a). Cut two plates as shown in Fig. 2, making the variable plate slightly wider than the stationary plate. Secure the rod (i) in the center of the insulating piece (b). The holes in the plates are drilled larger than the diameter of the rod (i) hole in the mica which is large enough to pass it. The movable plate (a) is fastened to the insulating block (d) by means of the two screws (c) (Fig. 1). The stationary plate is fastened to (d) by the two screws (c-1). A piece of mica is placed between the two plates and should be slightly larger than the stationary plate, thus avoiding the possibility of short circuit. Two binding posts (h) and (h-1) complete the construction.

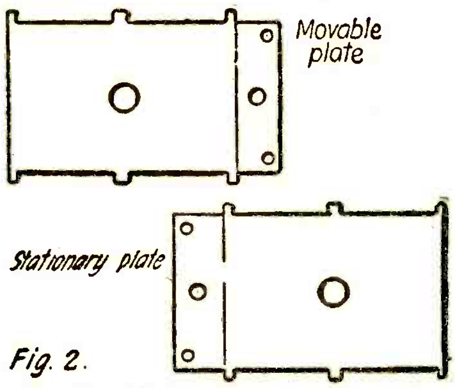


Fig. 2.

Details of the stationary and movable plates of the variable condenser.

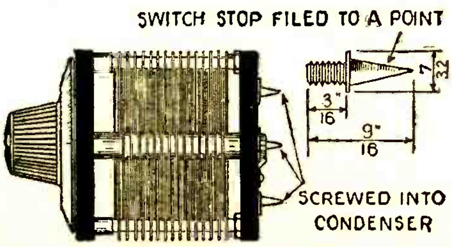
The capacity of the condenser is very close to .001 M.F. at its maximum and has a comparatively low minimum capacity.

Contributed by Andre Demorgny.

AID FOR MOUNTING INSTRUMENTS

The little device shown in the accompanying illustration is a great aid in the mounting of instruments on a panel, particularly the placing of condensers. The paper template usually furnished with variable condensers is not always accurate and a slight deviation from the screw-hole center will cause a bind. (Sometimes so slight that it is not noticed.)

Cut off the threaded ends of three switchpoints ¼ inch from the collar. File the other end of each one to a sharp point. Time must be taken to do this properly. Roll the switch-point frequently while filing in order to have the points in the middle and all the same length. Of course, if a machine shop is handy, do the filing in a lathe. With these operations completed, file a small slot in the edge of the collar, as a hold for a pen-knife or screw driver by means of which you can remove the pins if they should become tight in the instrument.



Instead of a template, the imprint of the points inserted into the screw-holes indicates on the panel where holes are to be drilled.

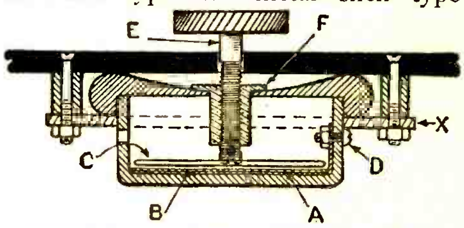
First determine the position of the condenser on the panel and drill the hole required for the shaft. Screw one of the prepared switch-points into each of the mounting holes of the condenser, just far enough so that the collar of the point is snug against the top of the condenser. Place the shaft of the condenser through the hole in the panel and press firmly against the back of the instrument. Upon removing the condenser, you will find dents in the panel sufficient for the punch, and you will have the satisfaction of knowing that they are accurate.

It is plain to be seen that with a supply of these points, it would not matter if condensers had several mounting screws, as a template would be unnecessary. The above applies, of course, to all other panel-mounted instruments having more than one mounting hole. A set of these points, machined from cold-rolled steel, case-hardened, would hold their sharpness indefinitely.

Contributed by Geo. E. Murphy.

AN EAR-PHONE CONDENSER

Procure an old receiver of the moulded type—the metal shell type



A variable condenser which is made in the moulded form of an old receiver should be handy for the experimenter.

will not do in this case—and remove the magnets, etc., from the interior. Insert a piece of copper A into the shell, so that it fits firmly in the back, as shown in the diagram, leaving a lug on this plate long enough for the screw D to pass through. This screw will form one terminal of the condenser.

Next obtain a piece of sheet mica B, the thickness of which will depend on the capacity which is desired in the condenser. The thinner the mica, the greater will be the capacity of the condenser; about .002 of an inch serves well. Cut the mica so that it entirely covers the copper sheet A, to which it should be fastened by means of a little shellac.

The movable plate C may be a piece

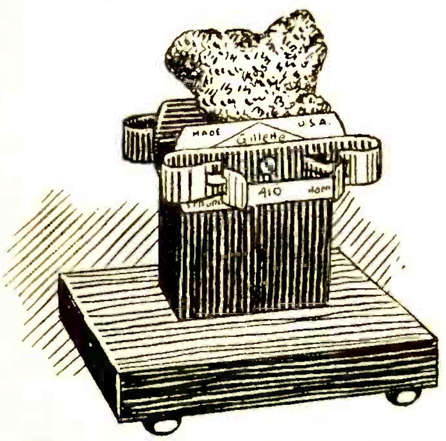
(*Continued on page* 91)

CRYSTAL DETECTORS

Dozens of ways in which one can immediately replace a broken or defective crystal detector are given in the columns which appear below.

EMERGENCY CRYSTAL DETECTOR

Have you ever been listening in to a good concert and in the middle of an interesting number broken the cat-whisker of the detector? Here is an emergency detector which will serve excellently.



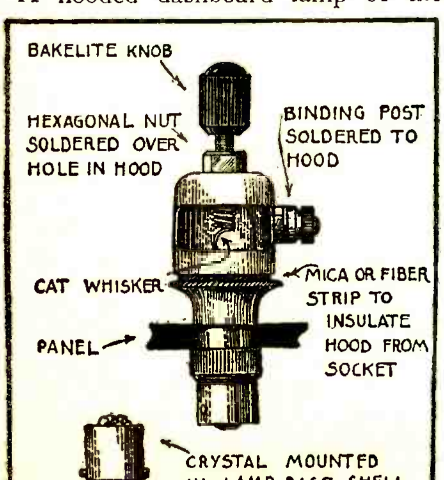
When your detector is out of commission, here is one easy to construct.

Two razor blades (Gillette are preferable as holes are already drilled in them) are mounted on a block of wood which is about ⅜ or ½ inch wide, with clips and wood screws, as shown in the accompanying illustration. This block of wood is mounted on a base and the connections to the circuit are made to the clips. For a crystal a piece of coke, carborundum or pyrites will serve very well. The crystal is moved about until sensitive spots are found, when balanced as shown on the edges of the razor blades.

Contributed by R. B. Wailes.

A COMPACT, DUST-PROOF CRYSTAL DETECTOR

A hooded dashboard lamp of the type shown in the illustration may readily be converted into a crystal detector stand of compact proportions requiring only one ⅝-inch hole for mounting. It takes up very little space on the panel and its highly nickeled finish harmonizes well with the other fittings.



An excellent dust-proof crystal detector made from the parts of a cowl lamp.

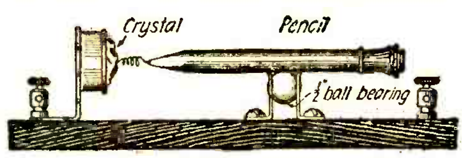
The hood is insulated from the socket proper by means of a thin strip of mica, ¼ inch wide, and long enough to encircle the socket flange over which the hood fits. A ¼-inch hole is drilled in the center of the hood. A 6/32, hexagonal, brass nut is centered and soldered over the hole to accommodate the threaded shank of the adjusting knob, which is provided with a coiled cat-whisker of phosphor bronze wire at its free end. The small binding post, shown soldered to the side of the hood, serves as one terminal of the detector, while the other lead may be fastened to any part of the socket.

Crystals to be used are mounted in the shells of old lamp bases, as shown. These are taken from burned-out lamps and thoroughly cleaned, after which the crystals are inserted and the remaining space filled with Wood's metal or some similar alloy. Thus the crystals may be changed as quickly and easily as are vacuum tubes.

Contributed by Philippe A. Judd.

A NOVEL DETECTOR

I present in this article a new detector stand. The control is universal and



A crystal detector using an eversharp pencil for adjustment.

when once adjusted will stand quite a jar. The principal feature of this detector is the small sum for which it can be made. The pencil which is of the ever-sharp type can be purchased for ten cents and the rest of the parts are found in nearly every amateur's junk box.

I removed the lead from the pencil and soldered a cat-whisker to the bar that runs through the center. If the type of pencil you purchase has no bar through the center, but just a clutch, use a piece of copper wire the size of the lead that is used in the pencil and solder the cat-whisker to it. Next I soldered a ½" ball bearing about 1¾" from the blunt end of the pencil; this can be done very neatly by heating the ball with a gas flame and putting a drop of solder on the ball. Put a little flux on the pencil where it is to unite with ball and apply the pencil to the ball while the solder is still soft; remove the flame and let cool; you will then have a good joint. Next make two little angles of sheet brass through which drill a hole ¾", and two holes ⅛". The former hole is to form a socket for the ball, which sets between these two angles of brass when mounted on the base.

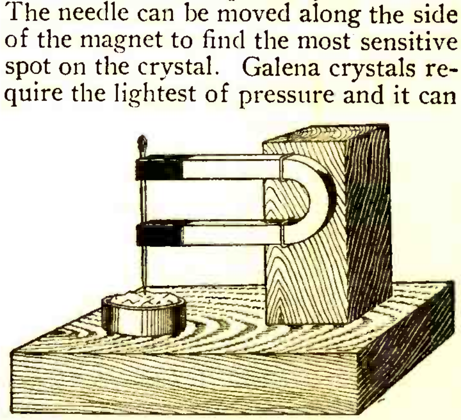
The crystal cup which is soldered or riveted to another brass angle is then made with two small holes for mounting it to the base. A knob for adjusting the pressure is made by using a composition binding post. Solder a small screw to the end of the pencil; an old battery terminal is very good for the purpose. Screw on the composition binding post and assemble and mount the parts on a base, which can be made of bakelite, rubber or a piece of hard wood.

Run one wire from the crystal cup to one binding post and one from one of the sockets to the other binding post which can be placed to suit the builder and you then have a detector that can be adjusted in every way. I am not giving dimensions of all the parts, for it is so simple it can be seen from the sketch or left to the discretion of the builder.

Contributed by John F. Dreper.

A MAGNET DETECTOR

This simple magnet detector may be made by any radio fan in a few minutes. A block of wood 2" high and ½" thick is glued to the base of the set. To the wooden block is attached a toy magnet. Ordinarily wire staples will hold it in place. The extremities of the magnet are placed directly above the crystal. An ordinary sewing needle is placed against the magnet which, of course, is held in place by attraction. The needle can be moved along the side of the magnet to find the most sensitive spot on the crystal. Galena crystals require the lightest of pressure and it can



Here is a clever arrangement in the way of crystal detector. The horseshoe magnet holds the needle in any desired position.

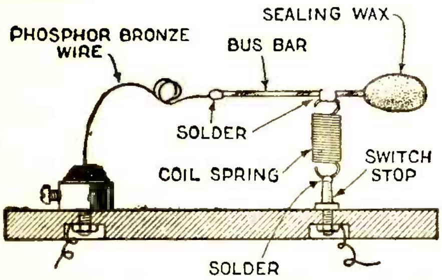
readily be seen that the magnet detector will allow less than the weight of a needle to touch the sensitive material.

One connection is made to the curved end of the magnet while the other is taken directly from the crystal mounting.

Contributed by Jack DeWitt.

HOME-MADE CAT-WHISKER AND HOLDER

A simply constructed cat-whisker for crystal detector may be made as follows:



An emergency cat-whisker, easy of construction.

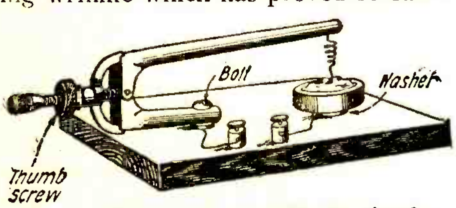
In the middle of a two-inch length of bus bar make a shallow notch with a three-cornered file. Around one end of the bus bar wind several turns of string and cover it with sealing wax for an insulated handle. A spring is wound on a ¼-inch rod ½-inch long, the ends being looped at right angles to the spring, as shown in the accompanying sketch. One of these loops is soldered to the notch in the bus bar, the other being soldered to the top of a switch stop. The cat-whisker is made of No. 26 wire coiled as shown in order to obtain the desired spring. One end of this is soldered to the bus bar, the other end being filed to as sharp a point as possible for contact with the crystal.

The knob of sealing wax is easily made by dipping the end of the bus bar wound with string into a small pot of melted sealing wax and then immersing it in cold water. This is repeated until a knob of desired size is obtained. This device may be mounted on a small bakelite or hard rubber base and with a crystal cup and two binding posts will form a very efficient crystal detector.

Contributed by C. L. Fender.

DETECTOR STAND OF NOVEL DESIGN

I present, in this article, an interesting wrinkle which has proved so satis-



An excellent and exceedingly simple crystal detector. Easy and universal control is afforded.

factory in actual use that I have decided to enter it in the contest.

Essentially designed for galena or silicon, this stand provides close regulation of the degree of pressure on the crystal. The importance of this feature is not to be overlooked if maximum efficiency is desired. When completed, the stand is placed on a solid base out of the way so that when once adjusted, movement of the receiver or accidental jars will not affect the adjustment. It would be well, in building a crystal receiver, to keep this point in mind.

As may be seen in the diagram, a compass or divider is used as the movable arm and pressure regulator. Secure a good compass; cut off one leg at the point indicated and bore two holes for the insertion of the pivot-contact. The arm may be cut off with a good hack-saw or sharp file and should be rounded off to avoid accidentally scratching oneself. The holes are to be cut with sufficient diameter to pass an 8/32 round-headed nickel machine screw. For a crystal cup I have used an old battery carbon terminal, although a purchased cup will not cost much and presents a neater appearance. If desired, the holder may be made after the builder's own ideas. A clip is sometimes employed with good results. As the size of the compass will vary from that which I am using, the exact distance between the swivel and cup cannot be given; however, the correct space is easily ascertained and should be marked on the base for drilling. Hardwood, fibre, bakelite, rubber or other good insulating material may be used for the base, the size of which will depend upon the type of compass employed. Secure a heavy piece and after the stand is assembled, it would be well to glue a thick layer of soft felt to the under surface. The felt will serve the dual purpose of preventing harm to polished tables and will allow the absorption of slight shocks and jars. I have used a piece of old storage battery jar for the base and after shining it up, was very pleased with it.

To assemble the instrument, it is necessary to drill two holes at one end for binding posts and two holes for the detector cup and adjusting arm. Use a good grade of well-insulated wire for connections and be sure that all points are soldered. For the cat-whisker, a No. 28 bare copper wire will give as good results as any. In actual use, the end of the wire touching the mineral should always be clean.

It is not necessary, contrary to our newspaper radio editor's opinion, to wash the crystal every week or so, or to wash it every day as advised by some. The daily tub in no way adds to the efficiency of the detector, as a trial will conclusively prove. If the dust is blown from the mineral surface every day, the unit will function satisfactorily.

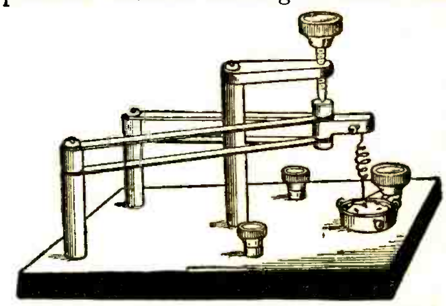
If it appears as though the sensivity of the mineral has faded, a new surface may be scratched with a knife. Either unmounted or mounted crystals give satisfaction with this stand. In general, keep the mineral as small as possible to allow only a short separation between the point of cat-whisker contact and the holder. This is said after the fact has been learned that most large crystals are "sensitive" near the edge. The stationary contact should be made to cover as large a portion of the unused surfaces as possible.

I am confident that anyone constructing this stand will find it entirely satisfactory.

Contributed by R. E. Gerhardt.

A GOOD CRYSTAL DETECTOR STAND

The following is a description of a crystal detector that, when set on a sensitive spot, pounding on a table is possible without moving it from that



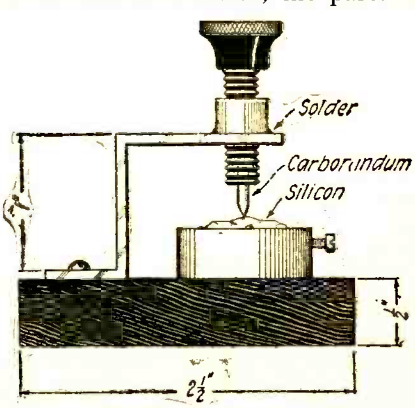
A very stable and serviceable type of crystal detector stand. The arrangement prevents the possible jarring out of a sensitive point.

sensitive spot. The ease of having a very light contact on silicon and heavy contact on galena is had in this detector. The bronze springs have a tendency to go upwards and are held in the right position by the knob for adjusting the cat-whisker. A base of dry wood or composition, two knobs, some sheet bronze, brass tubing and a few screws are all that are needed for this remarkable detector. Dimensions are not given, as they may vary with the same efficiency.

Contributed by William W. Smith.

A CARBORUNDUM-SILICON CRYSTAL STAND

For the construction of a carborundum-silicon detector, the parts re-



This combination of carborundum and silicon makes a very stable detector.

quired are one piece of silicon, one piece of carborundum (crystal form), one piece of wood 2½x1½ inches, one piece of spring brass 2¾x½ inch, one crystal cup, one brass bolt and nut ¼ inch, one screw ⅜-inch long and two ⅝-inch flat head thread screws.

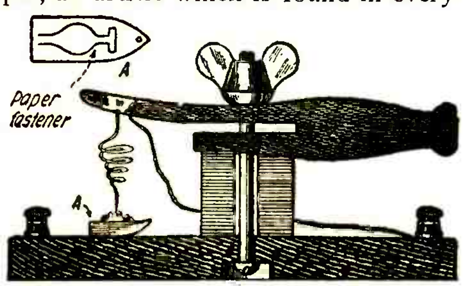
Bend the brass into shape as shown in the sketch, and drill one screw hole; also drill a 17/32-inch hole; solder the nut and drill 3/16-inch hole in one end of ¼-inch screw; fill this with solder and set carborundum in the solder while it is still hot. The crystal cup may be of any model. The carborundum must set very hard on the silicon, thus preventing the spot from being lost. This type of detector will keep the spot through the heaviest of thunderstorms and one may even pound on the table.

Contributed by Louis Hegel.

A CLOTHES-PIN DETECTOR

My endeavor to make a detector stand for my crystal receiver resulted in one similar to that shown in the sketch. Believing it to be novel and of interest to beginners I shall describe its construction.

The essential feature is the clothes-pin, an article which is found in every



Here is a practical crystal detector stand, utilizing a clothes-pin as an adjusting arm.

home. Secure a fairly smooth, dry pin and cut one leg off as indicated to allow for movement of the cat-whisker. Drill a ¼" hole in both legs to permit clearance of the adjusting screw. To the leg which has been partly cut off, glue a piece of wood ¾" square and 1" high. This small block also is bored with a ¼" hole and is so placed that the holes in the pin and the hole in the block coincide. Obtain a base of wood or other material about ½" thick and rather large; I used a base 4"x2". In the center of the base, secure an 8/32" machine screw, countersinking the bottom of the base so that the head of the screw will not protrude.

Mount the swivel and pin on this screw with a wing-nut at the top. The wing-nut provides the requisite pressure while the swivel and large hole provide movement in the other two directions. The crystal holder is made from a small strip of brass to which the head of a paper fastener is soldered. By bending the fastener as shown, any size crystal may be used. The cat-whisker and contact to the cat-whisker is soldered to a small metal strip at the point of the clothes-pin. A No. 28 wire was used. This detector stand has proved satisfactory and should be easy to make, as there are no complicated parts.

Contributed by J. Hatsuki.

SENSITIVE SYNTHETIC CRYSTALS

Super-sensitive crystals at 25c per gross! Here's how. Get some pure lead (Pb), *not solder* or lead alloy. Also some flowers of sulphur—ordinary powdered sulphur. Cut the lead in small pieces and mix with the sulphur in the ratio of seven parts by weight of lead to one part of sulphur. Place the mixture in a crucible, a tin cup, or some convenient container other than glass or porcelain. Heat over a Bunsen burner or over red coals in a stove. In a very short time the mixture will begin to glow and the lead and sulphur will fuse together. At this point, remove the mixture from the heat and place the container in a basin of cold water to cool.

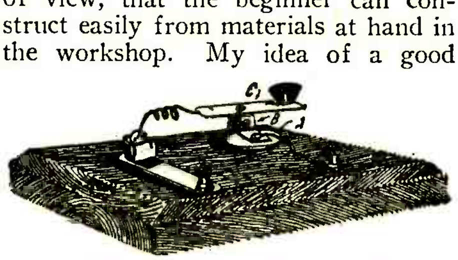
CAUTION: Do not let any water get on the crystals, as it will ruin them. If you have had things just right, you will have a lump of material that is supersensitive over its entire surface. If the lump is crumbly, you have "cooked" it too long, and if it is streaked with lead, you did not cook it long enough, or else you used too much lead. Your crystal will then be sensitive only in spots and not over the entire surface as it should. Use a very light contact. I have home-made crystals that are as good or better than the best natural crystal I ever used. Fine for reflex, too!

The above materials may be purchased at any drug store.

Contributed by R. L. Potts.

A UNIVERSAL CRYSTAL DETECTOR

I have not yet seen in *Radio News* a really good detector, from my point of view, that the beginner can construct easily from materials at hand in the workshop. My idea of a good



A universal joint crystal detector which is simple to construct.

detector is one with which a fine adjustment may be made on any point of the crystal. The detector described here has a form of universal joint which allows such an adjustment.

It is mounted on a wood base, 6 x 3 x ¾". The materials required are, a base, two binding posts, a strip of spring brass 2½ x ½", a wooden pot-lid knob, three small lock washers, and several pieces from a structural toy set such as "Erector" or "Meccano."

To make the universal joint first get a 2½" strip, three small angle pieces, and several nuts and bolts from the toy set. These are assembled as shown in the diagram with lock washers under the nuts at the points B and C. A round-head wood screw with a lock washer under the head is used to hold the joint to the base at A. A plain washer is placed between the wood and the angle piece to make it turn easily. The knob is put on one end of the horizontal arm and the cat-whisker on the other. A wire is soldered near the middle of the arm and a pig-tail lead is made over to one binding post.

The screws at points A, B, and C should be adjusted to give the desired stiffness of operation.

The crystal holder is shaped from the strip of spring brass. This is bent hair-pin shaped as shown and an angle piece is soldered on one side. A wood screw is used to fasten it solidly to the base. This holder is connected to the other binding post. The holder should be made so that it closes all the way when the crystal is not in it.

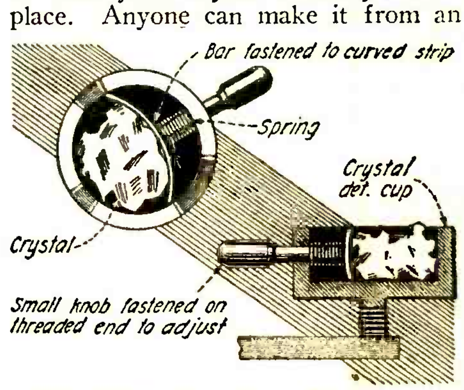
If lock washers are not to be had, small stiff springs may be used in their place.

By careful workmanship this may be made a very neat and efficient instrument.

Contributed by John W. Dixon.

SPRING CLAMP FOR CRYSTAL

Here is a little idea that is very practical. It is a simple spring clamp to hold your crystal securely in its place. Anyone can make it from an



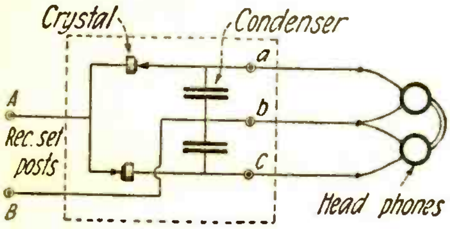
This spring clamp for a detector cup permits any size of crystal to be firmly held.

old crystal cup and a narrow bar. The spring is an easy factor to obtain and the small knob can be found anywhere in the experimenter's "junk box." Solder a curved brass strip to the brass bar, which latter should fit your set screw hole, put a spring between the strip and the body of the cup on the bar so that when the latter is pulled out the spring contracts. Tap the end of the bar on the outside and screw a small hard rubber knob on it to adjust the clamp. Thus on pulling the knob out the clamp contracts the spring and the crystal, which is then set in the clamp, is freed, thus holding the crystal securely in place.

Contributed by Jack Kahn.

A MULTIPLE CRYSTAL RECEIVER

I have used a double or two-crystal detector all summer with splendid results. Two-crystal, two-phone condensers with three binding posts are



This is a good stunt and well worth trying. Both halves of the incoming wave are made use of.

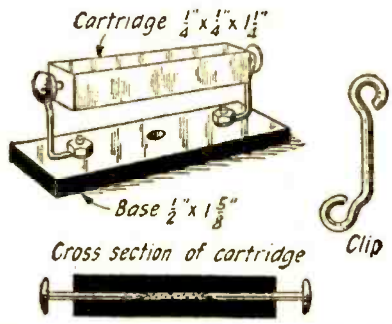
mounted on one base and connected as shown in the diagram, and two terminal posts, A and B, for connection to any ordinary receiving set.

In the ordinary crystal receiver only one-half of the incoming alternating current is rectified and passed to the receiving phones, that is, the pulsations running in one direction only, enter the phones. With two crystals, hooked up as shown in the diagram, the alternating pulsations are separated and those of one direction enter one phone while those of the opposite direction enter the other phone. It should be remembered that it is the number of turns of wire on the magnet of the phones that is desirable and not the high resistance. With the double crystal and the two phones connected separately, the results are the same as half the resistance with the same number of turns. This greatly increases the efficiency. If the phones are provided with three wires, you will find that you can connect them up not only with the double crystal detector but by connecting the two outer wires, A and C, to the binding posts of any ordinary receiving set, they will work exactly the same as with two wires. It is also possible to connect the center and one of the outer wires (B and C or B and A) to the posts of a receiving set and listen in with either phone or with two together as usual, thereby allowing a comparison of the effect of the resistance of one phone on the receiving set against that of both.

Contributed by A. N. Olson.

A FIXED CRYSTAL DETECTOR

A dependable crystal detector requiring no adjustment can be assembled from the following materials. Two upholstery or thumb tacks, two binding posts, two pieces of bakelite or other good insulating material, a length of hard drawn copper wire for clips and a small piece of crystal. Any good crystal will do, but perhaps best results will be obtained if the crystal is of the synthetic "all sensitive" variety. One piece of bakelite should be at least 1¼ inches long and about ¼ of an inch square. This piece is drilled lengthwise through the center with a small drill of a size to snugly accommodate the two thumb tacks. One tack is inserted in this hole to within about 3/16 of an inch of the center. The crystal should now be pounded to fine grains and 3/8 of an inch of them poured into the hole from the opposite end. The second tack should now be inserted in this end so that the crystal grains make contact between the points of both tacks. Mounting for this crystal detector may easily be made from the copper wire and may take the form shown in the diagram. This type of detector will prove both sensitive and



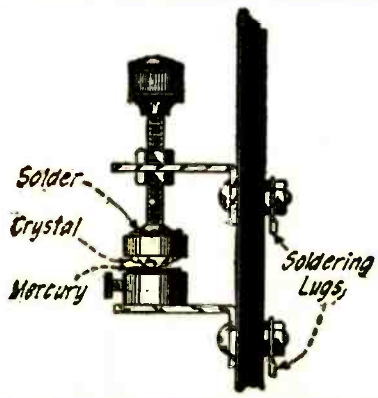
A cartridge form of fixed crystal detector especially adaptable to reflex receivers.

stable and may be used successfully in a reflex circuit.

Contributed by E. Lambert McDonald.

A MERCURY CRYSTAL DETECTOR

For those who are building reflex receivers and who wish a good sensitive crystal detector which will hold its adjustment under practically all conditions, the detector described in



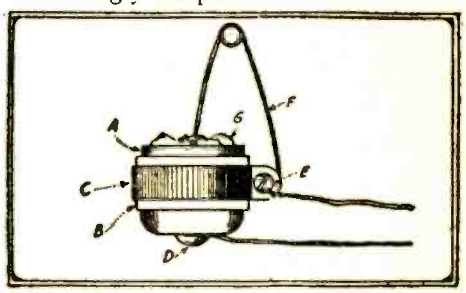
A crystal detector employing mercury as the contact. Turning the thumb screw on the lower cup raises or lowers the level of the mercury.

this article is recommended. For this detector you will need two brass angles ⅝ inch wide, with one arm ½ inch long and the other ¾ inch long. A crystal cup with a set screw on the side would also be required with a mounted crystal which projects at least ⅛ inch above the mounting metal. A synthetic "all-sensitive" crystal is preferable in this detector. You will also need ½-inch machine screws with two nuts and a soldering lug, a brass machine screw 1¼ inches long, with two nuts to fit. Now drill two holes 1½ inches apart in a line perpendicular to the bottom of the panel. Mount the cup on the lower angle with the set screw projecting away from the panel. Screw one nut on the shaft to within 3/8 inch of the head and put the other end of the shaft through the hole in the upper angle and screw another nut down to fasten it securely. A binding post knob may be screwed on the end of the machine screw to act as a handle. The mounted crystal should then be soldered to the head of the machine screw. At the nearest drug store obtain ten cents worth of mercury. Unscrew the set screw on the lower cup until it is almost out and nearly fill the cup with mercury. The crystal should then be lowered until it almost touches the mercury. The mercury should be forced up by means of the set screw, so that it barely touches the crystal.

Contributed by C. Wesley Wisel.

A SAFETY PIN DETECTOR

The following is a description of an exceedingly simple detector:



A real silicon detector, using a safety pin for simplicity.

A is the metal end of a cartridge fuse, B a strip of mica 1/16 around the cup, C a strip of brass forming a ring over the mica and tightly clamped by E, D one lead soldered to cup, E a binding post holding C and safety pin, F a safety pin and G a piece of silicon.

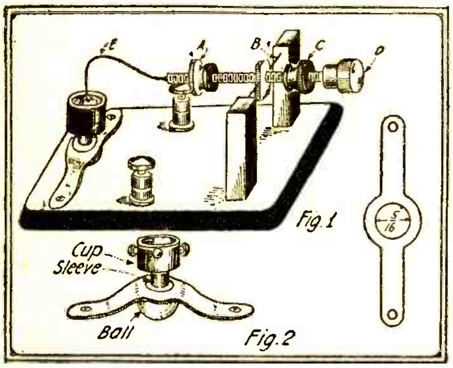
Contributed by Harry Rosenberg.

(*Editor's Note.*—Try the base of a broken electric light in place of the cartridge fuse end. Fasten the brass strip near the top so that the whole may be screwed into a lamp socket.)

BALANCED GALENA DETECTOR

Upon testing many galena detectors and finding their faults I constructed a balanced detector which I have used very successfully. This type has the decided advantage of eliminating the poor pressure control usually found on detectors of other types (due to the unreliable pressure of "catwhisker" wires). It therefore has more *accurate* pressure control, more uniform in operation, more reliable and is easier to adjust.

The finished instrument is shown in Fig. 1. It will be noted that the cup is movable and the unique pressure control is fixed; this enabling one to obtain and maintain the desired pressure adjustment so essential to good results with galena detectors. The cup is adjustable by means of a ball and socket joint, a piece of spring brass being cut and drilled as illustrated. A brass ball about 3/8 of an inch in diameter is drilled and tapped, and attached to the mineral cup by means of a short screw. These may be spaced by a sleeve, although this is not essential. The cup may be bought at any company handling radio goods. The base of the



This method of detector adjustment is not a bad idea. Try it.

instrument (formica, bakelite, or even composition) should be counter-sunk to receive lower part of the ball. See F, Fig. 2.

The balance arm is a ten twenty-four screw (two and one-half inches long) with its head severed off and in its place an ordinary electrose knob is screwed on. To the opposite end is soldered a gold or platinoid wire, which should be No. 18 or 20. Counter weights, A and C, enable any amount of pressure to be exerted upon the crystal. Knob D counter balances wire E. The trunnion, B, is a small disk of brass with two very small screws projecting outward, *exactly* opposite each other. These have their heads cut off and are sharpened to a point.

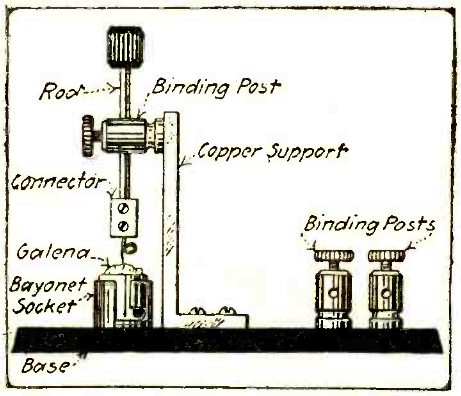
The two uprights are then mounted on the base exactly the correct distance apart. These may be square or round rod about 1¼ inches long with a very small hole drilled one inch above the base. The points of the trunnion rest in these holes and it should be so adjusted that the balance arm swings freely. Binding posts are then mounted and complete the instrument, unless the builder wishes to nickel-plate same for the sake of appearance.

It may be thought that a detector of this type would "jar out" easily, but I have found that this is not the case. Although the arm would ascend when detector is jarred, *it would return to precisely the same spot as before,* if the separation between the supports is not too great. Once the correct pressure for a certain crystal is found, all that is necessary to adjust the detector is to move the cup until a sensitive spot is located, this method being both rapid and permanent. The very satisfactory results obtainable with this device will more than compensate one for the little time required in its construction.

Contributed by Edmund S. Smith, Jr.

DETECTOR WITH UNIT CRYSTALS

The accompanying drawing shows a cheap but very efficient detector made



Here is a novel form of detector stand in which the unit crystals may be used.

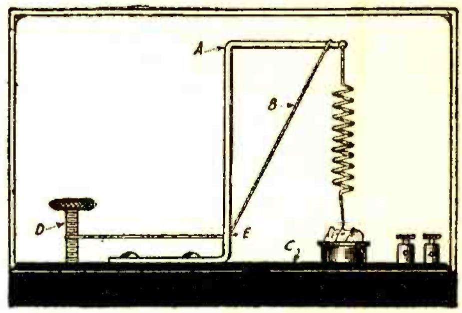
from material which can be found in any camp of a "radio bug."

First secure a base which can be either rubber, fibre or shellacked wood; then get a heavy copper strip about three inches long and punch or drill a hole at each end, bend one end at right angles and run a wood screw through the hole, fastening it securely to the base. Take a binding post and fasten it at the other end of the copper strip; next get a small brass rod which is threaded on one end and put it through the hole in the binding post. Twist a hard rubber knob on the threaded end, and on the other end put a wire connector so as to connect the brass rod with the cat whisker; the cat whisker can be soldered to the end of the rod if preferred. For the mineral cup take a bayonet socket and sink it into the base until the end of the socket is even with the bottom of the base. Now procure an old auto lamp and break off all the glass, leaving the insulating compound at the bottom; mount a piece of galena in the auto lamp base with Wood's metal; now place this auto lamp base or mineral cup in the socket. Make connections to the binding posts and the detector is ready for use. Many of these mineral cups can be made for using different minerals, and it takes but a second to change from one cup to another.

Contributed by Edward L. Friedman.

A SIMPLE DETECTOR

This is a detector suitable for the bug who lacks the tools required for making most detectors. A is a piece of flexible brass strip screwed to the base C. B is the adjusting wire soldered to A and running through the hole E and fastened to the screw D.



This amateur designed a detector so that the pressure on the crystal is controlled by a wire and thumb-screw.

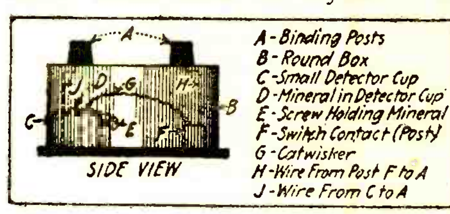
By turning the screw D it pulls the wire, thus pulling down the strip A and adjusting the cat whisker on the mineral.

Contributed by H. Richardson.

A SEALED CRYSTAL DETECTOR

This type of crystal detector is very valuable in small portable sets, where the buzzer test for every signal is too much bother. The detector is always ready for use and requires no adjustment. It can be made in half an hour and will prove a very satisfactory instrument.

Description: B is a small wood box. Any box will do. The writer used the box which had contained some *Radiocite* mineral. C is a small brass cup which is fastened to the box by means of a machine screw passing through the bottom of the box. E is a machine screw which holds the crystal D in



A detector of this type requires no adjustment, as the contact point and crystal are enclosed in sealing wax.

place; F is a contact point which is used as a post. G, the cat whisker, and H, a wire, are both soldered to F. H runs to a binding post A. J is a wire soldered to the cup C and runs to a binding post A.

The next step is to fasten the cat whisker to the crystal.

Connect the detector as for a buzzer test. When the most sensitive spot is found, heat some sealing wax and drop some of it on the crystal, thus holding the cat whisker in place. Always keep the buzzer running for by so doing you can easily tell if the sealing wax knocks the detector out of adjustment.

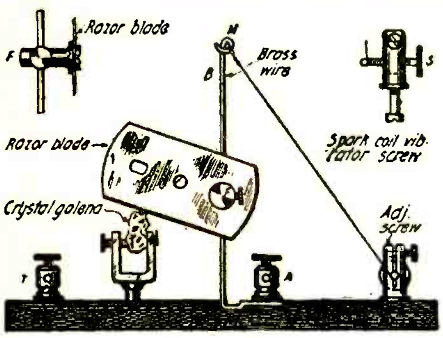
After the cat whisker is fastened to the mineral and the detector has been tested, pour sealing wax over the detector until it is entirely covered.

Glue the cover on the box and you have a sealed detector.

Contributed by Chas. H. Steiger.

A NEW SYSTEM OF CONTACT FOR A GALENA DETECTOR

As shown in the diagram the sharp edge of a Gillette blade is used instead



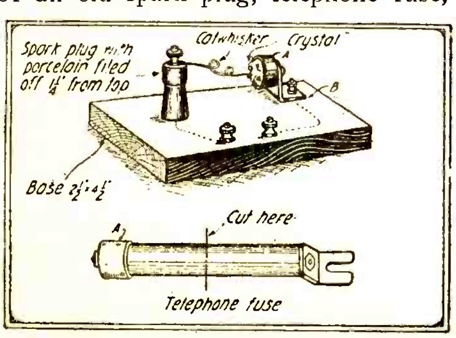
Here is a use for dad's old razor blades. They don't need to be stropped for this use.

of the common cat whisker to secure a contact on the crystal. This detector, when set up, cannot get out of adjustment. It is simply made of a copper wire along which a binding post supporting the plate can move. An old spark coil vibrator screw is fixed on the base, and allows a close adjustment of the pressure of the blade against the galena, by means of a cotton thread fixed at the upper end of the copper wire, and which can be wound or unwound around the screw of the vibrator. To adjust this detector, the blade is first fixed so that it is about 1/30 of an inch from the crystal, then by turning the screw of the vibrator, the thread fixed to the wire, which acts as a spring becomes loose and allows the contact to be made on the crystal with the proper pressure. This detector when adjusted is very steady in operation and may be easily built by the average junior constructor.

Contributed by M. Desforges.

A SIMPLE DETECTOR

The material needed may be found in any electrical workshop. It consists of an old spark plug, telephone fuse,



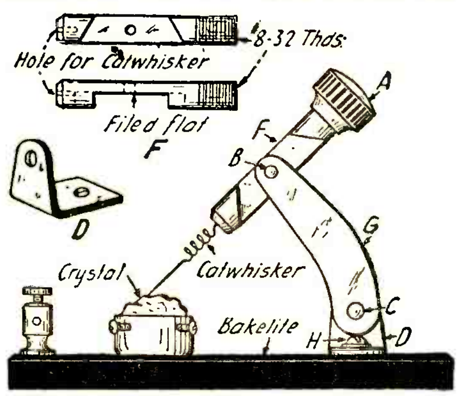
A spark plug and a telephone fuse form this detector.

binding posts from dry cells and a base. The cup holding the mineral may be rotated, raised or lowered. The dimensions and method of assembling are shown in the drawing. An ideal detector for all junior amateurs.

Contributed by Chas. H. Kressler.

A WELL DESIGNED CRYSTAL DETECTOR

Most crystal detectors made by amateurs seem to be hard to adjust and lose their adjustment very easily, but the design of the crystal detector shown in the diagram permits easy adjustment and once it is found the sensitive spot can be retained. The manner in which the cat whisker is formed is responsible for this. The detector is easily made. The elbow "G" and the angular piece "D" are made from 1/8 brass sheeting. The elbow is fastened to the angle piece with a small brass rivet "C." The angle piece is fastened to the bakelite base by a brass bolt "H" which leaves the angle piece free to rotate easily. Fastened to the upper part of the elbow "G" is a piece of 3/16 brass rod which is filed flat on one side and fastened to the elbow with another brass rivet "B." One end is threaded to take a composition binding post knob "A" and the other end has a small hole drilled in it to receive the



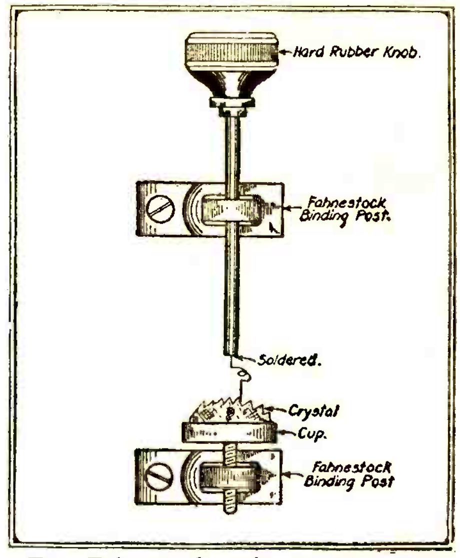
This crystal detector will not be put out of adjustment easily.

cat whisker. The cat whisker is soldered in. The rest of the detector needs no explanation. The cup is of the ordinary kind and everybody knows what a binding post is for.

Contributed by Floyd Rittman.

PANEL TYPE "FAHNESTOCK" DETECTOR

The following suggestion may prove of aid to experimenters who make their own sets. I have in mind a crystal detector which is simple in construction and "stays put." It is made by screwing two "Fahnestock" spring binding posts (may be taken from a Columbia dry battery) about two inches apart on a panel or base. A piece of phosphor bronze wire is soldered to one end of a two-inch piece of No. 8 B. & S. brass wire. The other end is threaded with an 8/32 die to take a hard rubber knob. The cat whisker rod is first passed through the top binding post before screwing on the knob. A brass cup, taken from a



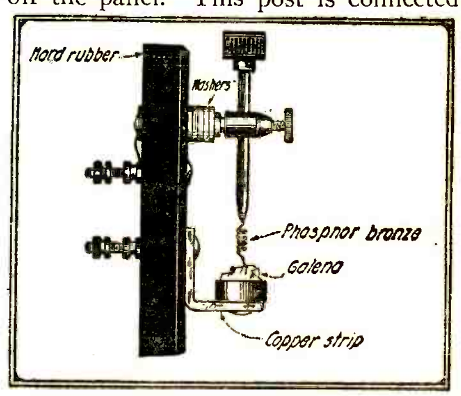
Two Fahnestock spring bindings and several "knick-knacks" and you have a good-looking panel type detector.

battery carbon, is fitted to the lower binding post.

Contributed by Joseph Liebowitz.

A PANEL DETECTOR

This detector is made for panel use only, as many sets are built without a detector. The back is cut out of an old phonograph record cut to size on drawing. The holder for the crystal is a small brass cup bolted onto a copper strip which is fastened to a battery binding post extending through back. The rod is held by a binding post held out by four washers to keep the knob off the panel. This post is connected



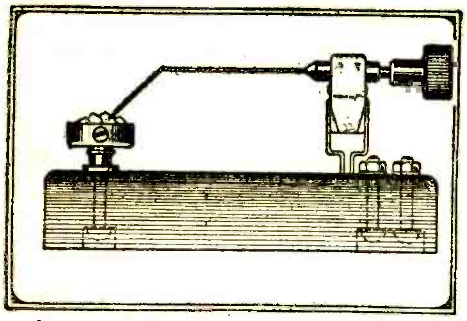
A phosphor bronze wire is soldered to brass rod for contact with crystal.

through the back to another post on the other side. A crystal of galena is held in the cup by a soft metal known as hugonum.

Contributed by F. G. Campbell.

SIMPLE CRYSTAL DETECTOR

Here is a small wireless detector which I made of very little material. Procure a cup from an old dry cell, two brass machine screws and a battery binding post. A heavy magazine clasp with the long end bent into the shape of a tube is fastened in a hole ⅛" in diameter drilled in the base. The knob is an old auto switch plug key. A piece of copper wire is then soldered to the



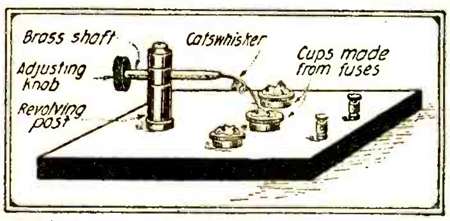
A crystal detector permitting ease of adjustment may be constructed as shown. Note the use of the magazine clasp.

shank of the knob. Refer to the drawing for other details. This detector was made for use with Galena.

Contributed by Harry Wardrum.

A TRIPLE-CUP MINERAL DETECTOR

First a base of hard rubber or fiber is procured. This is arranged as shown in the drawing. Then several 15 ampere fuses are called into use; three caps taken from these will make excellent detector cups. A hole is drilled in



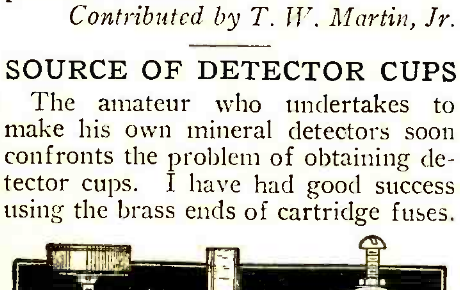
This is a simple three-cup mineral detector, easily made at little expense.

each base cap after the fuse wire and asbestos powder has been removed. Through this hole is shoved a 3-inch shaft threaded on one end with a cat whisker soldered to one end. On the threaded end screw a knob. Put a crystal in each cup and test out on receiving set. The standard should be pivoted at the base.

Contributed by T. W. Martin, Jr.

SOURCE OF DETECTOR CUPS

The amateur who undertakes to make his own mineral detectors soon confronts the problem of obtaining detector cups. I have had good success using the brass ends of cartridge fuses.



Many novel ways of making and mounting detector cups suggest themselves to the handy experimenter.

The small or thirty ampere size does very well for crystals mounted in soft metal.

Cut about 3/16 inch from the open end. This leaves a cup about ¼ inch deep. Solder to the bottom of this, as shown in sketch, a flat-headed brass screw long enough to make connection under the base of the detector. Countersinking slightly the hole in the base will permit the cup to come down properly.

To mount the cup horizontally on a base or up on a panel cut a strip of brass about 1/16 inch thick, ¾ inch long and ⅜ inch wide. Round off each end to improve the appearance. Drill a ⅛ inch hole at one end. Bend the strip in the center to a right angle and solder to the back of the cup in the place of the screw as in the previous case. This cup may be mounted to the base of a panel by a screw through the brass strip.

To make a cup with screws to mount the mineral, it is best to use a larger fuse end. The next size does very well. This cup may be cut down to give the required depth, about ⅜ inch. Around the wall of the cup drill three ⅛-inch holes each at right angles to the axis of the cup and at 120° to each other. These may be tapped and screws inserted to hold the crystal, or brass nuts may be soldered over each hole for the screws. Such a cup may be arranged for mounting as previously described.

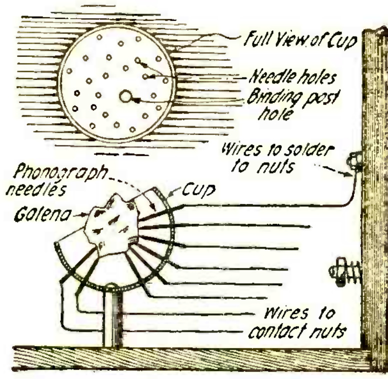
If the experimenter is properly equipped and so desires he can nickel plate these cups thus greatly improving the appearance.

A few old fuses for this purpose can usually be obtained from any user of electric power.

Contributed by Kenneth E. Miles.

PERMANENT CRYSTAL DETECTOR

The crystal detector illustrated in the accompanying drawing will be



If one of the sensitive spots of this type of detector becomes dislodged another can be easily found by turning the switch lever.

found extremely practical and very convenient. Usually one of the chief drawbacks of the crystal detector is the difficulty in keeping it in adjustment. A cat-whisker may easily be dislodged from the sensitive spot by static or when a transmitter is operated in the neighborhood. When this happens, it is necessary with the ordinary type of detector to readjust the cat-whisker and find another sensitive spot. This constant need for adjustment is the feature which makes the crystal an undesirable method of detecting radio signals.

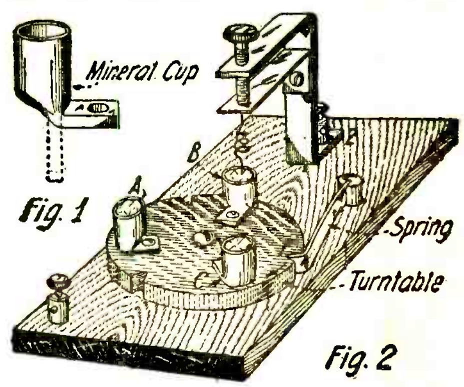
The type of detector suggested by the drawing eliminates this feature. Any number of cat-whiskers, in the shape of phonograph needles, may be brought to switch points on the front of the panel. If one of the sensitive spots becomes dislodged, another can be easily and quickly found by turning the switch lever.

The constructional details of this detector are clearly indicated in the illustration. Phonograph needles pass through holes in the detector cup and support the crystal. The ends of the needles are wired to the contact points on the front of the panel.

Contributed by C. E. Ackerman.

WIRE TERMINALS USED AS MINERAL CUPS IN NOVEL CRYSTAL DETECTOR

Procure three old wire soldering lugs (terminals) and bend them as



A three-cup crystal detector. The cups are made from wire lugs. The mounting table turns, thus affording selection.

shown in Figs. 1 and 2. In a piece of round brass drill three holes, A, B and C, as in Fig. 3. Thread these holes to fit screws and screw the three lugs on, as shown. Drill also the hole D and put a bolt with washer through the base, bringing over a wire to the binding post, as shown by dotted line. Mount a piece of spring steel as shown in Fig. 3. Bend a strip of brass as shown XYZ in Fig. 3 and tap a hole at E. Bolt on at Y a piece of steel soldered to the cat-whisker. Insert thumbscrew EX. As each cup is under the cat-whisker in the most convenient position place a mark at F wherever the spring steel touches the rim. File out a V-shaped piece; this keeps the turntable rigid. All three crystals are thus available for use by merely turning the turntable to the next notch.

Contributed by Maurice Goldstein.

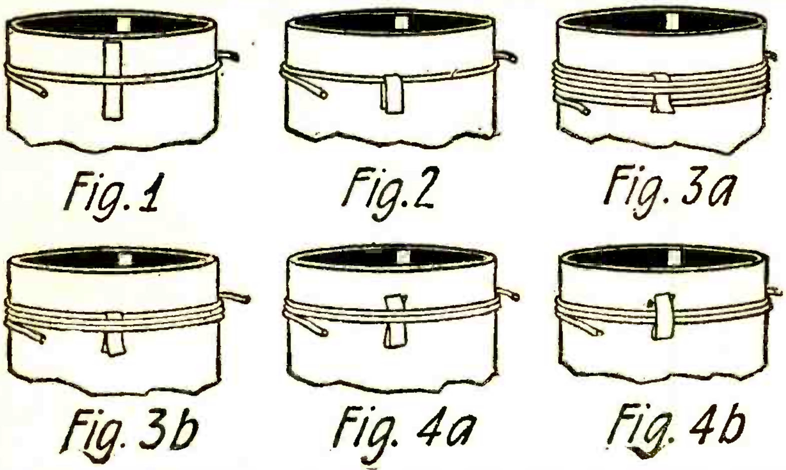
(*Continued on page* 90)

INDUCTANCES

The inductances in a receiver are of prime importance. A minimum of distributed capacity, internal resistance and a maximum of pure inductance are the earmarks of a good coil. Many such good ones are herewith described.

FASTENING COIL ENDS

Here is an easy way of fastening the extreme ends of a home-made coil. I have found that in using this wrinkle, it is possible to do away with drilling holes in the coil form for fastening the ends of the wire. It also prevents the wire from slipping while winding the coil. Following is the method of procedure:



This method of fastening coil ends does away with the necessity of drilling holes through the tubing. A bit of tape is all that is required.

Cut two strips of ¼" cotton tape 2" long. Place one strip and end of wire on form as shown in Fig. 1. Fold the tape over the wire as shown in Fig. 2. Wind from two to six turns over the loose ends of the tap thereby securing the portion of each to the surface of the form as shown in Fig. 3B. Lift the loose ends of the tape from the surface of the form and wind two or three more turns, then pull the ends of the tape and cut them off close to the wire and continue winding until reaching a point five or six turns from the intended end of the coil. Fold the other piece of tape in half and place as shown in Fig .4B. Wind from two to five turns over the loop as shown in Fig. 4A. With this done, cut the wire, leaving enough loose end for necessary connections. Pass this loose end of the wire through the loop and pull the loose end of the tape tight so that the loop will secure the end of the wire. Cut the loose ends of the tape and you have a very neat appearing coil.

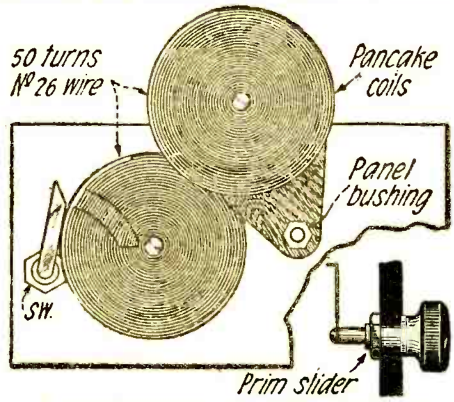
Contributed by C. M. Hallar.

A SIMPLE TUNER

The all-around efficiency and compactness of pancake coils should appeal to the average amateur constructor.

A very simple tuner can easily be made from these coils, a description of which follows:

The primary is wound with 50 turns of No. 26 wire and the secondary with 40 turns. The primary coil is mounted directly on the rear of the panel. A circular path on the coil is scraped free of insulation. A switch is procured and the lever is taken out of its regular place and mounted in back of the switch bushing. The lever is so arranged as to slide over the bare place on the copper wires of the primary. The secondary or movable coil is mounted directly behind the stationary coil, as shown in the diagram. This is connected to a knob in front of the panel and is kept in any desired position by using a tight panel bushing. Using a single circuit regenerative receiver, the writer has obtained excellent results, having heard KSD, St. Louis, Missouri, several times. This is over 2,000 miles away.



A unique tuner, employing pancake coils. Inductance variation is accomplished by means of a switch-arm slider.

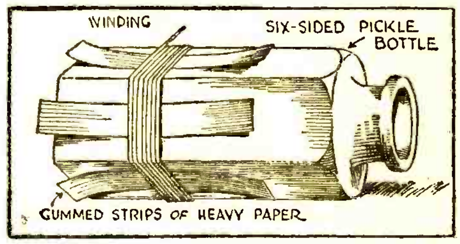
Contributed by Robert Muff.

SELF SUPPORTING LOW-LOSS COILS

Besides the spider-web and basket-weave low-loss coils, there has come into wide use the type illustrated herewith. For want of a better name, and because they are wound on pickle bottles, they have been named "Pickle Bottle Coils."

Not only does this coil possess all of the desirable features of the low loss coils, but they are a little easier to wind. Secure a bottle that has six or eight sides, as shown in the drawing. Secure strips of gummed paper, and run them with the gummed side up along each side.

Then start the winding. Number 20 wire will do. When the required number of turns have been wound, bend over the gummed strips, and secure them solidly. Then remove the whole coil from the bottle, by sliding it off. If you have wound the wire too tightly, it may be necessary for you to break the bottle. This can be done without danger with a small hammer.



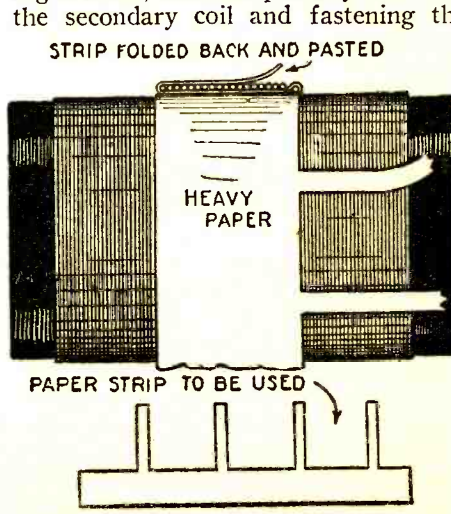
Method employed for winding the low-loss coil. The coil is secured by the gummed tape.

The finished coil will be found to be self-supporting, easily mountable, and to possess minimum losses.

Contributed by Harry Van Der Staal.

FASTENING A PRIMARY COIL

The fan who builds his own is often confronted with the problem of winding a small, untuned primary coil over the secondary coil and fastening the



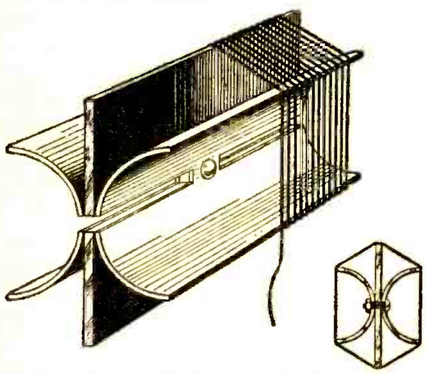
One of the best methods yet devised for fastening a primary coil that is wound over a secondary.

ends so that they will be permanently fixed. Cut from heavy paper a strip like that shown in the sketch. Make it as wide as the primary coil will be and leave several half-inch strips attached to one side. This is fastened to the secondary coil with collodion, the tabs extending to one side. Wind on two turns of wire before starting to wind the coil, these being the leads. After winding the first turn, bend the strips back over it and then wind on the rest of the coil *over* the strips, which should be previously coated with collodion. After finishing the coil, wind on two more turns for leads. Bend the tabs back over the coil and fasten them down as shown in the sketch. In a few minutes the wires can be clipped loose at the ends and the coil will be complete, with long leads.

Contributed by Clyde D. Williams.

LOW LOSS COIL FORM

A good form for low loss coils may be made by cutting a bakelite tube in half. There is a slot sawed down the center of each half, allowing space for the two halves to be bolted together. A strip of panel about 1½ inches longer than the diameter of the tube is drilled at the center and slotted so as to coincide with the central slots in the tubes. These three pieces are fastened together with slots coinciding. The wire may be wound on in either of two



A low-loss coil form made from hard rubber tubing and a panel.

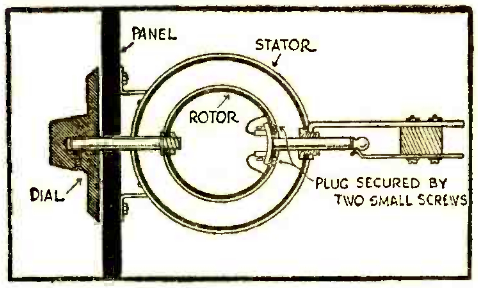
methods: Straight around the outside of the tubing, or wound as a "D" coil using the slot in the center.

Contributed by Reginald C. Requa.

ROTOR CONNECTION FOR VARIOCOUPLER

In the construction of the rotor connection illustrated in the accompanying diagram, the parts needed are to be found in most any fan's junk box. All that is needed is a telephone plug and single circuit jack.

Two holes are drilled diametrically opposite in the tube carrying the rotor winding. The phone lug may be inserted in one and a brass rod, ¼ of an inch in diameter, secured by two nuts in the other. The wires from the two ends of the rotor winding are secured in the binding posts of the phone plug, just as phone tips would be. The single circuit jack is placed on a suitable hole in the tube carrying the primary or stator winding. Connections may be soldered to the lugs of the jack in the usual manner and the result is a connection to the rotor, which is quiet and which furnishes a solid bearing. This arrangement allows the rotor to be turned as many times as desired without the necessity of stops to prevent the pulling loose of flexible leads. The jack also maintains an even tension counteracting any unbalanced condition of the rotor, which makes for accurate tuning.



An excellent contact for the rotor connections of a variometer or variocoupler can be made from a plug and jack as shown.

The same scheme will find its application in many places, where variable leads will cause awkwardness. With the cheapness of present day apparatus, it solves a troublesome difficulty inexpensively.

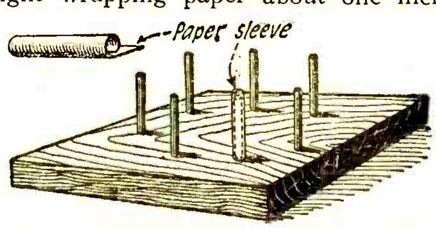
Contributed by Malcolm F. Jameson.

PAPER SLEEVES FOR BASKET-WEAVE COILS

Doubtless many experimenters who roll their own basketweave coils have had the misfortune to scrape the insulation from the wire when removing the coil from the pegs, even though great care was exercised in the act.

This difficulty may be overcome by making paper sleeves to slip over the pegs. When the completed coil is removed from the pegs, the paper sleeves slip off, too. As they are soft, they may be withdrawn from the coil easily, leaving the insulation intact.

The paper sleeves may be made of light wrapping paper about one inch



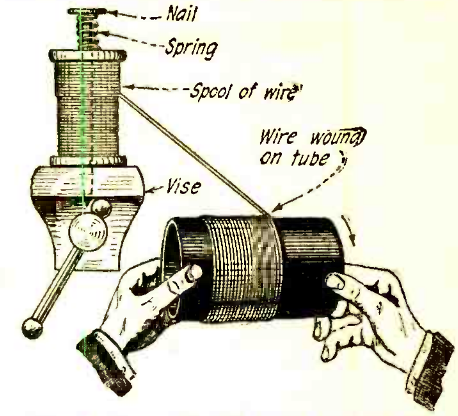
Paper sleeves slipped over the nails on a coil winding form make it easy to get the coil off when completed.

wide and the same length as the peg. The paper is rolled smoothly around the peg and fastened along the edge with glue or shellac. The sleeves must slip off the pegs easily, so that when the coil is completed, there will be no tendency for the wire to bind on the pegs.

Contributed by C. E. Multog.

COIL WINDING DEVICE

One of the most unhandy of radio processes is the winding of a coil when there is no one around to help. The scheme shown is a simple one and will aid wonderfully. A spring is placed



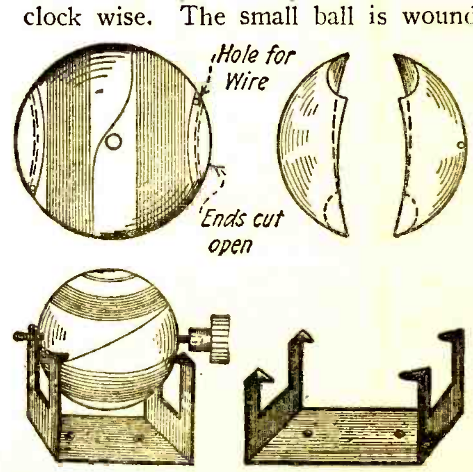
The spring and nail serve to keep the wire taut while winding a coil.

over a nail, as shown, and the spool of wire placed under it. The nail is then mounted in a vise so that the friction of the spool keeps the wire taut, helping greatly in the winding process.

Contributed by A. J. Hayward.

A VARIOMETER FOR TWENTY-FIVE CENTS

I recently made a variometer for less than twenty-five cents. It was made with two paper toy balls at five cents each, some No. 26 wire, two brass screws, four nuts and a strip of brass 8" by 1'. The whole expenditure was really the price of the two balls as the other articles were odds and ends. The diameter of the small ball is about 3" and of the other, about 3½". Each is wound with 48 turns of wire. The outer, or stator, is wound clock-wise and the inner, or rotor, is wound anti-clock wise. The small ball is wound



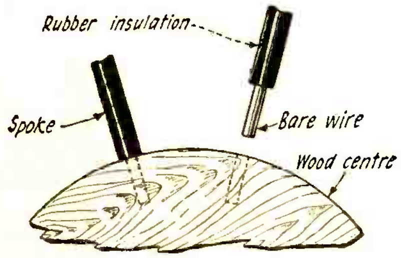
A simple variometer can be made from two paper toy balls. The total cost of this variometer is about twenty-five cents.

first. The wire is started through a hole punched in the edge, as shown in the illustration. The first turn is kept in place by running a sharp knife around the ball and raising up an edge. The two screws are then put in place, the nuts clamping the ball firmly to allow for turning. A knob can be put on an extension fitted to the same screw, making an up-to-date finish for mounting. The two halves of the larger ball are put over the small one and holes made in the center of each half for the rotor screws. A small strip of paper glued to the edges will hold the two halves together. The winding can then be put on. The stand was made of 1" brass strips turned up as shown and the ends made into prongs to pierce the outer ball just enough to hold it firmly.

Contributed by L. Album.

AN IMPROVED SPIDERWEB FORM

The conventional wooden, spider web coil form with its round wooden center and radial wooden spokes is rather difficult to construct, for the wooden center has a tendency to split when the rather large holes that are to take the spokes are bored into it. If the wood spokes are made so small that the holes bored in the center-piece are small enough not to split the wood, they will not be strong enough to support the winding of the coil, and they will be likely to break if the form is not handled with care. All these difficulties, and many others, are overcome by using lengths of rubber-covered No. 12 or 14 wire for the spokes. The pieces of wire are cut ½-inch longer than necessary for the spoke, the insulation on this extra half-inch of wire is cut away, and the bare part inserted in the hole bored to receive it in the wooden center disc. The bare end of the wire can be firmly held in the hole with a little glue. The holes in the center-piece need be only large enough to receive the bare wire. They may be almost a driving fit for the wire.



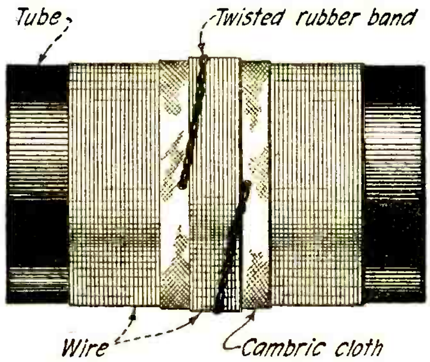
Rubber insulated wire is used for the spokes of this spider-web form.

The advantages of the wire over the wooden spokes are numerous. The winding on the form sinks slightly into the insulation of the wire spokes and holds it in place without paint or other treatment. The insulation also holds the turns of the winding apart, assisting in insulating them from each other. Last but not of least importance, a form constructed with the wire spokes is much easier to build and is stronger than the all-wood form.

Contributed by Charles F. Felstead.

FASTENING FOR COIL WINDINGS

An excellent idea for the experimenter who winds coils and does not wish to go to the trouble of making permanent fastenings, is illustrated in the accompanying sketch. A twisted rubber band is attached to one end of the winding and around the windings to the opposite end of the coil. Here it is attached and the pull of the elastic keeps the windings in place.

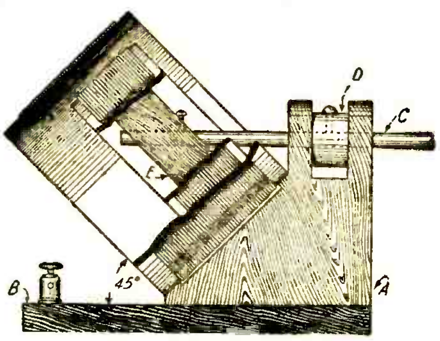


Coil ends can be successfully fastened with a rubber band, as shown.

Contributed by G. P. Longstreet.

EASILY CONSTRUCTED 180° VARIOCOUPLER

The object of this article is to describe the construction of a cheap and efficient 180° variocoupler. The device is so simple that hardly any explanations are necessary. The accompanying sketch shows plainly the details of construction.



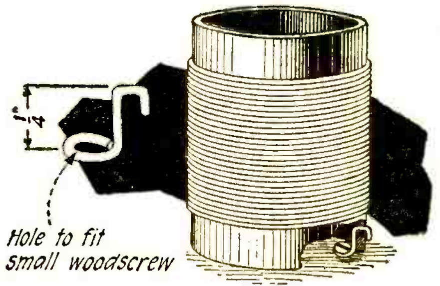
Details of a simple 180° variocoupler unique in design and construction.

The stator and rotor are pieces of cardboard cut out of old round cardboard boxes. These pieces should be given one or two coats of shellac before they are wound. The primary consists of 50 turns of No. 26 D. C. C. wire and the secondary of 40 turns. The shaft is a ¼" round brass rod bought in a ten-cent store. If this is not obtainable, a round lead pencil will work as well. Pieces A, E and base B are of wood (preferably hard wood) ½" thick. It is well when making piece E to leave it about ½" longer than necessary and then drill a hole for the shaft. The ends are cut off evenly coming from the edge of the shaft hole. This will insure a true running rotor. This piece is fastened and placed with glue. D can be of wood or metal and should fit close in the notch in the bracket, A, so as to prevent end-play of the shaft. The coupler can be mounted directly on the back of a panel if desired, in which case base B is omitted. Flexible leads from the primary and secondary coils are led to their respective terminals in the receiving set or connected to four small binding posts mounted on the rear of the base. Taps may be taken off the primary coil at the most convenient positions. This variocoupler has been built by the writer at the cost of a few cents and has given as good results as any on the market.

Contributed by A. Ferrand.

COIL CLAMP

An easy and inexpensive way of fastening coils firmly to the baseboard without using brackets or bolts is illustrated in the accompanying sketch. Cut a piece of bus-bar or round wire (about No. 14 or 16) 1½ inches long. Bend a loop in one end of the wire to fit a small wood screw and then turn the straight part of the wire at right angles to the loop. Form a hook in the straight part, which passes through a hole drilled in the tube about ¼ inch from the bottom. The coil may then be placed on the baseboard and fastened down by using a wood screw through the loop in the clamp.



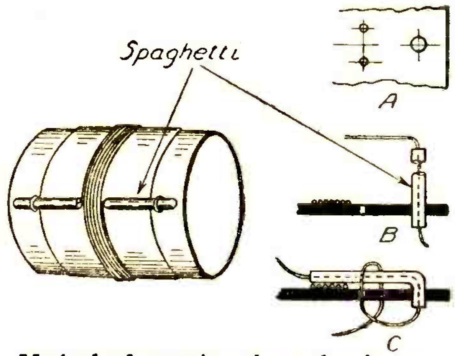
A coil clamp easily made.

Contributed by T. J. Brant.

A DEVICE TO FASTEN ENDS OF NARROW COILS

In winding coils for various purposes, it is frequently necessary to place a winding having but few turns over another winding, the turns of which cover a considerable width. When such a case presents itself, the problem is to provide a suitable anchorage for the beginning and end of the smaller coil.

The usual method is to fasten the wire to the form outside of the winding already in place and make a turn with a large spiral to the point where the second coil is to be wound. At the end of the winding the process is reversed. This method does not make a neat job and unless shellac or some form of "dope" is used, there is a pronounced tendency for the end coils to loosen.



Method of securing the ends of narrow coils.

The sketch herewith shows a quick, neat, simple and substantial method of fastening the ends of narrow coils when such coils are wound centrally or otherwise over wider coils. All this requires is two small pieces of fairly stiff spaghetti. The work proceeds as follows

Drill three holes in the form opposite the beginning and end of the winding. Sketch A shows one group of holes. The larger hole should fit the outside diameter of the spaghetti and the smaller ones should be large enough to permit the size of wire used for the coil to pass through several times.

Cut two pieces of spaghetti to suitable length draw the wire to be used for winding the coil through one piece of spaghetti and insert it in the large hole, as shown by B.

Bend the spaghetti over, as shown by C, and thread the free end of the wire through the small holes, forming one or more loops around the spaghetti as shown.

Wind the required number of turns on the coil. Hold the last coil with one hand, cut the wire, draw the end of the winding through the second piece of spaghetti and repeat the foregoing operations.

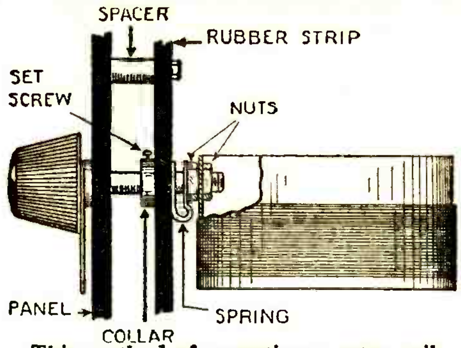
Contributed by William C. Roemer.

ROTOR MOUNTING

One of the most difficult pieces of apparatus to mount so that it will operate smoothly is the rotor in a coupler. The following method should prove satisfactory to constructors, as it provides for an even tension on the bearing, which prevents slipping or binding.

The parts required for this mounting are as follows: a knob and pointer, a shaft which is threaded at both ends, a collar to fit shaft with a set screw, a strip of insulation about ¾ of an inch in width, spacers, washers, etc. The ordinary tap-switch will supply most of these parts.

The insulated strip is mounted behind the panel, as shown in the accom-



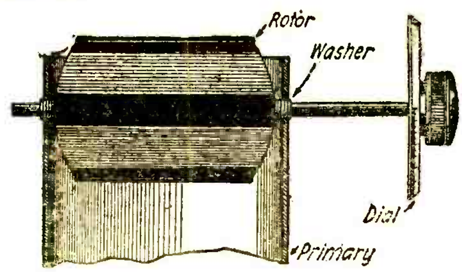
This method of mounting a rotor coil keeps it exactly in the desired plane without deviation.

panying sketch. The stationary coil is mounted on this strip in any convenient manner and in its proper relation to the rotor coil. The knob, pointer and a threaded washer are fastened to the shaft and the latter thrust through the panel. The collar is placed on the shaft against the inner side of the strip. On the other side a spring or a piece of spring metal bent as shown and drilled to take the shaft, is put in place and a nut screwed down until the proper tension is obtained. Another nut holds the rotor firmly on the shaft.

Contributed by John P. Arnold.

A PRACTICAL TYPE OF BEARING

How to make the rotor fit snugly and revolve smoothly, is a question which no doubt confronts the amateur constructor, who builds his own variocoupler. When he fails to know how to accomplish this, the outcome of his work is discouraging. When revolving the rotor flops about and can be moved from side to side the result being that the axle supporting the rotor soon wears a large hole in the primary tube, providing the tube is cardboard. The remedy for this, however, is simple:



A snug fitting bearing is easily made by winding wire into a tight coil to fit the rotor shaft.

When ready to put the coupler together, take a piece of No. 15 enameled covered copper wire and wind four or five turns tightly about each rod which is to support the rotor. These will act as washers, and care should be exercised to see that the wires are wound close and tight. The next step is to slip both washers off the rods and make two holes in the primary tube, just a bit *smaller* than the outside diameter of the wire washers. As cardboard is soft, the washers can be easily "screwed" into the primary tube, by way of these large holes. The rotor then is next slipped inside the primary and both washers screwed tight, until it is found that there is no side play. The rotor can now be turned as much as desired, without fear of wearing a large hole in the primary tube where the rods pass through. The idea is worth trying, and it will be met with unanimous favor.

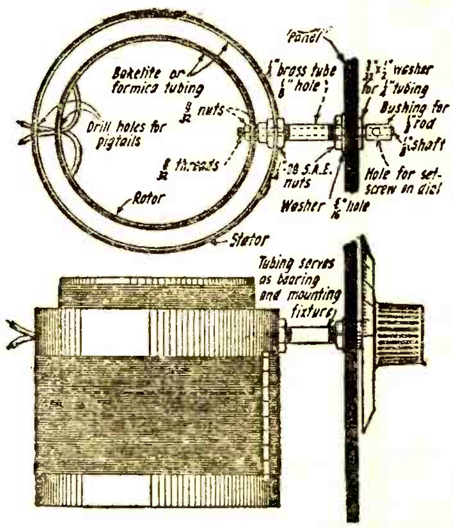
Contributed by C. A. Reberger.

A COMBINATION BEARING AND MOUNTING FOR VARIOMETERS OR VARIOCOUPLERS

Herein is described a combination bearing and mounting for a home-made variometer or variocoupler which can be built very easily and will prove quite efficient. The sketch is self-explanatory, but a description of the mounting may prove helpful.

A variometer or variocoupler, light in weight, preferably made of thin bakelite tubing or cardboard, should be used in conjunction with this mounting.

The mounting consists of a ¼-inch brass tube about two inches long, with an inside diameter large enough for a ⅛-inch brass rod to rotate freely inside, this rod to be about 1¼ inches longer than the tube. The tube should be threaded at both ends for about ¾ of an inch. A brass washer should be threaded to fit the ¼-inch tube. A nut and a plain washer are now placed on one end of the tube, and the tube is inserted through the panel from the



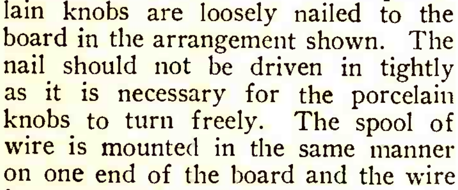
A neat method for mounting a variometer or variocoupler. Only one hole is drilled in the panel.

rear, through a ¼-inch hole. The threaded washer should be screwed on the projecting tube so that the end is flush with the face of the washer. The nut on the inside is now tightened and the tube is rigidly held at right angles to the panel. Two nuts are now screwed on the other end of the tube with the primary of the variometer or coupler between them, but these nuts are not tightened until the secondary is in place. To mount the secondary, the rod is inserted in the tube from the outside and the secondary securely fastened on it between two nuts. The secondary can be centered in the primary by moving the nuts on the tube backward or forward. When the correct position is found, these nuts are tightened. A bushing is made of a piece of ¼-inch brass tube, ½ inch long, to be slipped on the rod so a standard dial may be employed. This bushing should have a small hole drilled through one side so the dial set screw may be fastened on the rod beneath.

Contributed by W. H. Gordenier.

AN AID IN COIL WINDING

When winding inductance coils, using the conventional small gauge cotton or silk covered wire, which is usually purchased in quarter to one pound spools, it has always been a problem to straighten the wire and also to keep it tight so that a smooth neat winding job can be done. Therefore, I constructed the following handy and inexpensive device that I find to be most convenient and particularly handy for coil winding. The accompanying diagram shows the entire construction of this device and very little description is necessary. All that is required are six porcelain knobs such as are used in house wiring and



A simple contrivance which will materially assist in winding coils.

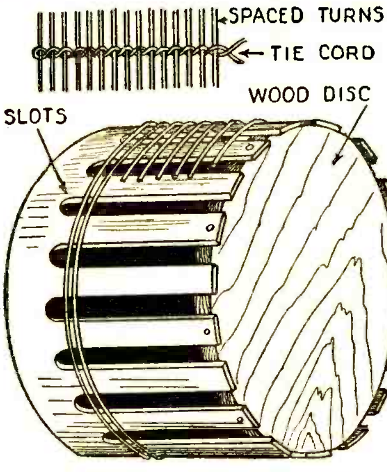
a small piece of board. These porcelain knobs are loosely nailed to the board in the arrangement shown. The nail should not be driven in tightly as it is necessary for the porcelain knobs to turn freely. The spool of wire is mounted in the same manner on one end of the board and the wire is run around from insulator to insulator. It will be found that this scheme will keep the wire tight and at the same time will straighten out any kinks or bends that it may have. If the experimenter has a great deal of coil winding to do he will find that this scheme greatly facilitates winding and will enable him to make a much neater appearing coil.

Contributed by Julian L. Wilhelmi.

LOW LOSS INDUCTANCE

The inductance here described is not difficult to construct and requires very little preparation. A piece of bakelite or hard rubber tubing of the desired diameter of the coil is slotted as shown in the accompanying illustrations. There should be at least ten slots and they should be ½ inch longer than the finished coil. Cut a disc of soft wood ¼ inch thick, with a diameter equal to the internal diameter of the tubing. Place this disc inside the tubing and fasten it with beads, as shown.

Wind the number of turns on the tubing that is called for in the construction of the coil, using two wires—one for the winding and the other for a spacing wire. A very satisfactory combination is No. 20 wire for the winding and No. 28 for the spacer



Low resistance, air-core inductances may be wound by this method.

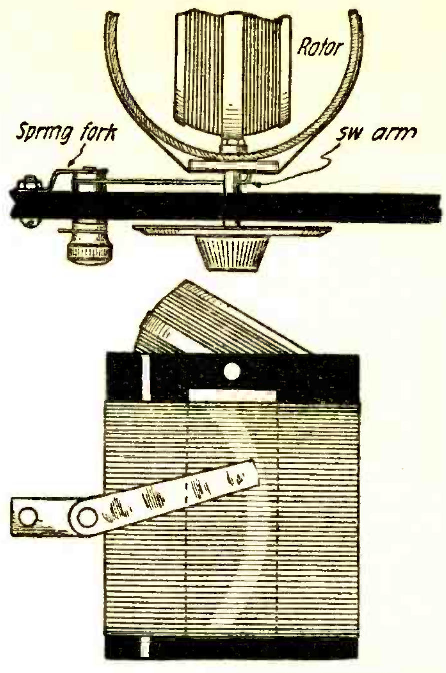
wire. When the spacer wire is removed, the coil will be found to be equally spaced on the tube. At each slot tie the coil as shown in figure so that none of the turns are shorted against each other. Pull out the brads holding the wooden disc in place and remove it. This allows the tube to contract so that the coil may be easily slipped off. With a small brush carefully paint the string that has been used for tying the turns in place, with shellac or collodion. This also adds to the rigidity of the coil.

Contributed by W. E. Condit.

FOR YOUR VARIOCOUPLER

Enclosed is a drawing of a variocoupler, of my design, which departs from the conventional form of changing the number of turns of primary circuit to tune the wave-length desired. By using a long switch arm attached to the back of a switch lever, single tap tuning is afforded.

To construct the variocoupler, simply wind the primary coil around the tubing and also a narrow strip of bakelite the length of the tubing. This gives a flat surface for the switch arm to slide on, and is more compact, as



A very fine variation of inductance can be obtained by using this system, which is less complicated than the usual method.

well as being neater in the outside appearance, than the ordinary coupler that requires several switch points, and even two sets of switches if signal tap variation is to be had.

Contributed by H. W. Sutton.

CONSTRUCTION OF AN INSULATION TUBE FOR COIL WINDING

Sheet celluloid, such as old photographic films, when rolled and cemented together with collodion, or a cement made by dissolving some scrap celluloid in acetone, or in equal parts of alcohol and ether, makes a first class tube upon which to wind inductance coils.

These old films, which range in size up to 12 inches by 14 inches, can be had for the asking from most any photographer, or from some doctor friend who does X-ray work.

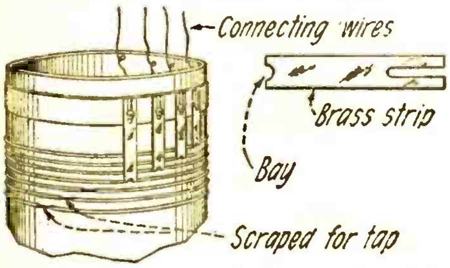
First remove the gelatine emulsion from them by soaking in hot water and scraping. Hang them by two corners so they will be smooth when dry. Get a smooth round stick or bottle or mailing tube with a diameter a little less than the tube you wish to make. Wrap the celluloid tightly and smoothly around this core, and when one complete turn has been made, quickly smear a light coat of the cement over the whole surface. Then make another turn, keeping the entire outside face lightly coated with the cement. When you have from four to six layers, depending upon how thick you wish the tube to be, wrap the whole thing tightly in a cloth or towel and lay aside to dry for a few hours.

Remember to wrap tightly and smoothly and to apply only a light

smooth coat of cement and you will have not only an efficient insulating tube but one that is neat in appearance.
Contributed by Dr. William H. McKie.

CONVENIENT METHOD FOR TAPPING COILS

A very neat looking job of tapping tuning coils can be done with little



Not only does this make a neat-looking job. But it insures a ruggedness that is not found in the usual tapped coil.

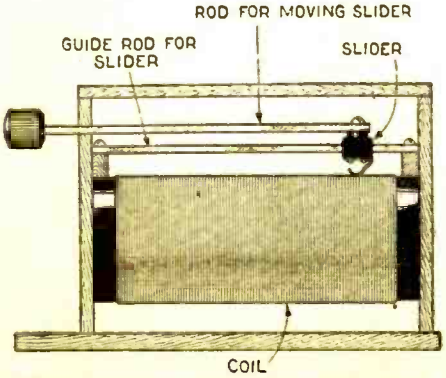
work in the following manner. The entire winding is done first with enameled wire, which insures tightness and neatness, after which about 1/4 inch of the selected turns are scraped of insulation with a knife.

The tapping leads are cut from stiff brass ribbon, as shown in the drawing, being about 1/4 inch wide, with a slot cut in one end, and a bay as wide as the diameter of the wire, in the other end. The slot should be wide enough to be slid on to a small screw fastened to the tube, by a nut on the other side. The lengths of the strips vary according to the distance of the tapped wires from the screws. The small bay at the other end permits soldering.

In order to bring the contacts exactly on the wires, the former should be bent slightly downward, and slid back and forth under the screws until adjusted. Connecting wires are fastened with another nut on the screws inside the tube. The wires in the drawing are shown spaced only for clearness.
Contributed by Karl L. Martin.

DUST-PROOF SLIDE TUNING COIL

One of the drawbacks to a slide tuning coil generally used in crystal sets is that there is no provision made for keeping the dust from collecting on the coil. This not only detracts from the looks of the set, but also decreases the electrical efficiency of the receiver. An easy method of overcoming these disadvantages is to inclose the coil in a cabinet just the size of the coil. In one end there is a hole provided for a rod for operating the slider. This rod is fastened either by soldering or bolting, to the slider of the coil and is of sufficient length so that it may be pushed the entire length of the slide bar. The details may be seen in the accompanying self-explanatory sketch.
Contributed by E. R. Carpenter.



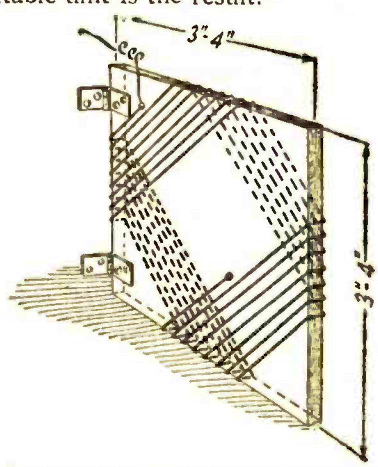
How to make your slide tuner dust-proof and improve reception.

A NOVEL WINDING INDUCTANCE

A novel and handy method of winding inductances, so that they will not take up too much space, and yet be efficient, is illustrated herewith.

The frame consists of a piece of bakelite, hard rubber or other supporting insulating material, about 3 to 6 inches on the side, according to the size of the inductance unit desired.

A small hole is drilled for the beginning and the end of the winding, which continues as shown in the drawing. No "dope" or varnish is necessary to hold the coils in shape, and if the job is well done a neat and very presentable unit is the result.



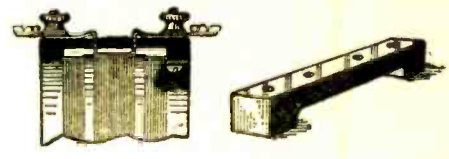
A very compact inductance wound on a piece of cardboard or wood. The sketch shows clearly how the wire is wound.

For tickler circuits and others requiring a means of coupling, the plate can be equipped with small brass hinges, as shown. The degree of coupling is controlled by the swing of such a coil. These coils can be used as any other types, in any kind of a circuit.
Contributed by Charlie Olson.

FASTENING THE PRIMARY OF HOME-MADE COILS

In the construction of apparatus many little problems arise, the most frequent one being how the wire wound on a coil shall be fastened. It is a simple thing to fasten wire when it is wound flat on a tube, but when there is one winding placed over another, the constructor may resort to the method illustrated in the accompanying sketch.

A strip of bakelite or hard rubber 1/4 x 1/4 inch and as long as the tube is wide, is used. Two holes are drilled $\frac{3}{16}$ inch from each end large enough to take an 8/32 machine screw. This

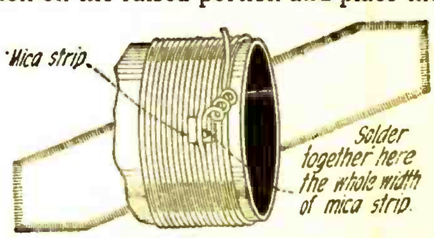


A good way to fasten the leads of the primary coil of an air core radio frequency transformer.

bakelite is filed out in order to clear the windings, as shown in the sketch. Two $\frac{1}{16}$-inch holes are drilled directly over the ends of the primary coil, the ends of which are drawn through these holes and fastened to the 8/32 machine screws, which clamp the bakelite to the tube. The knurled nuts from a discarded dry cell may be used to form binding posts.
Contributed by Joseph C. Coffee.

TAPPING COILS

Of the many ways of taking taps off an inductance, there are few good ones that merit use. It is most convenient to use a method whereby a coil may be wound without the necessary stop to provide for a tap. The method of taking off taps, I am about to describe, allows the entire procedure to be carried out after the coil has been wound and at the same time bringing about no difficulty. After the coil is wound and fastened on the end of the tube, select the places you desire to tap. With a strong darning needle or a sharp scriber, carefully lift the wire to be tapped and slip under a piece of thin mica about 3/8 x $\frac{7}{16}$ inch as shown in the diagram. Scrape away insulation on the raised portion and place the



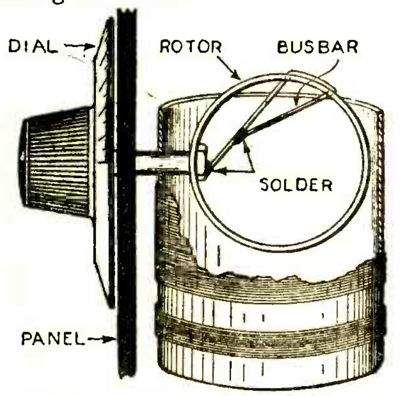
Using this method of procedure, a coil may be fully wound before providing for taps. This makes a very neat job.

lead along side of this wire; just a bit of solder and a stroke of the iron make a good contact joint.
Contributed by F. L. Luke.

METHOD FOR SUPPORTING ROTORS

Any experimenter who makes his own variocouplers or variometers knows that it is a difficult job to make a rotor that is firm and will not slip. As these parts of the instruments are most essential, the following idea is recommended for making a rotor as strong as necessary.

All rotors have two windings that are divided in the middle for anchoring the shaft, except the 180-degree type of couplers. For the average rotor, make one hole between the windings in the center and another in line with it about ¼ inch away. These holes should be of a size to accommodate the average bus bar. Then bend a piece of bus bar in a U shape, the distance between the two holes in the rotor being equal to the bottom part of the U. Solder one end of the bus bar to the middle of the other side, after passing the wire through the holes, and solder the other end to the shaft to which is attached the dial for rotating the rotor.



Another easy method of mounting the rotor of a coupler. This scheme employs only bus bar and a shaft.

This method give a firm connection and makes it impossible for the rotor to slip when the dial is turned. With other types of couplers the bus bar can be connected outside the windings in the usual manner.

Contributed by Dr. C. R. Doyne.

A VARIOMETER WITH A WIDE RANGE OF INDUCTANCE

Herewith is a description of a variometer that can be used to cover a wide band of wave-lengths without the necessity of employing a switching arrangement. It is especially adaptable to a Colpitts tuner, or as an inter-valve coupling for a tuned impedance radio frequency amplifier. This is in reality a 360° variometer, as the coils oppose each other at one parallel setting, thus affording a lower value of inductance, providing the windings of the coils are equal. As the rotor is turned through 180°, the inductance increases, until it equals the sum of the inductances of the two coils, viz., the rotor and stator. Continuing the rotation in the same direction, the coils are connected, to assist each other. Therefore, the inductance increases through another 180° until the maximum of self-inductance is reached, when the coils are again parallel. This arrangement for switching the coils is accomplished by

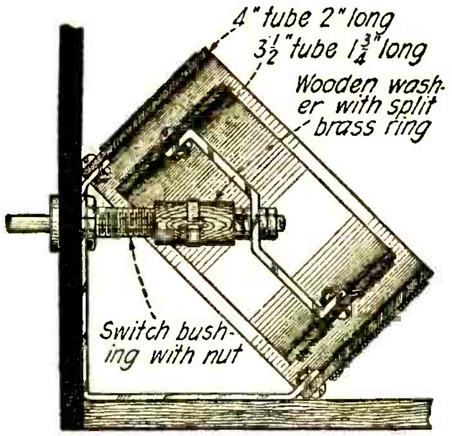


Fig. 1. Constructional details of the 360-degree variometer. The two brushes are attached directly to the front panel and make contact with the split ring on the wooden washer.

a commutating or switching arrangement that is mounted directly on the shaft of the rotor coil. This can be better understood by referring to the sketch, Fig. 1.

Due to this switching arrangement, a very large number of turns can be used on both the stator and rotor coils, with a corresponding broad range of tuning; 100 turns or more are suggested for each coil. Referring to Fig. 2, the variometer is connected as follows: One terminal of the stator coil is connected to a binding post. The second terminal of the stator is connected to one brush, and the other brush to the second binding post. The terminals of the rotor are connected to the split ring on the wooden washer.

The construction of this variometer is very simple, as it is made of standard parts easily obtained. The details given in the sketches are self-explanatory.

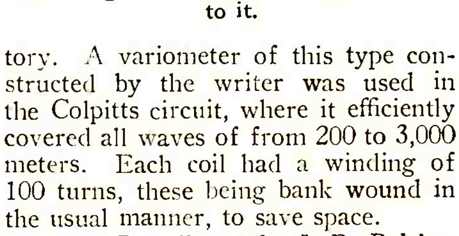


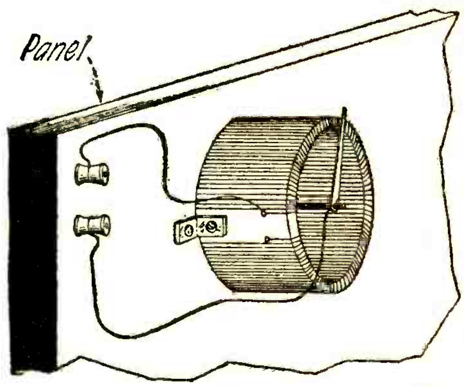
Fig. 2. A section of the commutator arrangement and the two brushes, showing how the coils are connected to it.

A variometer of this type constructed by the writer was used in the Colpitts circuit, where it efficiently covered all waves of from 200 to 3,000 meters. Each coil had a winding of 100 turns, these being bank wound in the usual manner, to save space.

Contributed by J. R. Balsley.

A PANEL MOUNTED COIL

This coil, unlike the usual type, is wound through instead of around the core. The tuning or variation of inductance is accomplished by adjusting a knob and dial on the front of the panel, which is attached to a rod having on its end a switch-arm, or other suitable means for making contact with the edge of the coil farthest from the panel. The insulation is scraped off the wires on this edge in order to make the necessary contact between the



An easily constructed tuning coil for panel mounting. A switch arm replaces the usual slider.

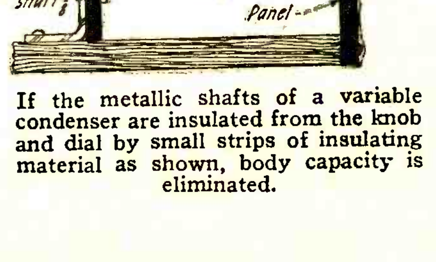
switch-arm and the successive turns on the coil. A flexible lead is attached to the switch-arm and connected to the ground binding-post. A lead from the aerial binding-post connects directly to one end of the coil; this is clearly shown in the sketch. An inductance of this kind takes but little space on a panel and is capable of accommodating a large amount of wire. I am now using a crystal set employing this type of coil and obtain excellent results.

Contributed by C. J. Morrison.

TO ELIMINATE BODY CAPACITY

It is well known that the general practice of shielding panels is not as efficient as it might be. While tinfoil or sheet metal eliminates the body capacity, it also has a tendency to absorb energy from the apparatus which it is shielding.

I present herewith a novel and efficient method of eliminating this nuisance, as per sketch, which is practically self explanatory. When mount-



If the metallic shafts of a variable condenser are insulated from the knob and dial by small strips of insulating material as shown, body capacity is eliminated.

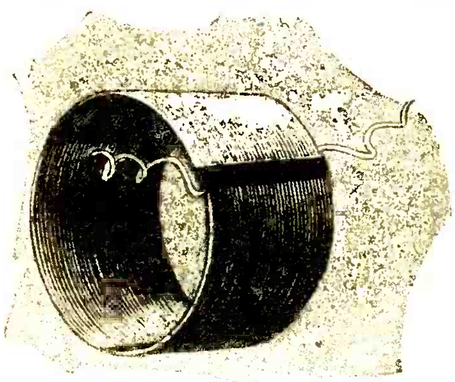
ing a variable condenser with a vernier, the connecting link between the two vernier shafts should be a flat piece of bone or any good insulating material, the same being fitted into the saw slit and a hole drilled with a No. 50 drill and a copper rivet inserted. The ¼-inch shaft upon which the dial is mounted should be of hollow brass in which the smaller rod fits.

This method may also be applied to variocouplers; no rear panel is necessary with a variocoupler, as the average coupler on the market today is self-supporting.

Contributed by E. G. Mahoney.

A LOW LOSS SPACE-WOUND COIL

The following is a description of a coil having very low electrical losses and sufficient mechanical strength to enable it to be used under the most



An efficient form of inductance. The coil is space wound and is self-supporting.

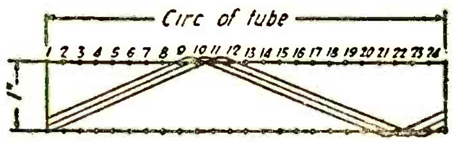
rigid conditions. This coil eliminates two undesirable features found in other popular low loss coils, *viz.*, the danger of short-circuiting turns as in the "basket-weave" type and the high distributed capacity as found in the "pickle-bottle" type.

Any size wire between No. 12 and 20 will be satisfactory for winding the coil. However, it is recommended that No. 16 or 18 be used if possible. Obtain a bottle whose diameter is equal to that of the coil to be constructed. From a piece of gum paper tape cut out three strips $\frac{5}{16}$ inch wide and approximately three times as long as the finished coil is to be. Several rubber bands will come in handy here to hold the tape strips on the bottle while the wire is being wound on. The turns should be spaced by a string which is wound on along with the wire. Ordinary wrapping twine will be satisfactory for the smaller wire, but something bigger should be used for the larger sizes. When the correct number of turns have been wound on, fasten the end of the wire by another rubber band and remove the string. Apply a thick coat of collodion on the wire over the tape strip. Allow this to dry and put on a second thin coat. Moisten the tape not covered by the wire and collodion and press down while it is still sticky. When this dries, break the bottle and remove the completed coil.

Contributed by E. F. Powell.

A BETTER METHOD OF WINDING HONEYCOMB COILS

Having experimented with various systems of winding honeycomb coils as described in *Radio News,* I hit upon the following method which will produce a coil exactly the same as the machine wound type.



By this system of winding unit honeycomb coils the appearance of the commercial product may be duplicated.

The diagram shows how this is accomplished by taking a turn around two of the pins instead of one, as is the usual practice.

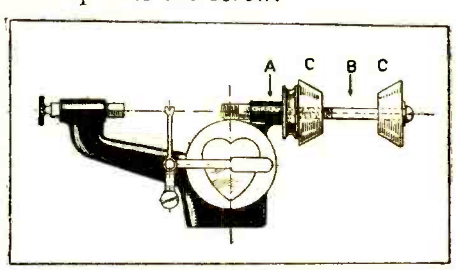
Start the winding by taking a turn around one of the pins. Then lead the wire around the 11th and 12th pins on the opposite side, then back to the 23d the 24th pins on the first side, then to the 10th and 11th pins on the opposite side, then back to the 22d and 23d pins on the first side, and so on.

After the first layer is wound it will be readily seen that an exact duplicate of the machine wound coil is obtained.

Contributed by Edward Johnson.

AN EXCELLENT COIL WINDER

Any sewing machine bobbin winder similar to the one shown in the sketch may easily be made into a very satisfactory and rapid coil winder by simply drilling and tapping a hole as indicated at A for the screw B which acts as a mandrel or arbor. Cones C may be made of either wood or metal and slip over the screw.



Sewing machine bobbin coil winder.

To operate, place the core on which the coil is to be wound on these cones and tighten the screw. Several different size cones may be made and also several different lengths of screws, to accommodate coils of different sizes.

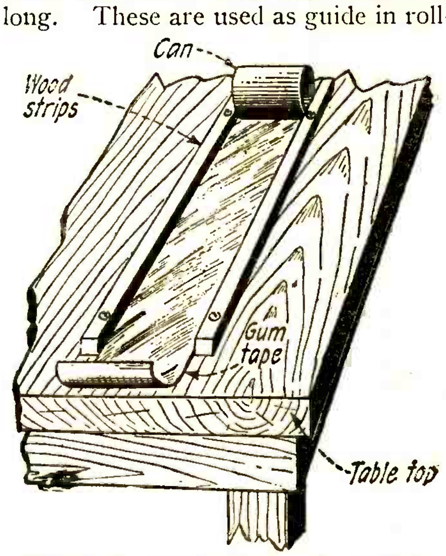
If care is taken in drilling and tapping the hole A centrally, a smooth running winder will result.

Contributed by Chas. M. Otis.

HOME-MADE TUBES OF ANY SIZE

Although a reader of *Radio News* for quite a while, there has never come to my attention any method where the experimenter might easily construct his own cardboard tubing for winding inductance coils. Standard sizes are sometimes readily obtainable, but where the circuit requires an odd size, such as one tube fitting tightly over another, this presents a problem.

Herein is described the easiest and most satisfactory method which may be employed to construct tubing of any size. Procure a roll of heavy 3-inch gum tape, sometimes called Kraft tape, at any paper goods or cordage store. No other size is needed, as three inches is wide enough for all couplers, variometers or any other coils. There will also be required two strips of wood about ¾ x 1 x 30 inches, and some small tin cans not over three inches high. These cans are used for forms and need not be the exact size, as they can easily be padded with a few turns of the gum tape. The two narrow strips of wood are fastened to an old table top or a smooth board about six inches wide and three feet long. These are used as guide in roll-



Showing arrangement of wooden strips on table top to make paper tubes.

ing the form over the gum tape. They are fastened on the table three inches apart with just enough clearance between them to accommodate the tape without binding. Take one of the forms (which is padded if necessary), and wind the tape on it until the desired size of coil and thickness of wall have been obtained. Cut off this strip of paper and measure it, so if more are needed they all will be of exactly the same size. Lay this strip of gum tape between the two strips of wood fastened to the table and proceed to wind. Make about one and one-half turns on the form evenly, then with a damp sponge or rag moisten the tape as the form is rolled over it, between the two wooden strips.

Care should be taken to just moisten the gum tape; if it is too wet, blisters will form. When it is perfectly dry, a light coat of shellac may be applied to the inside and outside of the tube.

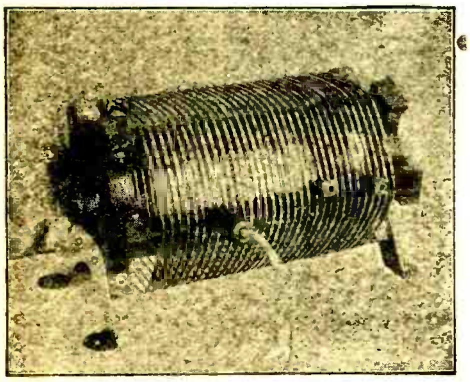
By following these directions, a tube with a thin wall but of very rigid construction can be made and it will compare favorably in appearance with any tube that can be obtained on the market.

Contributed by Elmer Ring.

AN EFFICIENT INDUCTANCE

The inductance described herein consists of a coil wound upon six bakelite strips, which are mounted edgewise in two wooden end pieces.

These end supports are made by boring six 2-inch holes at equal distances around a 6-inch circle. The best



A C. W. inductance of this form has few losses in comparison to types wound directly on solid insulating tubes.

material to use for this purpose is ¾-inch oak. By putting two boards together in a vise both ends may be cut at once. After the holes are bored the waste wood is cut away with a key-hole saw. This will leave six "spokes" in each wooden end, each of which must be slotted to hold the strips of bakelite. The strips have a ¼-inch hole bored ⅜ inch from each end so that they can be bolted securely in their slots.

The bakelite pieces used are 1 inch wide and 10 inches long. Before assembling, the strips should be put in the vise and slotted every $\frac{3}{16}$ inch with a hacksaw.

After the framework is assembled, the wire is wound carefully in the slotted edges of the bakelite. No. 10 hard drawn copper wire is ideal for this purpose, but if this is not available No. 8 soft copper will do.

Suitable clips may be made very easily by attaching a 30 ampere switch jaw to the shell of a Walger fixture connector.

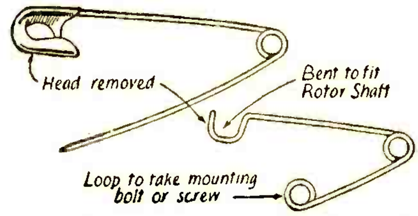
The unit may be mounted in any position by means of feet cut from sheet brass as shown.

The inductance has a pleasing appearance and most of the material mentioned can usually be found around the experimenter's workshop.

Contributed by J. M. Fox.

A SIMPLE VARIOMETER CONTACT BRUSH

Unless a pig-tail connection is employed for the rotor of a variocoupler or variometer, the contact is, as a rule, very poor when the circuit is made through the shaft. A good contact will be had by employing a contact brush constructed of a safety pin. The head of the pin is removed and this end of the pin bent into a semi-circular



A variometer contact brush made from a safety pin. This affords a good wiping contact.

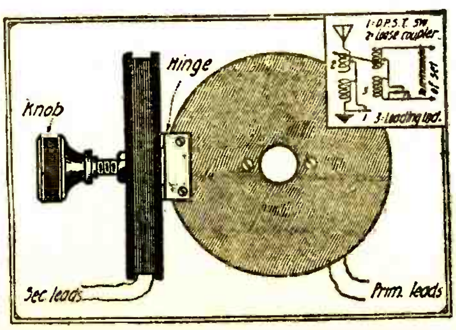
shape as shown in the diagram. The pointed end is bent in the form of a loop to take a mounting bolt or screw. This contact brush is screwed on one end of the variometer in such a fashion that the semicircular end comes in contact with the shaft and makes continuous pressure. With this brush in service there will be little trouble due to imperfect contact when the rotor is revolved.

Contributed by James D. Johnston.

A LOOSE COUPLED LOADING INDUCTANCE

A good loading inductance is essential in all up to date receiving sets. The inductance described below is readily adaptable to any set, but is especially constructed for use in portable or on panel sets, on account of its compactness and ease of mounting. The over-all size of the one used for loading from six hundred meters to twenty-five hundred only three inches in diameter and one inch thick.

The forms, two in number, are turned out of hard rubber, bakelite, or wood three-eighths of an inch thick. They may be made any diameter to conform to the needs of the constructor, the author's being three inches in diameter. A groove, one-eighth of an inch wide and one inch deep is cut in



This loading inductance may be found of value for both the primary and secondary circuits of the loose coupler.

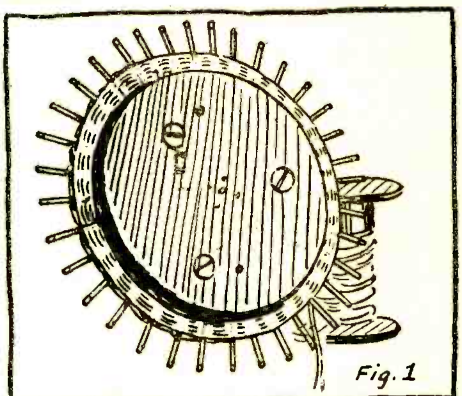
each disk. One hundred and seventy turns of number twenty-eight double silk covered wire is wound in each groove. Holes are bored in one disk to fasten it to the panel with screws or bolts, while the other disk is hinged to the first to enable the coupling to be varied. A small insulated knob fastened to the hinged disk completes the instrument.

In use, one coil is connected in series with the primary, and the other in series with the secondary. A small double pole double throw switch 1 (Fig. 2) is employed to short circuit the loader when short waves are being intercepted. The instrument was designed especially for use with the six hundred meter Signal Corps coupler, in conjunction with which signals from Arlington were very readily copied as far away as Boston.

Contributed by Robt. W. Dennis.

A NEW COIL WRINKLE

In the various radio magazines there have appeared from time to time articles describing methods the amateur might use for winding inductances in receiving circuits. These have included the "duo-lateral," "honeycomb," "spider-web," and the "bank-winding," but none that I recall ever have described the method of winding, as herein.



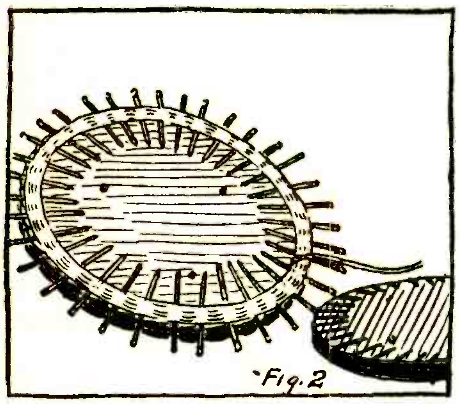
The two wooden discs grip the nails firmly while winding.

When planning to build a tuner to give a range of from 150 to 3,000 meters, I struck upon an idea which may not be new in some respects, yet may help others in the construction of their coils.

The tuner that I desired to construct was to be wound on a 4⅛-inch outside diameter fibre tube, and was to consist of about 425 turns of No. 24 D.C.C. magnet wire; this would require in a single layer, a winding space of about 11 inches. By the method herein described, I was able to get all the required turns into a 2⅜-inch space, thus making the tuner very compact for its range and yet not using any of the methods above mentioned.

The winding is a series connection of "spider-web" coils assembled as pancakes or sections.

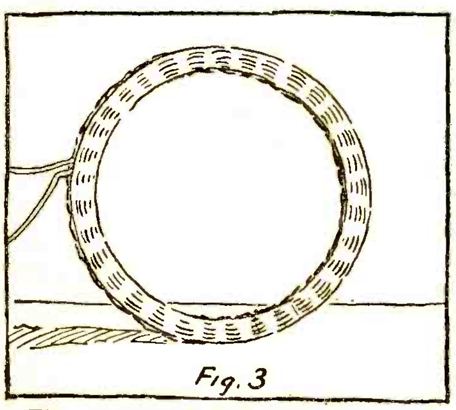
Two ¼-inch boards were screwed together with three heavy flat head screws and turned down in a lathe to 4 9/64-inch diameter. (Fig. 1.) The circumference of these discs was marked off into 35 equal spaces on the crack between them. Then holes were drilled diametrically ¾ inch deep on



Outer disc removed, showing method of formation.

these marks so as to just receive a 4d finish nail. Thirty-five nails are then stuck in the holes; the winding can then be started at any nail and proceed by weaving in and out every other nail as the disc is turned by hand or with a slow lathe. To make a neat job, be very careful not to miss weaving between every other nail. As there are an odd number of nails, after the third turn is in place a wire will appear to cross between each nail. The winding may proceed in this manner until the desired number of turns are in place for each pancake. (Fig. 1.)

After one coil is completed it may be removed by unscrewing the three screws. The two discs are then separated and the winding is intact with the nails. (Fig. 2.) To make the



The completed coil after removing the nails.

coil secure, as the nails are withdrawn the coil should be run through and through where the nails come out with about No. 36 cotton thread; using a bodkin or needle. Remove only six or eight nails at a time. Fig. 3 shows a finished coil.

Each pancake for my tuner was wound with 25 turns of No. 24 D.C.C. The finished coil was 4 9/64 inches inside diameter, 4⅞ inches outside diameter and 9/64 inches thick. Seventeen coils, of course, were needed and then assembled on the tube, as shown in Fig. 4. Care should be taken to put the coils on with the windings all in the same direction, then connect the inside of one coil to the outside turn of the next adjoining coil.

The advantages of winding a tuner in this fashion are:

(a) As efficient as a honeycomb or other type of anti-capacity winding.

(b) Additional coils can be added without disturbing other windings already in place.

(c) Taps can be taken off at will at any point and especially at the splices between the coils.

(d) It is not necessary to mount the coils on a tube, as they can easily be bound together rigidly with thread.

(e) Are very handy in making up different sizes of inductances for experimental work by adding or taking off coils at will and so prevent any "dead end" effect, etc.

The tuner built by the author using this method is all that is to be desired in a tuner of long range and dead end switches are found to be unnecessary.

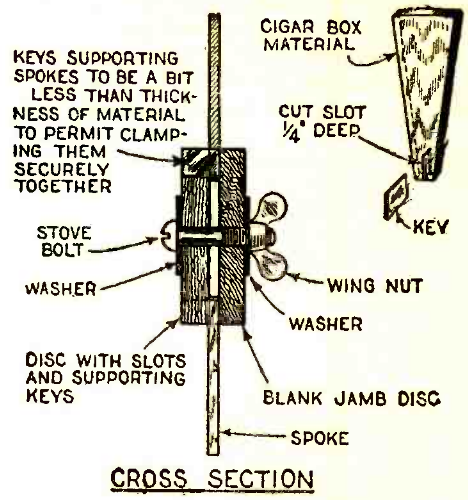
Contributed by J. W. H. Martin.

A LOW LOSS SPIDER-WEB COIL WINDER

There are many different methods of preparing coil forms, the majority of them requiring holes drilled around the circumference of the disk. The form here described eliminates all such drilling and also pegs that wear and get loose in their sockets. The materials necessary are a side of a cigar box (straight grained), a ⅜-inch piece of hard wood from which the disks may be cut, a piece of strip copper about 1/32 inch thick, and a ¼-inch stove bolt. A fret or scroll saw is necessary to cut the slots.

Cut from the cigar box material 13 spokes, as shown in the accompanying sketch, clamp them together and even them off with sandpaper, making them all the same shape. While the spokes are clamped together, mark off a center line (at the edges of the spokes which are clamped between the disks or the inside ends nearest the center) and saw a slot ¼ inch deep. This slot acts as a support and centralizer for the spokes, which slip into the key carried on one face of the disk, as described later. The slot permits the spokes to be slid off after the coil has been wound.

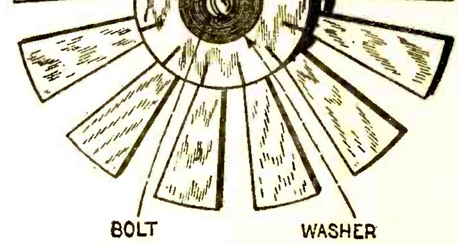
Next cut two disks from the ⅜-inch material and divide one of them into 13 equal parts on the outer circumference and draw lines to the center. A second circle is drawn ¼ inch nearer the center, which acts as a guide for the depth of the slots carrying the keys. These slots are sawed also with the scroll saw. The keys are cut from the thin sheet copper and fitted to the slots, the width being a little less than the thickness of the spokes. If these keys are exactly the width of the spokes



Showing how the various parts of the coil winder are assembled.

when the disks are clamped together, it will be impossible to remove the spokes after the coil is wound. These keys are glued in the slots on one disk only, the other disk acting merely as a backing to clamp against. A ¼-inch hole is drilled through the two disks to take the stove bolt, which may have a wing nut to tighten with.

Slide the spokes on the keys and place the blank disk in position, clamping with the wing nut and stove bolt, using washers as shown. After winding coil, paint the intersections of windings with collodion and allow to dry about 15 minutes before removing



The final assembly of the winder is a simple matter, as shown above.

from the form. The resulting coil will be one having as few losses as possible and in addition once made the form may be used indefinitely with no appreciable wear.

Contributed by H. A. Macdonald.

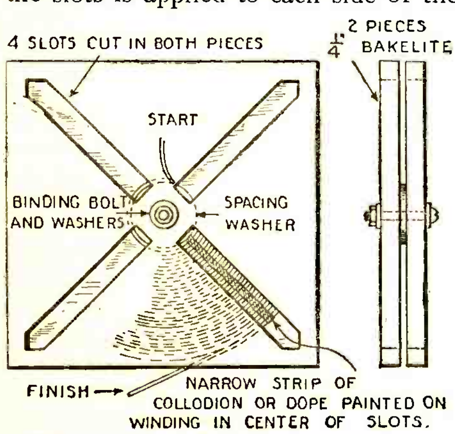
PANCAKE COIL WINDING FORM

Many of the circuits that have been recently published call for coils of the pancake type. To make these coils to have as low losses as possible it is desirable to wind them so there is a minimum of insulation used.

In the accompanying sketch there is shown an easily made form that will be an aid to the constructor who wishes to make coils of this type. Two square pieces of bakelite or hard rubber, having dimensions 4 by 4 by ¼ inches, are clamped together and through the exact center is drilled a hole large enough to accommodate a 6/32 machine screw. On the diagonals of the squares there are made slots as shown. First there is a hole drilled at each end of the place where the slot is to be made. Then with a fine saw cut away the material between these two holes and smooth with a file. These operations are performed while the two pieces are clamped together.

In one of the pieces there is a hole drilled ¾ inch from the intersection of the diagonals, about the size of No. 18 wire. This is to hold the wire tight at the start. Three washers are needed to fit the 6/32 machine screw, two of them being large enough to accommodate the head of the screw and the nut. The other should be ¾ inch in diameter and 1/16 inch thick. This last washer is the spacer between the two bakelite plates and is used as the winding center of the coil.

The wire is first put through the small hole that was drilled just on the edge of the ¾-inch washer and then the two plates are clamped together, as shown in the sketch. The desired number of turns are then wound on and fastened by winding the wire around the central screw. Through the slots is applied to each side of the



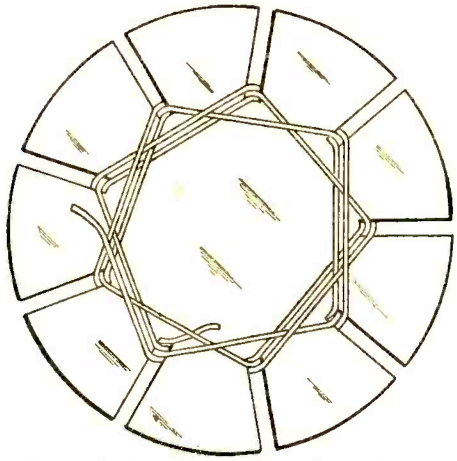
Two pieces of bakelite cut as shown make an excellent winding form for pancake coils.

coil a thin coating of collodion or other "dope" for holding the turns in place. The result will be a coil that is wound on air and having as great an efficiency as many others that are much more difficult of construction.

Contributed by Wm. E. Anderson.

A COMPACT SPIDER-WEB COIL

The diameter of a spider-web coil, with a fairly large number of turns, may be kept down so that the coil will



By winding a spider-web coil, as shown above, it is possible to place more wire on a smaller form than if wound in the usual manner.

be of a size that can be conveniently used with the ordinary radio sets by another method than the double form windings.

To obtain twice the number of turns that may be obtained by the regular method of winding on a given sized spider-web form you wind in the ordinary way except that you skip a slot each time.

To treble the number of turns, skip two slots each time; and so on for any other desired increase in the number.

Two things must be considered. First, you must see that the number of slots is such that you will be either ahead or behind one slot of the previous turn when you complete each winding. And secondly, you must increase the number of slots with each additional slot you skip, so that the windings will not get too far from the circular shape.

This method not only allows more turns to a given diameter of form but also gives somewhat of a honeycomb coil winding effect.

Contributed by A. R. Crookshank.

BINDER FOR COIL WINDINGS

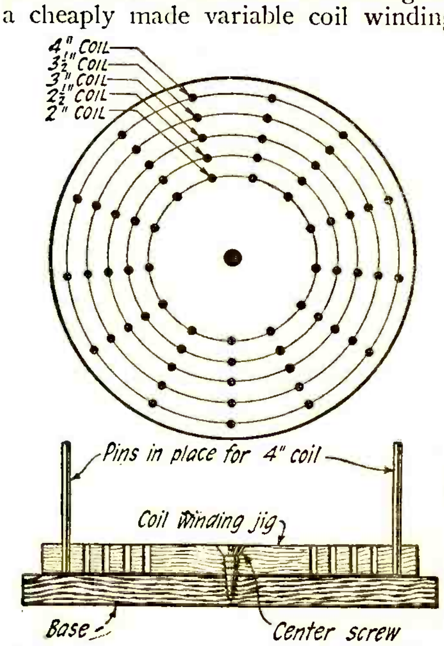
Here is a hint for those amateurs who "wind their own" coils for variocouplers, variometers, etc., on cardboard tubes. We have all been warned time and again regarding the ill effects following the shellacking of such coils to keep the wire in place after it is wound, the said ill effects being capacity or a condenser-like action between the wire and the shellacked covering, which causes a certain degree of choking of the signals.

I have surmounted this difficulty in the following way. The cardboard tubes are thoroughly dried in a warm oven and then given a coat of shellac both inside and out; as soon as this has dried the outside is given another coat. This should leave the surface quite glossy. The wire is then wound in the usual manner, the ends being secured through holes in the edges of the tube. The wire is then "painted" with *wood alcohol,* which the covering absorbs greedily, then the coil is set away to let the alcohol evaporate. *Keep it away from fire.* The alcohol softens the shellac and this in turn sticks to the cotton covering of the wire where it is in contact with the tube. It will be found that the wire is held securely enough for couplers and variometers also the rotors of these, but not for tuning coils with which a slider is used. I have used this method with good results.

Contributed by Carl W. Beese.

A VARIABLE COIL WINDING JIG

Inductances should be prepared with the greatest care and consist of the proper materials and correct design. The extremely minute energy collected by the antenna must be handled skillfully if we are to make secondary apparatus function to the best advantage. Coils then should be wound subject to as little dielectric material as possible, distributed capacity reduced to a minimum, and high frequency losses materially lowered. Staggered weave coils, supported with a fraction of insulation, meet this requirement as nearly as it is possible to do so. With this end in view there has been designed a cheaply made variable coil winding



When holes are drilled, as indicated, and pins inserted in any set of holes, an excellent winding jig is produced.

jig, so that staggered weave coils of practically any diameter may be wound. All that is necessary to vary the dimension of the coils is to move the pins to their proper holes. Above is shown a template pattern giving the exact position and odd number of pins.

The first requisite is a round, hard wood block 5 inches in diameter and 5/8 inch thick. Lay a template in the exact center of this block and with a sharp-pointed instrument punch hard enough through the paper, exactly on the dots, to leave a pattern in the wood. This is a drilling pattern and can be made to show up much plainer by marking with a pencil in the indentations. The pins are simply long finishing nails and can be purchased at any hardware store. If extra long coils are to be made, the pins may be cut from stiff wire to any length desired. Care must be exercised, however, in choosing a drill of the right diameter so that the pins will fit the holes snugly. After selecting the proper drill, bore the holes completely through the hard wood block, holding the drill perfectly straight. Next, with a larger drill, bore out the center for a fastening screw (see Fig. 2). Thus completed, it will give you five diameter variations of the 13 pins, making it easy to wind a coil to specifications.

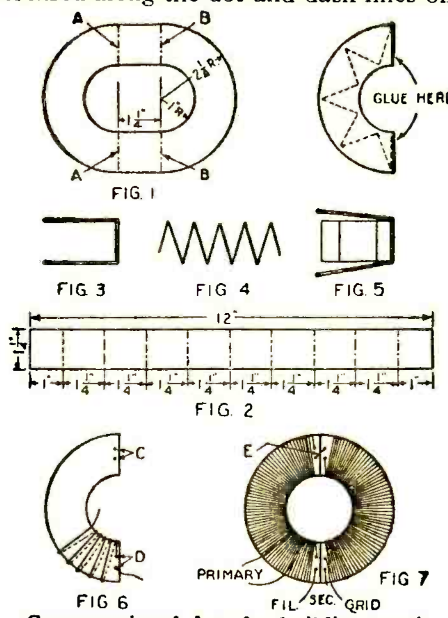
In making staggered windings, start with any pin and weave in and out of every other pin. The second time around should cross that of the first, and so on. Once correctly started, it is an easy matter to get the proper results. Before slipping the pins from the coil block, bind each turn of wire by sewing securely with silk thread. This should be done in three places. For the coil support, and directly opposite from where it has been sewed, force a narrow piece of good insulation through the entire length of the coil. The insulation should be just wide enough to go through the coil layers and accommodate a very small wood screw at its end (see Fig. 3). Drill a series of small holes just large enough to pass a needle in this insulation support, and sew the finished coil to it. For all around efficiency No. 18 wire is best. This wire is stiff enough to retain its shape and with careful workmanship the coil should rival the manufactured article. The finished inductance needs no shellac for the windings and a minimum of insulation, making a very efficient and good-looking unit.

Contributed by Loyal F. Garris.

ANNULAR COIL CONSTRUCTION SIMPLIFIED

The method for constructing annular coils described here is admirably adapted, for several reasons, to the purposes of the experimenter. The construction is simple and substantial and it has the advantage that changes in windings can be made after completion just as readily as in the case of solenoid coils.

The coil forms are made from cardboard. Cut two pieces as per Fig. 1 and two as per Fig. 2. After cutting out the pieces shown by Fig. 1, crease along lines A and B with the point of a knife to facilitate bending and bend them into the shape shown in Fig. 3. Pieces shown by Fig. 2 should also be creased along the dot-and-dash lines on



Constructional data for building toroidal coils.

alternate sides and bent into the shape as shown at Fig. 4. Punch two small holes in one side of each end of each form, as shown at C and D, Fig. 5. These holes are used to retain the ends of the windings.

Wind 100 turns of No. 24 S.C.C. wire on each form, starting the winding as shown by Fig. 5. When winding the second form make sure that the direction of winding is the same as in the first one. The primary winding is wound over the secondary and separated from it by winding spirally a narrow piece of empire cloth over the secondary. The ends of the primary are retained by the same method as the secondary. The position and number of turns in the primary is a debatable matter. The writer obtained very satisfactory results by using 25 turns of No. 26 S.C.C. wire placed near the filament end, as shown in Fig. 6.

When both forms are wound, they are placed back to back (see Fig. 6) and held together by several turns of string wound around the outside circumference. The ends of the coils are soldered together at E (Fig. 6) which makes a continuous winding of 200 turns. When used with a .0005 condenser this coil will tune from 212 meters at 5, to 525 meters at 80 on a 100-point dial.

Contributed by Wm. C. Roemer.

HOME-MADE TUNING UNIT

This tuner should meet the needs of experimenters especially, as it makes possible the trying out of various sizes of coils as well as different adjustments in relation to one another. The primary and secondary coils may be placed either on the right or left of the tickler, or one may be placed on each side of it by an easy change of the position of the tubes in the frame.

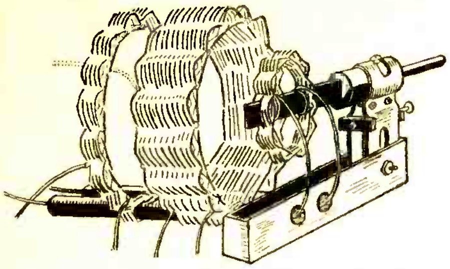
The plate coil is carried on a shaft made of wood, preferably straight grained walnut—the blade, bearing surface and dial shaft all in one piece. To make it moisture-proof and extremely surface-hard, it should be coated with a solution made by dissolving a piece of phonograph record in alcohol. The leads of the plate coil are taken from opposite sides, given a couple of loose turns around the shaft, as shown, and then run directly through the tubes to their respective binding posts in the set. This coil should be of No. 24 or 26 wire.

The upright and horizontal pieces are made from two strips of medium weight aluminum. The tubes may be 1/4-inch bakelite or rubber, or may be made at home by winding several turns of good paper around a nail or wire with a bit of glue on the turns and at the finish. They should be trimmed to length before removing from form, and afterward coated inside and out with the solution mentioned above for the shaft.

In constructing, the tickler shaft should be made first, followed by binding one of the strips at its middle nearly around the shaft, then back somewhat, something after the way shown in the sketch, leaving the two sides parallel. The other piece, or horizontal member, is made by bending the turns at right angles with short right-angle turns at ends to make a face against the back edges of the vertical piece, forming a lock in connection with the bolt in the slots. This bolt has a piece of tubing on its middle —that is, between the slots, and of a length to keep the sides of the pieces parallel and the whole frame rigid when the nut is tightened.

A screw passes through the slot of the bearing and into the shaft to hold the shaft in position and to act as a stop to prevent injury to coil by unnecessary twisting. The two small bolts below adjust the tension on the shaft to suit the uses. A small piece of rubber, or other 3/8-inch panel "scrap," carries a screw or bolt by which the tuner is mounted either to the panel or baseboard at practically any point on either piece of the tuner frame. In panel mounting a piece of fibre board should be used at the back to balance the thickness of turned ends of the piece carrying the tubes. The slots at the bottom of the vertical piece are to allow raising or lowering different diameter coils in relation to the tickler. All the holes and slots should be made after the pieces are formed and trimmed. The strip carrying the antenna and ground posts should be placed in front of the tuner, as is customary, and the leads from the coils carried directly to them. The dotted line shows how the upper secondary lead may go to the condenser.

An article elsewhere covers the making of coils for this tuner. The number of turns on the coils will, of



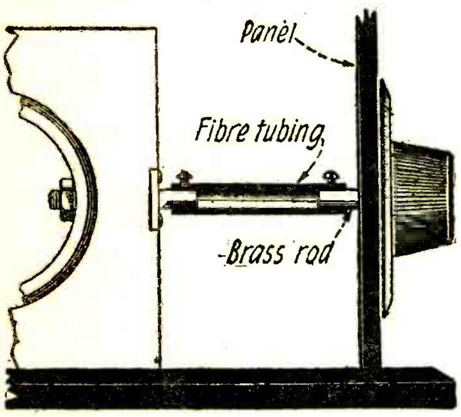
An excellent method of mounting a three-circuit tuner is shown above, there being a minimum of insulation in the apparatus.

course, depend on the wave band to be covered and the particular condenser used. Measurements for the various pieces are not given as these can be worked out easily from the sketch to suit the constructor's own ideas.

Contributed by M. A. Richardson.

AN INSULATING SHAFT FOR VARIOMETERS

Certain types of variometers and variocouplers, and all types of condensers (variable) are so constructed



If the shafts of your instruments are too short, or if you are troubled by body capacity effects, try this.

that the shafts are "live"; that is to say, they are used to carry the current from the windings (or plates) to the binding posts on the instrument. With this form of construction the capacity effect caused by the proximity of the operator's hands to the dials is very pronounced, and cannot be remedied by shielding the panel. This will be understood when it is seen that the live shaft on which the dial is mounted passes through the panel, with the result that the shaft is not protected by the shielding.

To overcome this defect the following idea was originated. As will be seen from the accompanying drawing, the variometer was placed as far back from the panel as the size of the cabinet would allow, in this case about three inches. A piece of fibre tubing was then obtained with an inside diameter equal to the diameter of the variometer shaft. One end of this was slipped over the shaft, and kept in place by means of a set screw, as shown in the drawing. Into the other end of the tubing was then inserted a piece of round brass rod, of the same diameter as the shaft, and about an inch and a half long. A set screw was used to keep this rod firmly in place in the tubing. The rod was then adjusted so as to project through the panel to the distance required to accommodate the dial, and the two set screws tightened up. The hole in the panel should be exactly in line with the shaft, and of such size that the brass rod will just slip through it; this forms a third bearing for the shaft, and precludes the possibility of the latter wobbling.

If this scheme is used in connection with a shielded panel there will be absolutely no capacity effect noticeable from the operator's hands, and tuning will be, therefore, much simplified. The fact that the variometer is well set back from the panel, helps to further reduce any possible capacity effects that might exist between the variometer windings and the hand of the operator. This may exclude the necessity of shielding the panel. Condensers and couplers may, of course, be threaded in the same way.

Contributed by A. H. Whitehouse.

INSURING PROPER SLIDE CONTACT

While receiving signals one night I moved the slider slightly and weakened the signal some, and again it would sometimes increase the signal strength, so I arrived at the conclusion that the slider made poor contact with the rod. I then soldered a flexible piece of wire to the slider and binding posts, to which it was connected, which resulted in an increase in efficiency.

Contributed by Wm. J. O'Neill, Jr.

WINDING COILS WITH A HAND-DRILL

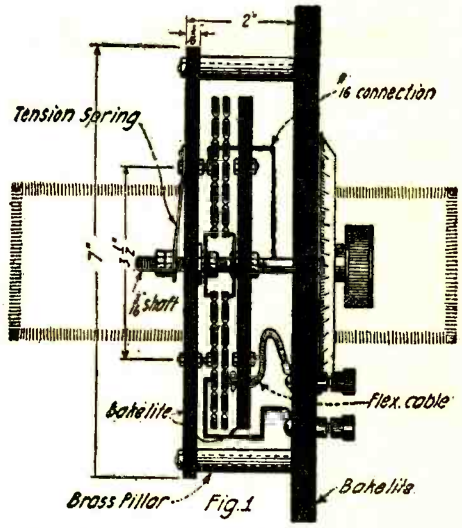
I have noticed that a great many amateurs have trouble in winding the wire on their tubes by hand. Nearly all amateurs possess a hand-drill, and with a little adaptation, they may easily construct a coil-winder as shown in the diagram. It will only cost about fifteen cents and will save considerable time and trouble and add to the appearance of the finished coil.

The two end pieces are adjustable in order that different lengths of coils may be wound. The taps are taken off from the inside of the tube while winding.

Contributed by N. J. Hughes.

A PANCAKE TYPE VARIOMETER

Having need for two variometers and not wishing to use the usual ball form, led to the construction of a type which is illustrated here.



Here is a new idea in variometer construction. Using spider-web type inductances a variometer may be built that is very efficient and small.

After completing and hooking up this variometer, the results were much better than expected, especially the sharpness of tuning, probably due to the form of winding, reducing distributed capacity to a minimum, closer coupling, more inductance giving a higher ratio.

The inductance form can be made of some good thin insulating material 3/32 inch thick, such as bakelite, fibre, celluloid or perhaps a good grade of cardboard, given a number of coats of shellac after cutting.

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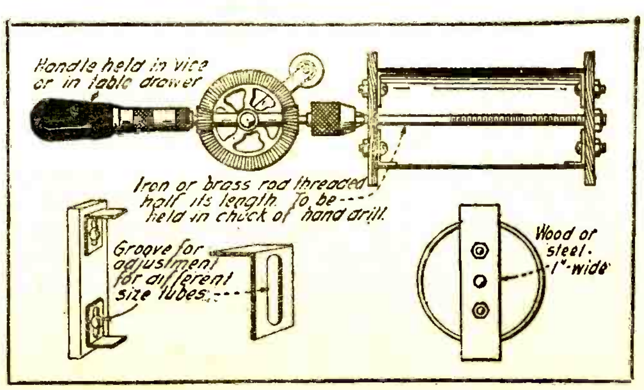


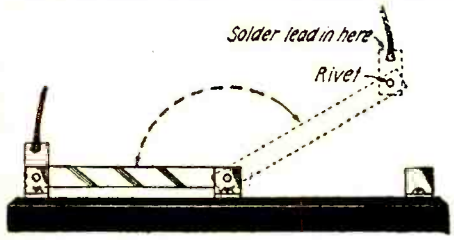
On the left is shown a simple method of winding coils with a hand drill. On the right an old binding post is used to make a vernier adjustment for the dials of condensers or variometers.

LIGHTNING PROTECTORS

In order to conform with the Fire Underwriters' rules, it is necessary to protect the antenna with a lightning arrester and lightning switch. Here are some excellent means of doing this.

A LIGHTNING SWITCH BLADE OF GREATER ELECTRICAL EFFICIENCY

In the design of radio installations, one of the simplest and best methods to increase efficiency in both transmission and reception is to eliminate, as nearly as possible, all unsoldered joints.



This type of lightning switch prevents any loss in poor or dirty contacts.

In going over my own set to get rid of unnecessary joints I found one stumbling-block in the joints of the lightning switch. Since the switch was out of doors, these joints, because of the action of the weather, were of very high resistance and a test showed that the chief trouble was at the point where the blade was pivoted. The pivot to work freely had to be loose, allowing dirt and oxide to collect, while at the jaws the clipping action made a fairly good self-cleaning contact. It is remarkable that reception is not entirely blocked at times by the poor contact at the middle support. Such a joint is particularly harmful to C. W. transmission with its low potential. A temporary solution of the problem was found by dispensing with the switch, but of course this could not be tolerated.

In designing a new blade the first consideration was to afford the same or even better protection from lightning and after that to increase electrical efficiency and maintain mechanical strength, economy, and ease of operation. The design evolved can be applied to any standard switch, is easily made by amateurs and can be standardized by manufacturers. It requires no changes in the switch except the blade, and, in the case of an entire switch being manufactured with this feature, would be cheaper. Several of these switches have been in use for almost a year and have given excellent results.

CONSTRUCTION

The blade proper is made of Bakelite 1/8"x1"x(the length of old switch blade, nearly always 6"). A strip of copper is needed 1/16"x1"x4 1/8", bent as shown in the drawing, and drilled one-half inch from the ends with a 1/8" drill or larger and counter-sunk. The Bakelite strip is also drilled to accommodate the pivot at one end and with the 1/8" drill at the other. All four corners should be rounded. The copper strip is then riveted to the Bakelite and the rivet filed off flush on each side. The copper must be allowed to turn freely. The lead-in is then soldered to the copper strip and the switch reassembled for use.

ACTION

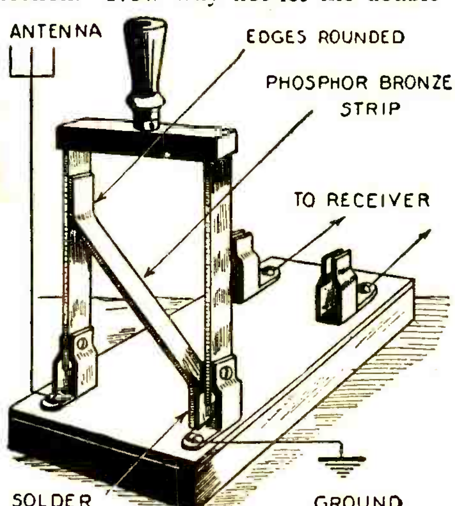
The Bakelite forms an insulating handle for throwing the switch and also increases the insulation of the parts from the base. Only one unsoldered contact remains, and several sharp turns are eliminated, which reduces brush discharge. As the copper strip swivels the lead-in is not kinked or twisted in any way.

The switch may be considered merely as a modification of the plug and jack system having an insulating handle, and a guide to direct the plug and keep it always at hand.

Contributed by E. P. Talbot.

GROUNDING A LIGHTNING SWITCH

Many radio fans use an ordinary double-pole, single-throw knife-switch for connecting the antenna and ground to their receiving set. Then another switch is employed between the antenna and ground for lightning protection. Now why not let the double-pole switch serve also as a lightning switch? This would be an advantage as the lightning switch is sometimes forgotten—and the cost of a lightning switch is saved, as well.



By adding a strip of copper or bronze to a D.P.S.T. switch, an efficient lightning switch can be made.

A small strip of phosphor bronze or copper about 1/2 or 1/4 inch wide and about 1/32 inch thick is bent to the shape shown in the illustration and soldered to the ground-point of the switch, so that the strip will just touch the antenna blade when the switch is in the open position. It is easily seen that this will interfere in no manner with the proper functioning of the switch. It is well to round off the edges of the strip so that the blade will make an easy sliding contact with it.

When the switch is left in the open position, which it ordinarily is, the antenna will be grounded, but when the switch is closed, the ground circuit is automatically opened.

Contributed by Oliver Kirchner.

MAKING AERIAL SWITCH LEAK-PROOF

The weak point of most aerial systems is the lightning switch. This is true especially in wet weather, the radiation often being halved; or in very bad cases the spark jumps directly to ground, making use of the wet switch base in so doing. Various methods of setting the switch blade and jaws on insulators to overcome this leakage have been described, but in most cases the construction has been rather complicated, and considerable time and energy have been required to make a neat job.

A regulation 500-volt 100-amp. S. P. D. T. knife-switch, mounted on a composition base that leaked badly at the least sign of dampness, was used. Three Electrose ball insulators were procured, care being taken to see that the iron rings were in line with each other, and fastened tightly. If they are not in line and rigidly fastened the jaws will either be mounted crooked or will wobble.

The blade and jaws were removed from the base and three 1/4-inch holes were drilled one-half inch in from the edge, directly opposite the original ones, as shown in Fig. 2. These holes must be countersunk on the under side of the base so that the screw-heads will not project beyond the surface. They must be measured accurately, as otherwise the insulators will have a certain amount of play, and at the least little knock or jar they will become out of line, throwing the jaws and blade out also.

A hole must now be cut in the blade support, Fig. 1, to accommodate the nut B. This is done by drilling a 1/8-inch hole through both sides of the support, and cutting out, with a thin bladed fret-saw, to a size that will easily allow the nut to be slipped in. However, care must be taken in turning corners with the saw, or there will be a pile of broken blades lying on the bench. The insulators are fastened to

(*Continued on page* 89)

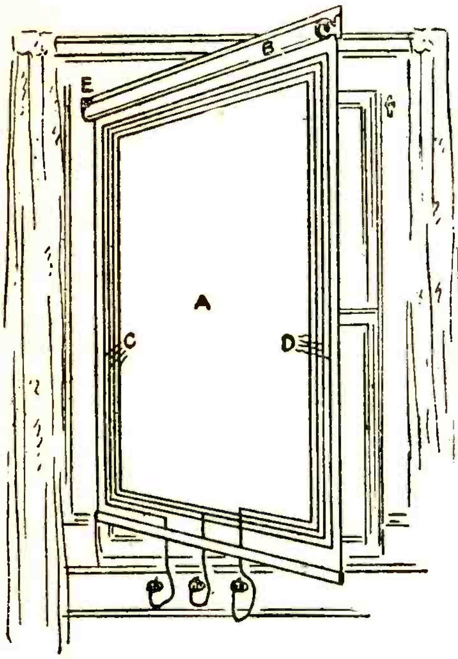
LOOP ANTENNAE

With the growing popularity of the loop antenna, it is a certainty that the advice concerning them as given here will stand in good stead.

A NOVEL LOOP AERIAL

Although a loop aerial is small when compared to an outdoor antenna it is quite a cumbersome object to have in a room. It requires considerable space in order that it can be swung freely in any direction desired.

The loop aerial shown in the accompanying illustration is minus the above mentioned disadvantages. It is composed primarily of a window shade A upon which is wound the wires C



Wind your loop aerial on the shade and save space. It is easily done and if flexible wire is used the shade can be rolled up.

which are fastened to the shade by stitches D. The roller and support B are free to swing out from the window frame by employing a small hinge E at one end. The loop connections are led to binding posts mounted either under the window sill or on the lower portion of the shade. In order that the shade can roll up freely it is advised that flexible stranded wire be used for the loop proper.

Contributed by B. J. T.

WIRE FOR CONSTRUCTING THAT LOOP

The radio fan with limited means, who desires a loop aerial is sometimes up against it because of the high price of such apparatus. Still, as long as necessity is the mother of invention, and as long as we have scrap heaps, the fan can at least rig up a substitute for that which he desires.

Expensive stranded, or ribbon wire is desirable for use on a loop, and if the experimenter will go to a Ford garage he can get an old Ford magneto field coil for little or nothing. On this field is wound about 200′ of copper ribbon wire, ¼″ wide, in 16-foot lengths. This kind of wire is said to be far superior to ordinary wire for aerial purposes, owing to the increased surface it gives to the flow of the radio frequency currents.

Ribbon wire may also be used to shield panels, connect up your set, and short pieces may be used as connecting links, or battery connectors; therefore, a roll of it should prove a valuable addition to the radio experimenter's hope chest.

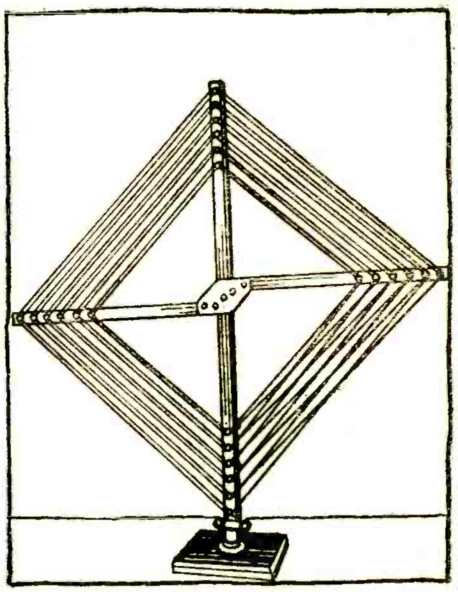
Contributed by Glen. F. Stillwell.

A GOOD PORTABLE LOOP AERIAL

The following is a description of a folding loop antenna. The outstanding features are: Original design allowing the cross-arm to fold up against the vertical support and its compactness when knocked down for transportation.

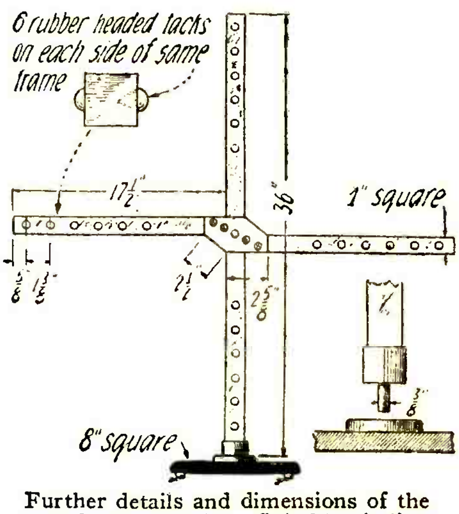
The loop frame in folded position.

Fig. 1 shows the loops closed. A small shaft fits in a bushing mounted on the wooden base. This permits rotation of the loop. Fig. 2 shows the loop ready for use with the flexible stranded wire wound around the rubber headed tacks on the cross-arms. There are six of these tacks on both side of each arm. When winding the wire on, it is started from one of the binding posts at the bottom and wound from the center out on one side, then crossed over to the other side and wound from the outside to the center, there being fastened to another of the binding posts. As to the constructional details, the vertical support is a piece of wood 1″ square and 3′ long as shown in Fig. 3. The horizontal support consists of two pieces each 17½″ long. Brass plates on each side of the frame attach them to the vertical support by means of long brass bolts, two being through each of the horizontal arms and one through the vertical arm, this one acting as a pivot. The drawing of Fig. 3 is self-explanatory. The dimensions of course can be changed to suit the requirements of the builder.



This photograph clearly shows the details of the loop. The wire is wound around rubber-headed tacks and fastened to binding posts at the bottom.

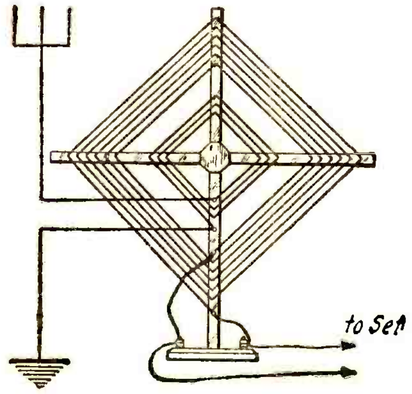
Contributed by William F. Gehrig.



Further details and dimensions of the portable loop series. Suitable binding posts can be placed at the bottom for fastening the wire.

USING A LOOP WITH AN UNTUNED PRIMARY

Any receiver designed for a loop would naturally give much superior results if it could be employed with an antenna and ground. Most of the loop receivers on the market, however, can be used with a loop only unless a separate tuning unit is employed. Such a tuning unit is, in a majority of cases, inconvenient, and for this reason the benefit of an outdoor antenna must be dispensed with. The obvious solution to this problem is to wind a primary coil directly on the loop frame in inductive relation to the loop winding. This primary winding will consist of about three turns of fairly heavy



Here is a good stunt. The extra winding on the inside of the loop frame functions as an untuned antenna circuit.

stranded wire wound on the frame of the loop inside of the loop proper. This winding should be from 1 to 3 inches from the loop winding, depending upon the degree of selectivity desired. The further this winding is removed from the loop the greater the degree of selectivity but the weaker the signal. This primary winding may be connected directly to the antenna and ground and the loop is connected to the set in the ordinary manner. It will be found that the signal strength will be greatly increased over that obtained when using the loop alone and practically the same dial reading will be had in either case. Sometimes greater signal strength will be had by using six or seven turns on this primary winding and connecting a fixed condenser of .00025 mfd. capacity in the antenna circuit.

Contributed by H. A. Everest.

A DIRECTIONAL LOOP AERIAL

From time to time I have read articles on the construction of loop aerials, from those that would fit inside a suit case to those of greater dimensions, each with different lengths and sizes of wire.

Before spending the time to construct an elaborate frame for a loop I looked around for something on which to wind wire temporarily so as to prove what length and size would give best results; this was easy enough, but then I went a step further and found that which would be adjustable and also directional, as shown in the drawing.

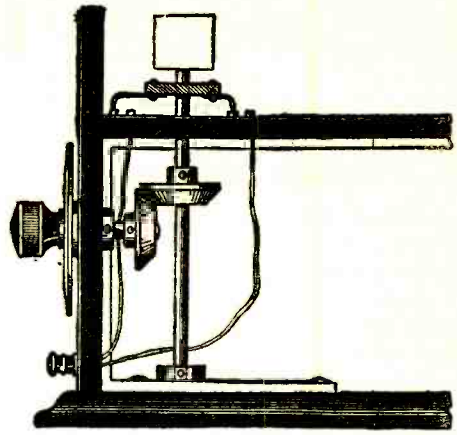
The construction of the pegs allows them to be fastened to the door by small R. H. screws which will leave a very small mark when removed.

After trying out a loop of this kind there is no reason why it could not be constructed neatly and used permanently.

Contributed by Henry L. Edwards.

PANEL MOUNTING FOR LOOP AERIAL

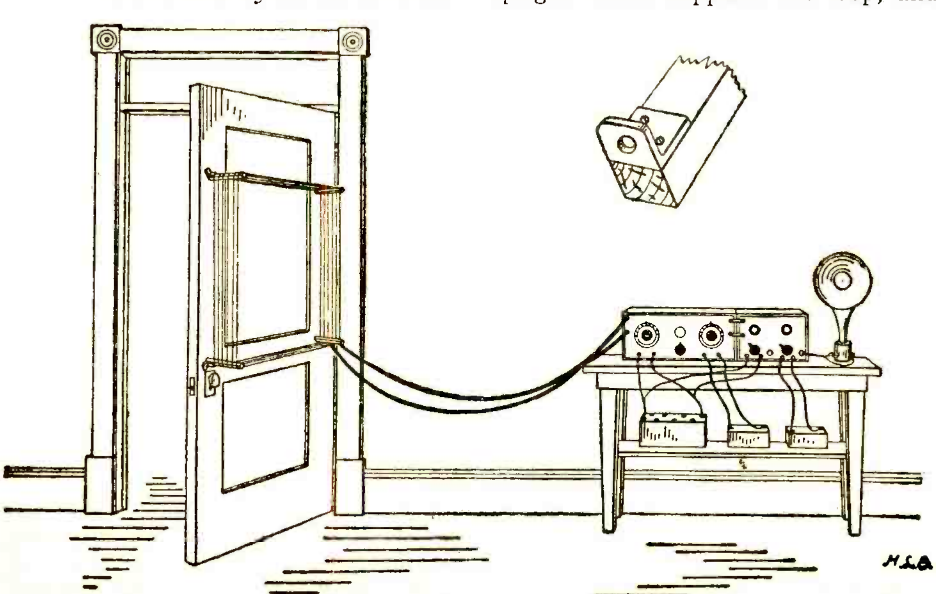
The arrangement suggested by the diagram is a panel mounting for a loop aerial. By means of the dial on the front of the panel, a record may be kept of the directions of certain stations or the angle at which it is necessary to turn the loop in order to receive strongest signals from any particular station. A simple method of turning a loop without handling the wires and entangling the leads has sometimes been a problem to the experimenter. This method controls the loop by a simple gear arrangement. When the front dial is turned the gear at the end of the rod passing through the panel engages with the gear on the upright which supports the loop, and



An ingenious method of mounting and turning a loop aerial. A record can be kept of the directions of stations.

the loop is revolved. The ends of the loop wire are brought to two switch levers held to the upright and revolves with the loop. Each makes contact with a circular brass strip on top of the cabinet. From each of these strips wires are led to two binding posts on the front of the panel.

Contributed by James Hoe.

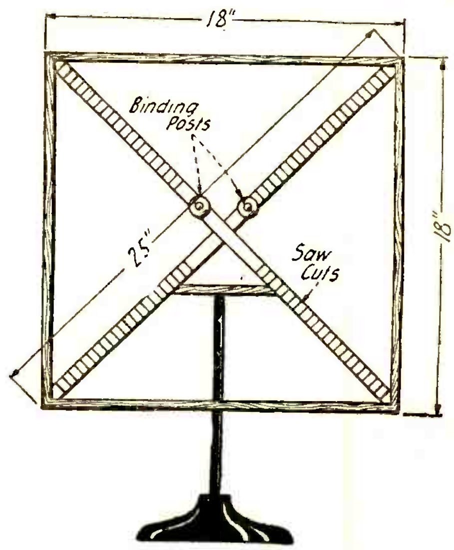


A loop aerial is rather cumbersome if placed on the table with the receiving apparatus. Why not mount it on the door of your room, as shown in the illustration?

HOW TO MAKE A LOOP ANTENNA

Many amateurs living in apartment houses are handicapped in their erection of an antenna by lack of space. I have constructed a loop aerial as shown in the diagram and obtain very good results with one vacuum tube detector.

To construct this loop, two laths of wood 25½ inches long should be obtained. A notch is cut in the center of



Good results will be obtained at short distances with this loop, using one or more tubes.

each and they are joined together to form an "X." Four laths of wood each one-eighth inch long are nailed across the extremities of the cross supports to form a square. Commencing 3½ inches from the center, saw-cuts ½ inch apart are made on both edges

(*Continued on page* 89)

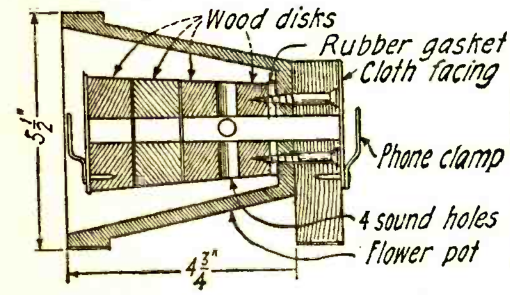
LOUD SPEAKERS

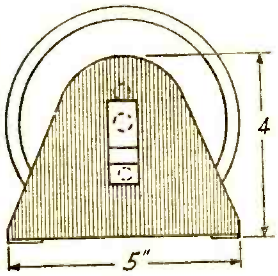
If you are looking for good quality in reproduction, the following wrinkles are bound to offer a solution to your problem. Good results are assured.

A GOOD LOUD SPEAKER

An inexpensive, compact, light-weight, efficient, non-metallic loud speaker is a rare prize. We own three at our house, two of which represent a considerable investment. The third, and by far the most satisfactory one, is constructed of a ten-cent flower pot and a few bits of wood, cloth, rubber, brads and screws. It is of neat appearance and weighs only one and a half pounds. It can be built in about one hour.

Any hardware man who handles screen wire will give you the four wooden disks shown in the drawing. These are about 2" in diameter by 7/8" thick. Clamp two of these in a vise and bore two 1/2" holes edgewise through and between them, as shown. Bore a 3/4" hole through the center of the disks flatwise. Assemble the four wooden disks as shown, using brads and glue. The rubber gasket shown was cut from an old inner tube. Make rear end of 7/8" wood and bore as shown and use as template in drilling corresponding holes in bottom of flower pot. Two phone clamps made of strips of spring brass 1/2" wide are screwed on





Here is a new one in the way of loud speakers. The horn is nothing more than a flower-pot, enameled for beauty's sake.

where shown. Assemble these. Glue a woolen cloth phone gasket at each end of speaker. Glue three pieces of cloth for the feet, where shown. Paint with auto enamel.

This is the clearest and most distinct loud speaker for song and speech that I have ever heard. You will like it.

Contributed by James Mecham.

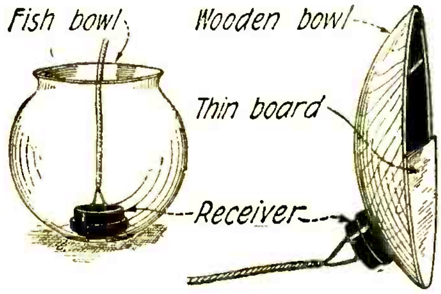
A MAKESHIFT LOUD SPEAKER

The following kink may be of use to some of us who for various reasons, do not care to place a horn on the radio set.

I have found that if a single receiver is lowered gradually into an ordinary fish bowl, there is a point found where the music simply roars out. This point will vary with the size of the bowl but is usually only a short distance from the bottom. The action is the same as with a Hertz resonator.

If one does not care to use the fish globe he can secure still better results by utilizing another article to be found in every household; the food chopping bowl. A thin board is placed over half of the bowl and the phone placed as shown in the sketch. The music will roll out in an astonishing volume.

Contributed by Wesley McArdell.



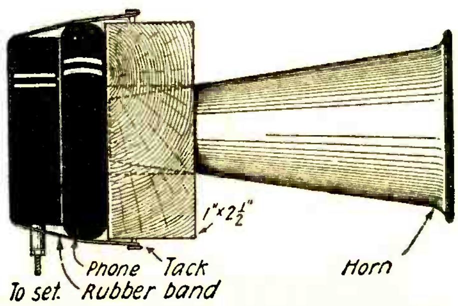
A fish bowl and a wooden meat chopping bowl, both make good loud speakers. This illustrates how it is done.

SIMPLE LOUDSPEAKER ATTACHMENT

The device here described has been in use at my station for several months in connection with an ordinary phonograph horn. It is neat, simple, efficient and it may be made at practically no cost.

The materials are as follows:
1 block of soft wood 2½x2½x1".
2 common tacks.
1 rubber band.

The method of construction is seen clearly by the drawing. The hole in the



Here is an easily constructed loud-speaker attachment that works very well.

block is drilled slightly larger than the horn end if it tapers. If the horn end is not of conical shape, such as a phonograph tone arm, the hole is made just large enough to fit snugly. The receiver is placed as is shown in the cut. And it works!

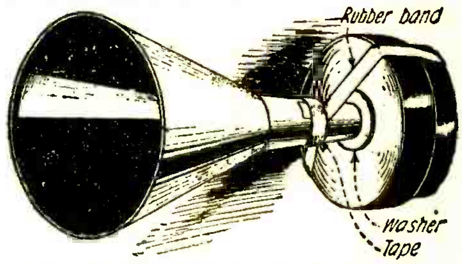
Try to beat that for simplicity.

Contributed by E. B. Gobrecht.

A LOUD SPEAKER FOR THIRTY CENTS

The accompanying sketch shows a very good loud speaker that can be constructed from an ordinary funnel purchased from any hardware store.

Attach a strong rubber band, about 1/2" wide, to the small end of the funnel with friction or adhesive tape, make it tight enough to securely hold the receiver to the end of the funnel. Cut a



A loud talker from a funnel. Simple, isn't it?

rubber washer, 1/4" thick, with 1/2" hole in the center. Place this between the horn and the receiver and the loud talker is complete.

Contributed by W. J. Braublett.

IMPROVING METAL HORNS FOR LOUD SPEAKERS

Metal horns are subject to tinny vibrations when used in radio and are usually discarded. Radio fans can greatly improve them and overcome the tinny sound by giving the horn the following treatment.

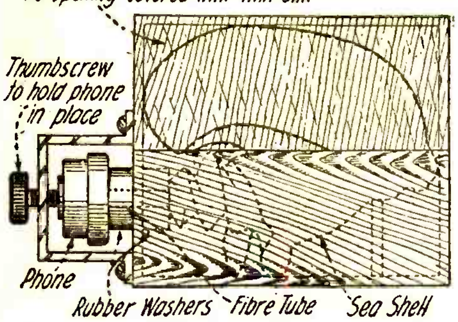
Buy a 10-cent sack of salt and 1/2 pound of paraffin. Melt the paraffin over a steady flame in a pan or pie tin; when very hot, put in salt until nearly all the wax is taken up. The salt will not melt. Add several drops of vinegar to make the mixture adhesive. Then, using a small spoon, spatter the mixture all over the inside of the horn until it is 1/8 to 1/4 inch thick. It will be crystal-like, rough and white. The work must go along slowly to allow the wax to set and the horn to cool off, or it will not stick. Be sure to cover all the surface inside. In a day or two, paint it thoroughly three to five times inside and out with a flat black paint and, if a proper amount of the wax mixture has been spattered on the inside, a clear tone, non-vibrating horn will be the result. My horn is from an Edison phonograph, rather large and made of brass. After giving it this treatment, all voice and music were produced in very clear tones.

Contributed by J. B. Cook.

A SEA SHELL LOUD SPEAKER

Having tried all kinds of horns, funnels and electric heaters for the amplifying of speech and music I finally found something which I think has an advantage over others as a loud speaker. This "something" is no less than a large sea shell of the variety that in the past held a high place in the family "curio cabinet." I am using a regenerative set with a Western Electric phone and through this shell the concerts are audible 40 feet away. The seashell has the volume of a large horn, does not take up much room and, thanks to nature, has no tinny sound.

The shell I have is 8 inches high and 8½ inches long but they vary in size according to their age. By sawing off one half of the tip on the left hand side, a spiral channel is opened which runs around to the large opening, or mouth.



A very good loud speaker made out of a large sea shell. It is conveniently mounted in a cabinet.

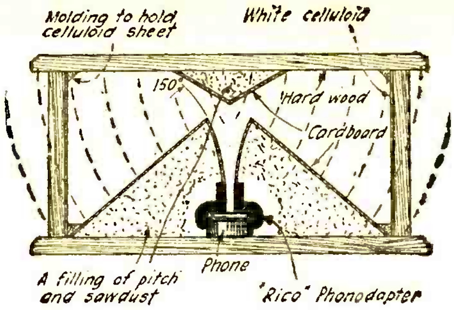
I am using a large rubber washer between the phone and this opening. A cabinet can be built to accommodate the shell with very little work and the same will appear as good looking as any loud speaker on the market. The sketch shows clearly the details of the complete instrument. A piece of silk is stretched over the opening to improve the appearance.

No dimensions are given on the sketch, since the shells vary in size.

Contributed by Frank E. Jensen.

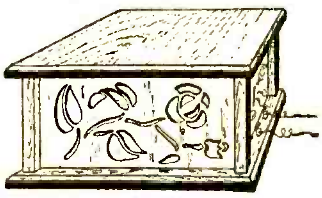
A HORIZONTALLY DIRECTIONAL LOUD SPEAKER

The accompanying diagram illustrates the simple construction of the home-made reproducer for various sound frequencies of broadcasting. The sound waves it will receive pass vertically through the horn. They are then reflected from the sides of the right pryramid, down and outwards, striking the surface of the table upon which the reproducer is placed. To give the reproducer the advantages of a solid horn, all hollow spaces were filled with a mixture of melted pitch and sawdust before setting into place. The appearance of the finished article is greatly increased after the customary finishing of all wood work, by placing



Details of the interior construction of the loud speaker.

between the four uprights sheets of white celluloid. With a fine fret saw, the pattern was cut (before setting in position) and colored paper mounted on the back to improve the appearance. As places in this celluloid sheet showed a tendency to vibrate at certain audible frequencies, small pieces of celluloid were cemented on the backs of these portions.



Exterior view of the completed loud speaker.

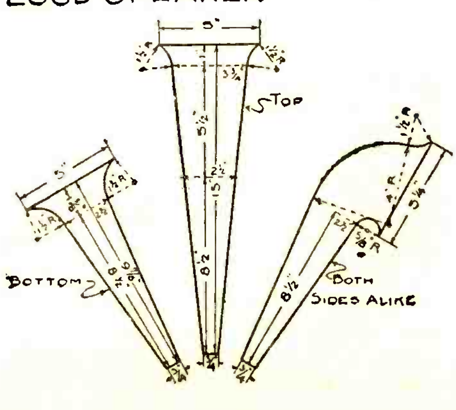
This reproducer which may be small in size can find a fitting place anywhere in the room. There is very little distortion of speech or music and the music is right there in the room and not at the end of a long hall. I am contemplating the building of another, having its three radiating surfaces in the form of half a hexagon, the middle surface having a clock set in its center, so that the reproducer may take the place of my clock on the mantle piece.

Contributed by E. H. Woods.

A PRACTICAL INEXPENSIVE LOUD SPEAKER

Why spend five dollars for a "tin" loud speaker when a simple and effective one can be constructed by anyone who has a little ingenuity and about 25c in cash?

LOUD SPEAKER



Accurate mechanical details are here given for the construction of the loud speaker.

The horn shown here was constructed by the writer, and, with only a Murdock 2,000-ohm receiver in the base and a detector and one-step, music and ball-scores were heard clearly and easily all over a medium sized room and and for a distance of about 40 feet from the horn. The tone was excellent and showed little or no tendency to over-vibrate on the high notes.

The finished loud speaker.

The horn itself is made from stiff red cardboard similar to that used as covers for note books, and this material may be purchased for about ten cents at any stationery store. Lay out the design with a ruler and compass to the dimensions shown. Cut out the parts and bend them to the required shape, taking care to make no sharp bends in the cardboard. A little trimming may be necessary to make the edges around the curves fit nicely.

The secret of assembling the horn is in the use of surgeon's adhesive tape, which seems to have a peculiar affinity for the cardboard and makes an excellent cementing tape for the corners. This tape may be purchased at the drug store; it should be ½" wide and cost about 15 cents.

In assembling the horn, cut the tape into strips about 10 inches long and fasten the inside seams, first pressing the tape firmly in place and rubbing slightly with a small block of wood. For a short time after the outside seams are covered, the horn may be held in true shape by elastic bands. The base may be any small wooden box at hand or specially constructed to any desired dimensions. The cover, which is to support the horn and receiver below, should preferably be at least ½" thick. To receive the horn a square tapered hole should be cut through the cover. Push the horn firmly in the hole and glue it in place or attach it on the under side of the cover by four strips of adhesive tape reaching up inside the horn. The cover may be hinged to the box to facilitate a quick change of receivers from the head-band to the box.

To hold the receiver tight against the bottom of the horn, two clips of brass or iron should be fastened to the underside of the cover and bent in such shape as to hold one of your particular type of receivers firmly in place. A slot should be cut in the side of the box to receive the phone cord.

Contributed by H. E. Bailey.

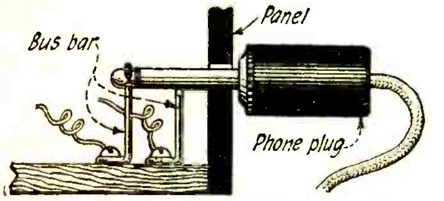
(*Continued on page* 89)

MISCELLANEOUS

Under this heading will be found a great variety of helpful suggestions on every phase of radio equipment. By duplicating these items, one is bound to save time and money and be certain of getting the best results.

USE FOR BUS BAR

An emergency phone jack may be made, as shown in Fig. 1. A hole is drilled in the panel large enough so that the plug may be moved up and down slightly. Two pieces of bus bar are



A simple single circuit jack made from bus bar wire.

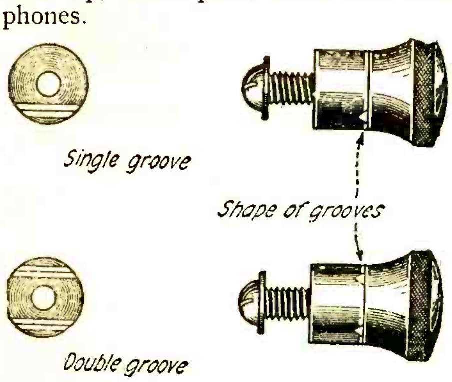
bent as shown, the one nearer the panel being bent so that the horizontal portion is just at the level of the bottom of the hole. The other one is bent so that the tip of the plug will fit in it snugly. The weight of the plug is sufficient to insure good contact.

Contributed by Arthur A. Blumenfeld.

A PHONE BINDING POST KINK

The accompanying sketch shows how the writer uses a hard rubber top binding post for telephone connection. A good many people prefer a binding post of this type, but the cord tips ordinarily supplied on phones are hard to grip in these posts.

By simply filing a groove across the brass base as shown, to a depth equal to about one-half the diameter of the cord tip, these posts work fine with phones.



If binding posts are filed in this manner, telephone tips can be inserted.

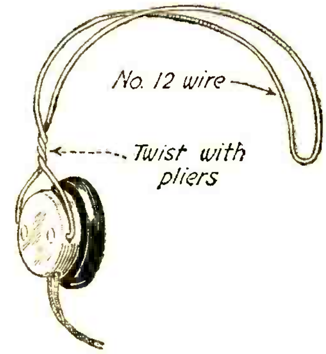
If desirable to hook two sets of telephones in parallel use two double grooved posts, connecting one side of each headset to each binding post. To connect two headsets in series, use three posts, the two outside posts, only, being connected to the inside wiring. To use one headset on this arrangement it can be connected across the outside posts.

It is obvious that any number of headsets could be connected in series by adding double grooved binding posts.

Contributed by Lloyd B. Gangawere.

SINGLE RECEIVER HEAD BAND

All of us, at one time or another, have had friends come in to listen in with us and if we were not lucky enough to own a two-stage amplifier with loud speaker, the phones, of course, had to be used. As a rule there were not enough pairs of head sets to go around and we had to "split" them. After a while it proved very



When an extra head-band is needed, it can be made in a few minutes with heavy wire.

tiresome to hold a single receiver to the ear so I devised a head band which could be made in a few seconds and which admirably accomplishes the purpose. The illustration of this head band is practically self-explanatory and very little need be said concerning its construction. About 2½ feet of No. 10 or 12 iron or stiff copper wire is required and is bent into the shape shown, by means of pliers. Two or three of these head bands may be made and used on occasions when there are more listeners-in present than head sets.

Contributed by Graham Joyner.

A SAFETY HINT

It has happened to me and no doubt to many others, that while tightening some screws inside of the set, the screw driver has slipped and shorted the "A" or the "B" battery. It also usually happens that the "B" battery will be

By wrapping a layer of tape around the screw driver, the danger of short circuits is eliminated.

shorted directly across the "A" battery thereby burning out one or more tubes. This could be prevented by disconnecting the "B" battery, but as a rule, the experimenter does not take the trouble to use this safety expedient. This being the case, it is the best policy to insulate the screw driver so that such an occurrence will be impossible. This is done by wrapping a layer of ordinary friction tape around the metal part of the screw driver down to about one-half inch of the point. This operation is quickly done and it will allow work to be done on the interior of the receiver without fear of shorting batteries or burning out tubes.

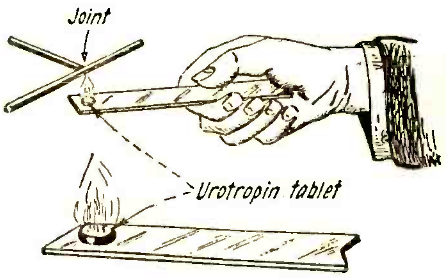
Contributed by Nathan Swerdlow.

AN EMERGENCY SOLDERING FLAME

A tablet of Hexamethylenamine, or to use an easier name, Urotropin, will furnish an ideal soldering flame in an emergency.

A five-grain tablet when lighted with a match, will burn for two or three minutes with a steady, pointed, smokeless, sootless, odorless, blue flame of an intense degree of heat. The seven and ten grain tablets will burn proportionately longer.

Go to the drug store and get five cents worth of five-grain Urotropin tablets and put them in your tool kit.



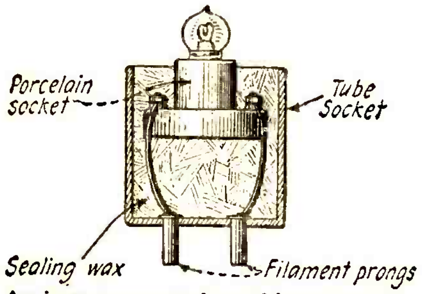
Urotropin tablets generate intense heat when lighted and prove handy as a soldering flame.

Then when you break a wire or want to make a new connection, and your soldering iron is loaned or is out of commission, or you do not want to start the blow torch, just take a tablet, lay it on a piece of metal or in a spoon, put your solder and flux on the piece to be soldered, light the tablet as you would a candle and hold it under the work. You will be surprised how quickly the solder will run and will be delighted at the clean, perfect joint. When soldering in this manner, care should be taken that too much flux is not used, as it might drop into and put out or dim the soldering flame.

Contributed by Dr. William H. McKie.

A TUBE PROTECTOR

Have you ever finished a new set, inserted the tubes, connected the "B" battery and immediately burned out the tubes. If not, you always have



An instrument such as this to test the filament circuits of your tube sockets is well worth while. It may save you the price of a new tube.

this pleasure in store unless some precaution is taken to prevent such an occurrence. By using the device described here, you can always tell if the "B" battery circuit is mixed with the "A." An old burned out tube is obtained, and the glass and elements are removed and the base is thoroughly cleaned. The prongs of the tube are heated by a soldering iron or a blowtorch until the solder melts. Then the wires are withdrawn. A small porcelain socket designed for flashlight bulbs is obtained and wires are soldered to the contacts. These wires are run through the filament tube prongs and soldered so that the top of the flashlight socket is level with the top of the tube base. Melted sealing wax should be poured in the tube base until it is level with the top of the tube socket, and when it has hardened, the small socket will be firmly fixed. A flashlight bulb of the desired voltage to correspond with the voltage of the tube can be screwed in this test socket and the device inserted in the regular tube socket before the tube. If the "B" battery has been accidentally connected to the "A" battery leads, the flashlight bulb will go out, thereby serving as a danger signal. When one flashlight bulb is burned out, a new one can be screwed in, and the tester is ready for service again.

Contributed by John J. Strayer.

A NAVY TYPE KEY KNOB

A common key knob can be made into a navy type knob by using an ordinary poker chip. The poker chip is

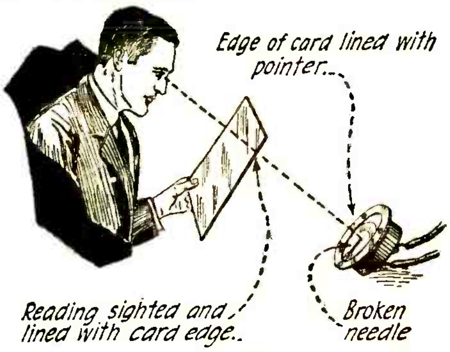
A poker chip transforms an ordinary key knob to one of the Navy type.

drilled in the center so that the screw on the key knob will pass through readily. It is then inserted between the regular knob and the frame of the key and the knob screwed down tightly. Care should be taken when drilling the poker chip as it is liable to crumble or break. The drill should, therefore, be turned very slowly in the process to make a neat hole. Besides giving the key an excellent appearance, this simple device is a great improvement over the regular key knob as it will be found that sending is easier with it.

Contributed by H. H. Schoolfield, Jr.

READING A METER WITH A BROKEN NEEDLE

Many times the needle of a meter becomes broken, making it almost impossible to take accurate readings. The following method may prove of assistance; it may also find application in taking accurate readings where the dial of the meter is not equipped with a mirror. In the latter case, if precision is desired, the operator must be sure that he is looking at the needle vertically. The system here delineated assures this fact.



A good way of reading a meter that has a broken needle.

Most meters have enameled dials. For taking the accurate readings, hold a piece of cardboard or paper, with a true edge, between the eye and the meter, and sight from the edge of the card to the edge of its reflection in the dial. Line the two up with the needle and take the reading.

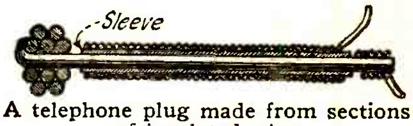
Contributed by Don M. Mumford.

EMERGENCY PHONE PLUG

An easily constructed emergency phone plug that will fit the standard jack is shown in the accompanying sketch. The only materials needed are a short length of No. 18 B. & S. gauge D.C.C. solid copper wire and a few feet of No. 20 B. & S. gauge S.C.C. solid copper wire.

Remove about ¼ inch of the insulation from each end of a piece of the No. 18 wire, which should be about 1¾ inches long. Scrape enough of the No. 20 wire clean to wind two layers on each end of the No. 18 wire, clipping the winding at one end off short and allowing the other to remain about an inch long, with which a terminal is made for the phone tip (see sketch).

Clean the insulation from about 18 inches of a piece of No. 20 wire that is about 2 feet long. Start winding the uninsulated part of the wire on the insulated part of the No. 18 wire, beginning about ⅛ inch from the end where the No. 20 wire was clipped short, which is the tip of the plug. This bare wire will cover about ¾ inch of the No. 18 wire. Then the insulated part of the No. 20 wire is wound on



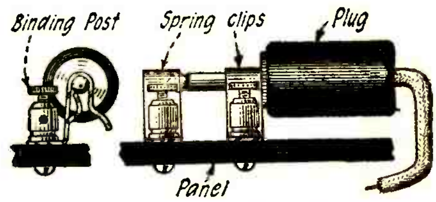
A telephone plug made from sections of insulated wire.

nearly to the end of the insulated No. 18 wire, the insulation thus forming a place to hold the plug. The end of the No. 20 wire is formed into a terminal, as was done with the inside wire.

Contributed by E. C. Morrison.

A QUICKLY MADE EXPERIMENTAL JACK

To the experimenter who delights in making new circuits in breadboard fashion, the jack described here will prove very handy. It is constructed of two ordinary spring clip binding posts, as shown in the illustration. Two holes are drilled in the board for mounting the clips and should be about 1⅛ inches apart. The spring clip binding posts are fastened to the board by two standard binding posts and are then bent upward as shown. The plug can easily be forced under the spring clips so that the tip and the main shaft are securely held by the spring binding clips. If it is not desired to use the plug, the phones may be fastened directly to the spring clips in the usual manner. With this emergency jack in use it will not be necessary to discon-



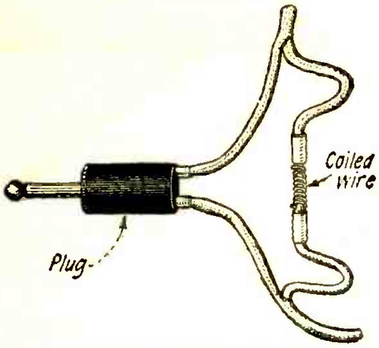
A simple jack made from two Fahnestock clips attached directly to the phone binding posts.

nect the phones from the plug when changing from the regular set to the experimental one.

Contributed by J. E. Dixon.

A SIMPLE PHONE CONNECTOR

Here is a little stunt which will prove very handy when two or more pairs of phones are to be connected in series and no connecting units for this purpose are handy. All that is required is a short piece of No. 20 or 18 bare copper wire. This piece of wire is tightly wound around one of the cord tips or any rod of the same size to a length of about one inch. If more than two pairs of phones are to be connected in series two or more of the simple connectors will be required. The method of using is very simple, the phone cord tips of the separate pairs of phones being inserted in each end of



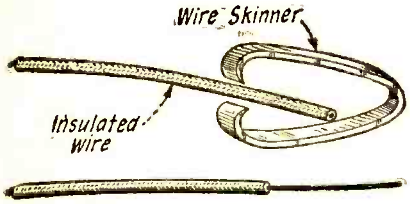
An emergency phone tip connector can be made from a piece of wire, coiled tightly.

the connectors. The accompanying diagram shows very plainly how this little device is employed. It will be found that a good tight connection is obtained which will hold indefinitely.

Contributed by Charles L. Mitchell.

A HANDY WIRE SKINNER

When using a knife to remove the insulation from a cotton or rubber covered wire it often results in a cut finger.



An excellent wire skinner made from a thick piece of spring brass.

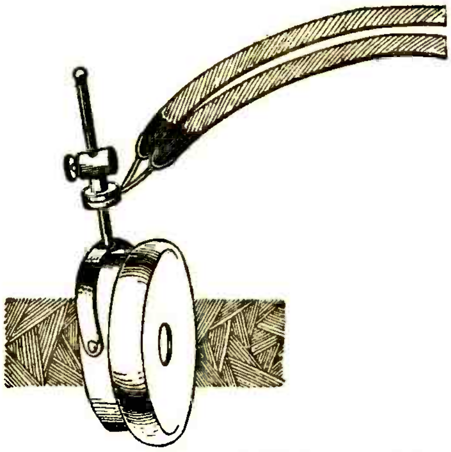
Also, if this work is not done carefully, it is possible that a small fragment of copper in the shape of a splinter will be run into the hand. Herein is described a little device which will safely and easily remove the insulation from any size wire. All that is required is a strip of spring brass 1/16 of an inch thick, 10 inches long, and 1½ inches wide. This piece of brass should be bent into the shape in the diagram. The two edges of the wire scraper should then be sharpened on one side only. To use this device it is held in the hand and the jaws forced together over the wire so that it cuts through the insulation. It is now pulled towards the end of the wire and if necessary the operation is repeated two or three times until all of the insulation is removed. This little instrument will prove extremely efficient in removing the insulation from heavy rubber covered wire.

Contributed by T. J. Hacker.

PHONE ADJUSTER LOCK NUTS

Many of you have adjustable head phones that, although convenient, have the disadvantage of lacking lock nuts. Without these, a desired adjustment cannot be held. Simple lock nuts can be made from ordinary binding posts, as shown in the sketch.

Obtain two of these and redrill the holes so that they are large enough to easily slide down the adjuster rod.



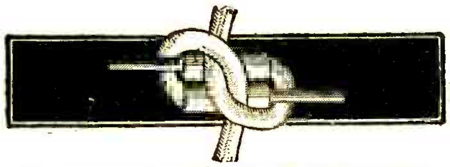
Here is an idea. A binding-post is soldered to the headband adjuster and used as a lock nut.

File them both on one side so that they will fit snugly against the original adjuster. These posts are then soldered to the adjusters, the binding post nuts replaced and the job is finished.

Contributed by Thomas Cannariato.

CONNECTING PHONES

One often desires to connect two or more pairs of phones in series for the benefit of visitors who would like to "listen in." It is usually the case that nothing is handy for this purpose. The sketch herewith shows a quick as well



If you are in a hurry to connect up two or more pairs of phones do it like this. It's simple.

as a practical method for doing this. The cord tips are held in firm contact by an over hand knot. Care must be taken to make the knot tight, otherwise, stray noises and scratches will be produced. The drawing is self-explanatory.

Contributed by S. H. Emmes.

A TREATISE ON A HANDY-HANDLED CLIP

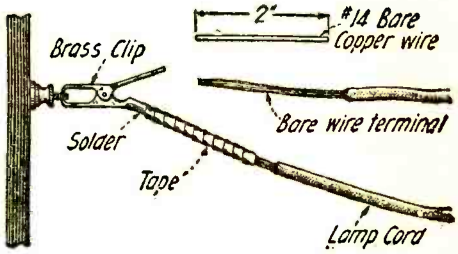
For use in experimental hook-ups I use clips on my wire terminals. I find these efficient and commendable for readily changing, one instrument to the other, without inconvenience. Needless to say, the results are sometimes gratifying.

After numerous tests I found my clips sometimes bent and worn through thus breaking the connections. I was able finally to devise a remedy in the following manner:

When making the connection, instead of using the single connection between the wire and clip (see illustration), obtain a short length of No. 12 or No. 16 copper wire and solder this to the clip at the same time, when making the regular connection.

Strap a coat of electrician's tape over the job and the clip connection will last indefinitely, and will lend to the attractive appearance and handiness. To obviate stickiness, rub a very little talcum powder (flour, etc.) over the taped handle.

Provided with a stout nickel-plated clip and a bit of lamp cord this idea will well answer in place of the modern plug (somewhat more expensive) feature on many of the up-to-date instruments.



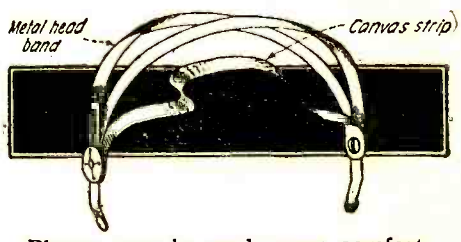
Lengths of wire, with clips on each end, are indispensable to the experimenter. This is a good method of fixing them up.

Will add that I have found this carried to good advantage on the phone terminals, the aerial, ground, most conveniently on battery terminals, and loading and amplifying transformers.

Contributed by H. Z. Wilson.

MAKING HEADBANDS MORE COMFORTABLE

By putting the phones on the head and measuring the distance from one adjusting screw to the other, I cut a piece of canvas 1½" longer than this distance, and ¾" wide. This had a hole in each end and was fastened to the adjusting screws. The headband



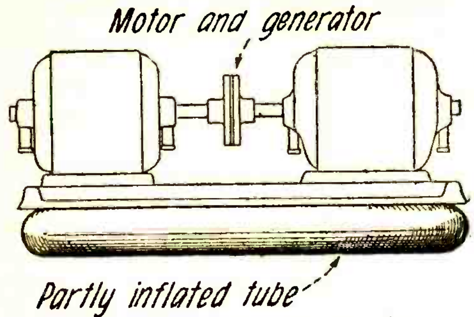
Phones may be made more comfortable by this little scheme.

was extended and the adjusting screws tightened. This left the weight of the phones on the canvas strip while the headband pressed the phones to the ears and at the same time left the user in comfort as the metal strips did not touch the top of the head.

Contributed by Arthur Hance.

NEW USE FOR INNER TUBES

Some time ago I was bothered by the racket caused by the vibration of a motor-generator outfit I had in my



If you are troubled by vibration from your motor-generator, a partially inflated automobile tube, placed underneath the frame, will eliminate it.

room upstairs. The noise could be heard all over the house, especially downstairs. It was necessary that I eliminate this. I thought of the idea of placing a partly inflated automobile inner tube under the base of the machine. I tried this out and found that it eliminated practically all the previous racket the motor-generator made. Those of you who are having similar difficulties would do well to try this stunt.

Contributed by Russel C. Nelson.

UNIT PANEL RECEIVING SET

The usual amateur is not content with a receiver for any great length of time, since new circuits are appearing monthly. To change from one circuit to another, it usually requires a change in position of the apparatus of the old set and possibly the addition of more instruments. After a panel has once been drilled, it is difficult to make any such changes. The arrangement shown in the illustration has an attractive appearance and allows for the changing about of the different instruments to conform to any desired circuit and at the same time allows for the addition

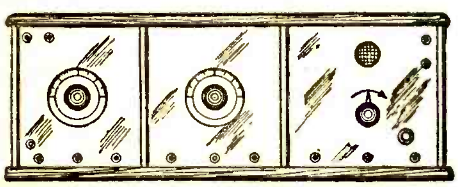


Fig. 1

Fig. 2

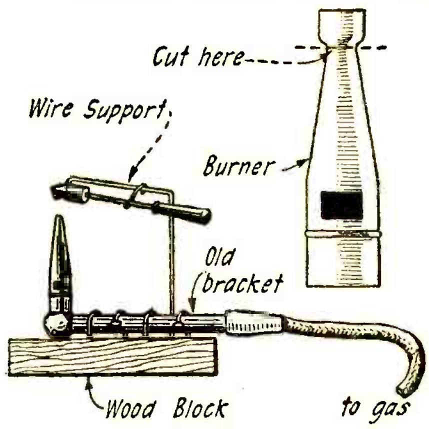
A unit panel receiving set in which the instruments can easily be interchanged.

of more parts without detracting from the general appearance of the entire unit. The small panels upon which the instruments are mounted may be cut from old hard rubber, storage battery cases which are easily obtainable in any garage. This can easily be accomplished with a hack saw and the pieces can be squared up to the desired sizes and sandpapered to give them a good finish. The application of a bit of paraffin oil will give them a glossy appearance. When joining each unit together, small lengths of light brass sheeting are bent as shown in the illustration and placed between each panel. This effectively conceals the joints between each unit.

Contributed by Joe Harner.

SMALL SOLDERING IRON HEATER

If the experimenter does not possess an electric soldering iron, he finds it a great inconvenience to heat his iron on the gas range in the kitchen. This trouble can be eliminated by constructing a small soldering iron heater which can be used anywhere there is a gas supply. To construct this heater, it will be necessary to procure a Welsbach Thrift Burner from the 5 and 10 cent or hardware store. With a file or hacksaw carefully cut the top



A good soldering iron heater constructed from a Welsbach burner.

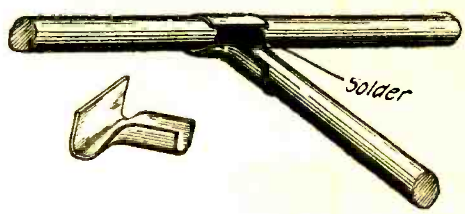
off, as shown by the dotted line in the diagram. An old gas light bracket should be obtained, mounted on a board and the Welsbach burner screwed into it. A rubber tube may lead from the burner to the nearest gas jet. The gas is turned on full and the burner lighted. If it flashes back, that is, lights at the bottom, the gas should be turned off and the top of the burner should be squeezed together slightly with a pair of pliers. It may take a few trials to obtain the right size of the opening for best results. It is operating correctly when a roaring blue flame is obtained. A support for the iron consisting of a piece of stiff wire may also be mounted on the wooden block. It will be found that this burner is very efficient and heats a small soldering iron quickly.

Contributed by Walter A. Troup.

A PRACTICAL CONNECTING LUG

It is usually a difficult proposition to solder a joint formed by two wires meeting at an angle. Utmost care is necessary and even then the job is apt to turn out a poor one.

A very simple connecting lug can be made from a small piece of sheet brass or tin in the manner shown in the ac-



Connecting lugs made in the manner shown are very useful where difficult soldering jobs are encountered.

companying illustration. By the use of a pair of pliers these small pieces of metal can be bent into any shape desired to conform to requirements. A lug of this type after being fitted into place is easily soldered to both wires.

Contributed by Joel Read.

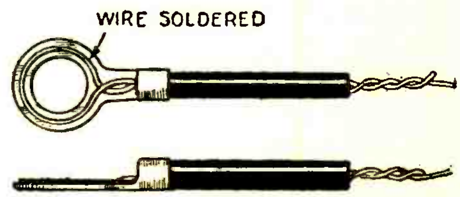
VARNISHED TUBING FOR A FEW CENTS

Having need of some varnished tubing, and not being able to obtain any at the time from a local dealer, I tried the following as an experiment. I purchased from a nearby drug store one dozen soda straws. These I placed in a pan of varnish to soak for three hours, after which I was careful to see that the varnish dried in an even manner. They were then cut to the proper length with a pocket knife.

Contributed by H. Fred Stroberg.

GREATER EFFICIENCY IN SOLDERING LUGS

One of the most important points in building any sort of radio apparatus is the connections that are soldered, and too often this point is neglected, causing endless trouble to the constructor. Soldering lugs help in many ways, but even these may cause trouble if the job is not performed properly.



A strong connection can be made if the lugs are soldered to thin wires in this manner.

If the lugs are soldered to the connecting wires as shown in the accompanying sketches, a good electrical connection will result. Instead of the wire being slipped into the end of the lug and soldered there, it is carried around the loop of the lug and fastened to it. This may then be filed flat.

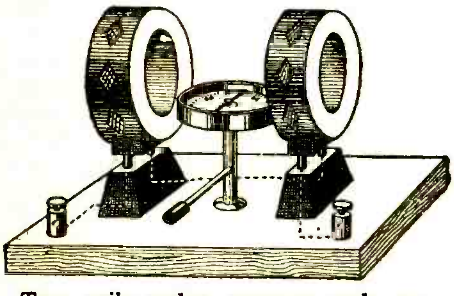
The advantages of this method of

soldering are that it gives a metal-to-metal contact between the lead wire and the binding post or tube socket; it eliminates chances of high resistance connections due to poor soldering or low-grade solder; the heavy, flat face of the lug insures a tight connection without injury to small size wire; and it improves the appearance of the set.

Contributed by V. S. Benson.

HONEYCOMB-COIL GALVANOMETER

A very handy instrument to have around the experimenter's work-bench is a galvanometer. However most of us would prefer to have a voltmeter and ammeter instead of a galvanometer, if we were going to purchase any measuring instruments, so the indicating device herein described should appeal to the fan who does quite a bit of experimenting.



Two coils and a compass make an efficient galvanometer.

This galvanometer is very simple to construct, if the apparatus is placed as shown in the accompanying sketch. Two 1500-turn honeycomb coils are mounted on the baseboard by means of the coil mountings. Care should be taken that the fields of the coils are assisting each other, *i. e.,* that the coils are so mounted that the windings are in the same direction; 1500-turn coils are specified, as these make a very sensitive instrument, but coils having fewer turns may be used.

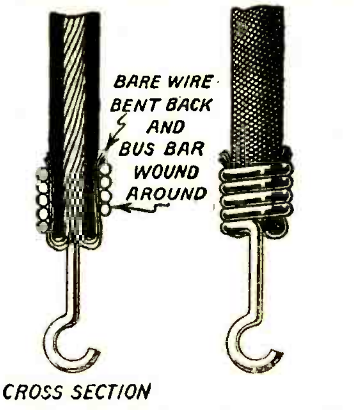
A small compass is mounted on a movable stand so that it can be placed in line with the center of the coils. If desired, four binding posts may be mounted on the baseboard, connecting one to the end of each coil. With such an arrangement either or both of the coils may be used. This instrument may be used in many experiments where it is necessary to ascertain whether there is a current flowing.

Contributed by Clarence Sampson.

BUS BAR LUGS

One of the best ways to connect a wire to any instrument in a radio receiver is to use lugs. However, inexpensive as these lugs are, there may come a time when they are needed and there are none on hand. Here is an easy method of making them from ordinary bus bar.

If an insulated wire needs a lug, remove the insulation from the wire about half an inch from the end and bend the wire back over the remaining insulation. Three turns of bus



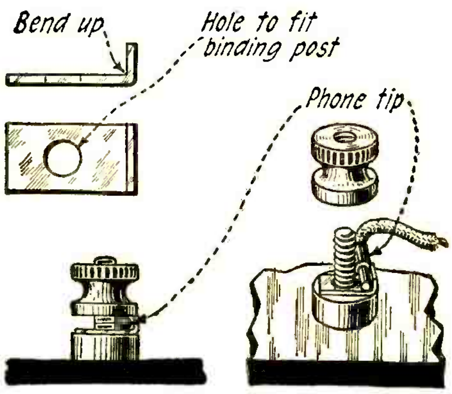
By bending back the wire over the insulation and wrapping bus-bar around the wire, a lug may be formed as shown on the left.

bar are then made around the bent wire and insulation, and the rest of it bent as shown in the sketch. It will be unnecessary to solder this connection of the bus bar to the wire, as the bus bar can be wrapped very tightly.

Contributed by A. A. Blumenfeld.

DEVICE FOR HOLDING PHONE TIPS IN BINDING POSTS

Here is a handy little idea to keep phone tips and large solid wire tight in binding posts. Bend a piece of thin sheet copper, brass or tin, as shown in the accompanying sketch. Drill a hole in the center of the flat portion to fit the screw of the binding post. When



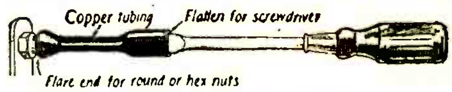
For loose binding post connections.

placed as shown, it will be impossible for the tips or wire to slip from the binding posts.

Contributed by Herbert Forsstrom.

HOME MADE SOCKET WRENCHES

When building radio receivers it sometimes happens that certain nuts are in places very difficult to reach except with a socket wrench. A set of socket wrenches can very easily be made of three pieces of copper tubing one-quarter, five-sixteenths and three-eighths inch outside diameter and two or three inches long. Each piece of copper tubing should be flattened on one end so that a screw driver will fit in snugly. The other end is flared with a punch. This flared end may be placed over practically any type of nut and when pressure is applied it will grip tightly and the nut can then be screwed



Handy socket wrenches can be made from a piece of copper tubing in the manner shown.

into place by the screw driver. I have used a set of these wrenches for several months in assembling sets and am sure that anyone trying this idea will find it excellent.

Contributed by C. R. Whittemore.

A RUBBERIZED PANEL

A great many fans who make their own sets and cannot afford to use bakelite, may be glad to know that they may use wood with all assurance that their panels will give entire satisfaction.

Break two or three old phonograph records into small pieces, place them in a tin can and add one-half pint of denatured alcohol. Allow this to stand until dissolved, a day or two. When thoroughly dissolved apply with a brush; this will give a very glossy finish when shellacked. I have had very good results by first putting on a light coat of shellac or water-proof varnish, then adding one or two light coats of the solution. One-fourth-inch wood is of correct thickness for most small receiving panels. It would be well to dry the material in a warm oven before applying the insulating mixture.

Contributed by C. E. Inman.

AN AID TO PANEL MARKING

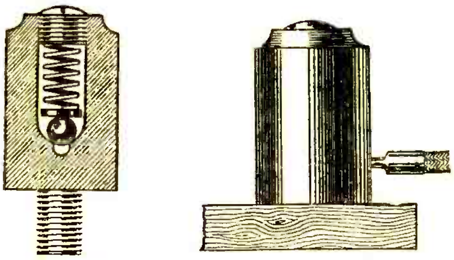
One of the most important things to be done in building a radio set, as far as looks are concerned, is laying out the panel. A great many schemes have been proposed, such as laying out on paper the proper place for each instrument, pasting this on the panel and then drilling. However, the writer has found by experience that drawing the locations directly upon the panel itself is much easier and more accurate. Here is the trick: Procure a black waxed crayon such as is used for marking packages, leather, glass, etc.; smear the crayon upon the panel where it is desired to draw a line. Measure exactly where the line is to be drawn and with a ruler and tooth-pick draw the line through the wax. Should it be in the wrong location, it is a simple matter to smear the crayon over it and try again. When drilling is completed, a soft rag will remove the crayon, leaving the panel in perfect condition.

Contributed by Edw. B. Johnson.

IMPROVING THE PHONE TERMINAL CONNECTIONS

There are many times when it is desired to make a quick change from head-phones to loud speaker. If the receiver is not equipped with phone jacks, but with binding posts, the operation will consume valuable time. The phone terminal shown in the accompanying sketch will facilitate matters to a great extent.

The top of a binding post is removed



A quick-change binding post may be easily made, as shown above.

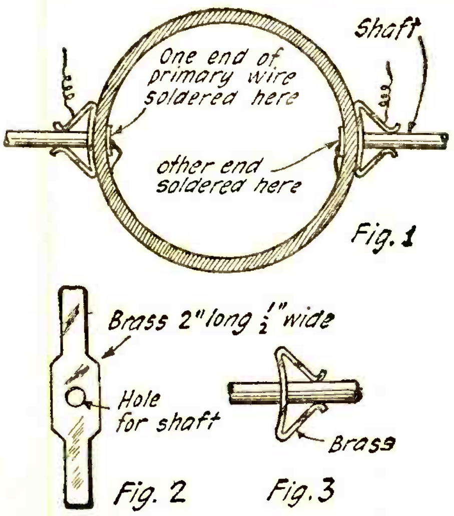
and the hole is redrilled and tapped, to take a steel ball, such as is used in ball bearings, about 3/16 inch in diameter. A spring is wound so that it will fit into the hole, long enough so that it will hold the ball bearing down firmly at the bottom of the hole. The spring is held in position by a cap screwed into the threads at the top of the post. There are no specific sizes given here, because of the varying sizes of binding posts.

With this connector the cord connection is simply slipped into place, where a good contact is made without variation by the spring-held ball.

Contributed by G. A. Luers.

A GOOD SPRING CONTACT

I think you will find the following scheme of great benefit to all amateurs. I have always had trouble in winding variometers or varicouplers, but just



Details of the spring contact for variometers and variocouplers.

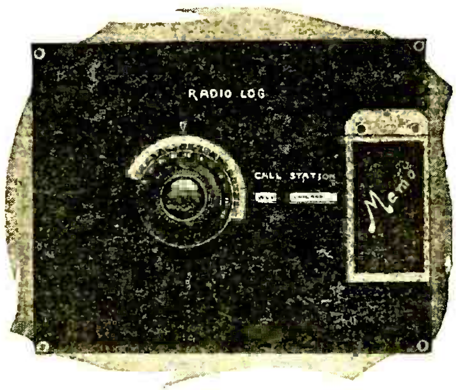
how I could attach the inside winding or secondary coil so that I could turn it through 360 degrees, if necessary, was a problem. In the old arrangement I had, the wires were continually breaking. The arrangement I used is shown in the accompanying sketch, consisting of a small piece of sheet brass with a hole in the center of a size that will fit over the shaft of the instrument. After it has been inserted, the two ends are bent so as to make a firm contact with the shaft proper.

Contributed by James Barr.

A NEW RADIO LOG

A radio log such as is illustrated in the accompanying photograph will appeal to the large number of fans who have sets that may be logged. It is comparatively simple to construct and should prove of great aid to any receiving equipment.

The panel may be of any stiff material. For the best appearance a thin radio panel may be used, or for ease of construction a good grade of black cardboard. A sub-panel is also necessary, which may be of binders board, or stiff cardboard about ⅛ inch thick.



A recording log such as this is a good looking and convenient adjunct to the set.

These two panels should be 8x10 inches. The log itself is made of heavy white bristol board and is 9⅞ inches in diameter. Four cardboard washers and a 3- or 4-inch dial constitute the remaining material. The memo pad may be purchased at a stationery store for a few cents and cut down to required size.

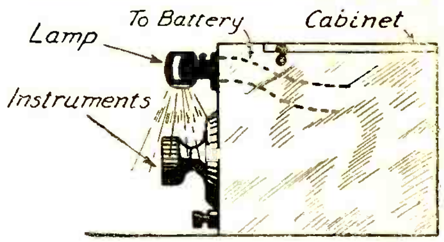
The two panels are cut exactly to size. On the face of the sub-panel and on the back of the panel describe a circle exactly the size of the recording dial, 9⅞ inches. Drill out both centers. Place panels together and drill screw holes in each corner, for fastening the panels together. Using the drilled hole as a center, cut a hole in the panel the size of the dial (which we will assume to be three inches) so that the dial will revolve freely in it. If the panel is of any great thickness, bevel it so that the indicating point will come near the graduations on the dial. Then cut the openings through which the call letters and the station name appear, these also being beveled.

Before assembling, four cardboard washers are prepared so that the cardboard may turn freely between the two panels. This cardboard log is pivoted on the sub-panel by means of a split-rivet or similar means. After the two panels have been fastened together by small bolts and nuts (or in case cardboard is used, paper clamps), make sure that the recording dial and hole are *concentric*. Spread glue thinly upon the back of the dial and set it firmly upon the recording log. Allow the glue to dry thoroughly. The face of the panel may be finished in any way that the constructor may desire.

Contributed by Herbert C. McKay.

A NIGHT LIGHT FOR THE RECEIVER

It very often happens that just the night you wish to stay up late and pull in DX stations, you have been commanded by the powers that be to keep the electric light bill as low as possible and to be in bed at a respectable hour. On occasions such as this, it invariably happens that these nights are the best for long distance reception. Therefore, if you wish to operate your receiver, it would be advisable to employ a night



Method of using lamp for night reception with portable sets.

light such as is described below. This simply consists of a nickel-plated lamp such as is used on the instrument board of an automobile. These lamps sell for about 35 or 50 cents and may be obtained at practically any automobile supply store. It should be mounted on the panel of the receiver, directly above the main tuning dials, as shown in the sketch and the two supply wires should be connected to the "A" battery line in series with the filament switch. The upkeep of this light will be very small and it can be switched off or on when desired.

Contributed by John J. Strayer

A SIMPLE PHONE CONNECTOR

The radio listener sometimes wishes to connect two or more pairs of phones in series, and not having a regular connector on hand is at a loss as to how it is to be done. The following stunt is simple and quick and should prove welcome. Two brass machine screws about ¾ inch long and three nuts to fit is all the apparatus necessary. A nut should be placed on each screw and the screws then inserted into the third nut from opposite sides, and tightened. The phone cord tips are then placed between the heads of the screws and the movable nuts, and the nuts screwed up tight. This makes a good connection and can be left on permanently.

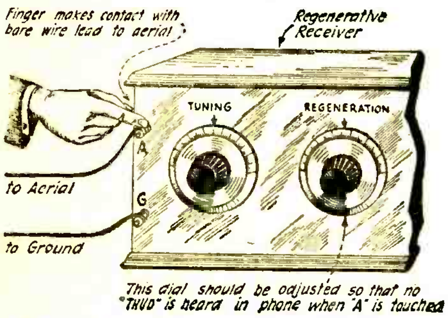
Contributed by T. B. Beatty, Jr.

HOW TO TELL WHEN A SET IS RADIATING

There are still a great many single circuit and other types of radiating receivers in use. These sets may be acting as miniature transmitters, and radiating in the ether waves that may be interfering with other broadcast listeners' sets.

At times the owner of such a set may not know that it is radiating, and would take steps to correct the trouble, if he knew.

One of the easiest methods to determine whether one's radio set is radiating into the ether is to simply touch the antenna binding post. A faint thud will be heard in the phones, even if the radiation is very small. The correction is simple: Merely adjust the tickler coil, or other regeneration control, until this sound is no longer heard.



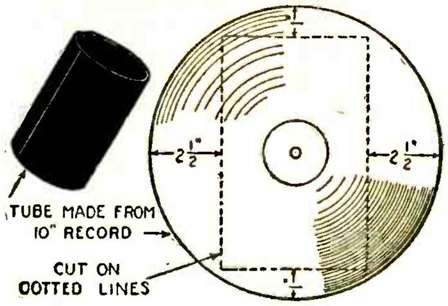
If your receiving set is oscillating, a plucking noise will be heard in the head-phones when the aerial binding post is touched by the finger.

The finger should be moistened slightly, so that better electrical contact may be made with the body. This experiment is entirely free from bodily harm, and is a very interesting one.

Contributed by Floyd French.

HOME-MADE TUBING

Everyone who has a phonograph has the problem of what to do with the old records. Here is a solution that is also a money-saver for the radio fan. Mark the records as shown on the accompanying diagram with a scriber, the length being equal to the circumference of the tube desired. Place the record in a medium hot oven and allow it to remain until it becomes soft, when it can easily be cut with a sharp knife or a large pair of scissors. A cylindrical form a little smaller than the desired diameter of the tube is prepared, around which the flat piece of record is wrapped after being reheated. When the record has become cool, it will hold this cylindrical shape very well. The inside form is then removed and the edges of the piece of record made to fit closely together. If desired, some cement may be placed on the inside of the tube to hold the edges together, but when the windings of the coil are



Tubing made from old phonograph records. Dimensions shown.

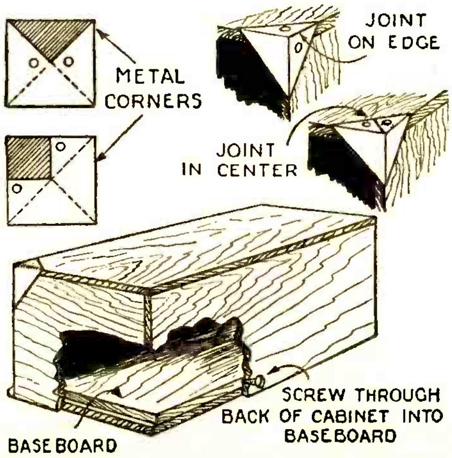
placed on the tube, they will tend to hold it in place. These tubes are easily made and are superior to the cardboard variety.

Contributed by Rufino Ramirez.

IMPROVING THE APPEARANCE OF RADIO CABINETS

Using metal corners to hold the panel of a radio set in the cabinet will not only eliminate the usual unsightly screws through the front of the panel, but will considerably improve the appearance of the cabinet as well. The interior of the set is made easily accessible for inspection simply by removing the two metal corner pieces and the screw in the back of the cabinet.

The metal corner pieces can be of sheet brass or copper. Lay out either of the patterns shown in the sketch below and cut out the shaded portion, then drill and countersink the two holes to pass a small-sized wood screw. After cutting out the pattern and drilling the holes, clamp the pieces in a small vise and bend in along the dotted lines as shown. Now remove the



The use of metal corners to hold panel to cabinet eliminates any need for screws.

pieces from the vise and procure some metal polish and polish the pieces up to as high a polish as you can get. They are now ready to attach to the cabinet.

The pattern in Fig. 1 will make a corner piece with the seam (where the two edges join) coming along the upper outside edge of the cabinet, as shown in Fig. 2.

The pattern shown in Fig. 3 will make a corner piece with the seam coming in the middle, as shown in Fig. 4.

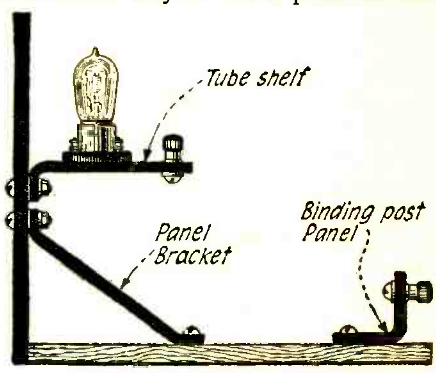
Screw the panel to the baseboard, then insert the whole thing into the cabinet as shown in Fig. 5. Drill and countersink a small hole in the back of the cabinet to pass a small wood screw, then insert a screw in the hole just drilled and screw it into the baseboard. This will hold the bottom of the panel and baseboard firm, while the two metal corner pieces will keep the top of the panel in place.

This method makes a very neat job, and the polished metal corner pieces improve the external appearance of the set considerably.

Contributed by Percy A. Field.

WORKING HARD RUBBER

Hard rubber, when heated in boiling water becomes quite soft and pliable. The easiest way to cut a piece of this



Uses for scrap rubber.

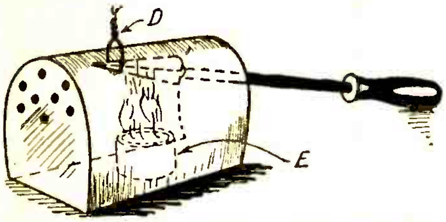
material is to place it in a untensil so that it may be totally covered with water and allow the water to boil just long enough for the rubber to soften so it may be bent with the fingers. If the rubber is allowed to remain in the water too long it will become so soft that the marks of the fingers will spoil the smoothness of the article. Heat a sharp knife to the same temperature as the rubber, by placing it in the same water. When the rubber has reached the proper stage, lay it on a flat surface and, with a ruler as a guide, cut along the desired line with the knife.

Hard rubber also may be easily bent to any desired shape if it is first heated. In the accompanying illustration are several brackets that are made by bending rubber when hot. After the rubber has been bent, dip it into cold water so that it will cool quickly and will not bend out of the shape wanted. Rubber after being treated in this maner will return to its usual hardness when cooled.

Contributed by Wm. King.

A COFFEE CAN SOLDERING OUTFIT

The following suggestion is made for the benefit of those who, like myself, do not care to invest a couple of dollars in an electric soldering iron. It works like a charm and will take any solder-



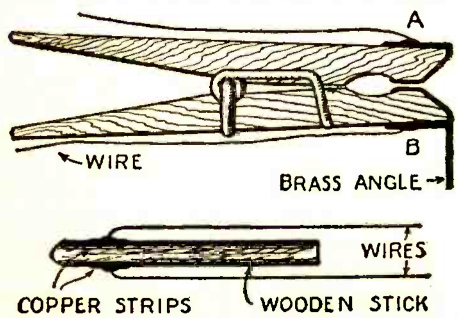
An excellent heating outfit can be made of an old coffee can.

ing iron from the ten-cent store variety up. This soldering outfit is made as follows: A coffee can should be obtained which has been put together without solder. By means of a pair of tin snips or a heavy pair of shears, a strip is removed from the can about 2½ inches wide. The closed end of the can should have 8 or 10 holes punched in it. Two holes are also punched in the top of the can and a piece of wire inserted in the form of a loop shown in the drawing as D. The heating element may consist of an ordinary can of solidified alcohol, but it is advisable to make a small alcohol stove for this purpose. A small can such as is used for canned heat is obtained and is packed full with cotton batting. A disk of wire screen or netting is then forced under the rim of the can. The cotton batting should be soaked with alcohol and will burn without danger. This is placed inside the coffee can, as shown at E in the sketch; the soldering iron is inserted in the wire loop and the alcohol lighted. It will take very little time to bring the temperature of the iron to the proper point. When sufficiently hot, the blaze may be partly covered by a tin cover.

Contributed by Chas. E. Gage.

A CLOSED CIRCUIT JACK AND PLUG

Nearly every object around the house has more or less use in a radio



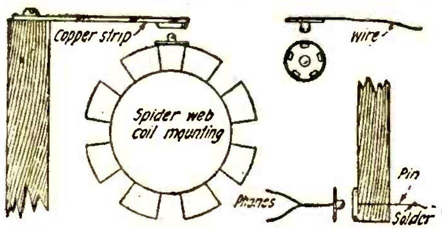
If a jack and plug are needed for an experimental set these are easy to make.

set and here is a use for the clothes-pin. Procure a clothes-pin of the type that is illustrated in the sketch and bend around the ends A and B strips of thin copper for contacts. As the jaws of the pin are normally in a closed position, these contacts will normally be closed. Lead wires are soldered at the points A and B. The plug is made from a wooden rod that fits snugly between the jaws of the clothes-pin. On this rod are fastened two contacts to which are soldered the phone leads. This jack and plug are easy to construct and should prove of value to the experimenter.

Contributed by Ellis Elder.

SNAP FASTENERS AS CONNECTORS

The small snap fasteners for dresses that are sold in all ten cent stores for



Snap fasteners are very useful as connectors and in many other ways.

five cents a dozen may be put to a great many uses by the radio experimenter.

The accompanying sketches show a few of the uses to which they can be adapted. These fasteners make very neat binding posts and by using different sizes and different halves of the fastener the set can be made so that it is impossible to connect it up wrong. By soldering one half of the fastener on the phone cord and the other half on the panel with a common pin as shown, the phones may be plugged in quickly and if the cord gets a strong pull they will release and not pull the set off the table. A very good multi-point switch may be made by pinning to the panel as many points as wanted in a circle and also one at the center of the circle, and then with the two halves of the fastener soldered on to a strip of copper at a distance equal to the radius of the circle a switch arm can be made. The fastener in the center makes a good swivel and when the right point of the switch is found in tuning the other fastener can be pushed home making almost a positive contact.

Another use I have made of them is in mounting home-made honeycomb or spider web coils. I fasten one part of the fastener on both top and bottom of the coil form and solder the ends of the coil to them. The other half is soldered to a strip of copper or brass that acts as the arm to swing them on. This form of mounting is very handy if much changing of the coils is made for it works so quickly. A good connection to the end of the variocoupler or variometer rotor shaft may be made by soldering a fastener on the end and the other half to a flexible wire.

No doubt other uses will occur to the experimenter. They are certainly cheap enough and always make a good contact and provide a neat appearance.

Contributed by Fred. W. Temple.

A PAIR OF "RADIO" CUFF LINKS

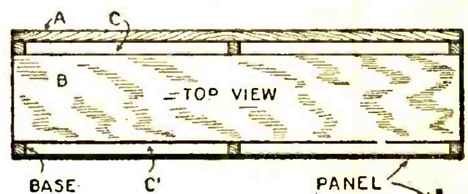
Do you need a pair of nifty cuff links to complete your radio equipment? Here's just what you want.

Take one of your extra binding posts and remove all the parts from the bolt. Put the bolt through the side of the cuff and then slip on the collar of the binding post. When this is on, screw the cap and there she is. No more losing the cuff links for you. The binding post is screwed on the cuff and hasn't the least chance to come off.

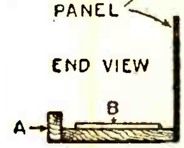
Contributed by Wilbert Whitfield.

RADIO RECEIVER BASE

One of the greatest difficulties that is experienced in wiring a radio receiver is keeping the connections as short as they should be and at the same time producing a neat job, which is efficient electrically. The base that is described below is easily constructed and should make the wiring job of the new set a great deal easier.



As the baseboard, B, is raised about ¾ of an inch from the table, wiring of instruments can be run out of sight under B.



The dimensions of length and breadth are purposely omitted, because they would differ for every set constructed. However, the spaces marked C and C[1] should be about ¾ of an inch in width and the back piece, A, should extend ¾ of an inch above the base, B.

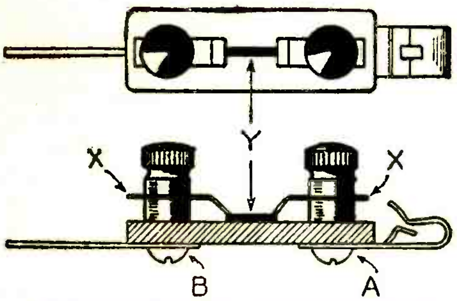
The back piece, A, may be used to mount strips on which to support coils, binding posts, etc.

The reason for the thin baseboard, B, is to facilitate wiring and mounting of the various instruments. A great deal of the wiring may be done under the thin baseboard as well as on the top of it, thus eliminating any danger from short circuits and unnecessary long leads. The transformers, sockets and other instruments may be fastened to the baseboard by small nuts and bolts.

Contributed by Hugo E. Anderson.

VACUUM TUBE FUSE

Every experimenter in radio thinks himself to be the one fellow who will never get the plate and the filament circuits mixed, but after once burning out two or three tubes, Mr. Experimenter thinks that he had better use some precaution. And here it is, at a very small cost.



A filament fuse is a money-saver for the experimenter. Above is one which is easily constructed.

Hunt the following articles in the old junk box: a piece of hard rubber or bakelite ½x1½ inches, two binding posts, two pieces of spring brass about ½x¼ inches, a Fahnestock clip and a piece of thin tin foil. Bore two holes that will take the binding post screws in the middle of the bakelite, ¼ inch from each end. Bend the spring metal as shown in the diagram, after drilling a hole in each end the same size as those that were drilled in the bakelite. These springs are then placed on the binding posts so that they make a firm contact with the base. Special attention should be given to the preparation of the tin foil strips. These should be cut about 1/64x¾ inches and several should be prepared and kept for future use.

One of these strips of tin foil is placed at Y (in the diagram) and clamped down by the springs; the fuse now is ready for use.

Contributed by Dana Miller.

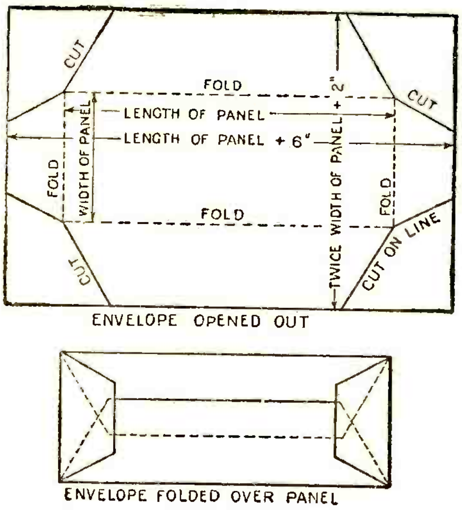
HOW TO LAY OUT YOUR PANELS

The writer has been somewhat surprised in looking over the many published directions for building various radio sets to note that, while considerable attention is often given to the proper lay-out of the different pieces of apparatus on the panel, and sometimes exact dimensions are given for drilling the holes and placing the instruments, no directions are given as to the best method of transposing these dimensions to the panel in hand or for the care of the panel while the drilling is being done.

Anyone who has tried the old method of clamping or pasting a piece of paper to the face of the panel and drawing the lay-out on this paper before drilling knows how hard it is to do a good job in this manner because the paper tends to become loose if pasted on and is sure to bulge and sag at different spots if clamps are used. In addition to this, the clamps are in the way during the drilling and are likely to slip and throw the holes out of alignment, as well as to mar the highly polished surfaces.

The following method has been used for some time by the writer and has proved highly satisfactory: A piece of tough wrapping paper is secured and cut as shown in the diagram. This paper should be twice the width of the panel plus two inches in one dimension and as long as the panel plus six inches in the other. The corners are then cut out as shown and the edges and ends creased along the dotted lines.

The paper should next be laid out flat on a smooth surface and rubbed evenly with a damp cloth until the entire paper shows damp on the opposite side. The panel should now be placed face down in the center of the paper and the two edges lapped over and glued. The ends should then be folded



A panel-drilling template that will not slip out of position.

down and glued over the folded edges, thus forming a closely fitting envelope around the panel.

The covered panel is now placed in the sunshine or close to a warm stove or radiator and allowed to dry. When wet, the paper expands a considerable amount, and being placed over the panel in that condition, it will gradually shrink as it dries and so become stretched as tight as a drum across the panel.

The desired panel lay-out can now be drawn on the smooth side of the paper and the holes to be drilled can be marked and center punched. There is no danger of the paper slipping and the panel is protected on both sides until all machine work has been done. Then the paper can be torn off and the panel will emerge in perfect condition.

Contributed by H. J. Nethken.

MAKING HOLES IN GLASS PANELS

In making holes in glass, one often experiences difficulties through the chipping of the glass. A very simple way to overcome this is to procure some sand, wet it, and place about a teaspoonful on the spot where the hole is to be made. A lead pencil or any piece of round wood the size of the hole desired is then pressed in the sand, making a cast of the hole. Melt some lead or solder and pour into the impression, and the glass falling out leaves a fine hole. Glass will prove to be a serviceable panel and in the way described may be made cheaply.

Contributed by Emmett Vance.

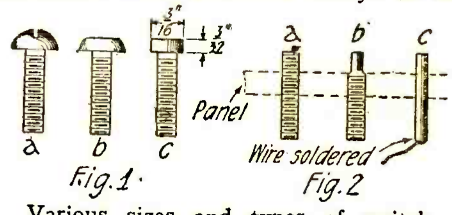
CONTACT POINTS FOR PANEL SWITCHES

The lack of contact points for multipoint panel switches often makes itself felt to the amateur who must depend upon mail orders for his supplies. Neat brass points which are as good as any lathe-turned point may be made from round head brass machine screws of the 6-32 or 8-32 size. The only tools required are a vise and a file.

Clamp the screws in a vise between a couple of pieces of cardboard or lead sheet to prevent injury to the threads. File the head down as shown in b, Fig. 1, keeping the file at right angles to the axis of the screw. Do not go deeper than the bottom of the screw slot. Next remove all that is left of the rounded portion of the head, as shown in c, Fig. 1. This may be done accurately with the file. Polish the head with fine emery cloth and the point is finished. If one possesses an emery wheel it is a simple matter to grind the screws to shape upon that, but it is hard on the wheel.

Points made from 8/32 screws will be about 3/32 by 3/16 inch as shown in the figure. It is advisable to drill and tap the panel for these heads, rather than to drill a hole large enough to take thread and all.

Often smaller points than those already described are desired. Fig. 2 shows three kinds which can readily be made from materials always to be



Various sizes and types of switch points can be made from ordinary round-head machine screws.

found in the amateur workshop. These tiny points are especially desirable for use upon midget sets where space is always at a premium.

The point shown in a, Fig. 2, consists simply of a short length of threaded brass rod. The end which projects through the panel front is filed square or slightly oval. The opposite end may be cut in any way, since it is immaterial whether the threads on that end are injured or not. The point shown in b, Fig. 2, is constructed in the same manner, except that it has the threads filed away on that portion which is exposed, thus giving a neater appearance to the panel.

The panel holes for mounting these points should be drilled 1/64 inch undersize, and threading should be done with the point of a taper tap. This insures a close fit for the shanks and prevents the points from loosening during operation of the set.

Sketch c, Fig. 2, shows a different kind of point which may be made in any size desired. A short length of brass rod is shaped as shown. The holes may be drilled slightly undersize and then reamed out for a close fit. Brush shellac upon the contacts before inserting them into the panel and paint the rear of the panel around the projecting points with the same material. When the shellac has set the points will be as solid as any of the threaded kind.

Points of the type indicated at a and b, Fig. 2, when made from 6/32 screws may be placed as close as 3/16 inch center to center, or about five points per inch. By using 1/16 inch rod and exercising reasonable care in drilling the holes, the point shown in c, Fig. 2, may be placed at a distance of ⅛ inch center to center.

Connections must be soldered to all points shown in Fig. 2, since there is not space enough between them to allow using nuts and washers.

Contributed by S. W. Watson.

AUTOMATIC REGENERATOR CONTROL

One of the chief tendencies in present-day radio receiver design is the reduction, as far as possible, of the number of controls. In the case of regenerative receivers, the constructor, by employing a little ingenuity, can eliminate one more control and still have his set working at the peak of efficiency.

The application of this principle to a tickler feedback set is shown in the drawing at Fig. 1. A is the tuning condenser, either 11- or 23-plate. The shaft, shown at B, should preferably have a diameter of one-half inch, with a set screw as shown. To this set screw, or to a lug which may be soldered on the shaft, a heavy linen thread, C, is secured and wrapped once or twice around the shaft. The other end is fastened to an arm, E, which is fastened to the tickler shaft, F. A rubber band, K, exerts a constant pull on the tickler, G.

The device is set as follows: With the plates of condenser, A, in full mesh, and with the thread C in such a position that as the condenser capacity is decreased, or the dial moved toward zero, the arm E is pulled toward the condenser, adjust the length of C so that the arm E is vertical. Then change the position of the tickler coil, G, by varying the angle, J, until the set is at the peak of the regeneration, without being in oscillation. Now try tuning in stations at various wave-lengths. If the tickler is in the correct position on the higher wave-lengths, but couples too closely on the lower wave-lengths, causing the set to spill over into oscillation. the arm E is too long; if the coupling is not close enough at the lower wave-lengths, the arm E is too short. With a ½-inch condenser shaft the arm E should be between 2 and 2½ inches long; in order to secure the best position, it is advisable to provide a variable adjustment as shown at D, so the length of the arm may be readily changed.

After these adjustments have been made, they may be left permanently. If the set is used in a different location, with a different aerial, it may be necessary to change the adjustment of the angle J. For an 11-plate condenser used in a three-circuit tuner, the constants are: Primary, 15 turns; secondary, 65 turns; tickler, 20 turns. For a 23-plate condenser: Primary, 10 turns; secondary, 44 turns; tickler, 20 turns; using No. 22 D.C.C. and diamond-weave spider-web coils. A variable grid leak is desirable, or if a fixed leak, the value should be 7 or 9 megohms for best results.

Contributed by M. P. Brogan.

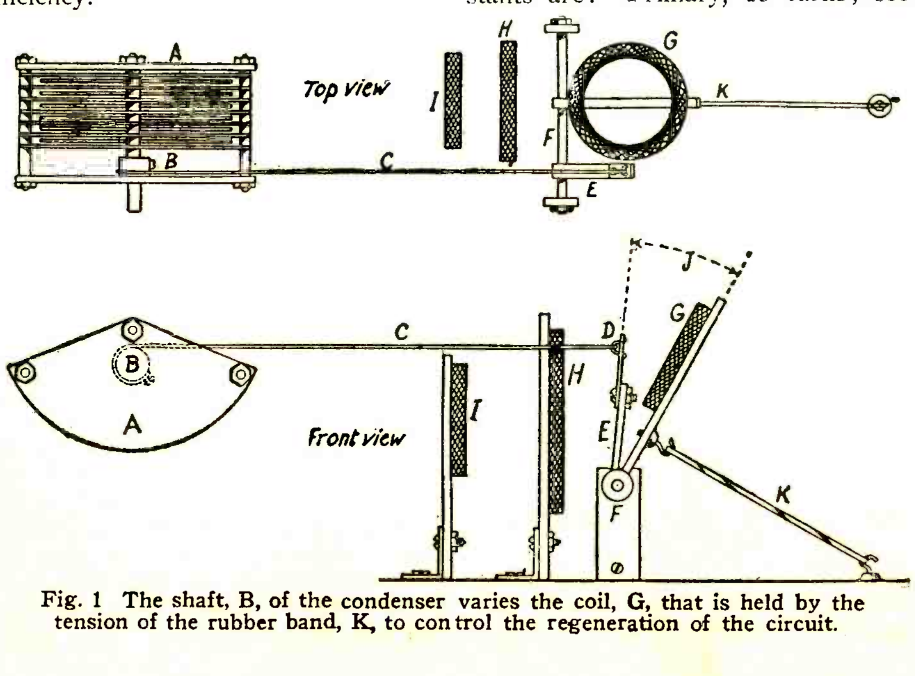
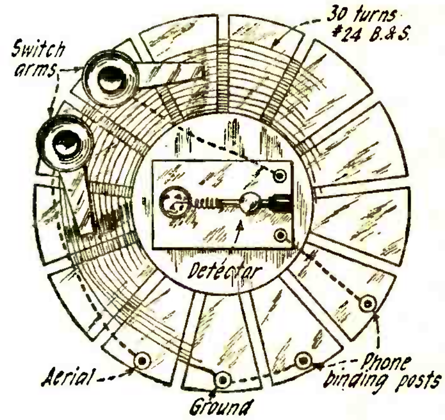


Fig. 1 The shaft, B, of the condenser varies the coil, G, that is held by the tension of the rubber band, K, to control the regeneration of the circuit.

A COMPACT RECEIVING SET

The accompanying illustration of a compact receiving set employing a spider-web coil as the tuning unit is, I believe, orginal. Tuning is done by means of the two switch arms which are used as sliders, the switch blades making contact with the wire of the coil. By mounting a crystal detector in the center of the coil form and binding



A simple crystal receiving set can be made on a spider-web coil.

posts on the edges, a complete receiving set is had. The wiring is shown in dotted lines which should be followed closely.

Contributed by J. Raymond Derby.

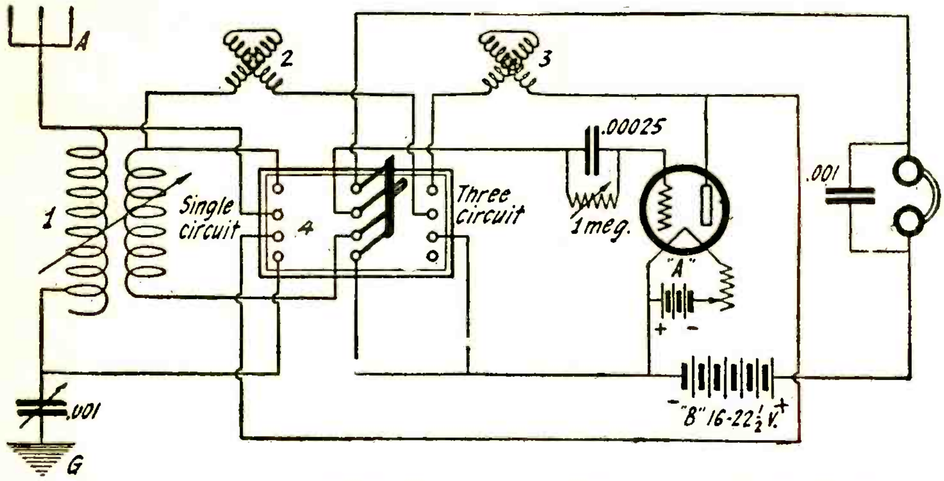
A USEFUL CONNECTOR

Very often it is difficult to connect two wires to one binding post. This little connector shown in the illustration will make it easy. The connector is made of brass 1/16" thick, 1½" long, and ⅝" wide at one end, tapering to ¼" at the other end. At the widest end, a 3/16" hole is drilled to receive the shank of the binding post. At the narrow end, a small brass machine screw, taken from the zinc of a dry battery, is soldered, and a brass nut, also taken from a dry battery, is screwed on. This completes the connector, which, in itself, is very simple. The accompanying illustrations make its construction very clear. When this little appliance is fastened under a binding post, it makes a positive contact, due to the pressure on the two metals. It is also very useful when building stationary spark gaps, crystal detectors, holders for audiotrons, etc., where there are two wires leading to one binding post; a better connection is obtained than by merely tightening the binding post down on the wire itself.

Contributed by Percy R. Parker.

FROM SINGLE TO THREE-CIRCUIT TUNER WITH ONE SWITCH

For ease of operation and volume of signals, the single circuit regenerative tuner stands supreme against the three circuit regenerative tuner. The latter, however, is more selective and will eliminate interference in cases where the single circuit tuner would be helpless. For consistent reception, it would be best to have both types, taking advantage of the single circuit set when the air is clear and switching over to the three circuit tuner when interference made clear reception in the single circuit set impossible.



By means of a four-pole double throw anti-capacity switch connected in the circuit of a three-circuit regenerative tuner as shown, it becomes an easy matter to shift from a single circuit to a three-circuit connection at will.

It is not necessary, however, to have two sets. With the use of a four pole double throw anti-capacity switch connected with the required apparatus as shown in the accompanying wiring diagram, a rapid shift can be made from single to three circuit tuner, or vice versa. It is connected as a single circuit regenerative tuner when the switch is thrown to the left.

It is advised that No. 18 copper wire be used for connections and that all leads are kept as short as possible. Parallel wiring should be avoided. All of the apparatus employed in this arrangement is standard.

Contributed by Paul E. Duffield.

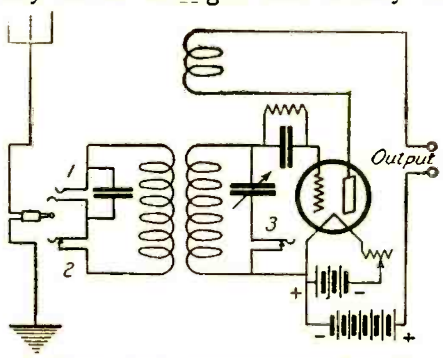
A SUBSTITUTE FOR RESISTANCE

Some experimenters, when constructing a rectifier, find considerable difficulty in finding suitable resistance to place in series with their battery that is being charged, other than a bank of lamps which is rather expensive since so many are needed. Instead of the resistance, place an ordinary plug receptacle in series with the battery terminal and the high voltage side. Then procure your mother's electric iron and taking care that it is on a holder and will do no damage when hot, connect it in the plug receptacle. This will do the same work that thirteen 50-watt lamps would do and when your mother wants her iron it is hot and ready for service.

Contributed by James V. Clark.

COMBINATION SINGLE AND DOUBLE CIRCUIT RECEIVER

It is often desirable when local stations are off the air, to use a single-circuit receiver to try for distance. An ordinary two or three-circuit receiver may be so arranged that it may be changed to a single-circuit receiver at will. This can be done by means of three jacks, as shown in the diagram.



A clever jack arrangement for different circuits.

Jacks Nos. 2 and 3 are the closed circuit variety and No. 1 is a single circircuit one. The antenna and ground are connected directly to a plug through separate leads. A telephone cord should never be used for this purpose as the capacity of the two parallel wires is sufficient to raise the wave-length of the primary circuit considerably. When the plug is inserted in jack No. 1, the variable condenser in the primary circuit is in parallel with the coil and when inserted in jack No. 2 the condenser is in series with the coil. When a single-circuit receiver is desired, the plug should be inserted in jack No. 3, and the tuning is then done by the variable condenser, which was originally in parallel with the secondary winding.

Contributed by A. W. Tervo.

AN ALL WAVE REINARTZ

The advantages of the Reinartz tuner on short waves are well known. However, when the amateur desires to hear the high wave broadcasters, ships or trans-Atlantic stations he finds that he must build another set or find some way of loading the Reinartz. With the scheme outlined in this article all wave-lengths can be received on the Reinartz with the same sharpness and efficiency as the short waves.

All the additional apparatus needed is a double honeycomb coil mounting and the coils. The mounting should preferably be one with a long handle for varying the coupling between the coils. This style of mounting is very convenient as well as practical, as it keeps the hands away from the coil.

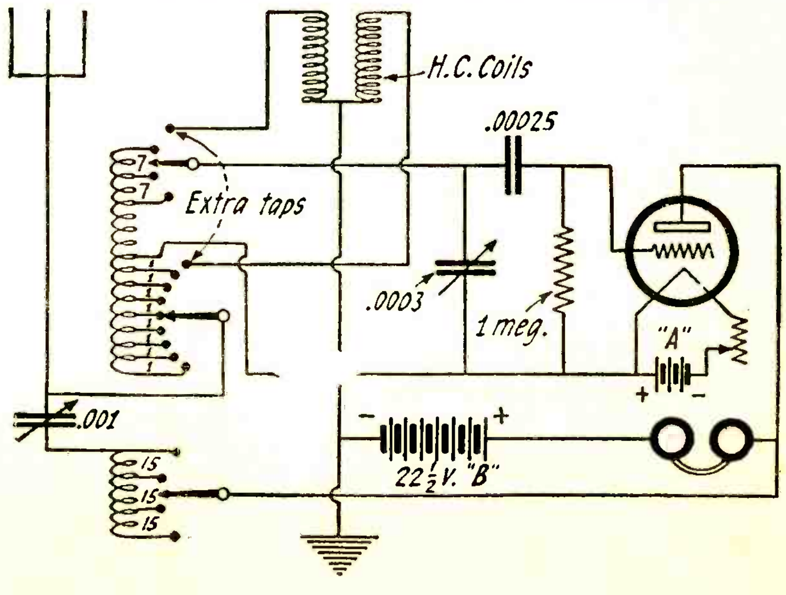
The honeycomb mounting can be attached to the panel, if there is room, or it may be put by the side of the cabinet, convenient to the operator's hand.

Contributed by Maxwell K. Murphy.

A RECEPTION REPORT CARD

The quality of the music and programs which are broadcast from the

The addition of two honeycomb coils in the Reinartz circuit, as shown, permits the covering of high wave-lengths.



radiophone stations will be, in the future, influenced by the wishes of the

RECEIVING REPORT

RECEIVED BY....................
AT............STATE.......U. S. A.
DATE.........1926.........P.M. E.S.T.
FROM STATION.................
METER WAVE LENGTH..........
PROGRAM ....
RECEIVING SET..................
REMARKS ....
....

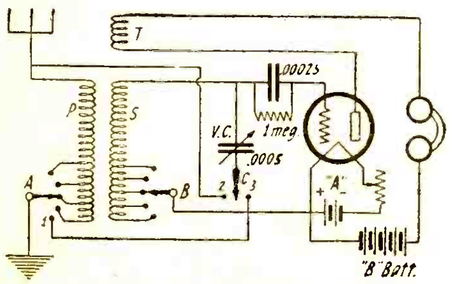
listeners. However, to let the stations know the wishes and the dislikes of the vast audience, it is of the utmost importance that you transmit to them your criticisms. The best time to write a line is while you are listening to the program or immediately afterward. I would suggest that you have cards printed by the local printer or have a rubber stamp made up similar to the enclosed report card. As far as I know there are no suitable printed cards which can be obtained from the radio trade. Irrespective of whether you write a letter or just send a card, let the artists and the owners of the stations know just what your views are—for everyone likes true appreciation and appreciates true constructive criticism.

Contributed by J. E. Frisbee.

ARRANGEMENT FOR SWITCHING FROM SINGLE TO DOUBLE CIRCUIT TUNER

A single circuit regenerative tuner is the most desirable for reception when there is no interference, but is not sharp enough in its tuning when interference is present. The use of a double circuit tuner is then of advantage.

The accompanying circuit diagram is a simple arrangement for switching from one to the other. When the single circuit connection is desired, switch C is placed on contact 2 and



A clever arrangement whereby it is possible to shift from a single to a two circuit connection at will.

switch lever A on the last contact point 1, of the primary coil. When a double circuit connection is required, set switch C on contact 3 and switch A on any other contact aside from 1.

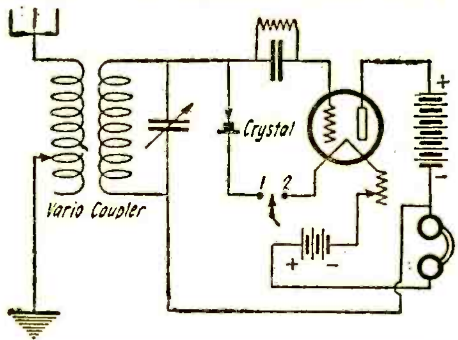
The usual procedure in tuning is followed when employing a double circuit connection, but when the single circuit is used, tuning is accomplished by the switch arms A and B and the variable condenser V.C.

This arrangement has proven very satisfactory in every respect.

Contributed by Hugo E. Anderson.

COMBINATION CRYSTAL AND TUBE RECEIVER

For local stations a crystal detector gives sufficient volume for headphones and is also recommended to conserve "A" battery current. A combination crystal and tube receiver can be employed so that either one or the other can be used. There have been many circuits advanced for this purpose, but none have proven very successful. The accompanying diagram shows a circuit that will prove very satisfactory, as it incorporates all of the good points that such a receiver should have. This circuit, when using the tube, is regenerative, being of the ultra-audion type. It changes from crystal to tube with a



A clever combination tube and crystal receiver.

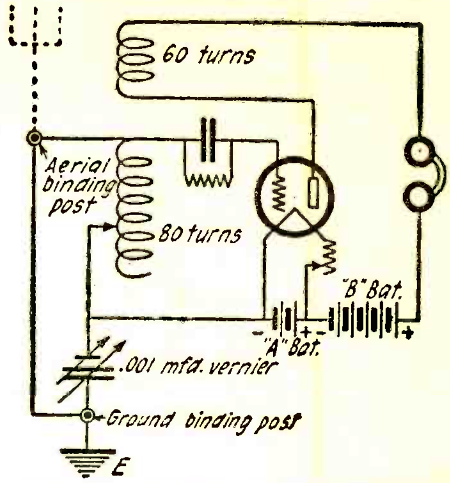
single switch, at the same time lighting the filament. On changing back to crystal, no current is used in the filament, as the "A" battery is automatically disconnected. When the switch lever is on the switch point at the left, the crystal is being used and no current is flowing through the filament of the tube. When it is placed on the switch point at the right, the tube is being used and the filament is automatically lighted. This set is recommended to those who cannot afford to use many batteries and like to listen in on the local stations on the crystal.

Contributed by K. Krichcretz.

GETTING AROUND STATIC

There are a great many readers who are using a single circuit set, but there are very few who know the following little kink.

Some time when the static is very bad and you wish to use your set try this: Disconnect the aerial wire from the set and run a wire from the aerial binding-post to the ground post, thus leaving the condenser across the coil. If the condenser has a vernier plate, you will experience very little difficulty in bringing in DX stations. Nearly all the static will be eliminated and you



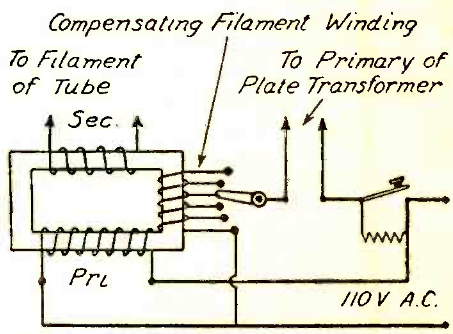
Reception without an aerial is feasible and will cut down static interference considerably without depreciating signal strength to any great extent.

will be surprised at the number of stations you will be able to hear.

Contributed by Wilford Lahman.

KEEPING THE FILAMENT VOLTAGE CONSTANT IN THE C.W. TRANSMITTER

Most amateurs who use C.W. transmitters of 50 watts or more find there is a drop in voltage on the sending tube filament every time the key is closed. Even though a separate filament transformer is employed this will still be found to obtain. In my case, using 50 watts, the filament voltage dropped about .5 volt and in order to get 10 volts on the filament when the key was pressed, I had to use 10.5 volts when the key was up, which was rough on the filament. So I worked up the scheme as illustrated in the drawing. A separate winding is made on the filament transformer of 30 turns of No. 14 D.C.C. wire tapped five turns



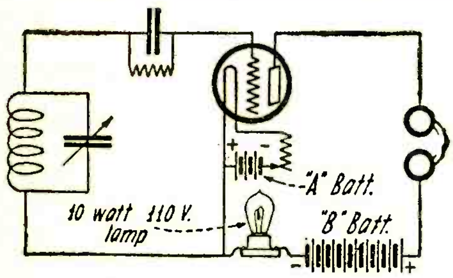
Use this scheme to prevent a drop in voltage on the filament when transmitting.

and well insulated from the core and other windings. The taps are brought out to a multi-point switch and this is connected in series with the primary of the plate transformer. Adjust the switch, starting with five turns, so when the key is pressed the filament voltage remains constant. It may be necessary to reverse the connections on this extra winding. It will be found that greater efficiency and a higher radiation will be obtained with this plan in effect.

Contributed by V. E. Thomas.

A VACUUM TUBE PROTECTOR

As to the need of protection for the filament of vacuum tubes against the excessive flow of "B" battery current, due to wrong connections, etc., there can be no question. Why use a piece of tinfoil, or a lot of fuses, to hunt and replace when blown when nearly 100 per cent protection with automatic visible indication and positive reset can be



This is a safe and sane way of protecting the filament of your vacuum tube. If a mistake is made in the connections, the 110-volt lamp will light, but the filament of the tube will not be harmed.

had at nearly zero cost and labor? A 10-watt, 110-volt electric light bulb, connected in the circuit between the "A" and "B" batteries, will have absolutely no noticeable effect on the small normal flow of plate current, but will not allow enough "B" battery current to pass even to burn out one of the new ¼-ampere filament tubes. This arrangement gives instant visible signaling of wrong connections and protects the "B" battery from damage by short-circuits in the set.

Contributed by Harry H. Strong.

A GOOD SOLDERING FLUX

For soldering connections in a radio set it is advisable to use resin instead of an acid flux. An acid flux is easier to work with and for this reason is more commonly used, to the detriment of any connection where fine wires are employed. The acid, besides corroding the wire, has a bad habit of "creeping," which often provides a high resistance leakage path between connections. This is particularly noticeable when soldering connections to jacks. An excellent flux, having resin for its base, may easily be made by the experimenter. It is non-corrosive, does not "creep" and leaves a neat looking joint. This flux is made by dissolving resin in a small quantity of denatured alcohol. If the resin is powdered, it will be dissolved much more quickly. This flux should be kept in a corked bottle and when used, can be applied with a toothpick.

Contributed by Frederick E. Wilkins.

CELLULOID VARNISH FOR SELF-SUPPORTING COILS

An excellent insulating fluid which can be easily made by the radioman has for its base celluloid. Drying very quickly, more so than shellac, it combines high insulating qualities with a beautiful gloss, strong body, not masking the original color of the coil or instrument treated. The composition is made by dissolving scrap celluloid such as photograph film in acetone, which can be purchased very cheaply at the corner druggist's. The photographic film should first be scraped of its gelatinous emulsion by immersion in lye water, hot water or household "ammonia." The coating is then easily removed by scraping. The cleaned cuttings of the film are then shaken in a corked bottle with the acetone, more acetone being added if the mixture becomes too thick, or more celluloid if it has a tendency to flow too easily.

Dissolving the cleaned strips of photo film in acetone to make the transparent insulating varnish. A formed and coated variometer rotor can be seen at the right. It is very rigid. Simply flow the varnish on your coils with a brush and it will be dry in two minutes!

Coils, such as variometer rotors, wound on forms and painted with the celluloid varnish will retain their shape wonderfully, allowing very close coupling between it and the stator, this not being possible if a tube or other support were used.

Contributed by Raymond B. Wailes.

BUSHING DIALS

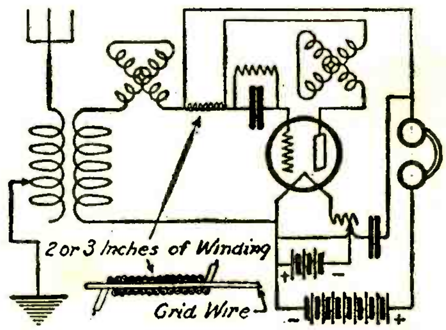
At times it is necessary to mount a dial or knob with a ¼" hole on a 3/16" shaft. After trying several methods, the following was found to be the most satisfactory and can be done by anyone without particular skill.

Take a length of bare No. 18 copper wire and wrap it snugly and closely around the 3/16" shaft. Remove the spring thus formed and dip it into molten solder, shaking off the surplus. When cool, a neat little bushing is complete and ready for use. Any high spots can be readily smoothed off with a file. Dials so bushed will turn true and even.

Contributed by Thomas Benson.

A SIMPLE WAVE-LENGTH INCREASE METHOD

Many times a broadcast listener has a receiver with variometer tuned plate and grid circuits. The wave-length range of most of these sets is about 150 to 420 meters. This range was all right until some of the better stations increased their wave-lengths. Now a broadcast receiver should cover from 200 to 575 meters. A very low value condenser connected from the grid to



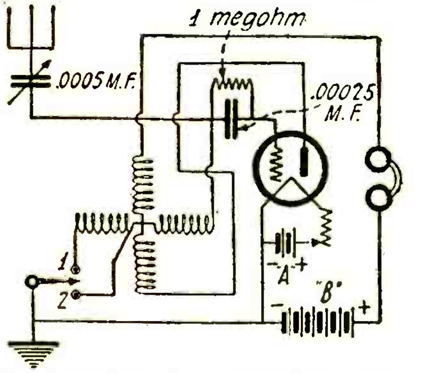
Two or three inches of winding on the grid wire will increase the wave-length.

the plate will increase the wave-length of both the plate and grid circuits, but will usually prevent the control of oscillation by the plate variometer. The above diagram shows a very simple method whereby the wave-length may be increased and at the same time creating no interference with the control of regeneration. It seems that the reactance of the turns offset the bad effect of the straight capacity between the grid and plate wires. This is a handy stunt to use in different places where it is desired to increase wave-length.

Contributed by Frank T. Parrish.

THE CHEAPEST AND SIMPLEST REGENERATIVE RECEIVER

The novice is always on the look-out for a simple and cheap receiving set, which is efficient in operation. Here is what is believed to be the best in this respect ever described. For the re-



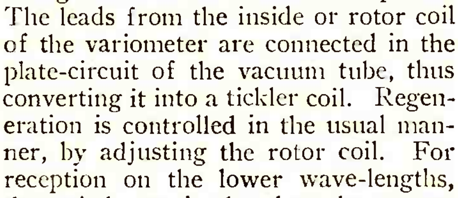
By breaking the connection from rotor to stator, any variometer can be adapted to this circuit. The rotor coil functions as the tickler.

ceiver the following parts are required: One variometer; one 23-plate variable condenser, with vernier; one 1½" switch lever; two contact points. The usual vacuum tube and its accessories fill the rest of the bill. With the usual amateur antenna, this receiver will easily respond to transmitters operating on wave-lengths from 175 up to and including 500 meters. The accompanying sketch explains how it is done. First, single connections are brought out from the two outside windings of the variometer, so that they can be brought out to the two contact points. The leads from the inside or rotor coil of the variometer are connected in the plate-circuit of the vacuum tube, thus converting it into a tickler coil. Regeneration is controlled in the usual manner, by adjusting the rotor coil. For reception on the lower wave-lengths, the switch arm is placed on the contact point marked 1, and on contact point 2 for the higher waves. This is a good stunt and well worth trying.

Contributed by Ray Dio.

HIGH VOLTAGE FOR I. C. W. FROM A SPARK COIL

For the man who has no city current supply, I shall try to explain a cheap method of obtaining a high



High voltage for a C. W. set can be obtained from a Ford coil and better results obtained if it is rewound as shown in this diagram.

voltage for the plate of the C. W. set.

Many people have advised a Ford coil. While this works very well a better source can be obtained just as cheaply. It is understood that a spark coil is wound to give an enormous voltage. Now why not build one which will give the right voltage? One can be made easily as follows:

Procure a Ford coil and dismantle it. Wind 50 turns of number 20 S. C. C. on the core. Bring the leads out on each side. Then wrap a single layer of empire cloth over the primary. Wind 5,000 turns of No. 28 S. C. C. over the empire cloth. The leads from this secondary, when 6 volts are used on the primary, give 600 volts. The primary is connected, as it was originally, to the vibrator and the other leads are connected as shown in the diagram. This voltage furnishes enough amperage for several tubes. I. C. W. is used here with one E. tube.

Contributed by
Wm. W. Kochersperger.

AN EMERGENCY TUBE REPAIR

It sometimes happens that the grid of a vacuum tube touches the filament or, if the vacuum tube is mounted horizontally, the filament may sag on the grid.

When this occurs some remedy is necessary, for the set will not operate with the audions in that condition. If the grid has not stuck to the filament, it can be jarred away by wrapping the tube on the palm of the hand. At times, however, this is not sufficient.

If you are not sure whether the grid and filament are touching, or something else may be wrong, you can find out easily by connecting two volts from one cell of your storage battery across one of the filament contact pins and the grid contact pin. If one-half the filament lights, you may know that they are touching. Do not apply the full voltage, for that might burn out the filament with only one-half of it offering resistance in the circuit.

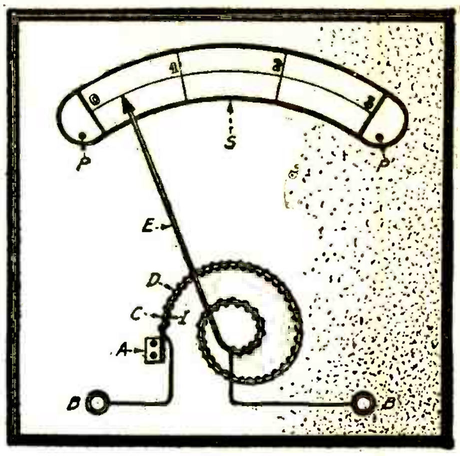
If the grid and filament are stuck together connect both filament terminals together and put two volts across the grid and filament connections. Then, while the filament is dimly lighted strike the tube on the palm of your hand gently. This will cause the grid to become disengaged. Then it can be jarred back into its place.

Contributed by M. B. Sleeper.

A THERMO-AMMETER

Many's the time you amateurs have needed an ammeter, and those you tried to make worked as good as a telegraph sounder. How about it, eh? Why don't you make a thermo-ammeter? You all know about the thermostat—that copper expands more than iron on being heated. All right, then, proceed.

First, get a board about six inches square, "trim it up" to your taste,



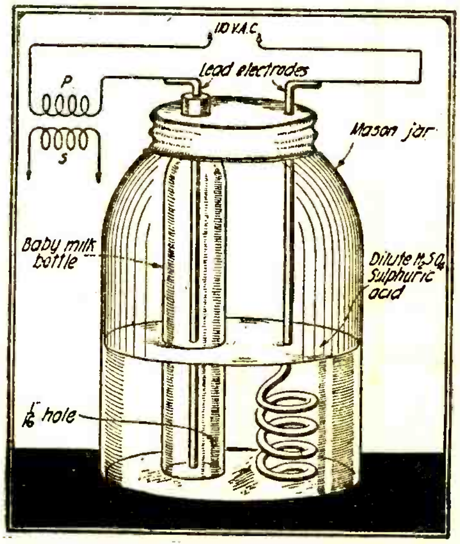
An excellent ammeter.

and bore two holes for binding posts—B and B'. Now get a strip of copper, C, and iron, I, as shown, and insulate same with two layers of newspaper, or better still, thin mica. On them wind one layer of well insulated (rubber) German silver wire or other wire that gets hot when a current goes through it. Now fasten to the end of this a pointer, E, and "curl" the thermostat about two or three times. Make this "curl" as small in diameter as possible, for on this rests the success or failure of the instrument. Now mount the thermostat on a block, A. Also fasten on a scale, S, with stops P and P', and connect up. See that the pointer is at zero before testing. Let the current pass through the coil a minute or two and she will show the amperage (?).

Contributed by Esten Moen.

INEXPENSIVE ELECTROLYTIC INTERRUPTER

This is an idea for a cheap and simple electrolytic interrupter.



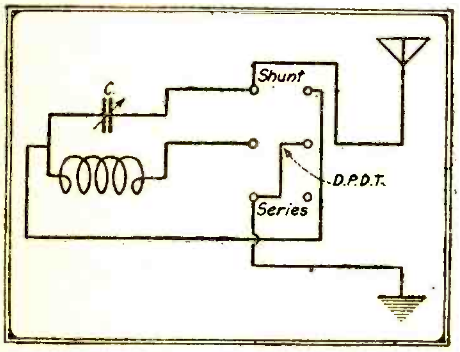
A Mason jar, a baby's milk bottle, a strip of lead and a diluted solution of sulfuric acid, and presto! You have an electrolytic interrupter. Be sure to bore an air vent on cover of jar.

As is shown in the diagram the only things called for are: a glass jar, one glass bottle and some lead. The jar must be large enough to hold the bottle besides the solution and another electrode. The main secret lies in the small bottle. About half an inch from the bottom a hole is made with a file. The larger the hole the more the "juice"; approximately a 1/16-inch hole will serve the purpose. A strip of lead to which a wire has been soldered is put into the bottle; this strip should reach to the bottom. Another lead electrode is prepared and this is to be put on the outside of the bottle in the jar. The jar is filled with water so that the hole in the bottle is covered by at least an inch of water. Sulphuric acid is then added till the desired results are obtained. If the hole in the small bottle is too big, the lights will blink.

Contributed by Theodore Shaw.

SERIES-MULTIPLE SWITCHING ARRANGEMENT

The accompanying drawing describes a series-multiple switch for placing a condenser either in series or multiple with the primary coil. A double-pole-double throw switch is required. A



In this hook-up a double-pole double-throw switch affords a rapid means of placing the receiving condenser either in series or in parallel with the aerial and primary of loose coupler.

strap is soldered from the aerial lead on the switch to the center lever, as shown. When in series this is not used, but takes place of third switch when it is thrown in multiple.

Contributed by Ray C. Stanford.

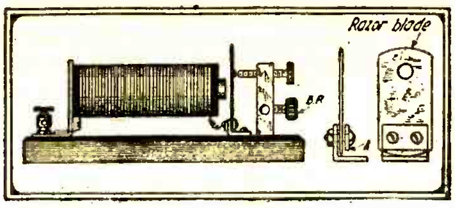
HIGH FREQUENCY BUZZER

Perhaps one has noticed on the market, the various high priced buzzers. They all work with a steel reed as an armature instead of a soft iron one. It is difficult to get a suitable piece of thin steel and the razor blade shown in illustration provides an excellent substitute.

The magnet is wound with a No. 32 wire, and the base is made of wood or bakelite. The razor blade is held in place by the piece of brass bent in the shape of A in the illustration. Two screws hold the blade tightly.

Solder a piece of nickel to the pole of the magnet facing the armature, so the armature does not stick. Also fasten a piece of platenoid on the razor blade.

This can be taken from an old bell armature.



A razor blade used as the armature causes this buzzer to give a high frequency tone.

The blade should be very stiff, and when the whole is assembled and connected to a battery, a fine high pitched sound is produced.

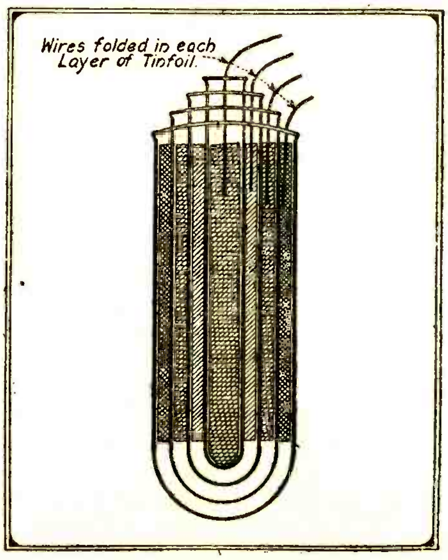
Contributed by Joseph Samuelowitz.

AN EFFECTIVE AND COMPACT SENDING CONDENSER

Herewith is a way of constructing a cheap, yet efficient, sending condenser which will cost hardly more than 25 cents. It requires four glass test tubes of graduated size and a small amount of tinfoil.

First secure four glass test tubes from a druggist or other supply house, each one a slightly different size. The difference in size should be such that each will slide into one another and leave enough room for two or three layers of tinfoil placed on the outside of each tube, except the largest, or outside, tube.

In the case of the center or smallest of the tubes, the tinfoil is placed inside the hollow part. A wire is then folded or arranged in each layer of tinfoil. This will leave four wires protruding when the instrument is completed.



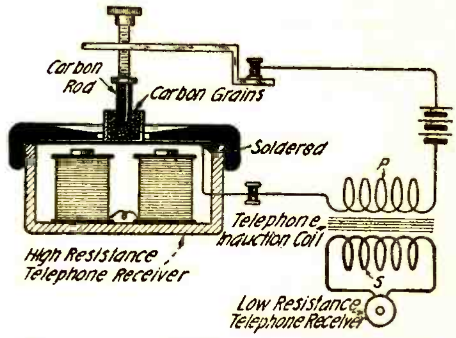
By means of four glass tubes, Bill Johnson constructed a novel condenser which he recommends to others.

I have personally constructed a number of these novel condensers for my own use, as well as for the use of nearby amateurs, and we find they have proven most efficient.

Contributed by Bill Johnson.

A SKINDERVIKEN OR MICROPHONE AMPLIFIER

An inexpensive and quickly-made amplifier may be constructed with a high resistance telephone receiver (about 2,000 ohms) and a Skinderviken transmitter button. Find the exact center of the receiver diaphragm and drill a hole through which the

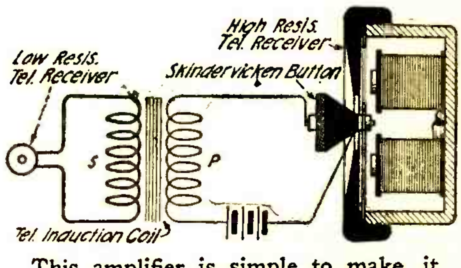


You may build this microphonic relay to boost up your signals.

screw of the button can slip. Make connections to the two binding screws of the transmitter button and connect the instrument to a telephone induction coil, battery, and low resistance receiver, as shown in diagram.

If no Skinderviken button is obtainable, the same device may work with a home-made microphone, as follows:

First, secure a sensitive receiver of about 2,000 ohms resistance. To the diaphragm solder a small brass cup, at



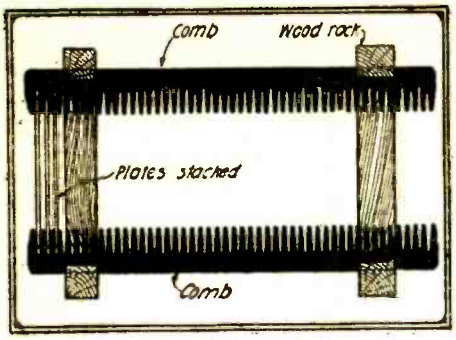
This amplifier is simple to make, it consists of a microphone button mounted on the diaphragm of a high resistance telephone receiver with a local circuit.

the center, and a wire at the edge. Fasten the receiver to a wooden base. Now make a brass bracket of the form shown, drill and tap a hole at the place indicated. Remove a carbon from an old flashlight battery and solder it by its brass cap to the end of a piece of threaded rod. Run the rod through the hole in the bracket and put a hard rubber knob on the other end. Make connections, as shown, to a battery, telephone induction coil and low resistance telephone receiver, and the amplifier is read to amplify.

Contributed by Joseph Liebowitz.

A CONDENSER RACK

Who said hard rubber condenser racks? Materials for a good hard rubber rack are at hand in *four old combs*, with every other tooth broken out.



This condenser rack necessitates four combs but don't take your mother's best ones. Buy some cheap ones.

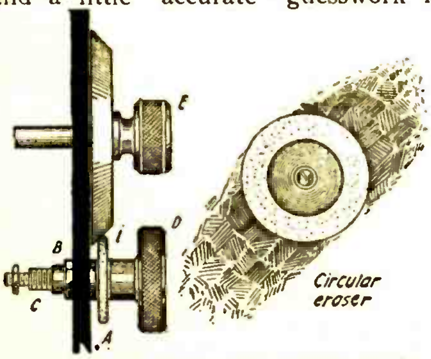
Two combs above and two below, set in a simple wooden frame, with the plates slipped between the teeth, makes a first class rack. It can be immersed in oil or left in the air.

Contributed by D. D. Whitson.

VERNIER MADE WITH ERASER

The sketch shows a simple vernier attachment which I devised. At present, similar models are retailed for $1.50. This one cost me 45 cents for a panel switch and 5 cents for the eraser. An attachment of this kind is of great assistance in obtaining fine adjustment of the condenser, tickler, etc., while tuning in C. W. signals and phone.

In assembling this attachment, all the parts are taken off the rotor panel switch leaving only the knob and shank screw. The eraser is then slipped on and placed flat against the knob. A threaded nickel washer, which is supplied with the switch, is made secure against the rubber eraser and these parts are slipped through a hole under the dial, for which vernier adjustment is required. The exact spot for the drilling of the hole must be calculated and a little "accurate" guesswork is



An ordinary typewriter eraser can be adapted to serve as a dial vernier.

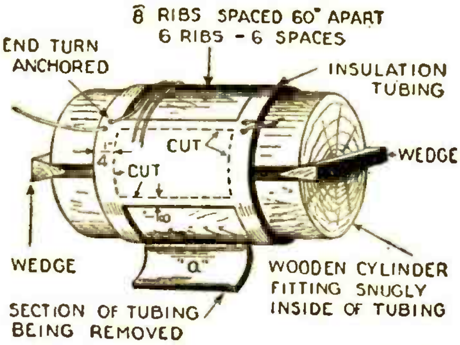
necessary. When the parts are pushed through, the metal bushing is tightened close to the panel and a small spring is put on with a small nut (or two) bearing against it. The tightening or loosening of the nut regulates the tension necessary for fine functioning. Pressure on the dial must not be too heavy.

I am sure that radio enthusists will appreciate this device, for it is reasonable in price and gives fine service. I have been using a few of these vernier attachments with success on my set.

Contributed by I. Korenman.

HOW TO CONSTRUCT "WOUND-ON-AIR" COILS

The "wrinkle" herein described will show you how you can very easily construct a coil which is practically "wound-on-air," but for a few thin supporting strips of a "skeleton" form. It is a simple, cylindrical, single-layer coil and therefore the most efficient in design. The trouble with so many of the "wound-on-air" coils like the basket-wound, spider-web, Lorenz type, the type wound on skeleton forms, similar to the one herein described, all made with wires running in straight or "tangent" lines from rib to rib instead of through the arc of a circle, is that the turns are bent out of the true circular shape, thus cutting down the inductance efficiency, since, all other



Coils constructed by this method will be perfectly cylindrical and wound on a minimum of insulation.

things being equal, more wire is required to obtain a given inductance value—hence, introducing more resistance. Evidently the reason why the coils wound on skeleton forms have their turns run in straight lines from rib to rib is because it has been a puzzle as to how to get the wire bent through the required arc of a circle over the open spaces and yet get it drawn up tight and in a neat and presentable manner.

Choose for your skeleton form a good, rigid insulation tubing which can be cut readily and neatly with a saw. Obtain or prepare a wooden cylinder which will just fit inside the particular size of tubing you have chosen, and long enough to project an inch or two at each end. Saw this cylinder in two longitudinally through the center. This cut, besides making it possible to drive a tight fit of the cylinder inside the tubing by means of small wedges, also makes possible the collapsing of the two halves for easy removal when coil is wound. Otherwise the tightness of the winding might make it next to impossible to withdrawn the cylinder.

Cut your tubing to a length such that end turns of finished coil can be readily anchored to the end rims as indicated in the figure. Carefully mark off and saw out with a scroll or other small saw the sections marked a, leaving the skeleton form, consisting of the six longitudinal ribs ⅛ inch wide to support the windings and the two end rims ¼-inch wide. The ¼-inch rims lend themselves readily to the attachment of mounting brackets, bearing brackets for tickler coil shafts, for binding posts, etc. A good way to start the saw is to drill a few holes at suitable points along the cutting lines. Be sure to place "matching" marks on each section to be removed and an adjacent rib or rim, as each one will be wanted back in its right place for winding.

Anchor your wire through holes provided in one of the rims, leaving a few inches as a lead. Through the holes in the other rim you should loop some good strong string with which to tie down the last turn of wire temporarily, as you cannot anchor this wire through the holes until after the wooden cylinder has been withdrawn. Insert the two cylinder halves inside the skelton form and tighten up to a snug fit by means of the wedges. Place each of the sawed-out sections back in its place, making it stick to the wooden cylinder inside with a little daub of glue. You are now ready to wind your coil, in effect, on a good, solid cylinder instead of on a shell or on weak, easily broken strips. And you may put all the tension on the wire you want, winding up your coil as neatly and as tightly as you like without danger of crushing the supporting ribs. Tie the last turn securely with the string provided, putting a kink in the wire to prevent its slipping back through the knot. Knock out the wedges, and the two cylinder halves will readily slide out, bringing the cut-out sections of the tubing with them. You now have a coil "wound-on-air" except for the thin supporting ribs, each turn being a true circle.

This system is readily applicable to various requirements. You may put both a primary and a secondary winding on the same form, leaving a small space between the two, or primary, secondary and tickler also, for a Reinartz circuit; or you may wind the primary on a similar form which will either fit inside or outside the secondary, or a tickler coil on a similar or solid form which will rotate inside the secondary in the usual manner, etc.

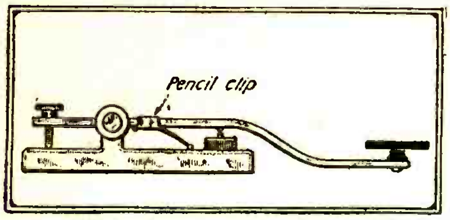
Contributed by F. C. Ruehl.

A MAKESHIFT KEY-SPRING

If you ever misplace the tension spring of your sending key, here is one way to replace it:

An ordinary pencil clip is used. The

part that fits around the pencil is bent flat, as shown, so as to take hold of the key lever. The long part is bent down so that it bears on the base of the key.



Surely you will have an old pencil clip laying around to replace a missing spring.

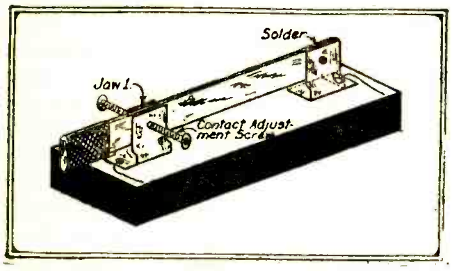
The tension is adjusted by sliding the clip back and forth. If the clip is of springy metal, such as phosphor bronze, this makes quite a good key-spring.

Contributed by Theodore D. Peck, Jr.

AN EASILY MADE DOUBLE SPEED KEY

This key is made from a S. P. S. T. (single pole single throw) porcelain base knife switch. Its total cost is about 50c.

Close the switch and drill a 1/16-inch hole right through the center of jaw 1 and the portion of the blade in the jaw. Open the switch and carefully rivet a platinum or silver contact in the



The "wig-wag" key which can be readily constructed for amateur use by re-arranging a single-pole single-throw switch for the purpose.

small hole in the blade. Now spread the sides of jaw 1 about ½ inch apart, enlarge both holes, and tap for any size screw that has a platinum or silver contact in one end. These screws are of the type used on spark coil vibrators and are easily obtained.

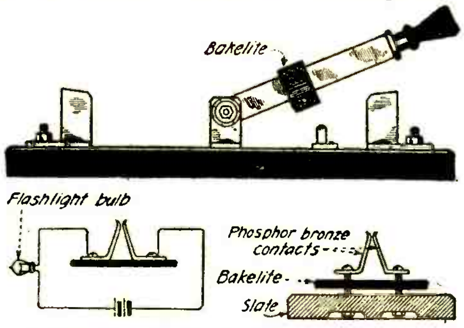
Now close the switch again, and solder the blade to the jaw on which it is pivoted, as shown. Adjust the screws till there is a 1/32-inch air space on either side of the blade contact.

Contact is made by pushing the knob either way in a sidewise motion. It takes a little while to get the knack of these keys, but with a little practice, speeds up to 30 words a minute can be obtained. The use of this type of key also prevents "operators' cramp." It is often called the "wig-wag" or double speed key and its operation sounds like that of a so-called "bug" or *vibroplex key.*

Contributed by Robert Hertzberg.

A LIGHTNING SWITCH REMINDER

Your "hams" do not want your apparatus damaged by lightning. Here is an electric reminder. Cut two pieces of bakelite 2"x¾"x1/16", drill a small hole in each corner, clamp these on the blade of your lightning switch in the center. Then cut another piece of bakelite about the same size, but a quarter of an inch thick and a piece of fosfor bronze ribbon 3" long; cut it in half and bend each as shown in illustration, then drill small holes through the fosfor bronze clips, the bakelite, and the base of the switch. Now bolt them down, as shown in illustration. Place a flashlight bulb in a conspicuous place and connect it with the clips on



With this simple device you will not forget to close your lightning switch.

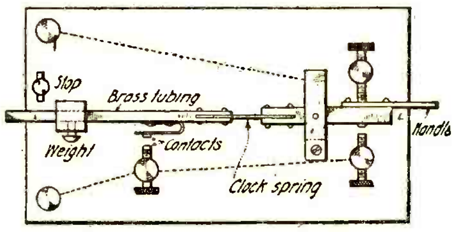
the base of the switch. When the aerial is grounded, the bakelite on the blade spreads the clips and the light is out, but if the switch is left open the clips spring together, closing the circuit, and the light turns on.

Contributed by Dick Long.

DOUBLE SPEED KEY

This double speed key will give entire satisfaction to the average "Ham." It is a bit more complicated than the ones shown in the later issues of *Radio News*, but it is more speedy and very easy to operate.

The diagram shows most of the constructional details. The lever "L" and the U-shaped piece X are made of ⅛"x¼" brass rod. The adjusting



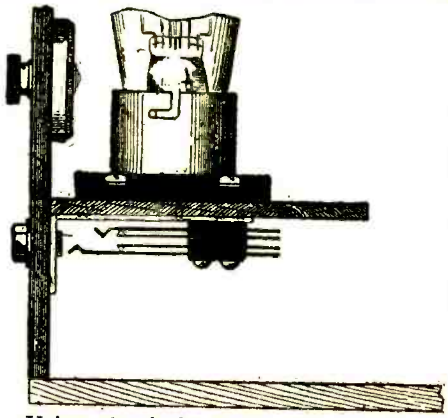
If you enjoy speedy transmission and if the other boys can read it thru the QRM, you may build this key convenient for summer, since it saves you from making the dots, thus a lot of work.

weight and the tungsten contacts are taken from a Ford coil. The shafts I made from a 2" American Model Builder axle pointed with a file. If the handle is made of fibre your fingers will not perspire as they will if hard rubber is used. CS is the contact adjusting screw. AS is the screw which makes the dashes longer or shorter. A'S' is the pivot adjusting screw. Slit the brass tube and lever L, with a hacksaw and either rivet or solder the piece of clock spring in after straightening it. Pressing to the left makes a dash; to the right it will give any number of dots desired.

Contributed by Al Blodgett.

V. T. SOCKET MOUNTING

As may be seen in the accompanying sketch, the jacks when used in an ordinary amplifier may also be used as brackets upon which the shelf holding the V.T.'s is mounted. The frames are merely inverted and drilled as shown in the sketch; corresponding



Using the jacks as brackets to support a panel.

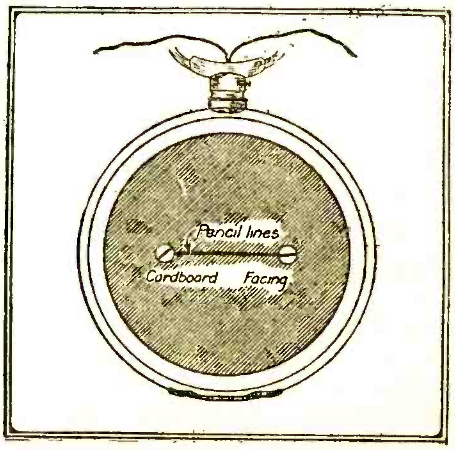
holes are drilled in the shelf. The jack may either be tapped or a bolt passed through. This not only adds to the compactness of the set but also simplifies the wiring somewhat. The sketch is practically self-explanatory, but only shows one jack. This process is repeated on the other two, forming a very firm mounting for the V.T. shelf.

Contributed by E. J. Hefele.

WATCHCASE GRID LEAK

A simple and very nice looking grid

(*Continued on page* 94)



Every real boy has an old dollar watch laying around. Use the case for a grid leak.

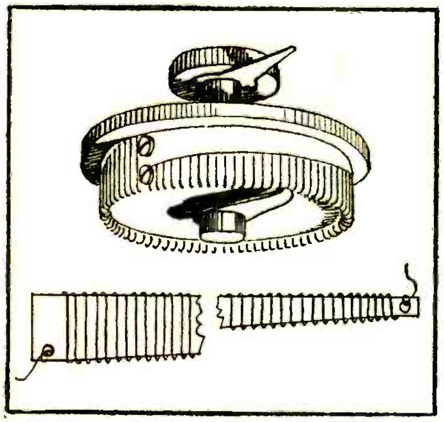
RESISTANCES

Under this heading come all types of rheostats, grid leaks, potentiometers and other resistances which a radio set may need. From the advice which you can glean, you will be able to effect real savings in every respect.

A VERNIER RHEOSTAT FROM A STANDARD INSTRUMENT

It seems rather far fetched to claim that a vernier rheostat can be made from a standard rheostat. Not only is this true, but it can be accomplished by using all of the components in such a rheostat, and without any additions whatever.

A regular 6-ohm rheostat is secured, and the resistance unit, usually supported upon a fibre form, is removed, and the resistance wire unwound. This wire should be carefully preserved. The fibre form is cut, as shown in the illustration. The wire is wound again on the form. A small hole drilled in



A standard rheostat can be made into a vernier rheostat in the manner shown.

the fibre will provide an anchoring place for the beginning and ending of this winding. Then, the resistance unit is replaced, the part cut off being used to stabilize the new winding.

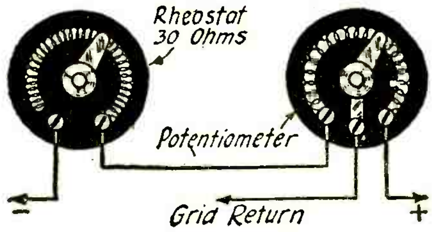
A vernier effect will be obtained with this rheostat toward the thin end of the resistance unit, because each turn of the resistance wire introduces a smaller change in current drop than on the high end.

As it will not require all of the wire originally wound on the fibre form, the resistance of this new rheostat may be less than the original. The extra wire may be wound on a form, and connected externally, so as to still have the required ohmage. The operation of this vernier rheostat is no different than that of a standard type.

Contributed by Harvey Longstone.

A VERNIER POTENTIOMETER

When using a potentiometer in a radio frequency circuit, great difficulty is sometimes experienced in bringing in weak stations without having the tubes spill over. This is especially the case with the usual wire wound instrument, as the variation is not even, but consists of small jumps as each turn of wire is passed. It is obvious that a



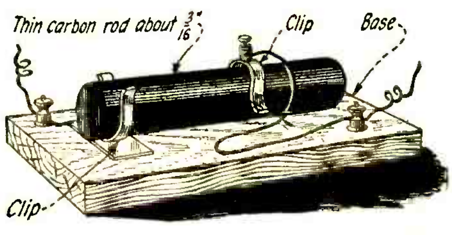
A 30-ohm rheostat makes a good vernier for the potentiometer.

vernier attachment cannot be used on the potentiometer itself as it is impossible to get any variation between the turns. The solution is to employ a variable resistance of low value in series with the potentiometer. This can take the form of a 30-ohm rheostat. If the potentiometer has a resistance of 300 ohms, it will readily be seen that, as a complete turn must be made on each instrument to vary the complete resistance, a ratio of 10 to 1 will be had. When using this rheostat, it should be placed in series with the potentiometer and the negative lead of the "A" battery. In operating this vernier, the movable arm should be placed about on the center of the resistance. Now, when as fine an adjustment as can be had is obtained with the potentiometer, a very fine vernier effect can be made with the rheostat. This attachment may be used with any radio frequency receiver and will prove extremely useful on long distance stations.

Contributed by S. Dominus.

NOVEL RHEOSTAT

The dry cells used in flashlights have carbon centers which may be utilized to excellent advantage in a set. The



A handy laboratory rheostat made from a dry cell carbon.

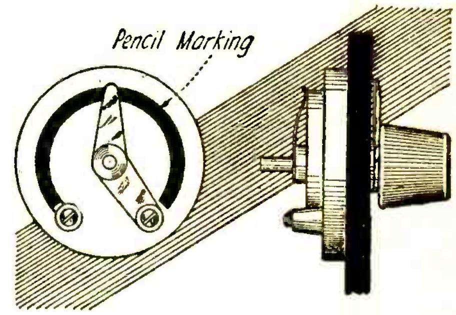
resistance of such a carbon is between 67 and 70 ohms. This can be mounted in a clip and used as a resistance element in the filament circuit of tubes. The resistance can be varied by making a sliding contact on the rod. This may be done in several ways, but the easiest would be to use a clip as shown.

Contributed by Jess Fillmore.

A VARIABLE GRID LEAK

Many of us have old rheostats laying around whose resistance wire is either loose or broken. Why not make a variable grid leak out of one of these?

Pry out the fibre ring on which the



An old rheostat can be made into a variable grid leak by removing the resistance wire and making a pencil line on the fibre strip.

wire is wound and remove the wire. Then replace the fibre ring and glue it back into place. Next, take a very fine file and make the surface of the fibre, where the contact lever touches, very smooth and mark this surface all the way around with a pencil. Connect one end of this marking to a binding post. It will then be seen that we can vary our resistance by just turning the knob located on the other side of the panel.

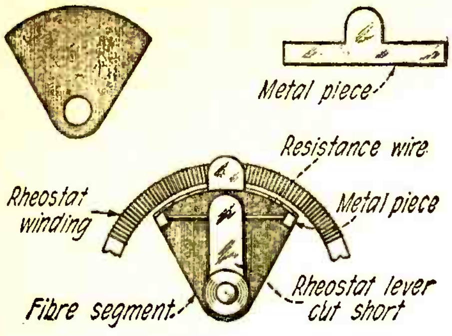
Contributed by John Burian.

MAKING A VERNIER RHEOSTAT

After a radio set is constructed, it is often found that the filament control is not sufficiently close for efficient operation. When such is the case and it is undesirable to replace the rheostats with vernier rheostats, an attachment can be made as shown in the accompanying illustration that will convert the strip-wound rheostats into vernier control.

It is simply a segment of fibre cut to the shape shown, with a hole large enough to fit around the collar carrying the rheostat lever. A piece of spring brass or German silver is cut as shown and the ears bent up around the fibre with a short length of resistance wire that may be cut from the rheostat winding, clipped under the ears and soldered thereto. The extended piece is used to make contact with the rheostat winding, as shown in the view of the assembled vernier.

This attachment is put under the rheostat lever which is bent to touch the single wire. The operation should be clear. When the knob is turned, the



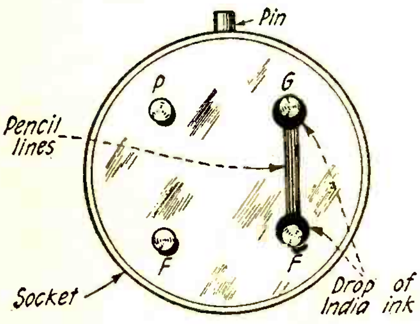
A vernier rheostat that is easily made. The long lever moves only when the short lever is at one or the other extreme end.

whole device will turn and give rough adjustment, but backing up on the knob will cause the arm to move over the single wire, giving fine adjustment.

Contributed by Thomas W. Benson.

A QUICKLY MADE GRID LEAK

An efficient grid leak can be made directly on the base of the tube, and will give excellent results. Holding



An excellent grid leak can be made directly on the base of the detector tube with a bit of India ink and a pencil.

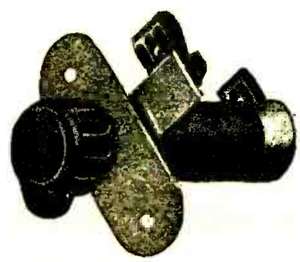
the tube with the base facing you, having the pin up as shown in the diagram, the top and bottom posts on the right are the grid and filament terminals respectively. A drop of india ink is placed at the base of these posts and allowed to dry. Several pencil lines are now drawn from one drop to the other according to the resistance of the leak desired. Best results will usually be had by connecting the positive terminal of the "A" battery to the leak.

Contributed by Wilford Lahman.

AN EFFICIENT CARBON DISC RHEOSTAT

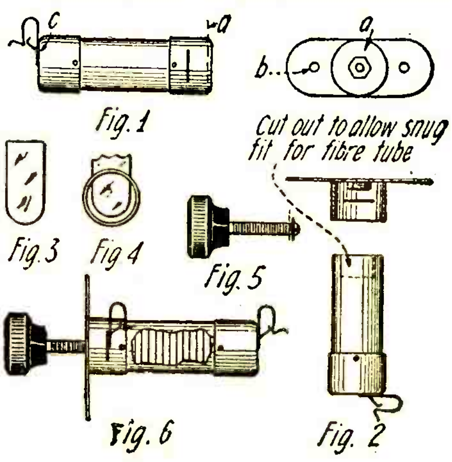
In constructing a receiving set for experimental purposes to plans published in a recent issue of *Radio News*, the writer had a desire to use a carbon disc rheostat for filament control. Not wishing to purchase one of the numerous types on the market, the following idea was conceived and a rheostat constructed accordingly, which was tested very rigidly and gave excellent results.

A non-refillable fuse of the cartridge type (30-60 amp.), with the ferrules secured to the fibre tube by small brass tacks was procured and one end sawed off as in Fig. 1-a. The filling material and remaining parts of the fuse link were next removed and a Fahnestock connector soldered on, as in Fig. 1-c. After cutting off ferrule 1-a, the ferrule had best be removed for subsequent soldering, etc., as the heat used will burn and char the tube. A saw cut is made ½" long (Fig. 1-b), to admit flat spring piece (Figs. 3 and 4). This was made out of a piece of brass socket shell nicely flattened and cut to shape. Solder in as shown in Fig. 4. A piece of brass (Fig. 2) 2½" long x ⅞" wide and about ⅛" thick is next secured. The ends can be rounded or



The carbon disc rheostat as it appears when finished.

squared as desired and three holes drilled, all to clear an 8/32 brass screw. One is drilled in the exact center, the other two, ¾" each away from the center hole. An 8/32 brass nut is now centered over center hole and sweated on. The ferrule is next placed on this piece centrally located and soldered fast with the nut inside. Another Fahnestock connector is soldered to a flat spring piece. Fig. 3, also shown in



Constructional data on the carbon disc rheostat. All measurements conform to the size of the fuse cartridge used.

Fig. 4. One side of the fibre tube is cut out on the end as shown in Fig. 2, to allow the fibre tube to fit up over the brass spring. Next, a knob from an old rotary snap switch is secured and an 8/32 screw is put in as tightly as possible and the head is cut off, see Fig. 5. This should be left long enough to pass through your panel and work against the spring piece, Fig. 4.

A number of discs about ⅛" or 3/32" thick are cut from a ½" hard round carbon, such as are used in arc lights, and these discs are nicely sanded and worked to uniform thickness. Cut and finish enough to fill the tube so that with the tension relieved the brass spring will make contact with the carbon discs when the front ferrule is replaced. One or two discs may have to be cut slightly thicker to make up properly. A little experimenting in this particular detail will soon determine the proper number of discs to be used. After assembling, the brass tacks are cut off to just fit through holes in the ferrule and into the fibre tube and the unit is ready for mounting. Fig. 6 shows a sketch of the complete assembly. As is generally known, the more pressure on the discs the smaller the resistance offered and vice-versa. The writer tested this piece of apparatus in every conceivable way and it is now giving service equal to, if not better than, most of the rheostats on the market. A little care and patience will well reward anyone who wishes to construct this rheostat, and the cost should not be more than a few cents. The writer is an electrical engineer, affiicted with the radio bug of course, and had access to a quantity of discarded fuses, sockets, carbons, etc., and the only cost was just what he would consider his labor. Almost anyone can secure enough material around home or from the junk box of the local electrician to build this little instrument.

Contributed by Clifford E. Mooney.

A PRACTICAL VARIABLE GRID LEAK

One of the bug-bears of the amateur constructor seems to be the making of a variable grid leak which will give half-way good results and will maintain its efficiency over a considerable length of time. Most of the home-made leaks become inoperative after being used for any period of time during which time resistance has to be varied occasionally.

The leak described herewith does away with all of these objections and when once it is constructed properly it will retain its efficiency, no matter how many times its value may be varied. Still another advantage is that the leak is absolutely dustproof.

The main part of this little instrument consists of an ordinary tubular fuse. It may be of any size that the amateur happens to have on hand. In order to have a good base for mounting, it is advisable to procure a fuse block into which the tube will fit. Connections can then be made to the clips instead of to the brass ends of the tube as shown in Fig. 1.

After obtaining the fuse, remove the two end brass caps and clean the interior of the fibre tube. Remove all solder from the caps. In one cap drill a hole of the correct size to allow a brass rod to slip through. This rod need not be more than 1/8" in diameter. Next secure some India ink and a pencil lead. With a file, work off a quantity of filings from the pencil lead and add to the India ink. Boil the mixture. While still hot, apply liberally to

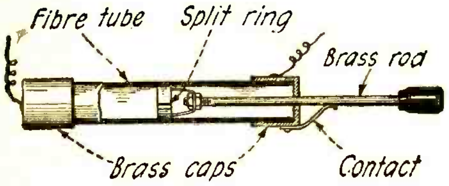


Fig. 1

This unique variable grid leak is composed of a fibre fuse case coated on the inside with a mixture of India ink and carbon. The movable plunger provides the variable contact.

the inside of the tube. During this process the tube should be kept warm. By so doing the material will soak into the fibre tube. Dip one end of the tube into the mixture so that some of the liquid will be deposited on the outside of the tube for a space of about 1/4" from one end. Allow the tube to dry and go over the inside of it with very fine sandpaper. This removes the excess of resistance material. The boiling process impregnates the fibre tube so that the carbon deposit will not wear off under frequent use.

The brass cap in which no hole was drilled may now be slipped over the end of the tube which was placed in the India ink.

Next make a contact ring as illustrated in Fig. 2, from thin phosphor-bronze. The edges of this link should

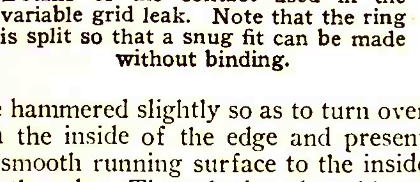


Fig. 2

Details of the contact used in the variable grid leak. Note that the ring is split so that a snug fit can be made without binding.

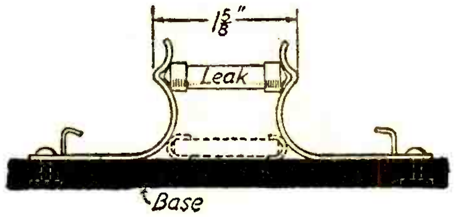
be hammered slightly so as to turn over on the inside of the edge and present a smooth running surface to the inside of the tube. The yoke is to be soldered to the split ring and the rod fastened here by means of two nuts, or by soldering.

In order to make good contact with the brass rod, it is desirable to bend a piece of phosphor bronze strip, as shown in Fig. 1, and solder it to the brass cap. The other end is to be bent so as to make firm contact with the rod.

Contributed by Leroy Western.

AN EASILY MADE GRID LEAK MOUNTING

During the course of construction of a new set, the builder often finds that a separate grid leak mounting is necessary. Such a mounting must be employed when the grid leak is connected from the grid directly to the filament. A very easily constructed mounting may be made from two old connection clips. These clips should be bent to the form shown in the diagram and should be mounted just far enough apart that a grid leak of the regular cartridge form will be held snugly. An old piece of bakelite or hard rubber of the proper length and an inch wide may be used for the base. Holes should be bored through the base to correspond with the holes in the clips and the clips fastened down by mean of screws or bolts. The two small lugs under which



Spring connection clips are employed to make this grid leak and condenser holder.

the wires are usually held are bent up and the connections are soldered to them. If a condenser of the correct size is used it may also be held by this mounting in parallel with the grid leak by inserting it in the position shown in the diagram by the dotted lines.

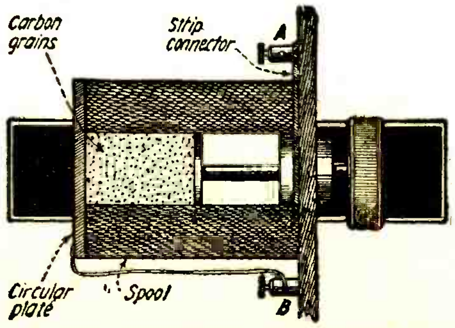
Contributed by D. M. Clayton.

SIMPLE RHEOSTAT WITH FINE ADJUSTMENT

With this rheostat in the filament circuit of the detector tube, very fine adjustments are possible.

The construction is quite simple as may be seen from the sketch. A tube of high heat-resisting material, such as porcelain, is almost filled with carbon grains. Contact is made to the grains by a small piece of metal sheet which serves to keep the grains in position.

At the front or panel end, a plunger is inserted. The shaft of the plunger should be threaded and the base should



Here is a rheostat for that critical detector tube. It is not difficult to make.

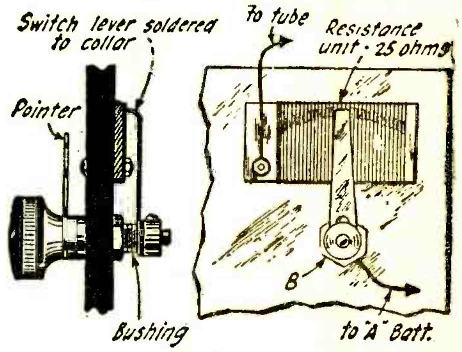
be just of correct size to fit the hole. The panel is tapped and the rheostat placed in position. Connections are made to the plunger by a strip of copper or brass. A knob and pointer or dial completes the rheostat. By turning the knob, the plunger moves back and forth and varies the pressure on the carbon grains. The pitch of thread will determine the rate at which the plunger operates. With a fine thread, a complete turn will not greatly affect the current flow; a heavy thread will allow a rather rough adjustment to be made, although it will be a finer adjustment than the ordinary wire rheostat.

Such a receiving rheostat will be satisfactory if carefully constructed.

Contributed by Clyde Hansley.

AN EASILY MADE 25-OHM RHEOSTAT

The rheostat shown in the illustration can be made easily with a 25-ohm resistance unit and a switch arm, preferably one with a bushing. The blade is removed from the knob and is soldered to the collar. The pointer is made from a piece of sheet copper or aluminum and is fastened directly on the arm, from where the switch blade was removed. The resistance unit is mounted on the panel by a small bolt passed through the eyelet in the unit.



A very neat 25-ohm rheostat can be made with a 25-ohm resistance unit and a switch arm and knob.

This bolt serves as one connection of the rheostat. The position at which the bushing is mounted will depend upon the length of the switch lever used. The bushing serves as the other terminal of the rheostat.

Contributed by Clarence F. Book.

A ROLLING CONTACT FOR VARIABLE RESISTANCES

With the continued use of a wire type potentiometer or rheostat the contact arm is very likely to cut through the wire, thus ruining the instrument. Also there are very few rheostats and potentiometers which have smooth sliding contacts. To eliminate these disadvantages I incorporated on the contact arm of a rheostat, a small roller contact. This arrangement has proven highly efficient and has given me so much satisfaction, that I have employed the same system on all variable resistances in my receiving set. Figs. 1, 2 and 3, clearly show how this arrangement can be applied to various types of rheostats and potentiometers. As seen, a small brass wheel or roller about ½" in diameter is fastened to the end of the contact arm and placed so that it will make firm contact with the resistance wire either on the end or on the side of the winding. This small roller is attached to the arm by means of a machine screw and two nuts or an inductance switch or binding post bush-

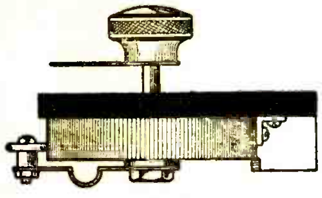


Fig. 1

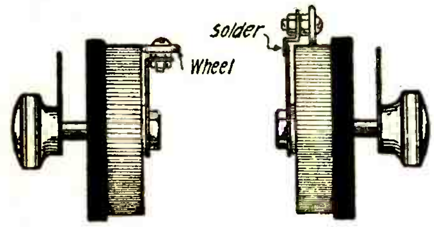


Fig. 2 Fig. 3

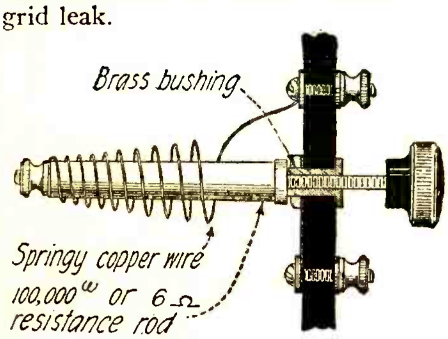
Showing different ways the roller contact can be attached to a rheostat or potentiometer. This provides an exceptionally smooth running contact.

ing. The slider contacts on all these instruments are made of spring brass so that it is an easy matter to bend them so that the rollers can make firm contact with the resistance wire. This arrangement is the most smooth running system that I have as yet laid hand on and I believe that many will find it a worth while addition.

Contributed by B. A. Kinsey.

A VARIABLE RESISTANCE

The old type of resistance made by a pencil mark or India ink over a small piece of ebonite is well known to every amateur who has used it for a long time as either an anode resistance or grid leak.



Here is a unique means of varying a resistance. This makes a very effective rheostat or variable grid leak.

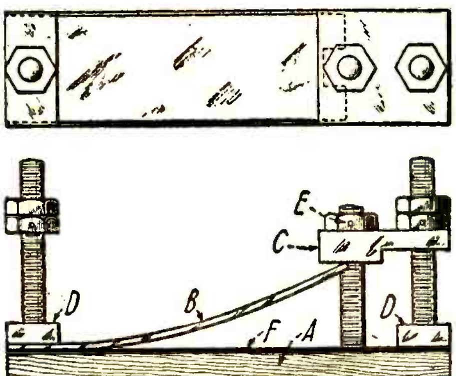
This has the chief disadvantage of varying its value with changes in atmosphere. On the other hand, some excellent types of resistance rods have been placed on the market by reliable manufacturers. With the B batteries offered on the market at present it is no longer possible to vary quickly the resistance according to particular needs. Nevertheless, it is very simple to have a variable resistance with one of these carbon rods. Fig. 1 shows how this is done.

A spring copper wire is coiled around the rod and fastened to one of its ends while the other end is provided with a suitable knob. The screw which fits the knob to the carbon rod passes through a brass bushing secured to the panel. The connections are taken from one end of the resistance through the bushing and from the other end by means of the coiled wire. Convenient values for the resistance rods are about 100,000 ohms and 6 megohms. The former is suitable for anode and the latter for grid leak. When turning the knob to the right, the wire winds around the carbon rod progressively shorting the resistance and continuously lowering its value. With this variable unit, any change required can be quickly made allowing an increase in the efficiency of the detector tube.

Contributed by Marius Thouvais.

AN EXCELLENT VARIABLE GRID LEAK

The variable grid leak condenser herein described has been used for over a year, and for durability, ease and permanence of adjustment, can't be beat.



A variable grid leak that is free from wear. The spring strip "B" progressively shorts the high resistance "F," when pressed downward by the adjusting nut "E."

Referring to the drawing: "A" is a piece of hard rubber, bakelite or formica, on which is a strip of cloth "F," dipped in India ink and clamped firmly in place by pieces of brass strip "D." A strip of spring brass "B," made of copper or phosphor-bronze, cuts out parts of "F" through the action of turning the machine screw which pulls "C" against "D." Either "A" or "C" must be threaded for this screw.

The two outside machine screws were placed 2⅛" on centers. This takes care of any of the flat rolled condensers on the market today. The correct grid condenser is fastened to the two outside screws with two nuts, together with the leads to the instruments.

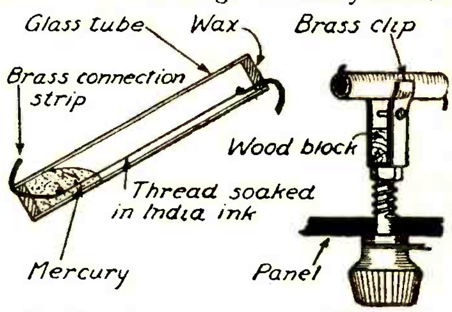
"E" is an ordinary straight pin used to keep the nuts from turning. Two nuts turned up tight may be used instead.

This instrument is preferably mounted with the screw heads up or the adjusting screw at the top. This affords a dust protector over the leak proper and also facilitates adjustment which can be done with a well insulated screwdriver. In this way a continuous adjustment can be obtained without removing the hand, to eliminate body capacity.

Contributed by Allen H. Fox.

A MERCURY VARIABLE GRID LEAK

An excellent variable grid leak may be made with a piece of glass tube about 2 inches long. A heavy thread



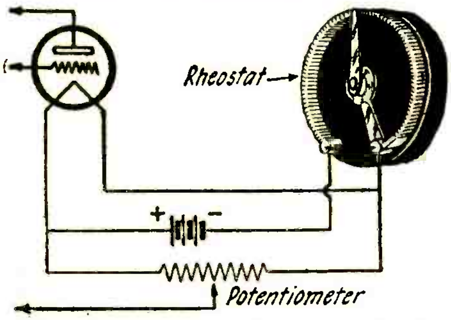
Details of a mercury variable grid leak.

is soaked in India ink and run through the glass tube close to the inside wall. This thread is held at one end by a short piece of brass or copper strip. The other end is embedded in a piece of sealing wax which entirely closes one end of the tube. Another brass strip is also inserted in this end of the tube so that it will make contact with a quantity of mercury which is placed in the tube. This mercury should be of such bulk that it will almost completely cover the thread when the tube is placed in a horizontal position. After the right quantity of mercury has been found, the other end of the tube should also be sealed with wax. This variable leak is mounted in a brass clip, which is attached to a knob and shaft inserted through the panel. A small block of wood is bolted to one end of the shaft and the brass clip is held in place over it, as shown in the diagram. A stiff brass spring is placed over the shaft between the panel and the wooden block so that sufficient tension is always had to keep the grid leak in any position in which it may be placed. Light, flexible leads may be soldered to the two brass connection strips at either end of the tube. When the tube is in a vertical position maximum resistance is had and as it is gradually turned to the horizontal position, the mercury short circuits more of the thread, thus cutting down the resistance.

Contributed by L. W. Elliott.

AUTOMATIC POTENTIOMETER SWITCH

Wherever a potentiometer is used there is a constant drain of current from the "A" battery, even when the set is not in use. This is particularly true when a potentiometer of low resistance is employed. To overcome this, an "A" battery switch may be inserted in one of the filament leads to disconnect the battery from the set when not in use. This switch, however, is not necessary and can be eliminated. Only one side of the potentiometer is connected to the battery, the other side going to one terminal of the rheostat. When the rheostat is turned to the "off" position, the potentiometer is also disconnected. The extra resistance of part of the rheostat is added to that of the potentiometer, but as this is only one or two ohms and as the rheostat is varied very little after the correct position has been found, it will make no difference in the functioning of the potentiometer. The diagram shows all connections clearly.

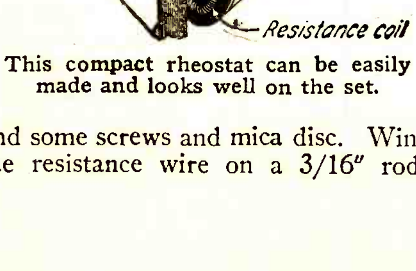


Why use a potentiometer switch? Make the rheostat serve the purpose as shown here.

Contributed by Julius Phillips.

A COMPACT RHEOSTAT

The materials needed to make this rheostat are a composition dial, some resistance wire, a small strip of brass, and some screws and mica disc. Wind the resistance wire on a 3/16" rod; when the coil is wound on connect one end to the brass backing inside of the dial and cut the other end off about ¼" from the set-screw that runs from the top of the dial to the bushing. Cut out a round piece of thick mica large enough so that the wire will fit tightly on it, and then groove the mica. Cut out a hole in the center of the disc so it will fit snugly over the bushing, and drill a hole the size of this set-screw parallel with the disc. Put the set-screw in and this will hold the disc on the dial. Punch two holes in the disc where the two ends come and connect one end to the bushing. This serves as one contact and the other contact is made by the small brass strip that is fixed on the panel.

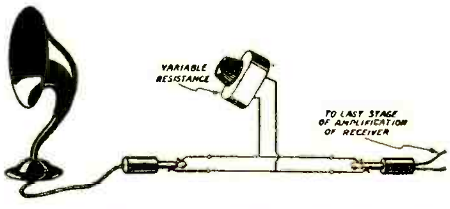


This compact rheostat can be easily made and looks well on the set.

Contributed by Landon Corrington.

AN EXTERNAL VOLUME CONTROL

Many of the sets purchased today have the internal wiring sealed so that there can be no changes made in the circuit and, sometimes, there is poor provision made for varying the intensity of the output of the receiver. The apparatus here described may be applied to any set, as it is placed across the phone terminals or connected to a plug that is inserted in the phone jack.



By the use of two plugs and jacks and a variable resistance connected, as shown above, in the output of a radio receiver, the volume of the signals received may be varied to any intensity desired by varying the amount of resistance.

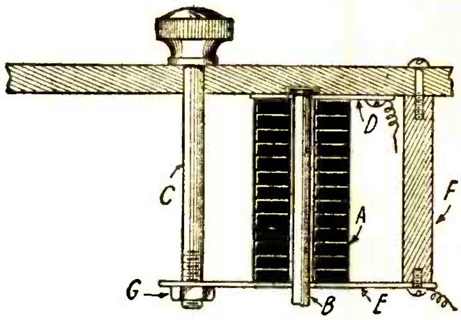
The apparatus needed for this control can be found in nearly every junk box. There are needed a resistance which may be varied from 500 to 1500 ohms, two single-circuit jacks, and a mounting panel or small box. The parts are connected as shown in the sketch. Such a control as this may be used as a remote control for the volume, as a long lead may be run to the control panel, which may be close to the loud speaker. In this way it will not be necessary to make several trips between the receiver and the loud speaker to adjust the volume by means of rheostats.

Contributed by Jack Roe.

A CARBON PILE RHEOSTAT

The following wrinkle is nothing radical in rheostats but possesses two advantages that recommend it to the radio bug who builds his own. First it occupies but little space, and second, the resistance is determined by the position of the screws and does not fluctuate when the screw is pressed sideways, as so many of the commercial ones do.

The accompanying sketch shows the construction mounted on a panel. The resistance elements (A) are drilled and sawed into washers ⅛" thick from a battery carbon. The supporting rod (B) is the glass post from a Mazda type B lamp bulb. The screw (C)



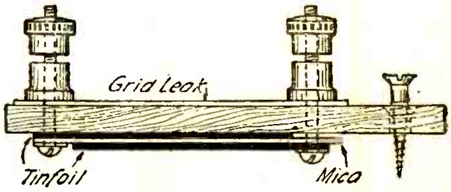
A very cleverly constructed carbon pile rheostat. It has the advantage of an evenly distributed pressure.

should have a fine thread, conveniently a 10-32, which permits the use of a standard knob with a 3/16" hole. The spring (E) is spring bronze, and has a nut (G) soldered to one end, and is fastened with two screws (at the other end) to the post (F) of ¼" fibre, which, in turn, is screwed to the panel with two screws. The contact plate (D) is of brass and is held in place with a screw which also serves to bind the wire, as does also a screw holding the spring.

Contributed by Amasa S. Tracy.

COMPACT GRID LEAK AND CONDENSER

Obtain a piece of thin wood, such as that used in cigar boxes, and cut it to size 2¼"x4". Cut two holes for binding about 2¾" apart. Then put down a sheet of tin foil about ⅛" smaller all around than the wood form. Next put on a sheet of mica, or waxed paper, leaving a space for the binding post to make contact with the upper foil. Now put on the next tin foil and insert the other binding post, being careful not to tear the foil. Of course washers should be used to insure good contact



A grid condenser and grid leak are easily made in one unit.

and to prevent tearing the foil. On the reverse side of the wood slip a strip of drawing paper on the posts and mark the grid leak with a soft pencil or India ink.

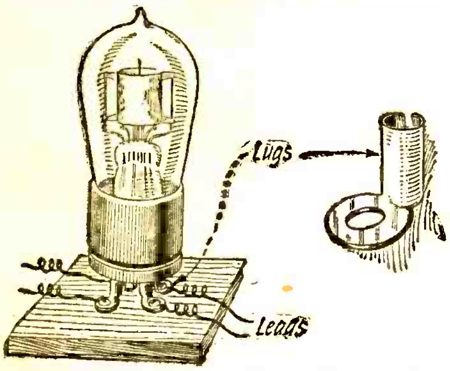
Contributed by W. D. McMillan.

SOCKETS

No necessity to run to the store to buy an expensive socket when any one of the following hints will do. The care of the socket prongs is particularly stressed in order to obtain good results from your set.

A CHEAP TUBE SOCKET

Many ideas of tube sockets have been shown from time to time, but for cheapness and simplicity of construc-



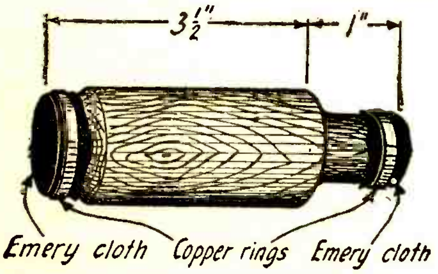
The cheapest tube socket. The cost is about two cents.

tion the socket described here cannot be beaten. The parts required for this socket are four soldering lugs, four small screws and a piece of quarter-inch wood about two or three inches square.

Contributed by Reginald Harvey.

A CONTACT CLEANER FOR SOCKETS

If your receiving set is to work at maximum efficiency, it is absolutely necessary that the tube socket contacts be clean. A dirty or corroded contact will often spoil what would otherwise be excellent reception. As a rule, these contacts are cleaned with a piece of sandpaper or emery cloth held in place on the end of a stick. This method, however, is clumsy and a good job is rarely done. If the little instrument herewith described is used for this purpose, it will be a simple matter to do this work, and clean contacts will always be assured. This contact cleaner can be used on both standard and



A socket contact cleaner cut to shape from a piece of round wood.

UV-199 or C-299 sockets. It is made of a piece of round wood 1⅜ inches in diameter and 4½ inches long. One end of this piece of wood, for a length of one inch, is cut down to ¾ of an inch in diameter. The other end is also slightly cut down for a length of about ½ inch. Two round pieces of emery cloth of a diameter ½ inch larger than the ends of the contact cleaner are now forced over the ends by means of two copper rings ¼ of an inch wide. It might be advisable to cut slits about ¼ of an inch deep on the edges of the emery cloth disks so that when forced in place, a smooth surface will be obtained. To use this instrument it is only necessary to remove the tube, insert one end of the contact cleaner in the socket and while applying pressure, twist it from side to side. It will be found that the contacts can be cleaned in this manner very easily. The time and labor expended on this contact cleaner will be amply repaid by the knowledge that the efficiency of the receiver will not be lowered by imperfect tube contacts.

Contributed by John A. Dengler.

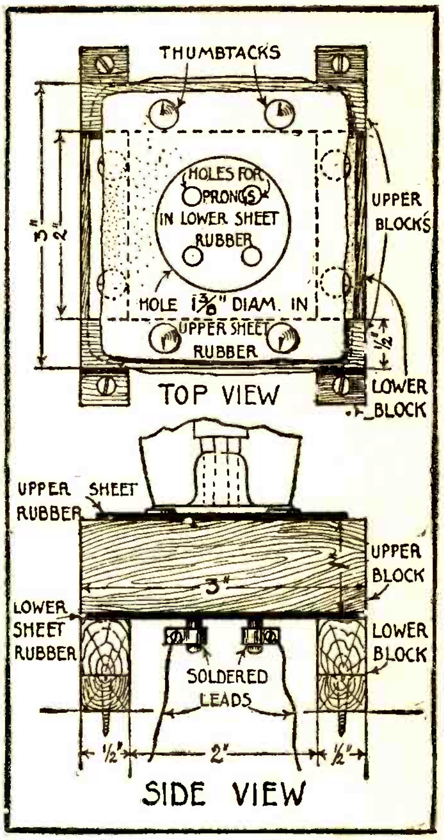
AN EFFICIENT, CHEAP SOCKET

Although a reader of *Radio News* and other radio periodicals for almost two years, I have not come across a simple explanation as to how to make a socket that is really shock-absorbing, has not loose contacts and most of all is cheap and easily constructed by the ordinary radio fan. Most sockets, supposed to be free from shocks, lose their ability to absorb them when they are connected to the rest of the set by stiff wires.

To remedy these defects, I constructed the following from parts easily obtainable. This socket being of rubber, compares favorably with bought ones in almost all respects. The average socket has about 12 loose, unsoldered contacts or connections which are reduced to eight soldered ones in this socket.

Two blocks of wood 3½x1x½ inch are placed parallel, 2 inches apart. A piece of sheet rubber 3x3 inches is mounted on these blocks with thumb tacks. The rubber sheet is taken from a discarded automobile inner tube and provided with four holes to contain the four prongs of the tube to be used. On top of this are fastened two other blocks 3x1x½ inch, as shown. Another sheet of rubber the same size, with a hole 1⅜ inches in diameter at its center, is nailed with enough thumb tacks to hold the sheet securely. In case a WD-11 tube is used, the hole should be 1¼ inches in diameter instead of 1⅜ inches.

Flexible wires of sufficient length are soldered to the prongs of the tube and serve as leads to the rest of the set. The tube is then inserted into the socket and all the leads soldered to their respective places, being careful to



A vibrationless vacuum tube socket made from spare parts. To avoid losses, the connections are soldered directly to the tube prongs.

clean the joints after soldering. The socket can then be screwed on the baseboard.

Contributed by Poblo Unson.

A TEN CENT V. T. SOCKET

In the accompanying sketch I show a home-made V. T. socket which I have made for about ten cents.

Believing that a socket of this type will be of interest to many amateurs, the complete details are given here.

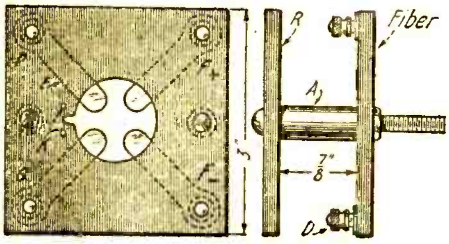
The socket consists essentially of two pieces of fibre (R) or other insulating material cut 3" square. In the center of each piece drill a 1⅜" hole. Drill four holes in the corners of the bottom piece and two extra holes for the supporting collar and screws.

From spring brass cut four springs as indicated (E). Secure the springs firmly to each corner of the bottom insulating strip, using binding posts, as shown (D). The two collars (A) are

7/8" long and may be cut from either solid stock or tubing.

Drill two holes in the upper spring and assemble the parts to form the completed unit.

The position of the slot for the tube pin should be carefully placed. Small studs (K) are driven into the upper strip on each side of the slot in order to prevent the tube from moving more than it should.



A tube socket can be made from pieces of scrap bakelite.

A row of these sockets may be made for an amplifier.

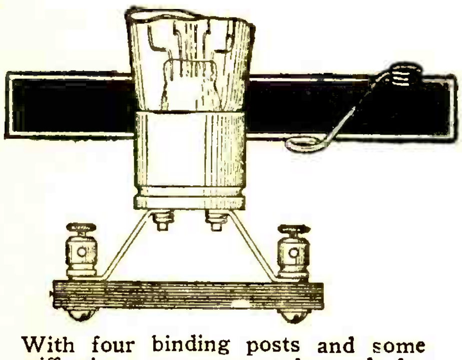
For the strips I have used the material on old storage battery jars with great success.

Contributed by Eugene Schmidt.

A MOUNTING FOR THE "W. D. 11" TUBE

I was unable to purchase a socket for this tube (generally called the "peanut" tube) at any price and doubtless others have encountered the same difficulty.

A piece of bakelite 3 inches square, four binding posts and some spring brass wire are all the things that are necessary. The spiral part of the wire



With four binding posts and some stiff wire a support may be made for the W. D. tubes as well as for the other types.

was bent around a six-penny wire finishing nail firmly held in a vise for the three small contacts and the one for the "grid" contact (which is larger on this tube) was bent around a twenty-penny spike.

The inside of the coils was brightened with a rat tail file to insure contact.

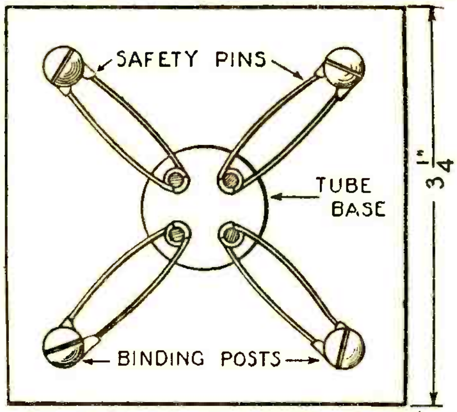
This "socket" works perfectly and the natural springiness of the wire takes up any sudden jar.

Contributed by H. C. Harvey.

HOME-MADE VACUUM TUBE SOCKET

For the constructor who likes to make as much of his apparatus as possible the socket below should prove of interest. Procure a piece of hard rubber or bakelite 3¼ inches square. In the center of this piece drill a hole in which the base of an electron tube will fit snugly. The coil spring guards of four nickel-plated safety pins 1½ inches long are removed and arranged on the bakelite square, as shown in the illustration. Mark the points where the holes are to be drilled for the screws, after inserting the tube in the hole made for it and thus fixing the pins' positions. Binding posts are used for fastening the pins to the bakelite base.

The prong connections in this socket are excellent and there is a small amount of insulating material near the tube, reducing the socket capacity to a great extent. All spring pressures are so arranged that possible damage to the



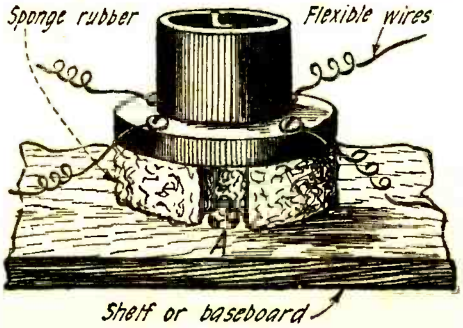
Four safety-pins, four bolts and a 3¼-inch square of bakelite make an efficient socket.

tube and socket is avoided. If it is desired to change tubes when using this socket it is better to disconnect the leads from the binding posts and change the entire socket. One advantage of this socket is its low cost.

Contributed by R. T. Pound.

A NON-MICROPHONIC SOCKET MOUNTING

A simple method of mounting a UV-199 socket on sponge rubber so that the bulb can be inserted in an inaccessible place without holding the socket



A mounting for a 199 tube made of sponge rubber will materially reduce microphonic tube noises.

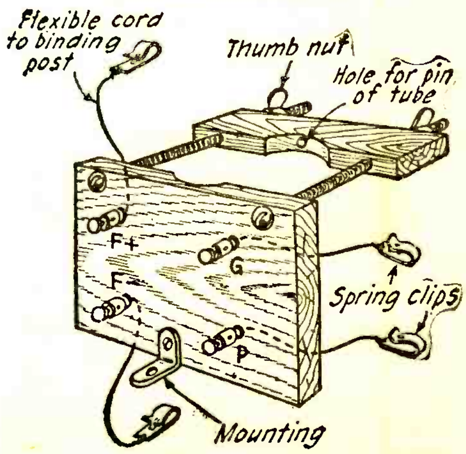
with the other hand is here described. It is accomplished by cutting a piece of sponge rubber (bath sponge) in a disc ⅝ inch thick and the diameter of the socket base; then cut two recesses in opposite sides ⅜ inch wide and deep as at A in the drawing. Get a 10-cent tube of para dry rubber cement from the nearest garage, place the socket without the rubber in position on the set where it is to be permanently located and mark the two holes that are in the base for fastening it. Then draw a circle around the base. Bore the two holes and place a brass bolt with head on the under side and out the upper side so that the bolt will stick about ⅜ inch or ½ inch above the baseboard, but will not touch the socket by ⅛ of an inch when the rubber is placed between. Scrape or roughen the under side of the socket and inside of the circle so that the cement will hold well, and wet the rubber on both sides; wet the socket and place in position, as shown in the drawing. Lay a light weight on top of the socket so as to compress the rubber about ⅛ inch. Be sure that the brass bolts are directly in the center of the holes in the base of the socket. Let it stand until dry. When using, insert bulb, and on pressing down, the socket goes over the bolts and when you turn it to engage the lock, the bolts hold the socket from turning and tearing loose from the base. Instead of bolts, switch stops can be used and the method of mounting either kind may be reversed so that they fasten in the socket instead of in the base and enter holes in the baseboard or shelf when the rubber is compressed. The socket should be wired with stranded covered flexible wire. Do not use bus bar, as it will not serve the purpose intended.

Contributed by Edwin L. Snook.

A FIT-ALL TUBE SOCKET

There are so many kinds of tubes now on the market, the bases of which

(*Continued on page 93*)



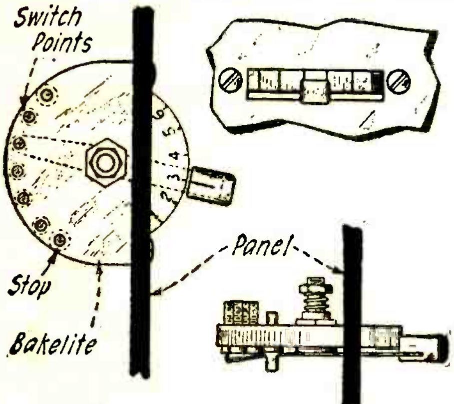
An ingenious form of vacuum tube socket particularly useful for experimental purposes. It will fit all tubes except the UV-199 and C-299.

SWITCHES

A switch for every conceivable purpose for a radio set. There are quite a number of them described here, so that the experimenter will have a wide choice for selection.

AN EXCELLENT INDUCTANCE SWITCH

One of the sore eyes of a radio receiving set is the inductance switch. Not only are they unattractive but usually due to the manner in which



A switch of this type is a great space saver and has a pleasing appearance as well. The switch points are mounted underneath the piece of insulation so that dust cannot collect upon their surfaces.

they are mounted, they do not make a clean contact at all times. The type of inductance switch described herewith is very convenient, and improves the appearance of any panel as it does away with the points and blade on the outside. It also cuts down body capacity as the points are behind the panel, which probably will be shielded, and it is also at right angles to the operator's hand.

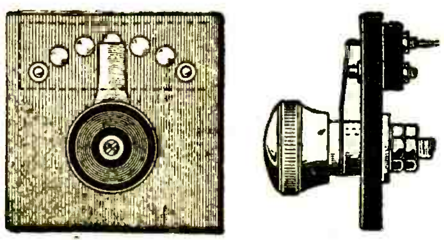
The drawing shows clearly how this switch is constructed. First a piece of bakelite is cut to the required size for mounting the switch points and stops. A small switch arm is cut from a piece of spring brass or other suitable material and a small piece of bakelite of the same thickness as the piece used for mounting the switch points, is secured to the end of the arm. The bushing from a common inductance switch and a small bolt sum the necessary parts. The numbers and hairlines are scribed on the extended piece of bakelite with a sharp pointed steel tool. These may be filled in with any coloring material desired. The colored crayons sold on the market for use with Eversharp pencils, are made of a soft material, and may be utilized. The color red for example, gives a very pleasing appearance.

Contributed by C. A. Lindenmeyer.

A NON-SHORT-CIRCUITING PANEL SWITCH

It is very likely that many amateurs have been confronted with problems centering upon the panel switch now in common use. One problem to overcome is short circuits between contacts. When the switch blade passes from one contact to the next the blade touches the two contacts at the same time. This connects the two contacts and thereby short-circuiting whatever may be connected to them. If a number of "B" batteries were connected to that type of switch, one can see that they would not last long.

To overcome this a panel switch like the one I describe can be made. Procure contacts, the thickness of the head of which is the same as the thickness of the panel. Lay off the holes for the bearing of the switch lever and also the holes for the contacts. In this case the radius of the switch arm is 1" and the distance between the centers of the contacts is ¼". The next operation is to drill the hole for the switch lever bearing, which is ⅜" in diameter. Then drill the holes for the contacts. First use a drill the diameter of which is the same as that of the shank of the contact. In this case the shank is 3/32" in diameter. Next cut out a piece of formica or bakelite large enough to



This switch will be useful for B battery control. It prevents short circuiting betwen contacts.

cover the space occupied by the contacts and also allow for the two stops which hold this piece to the panel and at the same time serve to keep the switch blade from running off the contacts. Clamp this insulating block in place, back of the panel. Then drill the two holes for the stops through the panel and also through the block in the rear. Then put the stops in place and tighten the nuts on back. This will hold the block securely to the panel. Using the same size drill that was used to drill the holes in the panel before, and following the same holes that were drilled before for the contacts, drill through the block in the rear. This will assure perfect alignment of the holes in the panel with those in the block. This is necessary because the block supports the contacts while the heads of the contacts fit in the panel. Next take the block off the panel, and drill out the holes in panel for the heads of the contacts. This drill must be the same diameter as that of the head of the contact.

When the switch is assembled the surface of the contacts must be a little below the surface of the panel. If they extend above the surface, the holes in the rear block must be countersunk just enough to allow the contact to come below the surface of the panel. (About .004" is the right distance the surface of the contact should be below the surface of the panel.) After this is done, put the switch blade and knob in place.

When the blade is passed from one contact to the next, the blade cannot fall in between the two contacts or touch both of them at the same time, or thereby connect the two.

The disadvantage of short-circuiting is eliminated in this type of switch because when the blade passes from one contact to the next it travels on the surface of the insulating panel. In this way the blade is prevented from touching two contacts at the same time.

Besides having the advantage of non-short-circuiting, this switch is very smooth running.

This type of switch is a necessity where an adjustable "B" battery is used or where connections between contacts would be a detriment.

Contributed by Frank Dieringer.

A PANEL SWITCH

Progressive design, as well as public demand, is pointing the way toward the simply controlled or uni-controlled receiver. The average person enjoying radio for the amusement or economic results obtained alone is averse to the manipulation of many knobs, handles, and dials in order to bring in the desired signals.

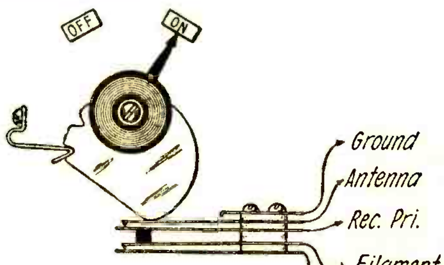


Fig. 1

Full view of the panel switch, showing how the cam bears upon the telephone jack.

Herewith is illustrated the design for a switch which serves several purposes. When at the off position, the antenna is disconnected and grounded, thus guarding against damage from heavy static charges while the set is not in actual use. At the same time the filament circuits are opened and waste of current through carelessness in not cutting off the "A" battery is

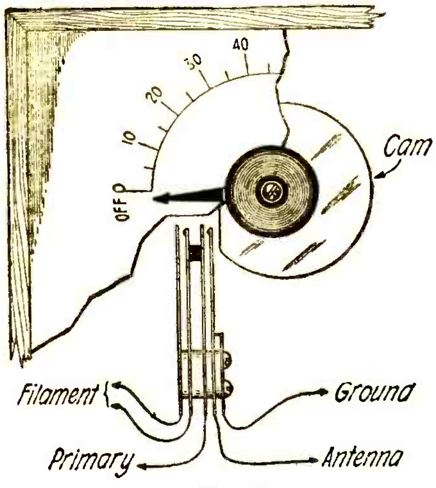


Fig. 2

Another view of a similar arrangement, which can be attached directly to the shaft of the tuning variable condenser.

avoided. Possible failure of the antenna wires and possible contact with power wires resulting in damaged circuits is also avoided by grounding of the primary lead from the antenna. The receiving transformer is disconnected.

At the *on* position the reverse of the above is true. All the operator is required to do when wishing to listen in is to throw the switch to the *on* side and the filament is lighted. The antenna disconnected from ground and connected to the receiver transformer.

The action and construction of the switch is simplicity itself. A cam of bakelite or other insulator is so shaped as to depress the jack leaves while in one position and to release them when at a certain point, which in this case is the *off* position. Fig. 1 shows the switch cam using a stop which works in the notches and retains the cam at a desired position. In Fig. 2 is shown a similar application with the exception that the switch works automatically when the receiver inductance or condenser knob is moved to the tuning position. The filament and antenna circuits remain closed until the pointer is moved to the off scale position. If automatic filament current adjusters are used in the filament circuits, the use of the switch reduces the necessary manipulations required for placing the receiver in operation to a fewer number than heretofore.

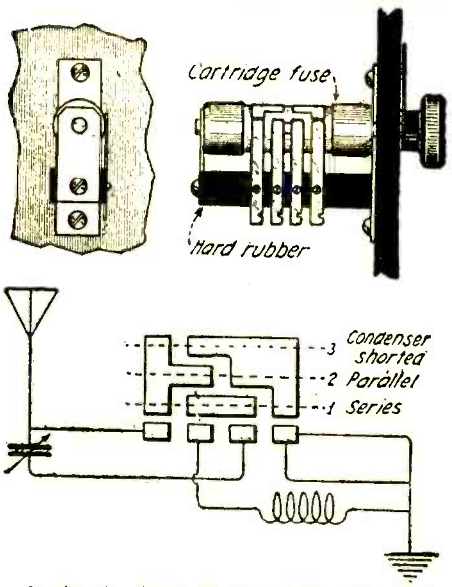
Contributed by John F. Bront.

HOME-MADE DRUM-TYPE PANEL SWITCH

The accompanying sketch is of a drum-type panel switch made from an old cartridge fuse.

I believe this sketch is self-explanatory. The wiring diagram shown contemplates using the switch for series or parallel connection of a condenser and inductance. It will be readily seen, however, that the same scheme may be used for a great variety of combinations, and by the addition of differently shaped contacts or more brushes, a great many different switching schemes could be worked out. This switch takes up very little room on the panel. No dimensions are shown on the sketch as these would depend entirely upon the size of cartridge fuse used.

A switch of this design was made up by the writer and works very satisfactorily. The brass and pieces were first removed and drilled. The contacts were then riveted to the cylinder by short pieces of copper wire, the brass plates being countersunk and the rivets filed off smooth. The end pieces were then replaced and soldered to the brass rod used as a shaft. The four spring brass brushes were fitted into grooves cut in the hard rubber block



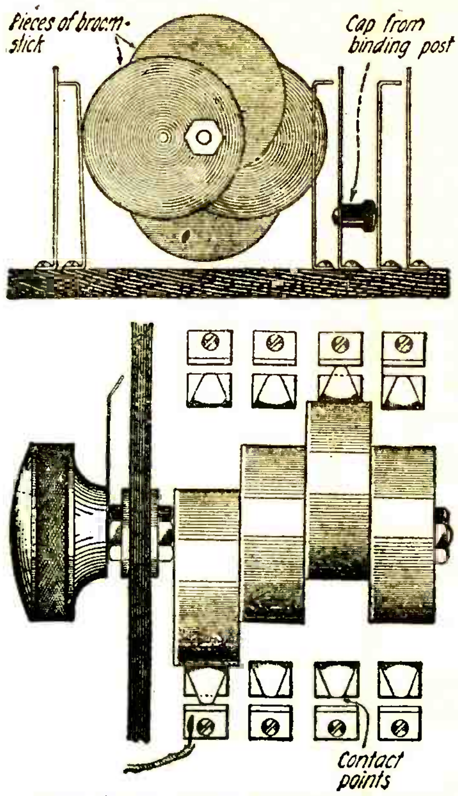
A simple drum-type switch won the first prize for the designer, R. H. Reynolds. Its constructional details are shown above.

and held by rivets. Wires from the condenser and inductance were soldered to these brushes. A knob and pointer were used with a simple indicator and stop.

Contributed by R. H. Reynolds.

A SIMPLE PANEL SWITCH

The diagram shows a simple panel switch, which is constructed from parts easily secured. The switch can be used instead of jacks and the experimenter will find many other uses for it. A piece of broomstick is cut into pieces 3/8" thick and a hole is drilled through each piece 1/4" off center. The number of pieces used depends upon the circuit the switch is to control. The contact strips are made from some springy material. Half of the strips should be pointed to make a better contact. The strips can be put on one or both sides of the cams. A rod is threaded for about an inch on both ends and two nuts hold the cams from turning. One of the nuts can be loosened and the



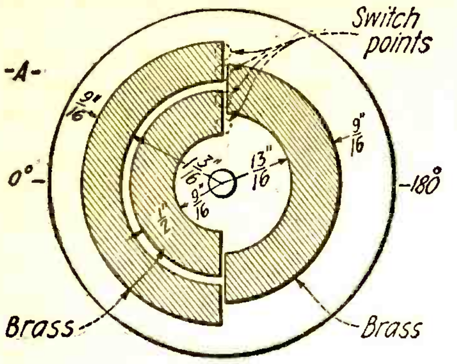
Here is an easily constructed panel switch that will serve many purposes. It is a good substitute for jacks.

cams can be adjusted for different circuits; the rod is put through the panel and a washer is put on both sides of the panel and a pointer is fastened on between the knob and the nut on the outside of the panel. The contact strips are now fastened on a base so that when the knob is turned the cam presses a pointed strip against another strip making a contact between the two. If desired, a knob from a binding post may be fastened to the outside strip, which in turn will move another set of contact springs.

Contributed by John Doe.

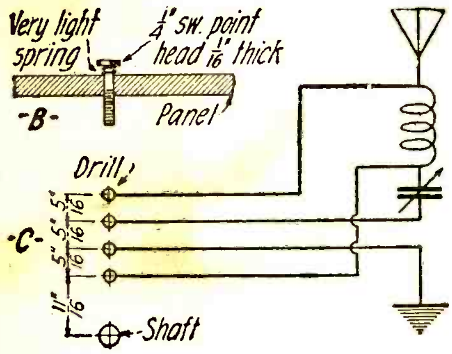
DIAL MOUNTED SERIES PARALLEL SWITCH

Following is a description of an arrangement for operating a variable condenser in series or parallel with an inductance by merely revolving the dial through 180°. For the first 90°, the capacity is in series and diminishes up to the point where it changes to a parallel connection after which it increases for 90° more. Using it in this manner, only one-half of the brass strips on each side are brought into play. If so desired, the condenser may be used in series through the entire 180° and in parallel for the next 180° as may easily be seen by studying A of Fig. 1. This switch requires the use of a flat back 4" dial of which there are many on the market, four switch points and a piece of brass or copper sheet 3½" in diameter together with a few inches of fine



The series-parallel switching arrangement is mounted directly on the rear of the dial. This is a very good scheme.

wire to make four light springs. The brass strips when cut to size, can be glued to the back of the dial more easily than fastening by countersunk screws.



The layout and connections for the series-parallel switch. Small springs underneath the switch points provide the necessary friction contact against the brass strips.

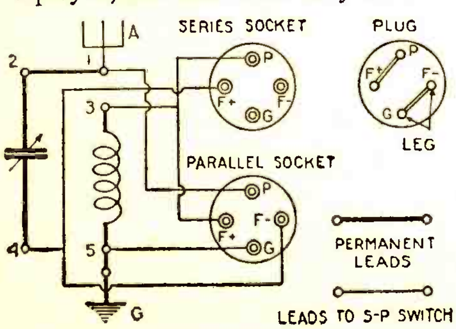
This is very easily made and eliminates the necessity of using the usual unsightly series parallel switch.

Contributed by J. R. Balsley.

HOME-MADE SERIES-PARALLEL SWITCH

Procure a burnt-out tube, also two sockets. For these latter may be substituted "sockettes" recently described in *Radio News.*

The sockets are mounted as usual, in any convenient position on the panel or experimental table; if sockettes are employed, the base itself may be used as a drilling template to obtain the correct spacing.



A series-parallel switch that can be constructed from two sockets and a burnt-out tube.

The tube and its leads are removed from the base (heating them will facilitate the removal by softening the cement), leaving the legs only. A wooden plug is cut to fit the top of the base, or the space may be filled with wax. The connections between the legs, which should be of No. 18 or larger wire, are now soldered in place as indicated in the diagram marked "Plug." These connections may lie snug against the base where the legs enter it, or they may be made on the interior before plugging the cavity.

The connections to the series socket are then made. Referring to the diagram, they are: 3 to P, and 5 to F. The insertion of the plug completes the circuit A-1-2-4-3-5-G.

Now the connections to the parallel socket. Again referring to the diagram, they are: 1 to P, 3 to F, 5 to G, 4 to F. The inserting of the plug completes the two circuits, A-1-3-5-G and 1-2-4-5.

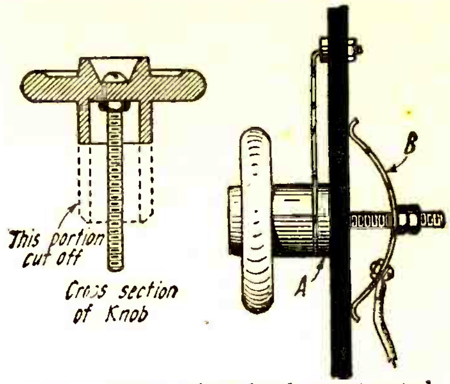
It should be noted that the connections A-1, 1-2, 5-G are permanent, being the same in either series or parallel.

This switch will prove acceptable to the fan who wishes to construct for himself as many as possible of the components of his set, as well as solving the problem of an emergency need. Variations of the scheme will no doubt present themselves to the experimenter, as adaptable to many switching combinations.

Contributed by
Fernando Steere-Llorens.

A MUSIC ROLL SWITCH KNOB

Having required a switch knob in building a set, and unable to procure one without, some delay, I looked around for a substitute and finally hit upon the following idea. I secured an old player piano roll and removed the composition end pieces, which have the same shape and appearance as a regular switch knob. The tubular end of this knob is too long, so about three-quarters of an inch must be cut off, as shown in the drawing. A hole is drilled through the center, through which a brass bolt is inserted and secured with a nut. The blade may be cut from a spring sheet brass of the desired shape, and placed on the shaft, being held by a thick washer "A," which is threaded to fit the bolt. Various methods may be used to fasten this switch knob to the panel but the plan shown in the drawing is recommended as giving exceptional results. A piece of spring brass is bent to the shape shown and slipped over the shaft through a hole drilled in it for this purpose. A nut is screwed down on the shaft until the right tension on the piece of spring brass is obtained. Another nut is also used as a lock nut so the original adjustment can be maintained. This switch knob looks very neat and



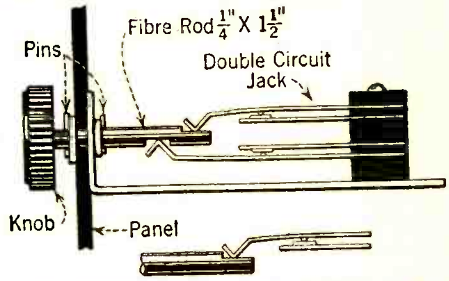
An excellent switch knob constructed from the knob of a music roll.

will not detract from the appearance of any set.

Contributed by William G. Roth.

DOUBLE CIRCUIT JACK USED AS SWITCH

A quick-acting switch that will control two circuits may easily be made



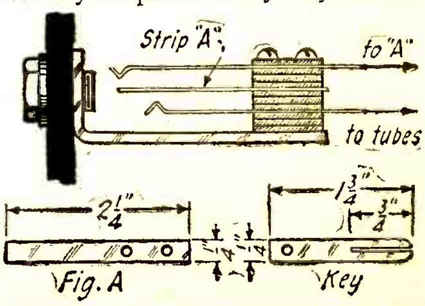
An easily constructed double pole quick acting switch.

from a double circuit phone jack, having four leaves or contacts. A rod, ¼ inch in diameter of an insulating material, is filed to the shape shown ¼ inch from the end. On the opposite side, ½ inch from the same end, a similar notch is made. This will open both circuits at the same time. If it is desired to open one at a time, then the notches should be filed on the same side of the rod. To keep the rod in place, a pin is placed on the inside of the panel and one on the outside. A rubber knob is attached to the end of the rod so that the switch may be easily operated.

Contributed by Morton Shaw.

A CLEVER SWITCH LOCK

A very simple and easy way to make



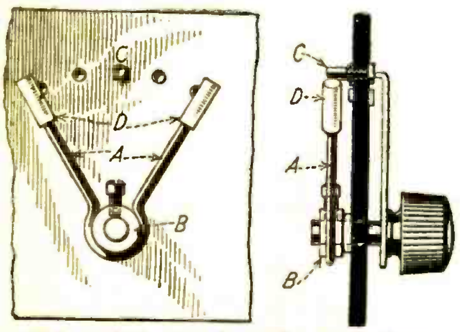
This filament switch requires a special key-plug to close the circuit. Other plugs will not fit the jack.

a switch lock for the "A" battery line is to use an ordinary telephone jack. This jack is slightly reconstructed and is placed on the panel in any convenient position. It has the same outward appearance as any other jack, but the set cannot be put in operation unless the proper key is inserted. An ordinary double circuit jack is obtained and the two middle springs removed. Cut a strip of brass or fibre (Fig. A) 1/4 inch wide, 2 1/4 inches long and 1/16 inch thick. At one end drill two holes to correspond to those on the insulating blocks of the jack. Assemble the jack again so that the strip A comes in the center of the plug hole. It is now evident that a plug cannot be inserted in the jack unless it is slotted. The key is made from a piece of 1/4 inch brass rod cut 1 3/4 inches long. A slot should now be cut in one end of this rod 1/16 inch wide and 3/4 inch long. This slot should be cut so that when the rod is inserted in the jack, the strip A will be in line with it. This end of the rod should also be rounded with a file so that it may be easily inserted. Be sure that the key, when inserted, short circuits the two springs of the jack, otherwise the "A" battery circuit will not be complete. A knob of some sort may be placed on the unslotted end to give it a neater appearance or a hole may be bored in this end so that it may be carried on a key ring.

Contributed by Herbert Frosell.

BACK PANEL SWITCH STOP

For the fan who is particular about the appearance of his panel, this switch stop will be a welcome idea. This stop requires no holes in the panel and may be adapted to the majority of the switches on the market.



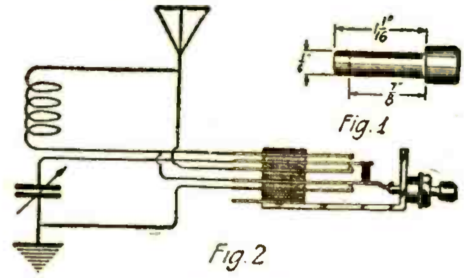
This switch stop is easily made from ordinary bus-bar.

In the accompanying diagram a length of square bus bar A is bent around the collar of the switch lever, B. This bus bar is bent so that the switch will stop at the end points, the bus bar being stopped by a piece of heavy wire soldered to the middle switch point, as shown at C. A length of spaghetti is placed over each end of the stop as indicated at D. This bus bar is soldered to the collar of switch lever.

Contributed by Lawrence Engebretson.

UTILIZING JACKS FOR SWITCHING PURPOSES

Extremely compact and neat multiple contact switches for panel mounting may be made from ordinary telephone jacks. They possess the desirable features of taking up a minimum of panel space, are easier of installation than switches of the more common types, requiring but one hole in the panel for mounting. Most telephone jacks on



By means of this jack the variable condenser can be placed in series or in parallel with the antenna circuit.

the present-day market are equipped with silver or platinum contacts, affording very low resistance at that point.

In order to adapt the jack for use as a switch, it is merely necessary to make a plunger of some insulating material, preferably of bakelite rod, of the approximate dimensions shown in Fig. 1. A hole drilled through the plunger as at "a" and having a small piece of stiff brass wire inserted in it, will prevent the removal or loss of the plunger when in the "out" position.

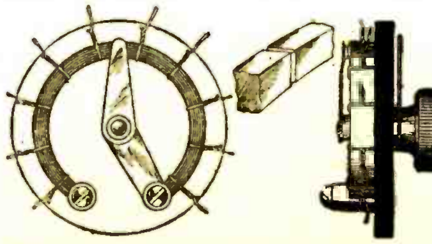
The uses to which such a multi-contact switch may be put are manifold. The accompanying diagram shows the correct method of connecting it for changing the antenna tuning condenser for series or parallel connection, although other uses will no doubt suggest themselves to the experimenter. A further advance in panel-neatness may be attained through stamping the head of the plunger with lettering corresponding to the use to which the switch is put, rather than engraving the panel surface.

Contributed by John M. Avery.

BACK MOUNTED SWITCH

A rotary, behind-the-panel switch may be made very easily from an ordinary filament rheostat:

1st. Remove the resistance wire from the fibre.



This rheostat has been converted into a back mounted panel switch. Pieces of heavy wire serve the purpose of switch points.

2nd. If a six tap switch is to be made, mark off the fibre into eleven equal parts.

3rd. Beginning at one end of the fibre, cut out the front edge every second part the approximate diameter of No. 18 wire.

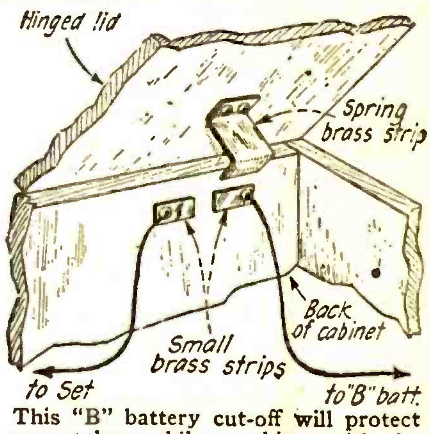
4th. Wind these spaces with No. 18 hard-drawn copper wire, leaving one inch for soldering at one end of each section, projecting outside.

5th. Reassemble the rheostat, and solder inductance taps to these extensions.

Contributed by J. C. Munday.

AUTOMATIC "B" BATTERY CUT-OFF

With vacuum tubes at $$! each, it would seem worth while that the owner of a multi-tube set take precaution to see that the "B" battery voltage is not accidentally applied to the filament circuit. When the modern bare bus-bar wiring is used in a set it is highly important that the "B" battery be disconnected while changing tubes or making adjustments, for the slip of a screw-driver or pliers can cause a short circuit that may cost the owner several new tubes. No protective method was followed by the writer, until one day it was forgotten, with the result that two



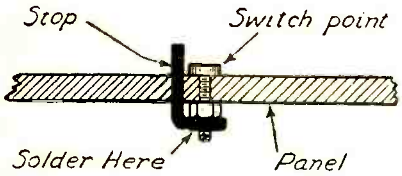
This "B" battery cut-off will protect your tubes while working with the wiring.

tubes went west. My set is now equipped with the automatic "B" battery cut-off, as illustrated. A few pieces of spring brass and a little time was all that was necessary, and I can now change tubes or make adjustments without fear of endangering the tubes, for the act of opening the cabinet lid automatically disconnects the "B" battery, while upon closing it the set is again ready for action. The diagram should be self-explanatory. Two small brass plates are screwed to the back of the cabinet. They are spaced about 1/4 inch apart, the one being connected to the "B" battery, while the other is wired to the "B" battery binding post of the set. A spring brass strip of the shape shown is fastened to the hinged lid in such a position that when the lid is closed it will close the circuit between the two brass strips. All of the parts may be small and neat, and when mounted near the corner of the cabinet are not in the way. The owner of a set so equipped need no longer be in fear of burned out tubes.

Contributed by John J. Carl.

A NEAT SWITCH STOP

In building a receiver wherein a switch stop is required, it will not be necessary to purchase one, as the following scheme may be used. This stop consists of a piece of No. 14 bare copper wire or bus-bar, bent into the shape



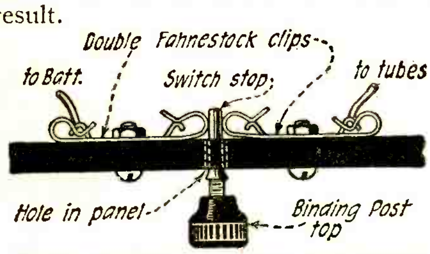
A neat switch stop made of a piece of heavy wire.

of an L. A hole is drilled through the panel close to the last switch point, and the piece of bent wire is inserted from the rear, as shown. It should be securely fastened to the switch point by soldering. This very simple switch stop will admirably accomplish the purpose for which it is intended and will not detract from the appearance of any cabinet.

Contributed by Herbert Forsstrom.

HOME-MADE BATTERY SWITCH

It may seem at first rather a startling statement to say that a battery switch may be constructed with two clips, two machine screws, a switch stop and an old binding post top, yet it has been done—and an efficient switch was the result.



Battery switch made from two double Fahnestock clips and a switch stop.

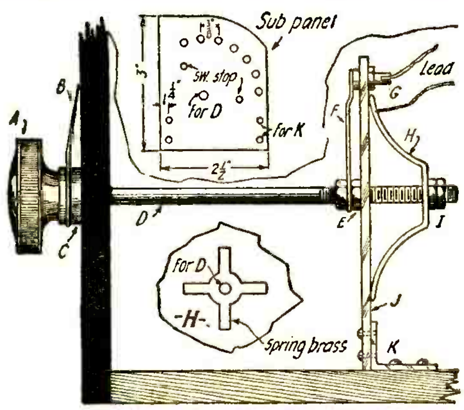
Two double Fahnestock clips were mounted end to end, on a panel so that a switch stop would fit snugly between them, thus making a connection. A hole was drilled through the panel large enough to admit the switch stop, to which is fitted the rubber top of the binding post for a handle, as shown in the sketch. The outer ends of the clips are connected to the battery and filament terminals of the tubes.

Contributed by Harold Fraulob.

A BACKMOUNTED SWITCH-LEVER

This switch lever is made from odds and ends found in any amateur radio station or laboratory.

The knob used is any ordinary radio knob which is made either of bakelite or composition, and can be procured at any radio supply house. This knob has a threaded shank into which is screwed a threaded rod about three inches long. On this, according to the diagram, is locked, by means of the threaded collar, an ordinary pointer. The switch blade is made of brass or phosphor bronze about 1½" long, and is held in place by locknuts at the proper distance on the threaded rod. The sub-panel was made of a piece of bakelite I had on hand. The contacts are spaced ⅜" apart on a radius of 1¾" also with the proper switch stops. The spider spring behind the sub-panel on the shaft gives enough tension to make very excellent contacts both for the lever and lead. This spider is made of some springy substance. The sub-panel may be mounted on the base of the variocoupler which made it necessary for me to use brass angles. Care



A unique and practical type of back mounted switch lever.

should be taken that the hole in the panel corresponds to the hole on the sub-panel so as to give excellent alignment and working ease of operating the switch lever.

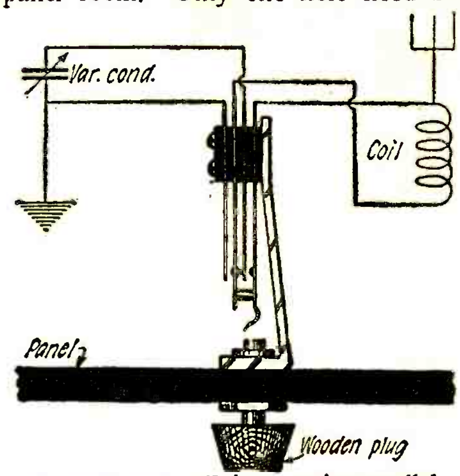
The panel can be engraved where the switch blade makes contact to points.

Contributed by Frederic J. Bruno.

UNIQUE SERIES-PARALLEL SWITCH

In constructing a honeycomb coil set, the diagram of which calls for a series-parallel switch to put the primary condenser in either series or parallel with the primary coil, a very neat job can be done by using a four-spring, two-closed contact jack. The jack should be connected as shown in the accompanying diagram. The change from series to parallel is made by inserting a wooden plug where the phone plug would ordinarily go. If you have an old violin key, this may be cut off and will suit the purpose very well. Another method of making the plug is to cut a small spool in half, shape the cut end of one-half to suit yourself, and insert a short, round stick just the size of the hole in the spool. The plug may be enameled black.

This arrangement not only works well, but requires a very short time for installation, and takes up very little panel room. Only one hole need be



A neat and efficient series-parallel switch can be made by employing a jack of the type shown.

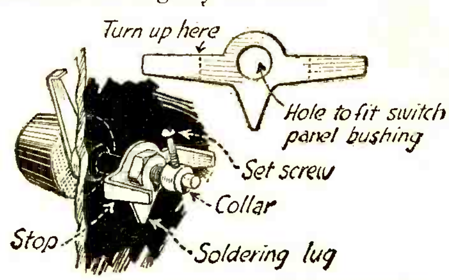
drilled in the panel instead of several as for the ordinary series-parallel switch, and the result is much nicer in appearance.

Contributed by S. Starr Walbridge.

A BACK PANEL SWITCH STOP

A back panel switch stop which I have used with great success on several sets can very easily be made from a small piece of sheet brass or copper cut as shown herewith.

The bottom projection is left for a soldering lug, while the other two, bent up at right angles on the dotted lines, serve as stop for the set screw on the switch. No dimensions are given as they will be determined by the kind and size of switch it is used for. With the shape shown, the switch will be allowed to cover almost half a circle. For more or less switch points the shape will have to be slightly different.



A neat and effective back panel switch stop.

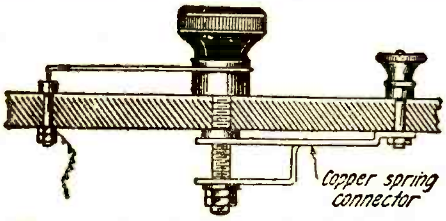
It is best to leave the piece of brass (or copper) flat until it is put on the panel as the nut holding it and the panel bushing can be put on much easier. The projections can then be bent as shown.

Contributed by J. L. McGuire.

PERMANENT CONTACT FOR SWITCH

A common trouble in some receiving

sets is a loose or broken connection on movable parts. This suggestion for the design of a permanent spring contact switch is made to eliminate this trouble. The essential part of the switch is a copper strip connecting the lever to the binding post. This does away with a wire connection which is apt to become loose or broken. The contact of the copper strip is maintained by bending it in the manner shown to form a spring action, and it is held in place by lock-nuts. This arrangement prevents loosening of the switch. I have used this very successfully and have found it very practical and efficient.

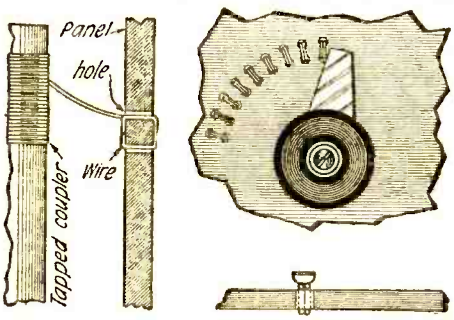


Permanent contact is maintained with this type of switch. The piece of bent copper connects the center of the switch to the binding post.

Contributed by Frederick Ayer.

SAVING SWITCH POINTS

In a set I made, I got along without switch points, by making my taps long enough to run through a small hole in the panel and then back through the panel again, without cutting. When the wires are in place, the holes can be plugged, but the loops are not cut off in back; in this way there is no joint in the circuit at all. The wires can be countersunk so that the switch will slide over perfectly smoothly.



This scheme does away with the use of switch points. Loops of wire are used instead.

Contributed by F. C. Galbreath.

AN IMPROVED SERIES-PARALLEL SWITCH

I herewith describe a new type of series-parallel switch which is easily made, is very neat, and eliminates much of the panel drilling necessary with the usual type. It can be made at a very small cost, as most of the materials needed are in the collection of every "bug."

As can be seen from the drawings, the switch has only one blade, but this is divided into two sections by the insulating block "A." This is made of fibre as the blades are riveted to it by small brass rivets. Hard rubber and other similar materials would be liable to split during the process. The drawings are quite clear. Blade B-1, is connected electrically to the shaft of the switch, while connection is made to B-2, as shown at "C," Fig. 2. This can be a switch point cut down and a small piece of flexible wire soldered to it and the blade B-2. Be absolutely sure that B-2 does not make connection with B-1, as the switch will not work. DD are two fibre washers; this material is used here to prevent the short circuiting of the blades by the brass rivets.

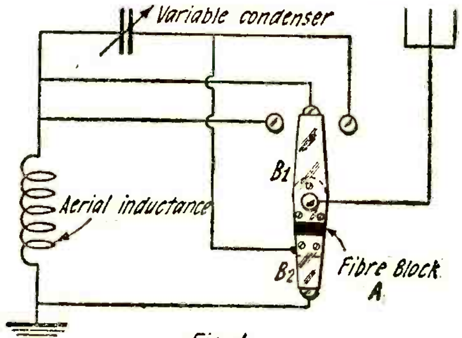


Fig. 1

Circuit connections for the series-parallel switch.

When the switch is mounted and wired, as shown in Fig. 1, the center position is "Parallel," left-handed position "condenser out," and right-hand position "series."

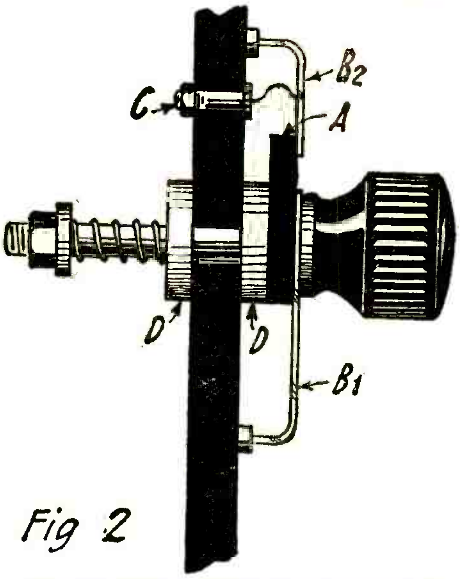


Fig 2

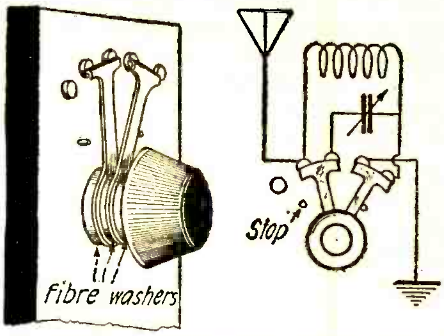
Details of the simplified series-parallel switch. Note that C connects directly to arm B2.

This switch can also be arranged for back of panel mounting.

Contributed by John A. Warr.

A CONVENIENT SERIES-PARALLEL SWITCH

One variable condenser will do the work of two when used with a series-parallel switch, easily made from the ordinary knob and switch points used for the coupler circuit.



A good series-parallel switch that takes up but little space on the panel. The two contact arms are insulated from each other by fibre washers.

In one position, the switch connects the condenser in series with the antenna circuit and in the other position it connects the condenser in parallel with the aerial inductance. The first position has the effect of shortening the natural wave-length of long aerials so that broadcast programs can be more readily picked up, or changing the broadcast receiver into a code receiver for amateur wave-lengths. The parallel connection tends to increase the natural wave-length and to make tuning sharper.

In addition to the five switch points it is necessary to make two switch blades, each wide enough to make contact with two of the points at a time. The two blades are insulated from each other, but as no connection is made to the screw which holds the knob, one blade can make contact with the screw in the ordinary manner.

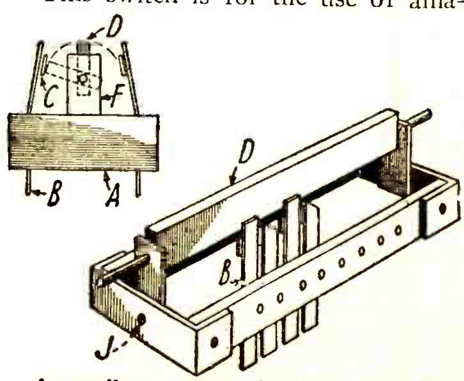
To insulate the other blade, make the hole large enough so that the blade will not touch the screw and then separate the two blades by a fibre washer. Both blades should be as narrow as possible where they come near to each other, to avoid a capacity effect.

The switch can be mounted on any panel. It takes up but little room and is neat in appearance.

Contributed by Paul McGinnis.

A DOUBLE-THROW FOUR-POLE ROTARY SWITCH

This switch is for the use of ama-



An easily constructed switch that will serve any number of purposes. It has the advantage of all contacts being stationary.

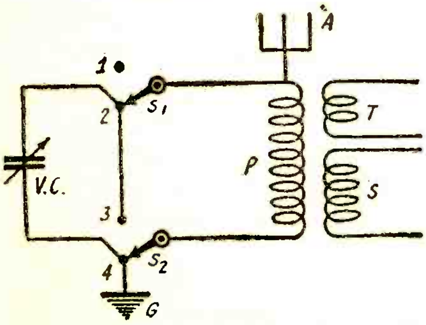
teurs who have not much money to spend on the different parts necessary for a radio set, in which class I belong. This switch works perfectly on my set. It can be put to any number of uses such as switching, from a short to a long wave receiving set or for switching from detector to one or two stages of amplification. It consists of a few pieces of insulation material together with a small quantity of brass stripping and a few screws.

The different pieces are lettered in the drawing: D and G are pieces of insulating material such as hard rubber, bakelite or any other similar insulation. A and F are pieces of brass, B and C are also of brass but of the spring type. H is a small brass rod for shelf D to rotate on. No dimensions are given in the drawing, for the nature of the instrument does not require any particular specifications. It can be built to any size desired so as to conform to any particular use that it may be put to. B and C are used as contacts; there are eight of these on each side of the switch, screwed separately on the arms G. These are bent toward the rotating arm D so that when it is tuned, it will press spring C against spring B to make firm contact. As seen, the upper parts of springs C are bent at an angle so that they extend in front of the upper portion of springs B. This bend may easily be accomplished with a pair of pliers. The rest of the construction is easily determined, as the drawing is self-explanatory.

Contributed by Joseph H. Thompson.

SUBSTITUTE FOR A SERIES-PARALLEL SWITCH

In constructing a honeycomb coil set, the diagram of which called for a series-parallel switch in the primary circuit in order that the primary condenser could be thrown at will in series,



A very simple type of series parallel switch that is easily mounted upon a panel.

parallel, or cut out entirely, I was confronted with the choice of a delay of several days to procure a regular four-contact switch, plus the extra expense, plus the very particular job of getting the switch points exactly right for this type of switch, or making a substitute with such material as the average fan usually has on hand. I solved the difficulty by using two ordinary switches and four switch points, as per the diagram.

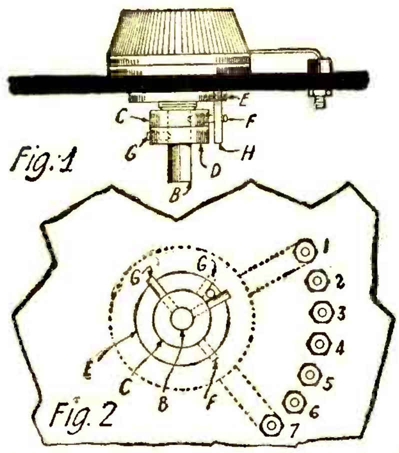
Nos. 1, 2, 3, and 4 are switch points, No. 1 being blank and the rest wired according to the diagram. S^1 and S^2 are ordinary switches. With S^1 on 2 and S^2 on 4, the condenser VC is in parallel. With S^1 on 1 and S^2 on 3, the condenser is in series and with S^1 on 1 and S^2 on 4, the condenser is cut out entirely.

This idea will work equally well with any of the ordinary forms of coils, honeycomb, spider web or vario-coupler.

Contributed by Charles E. Wells.

REAR PANEL SWITCH STOPS

Thinking switch stops are unsightly and detract from the appearance of a receiving set, I devised a unique method



This is a good stunt and not a hard one to accomplish. The switch stops are mounted on the shaft.

of eliminating them. It is very simple, the only auxiliary parts necessary being three short lengths of brass rod, and an extra collar (D in Fig. 1), from a discarded switch.

The set screws are removed from the collars (C) and (D), and two rods, after being threaded, are substituted. In the nut (E) a hole is drilled and threaded, and the third rod threaded and screwed in. Be sure that this hole is outside the circumference of the collars (C) and (D) when the switch is put together. It is assembled as shown in Fig. 1.

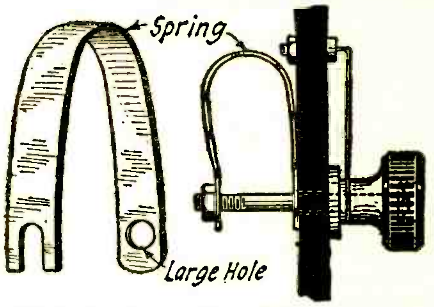
This switch may be adjusted to stop on the last of any number of switch points, by using the following instructions: Tighten the rod (F) of the collar (C) in the same plane as the switch lever, as in Fig. 2. The lever is put on the first point and the nut (E) turned until the rod (H) touches (F). The bushing is then tightened from the front side of the panel. Turn the lever to point 6, or 10, or whatever it may be, and tighten the rod (G), being sure it touches the rod (H), as in the diagram.

When the lever is turned to point 1, the rod (F) colliding with (H) prevents its sliding off the point onto the panel, while the rod (G) stops the lever at the right place at the other extreme.

Contributed by J. C. Munday.

AN EFFICIENT CONTACT SWITCH

If you have been using one or more switches on your panel, you undoubt-



Method of mounting efficient contact switch.

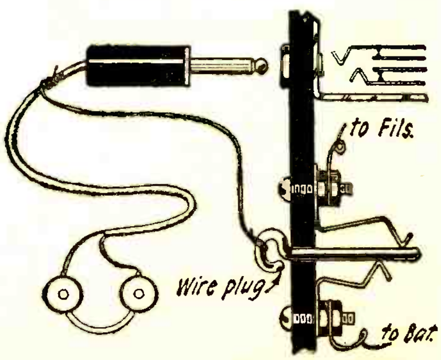
edly know the inconvenience and trouble caused by a bad contact in the switch assembly. Herein is described a switch which can be depended upon for a good contact at all times. The only new feature incorporated in this instrument is a piece of spring brass bent and cut, as shown in the diagram. Any switch having a fairly long shaft may be used with excellent results. The pressure of the switch arm may be controlled by the thickness of the brass spring and also the degree of curve which the spring is made to take. The pressure may also be varied by unscrewing the nut on the end of the switch shaft. Contact to this switch may be made directly to the brass spring. With this switch in service you will no longer be troubled by loose contacts.

Contributed by Bert E. Parsons.

A CONVENIENT FILAMENT SWITCH

It is the habit of most people to forget to turn off the vacuum tubes if a filament switch is used. Naturally, when the tubes are left burning, the storage battery is exhausted in a short

(*Continued on page 92*)



Do you ever forget to turn the filaments of your tubes off? If so here is an arrangement that will make up for your forgetfulness.

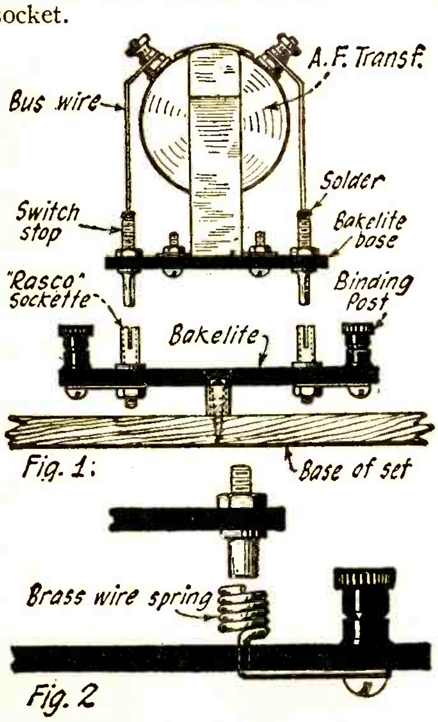
TRANSFORMERS

It is possible to make your own transformers. Discarded spark coils will come in very handy and you will be surprised to see how little time it takes to make good instruments.

A QUICK-CHANGE A. F. TRANSFORMER

This article is a description of a method whereby the formerly immovable A. F. transformers in a receiving set can be moved from one set to another as quickly as a vacuum tube and without disturbing any wiring or loosening and tightening any nuts or binding posts. This arrangement makes the purchase of more than two or three transformers unnecessary, no matter how many different receiving sets the experimenter may use.

The scheme, as can be seen from the drawing, consists of mounting the transformers upon separate, identical bases of bakelite or formica on which four contacts made from switch stop pins are fastened. The contacts are wired to the terminals of the transformers. If different makes of transformers are used, be sure the G P B+ and F terminals are wired to corresponding contacts on the bases to prevent reversed connections as the transformers are moved from socket to socket.



A quick transfer of A.F. transformers for test is possible with this arrangement.

The sockets consist of pieces of formica or bakelite cut slightly larger than the transformer bases. On each of these are fastened four binding posts and four "Rasco Sockettes" (small size). If the "Sockettes" cannot be obtained, cord tip jacks which will accommodate stop pins or the arrangement shown in Fig. 2 may be used.

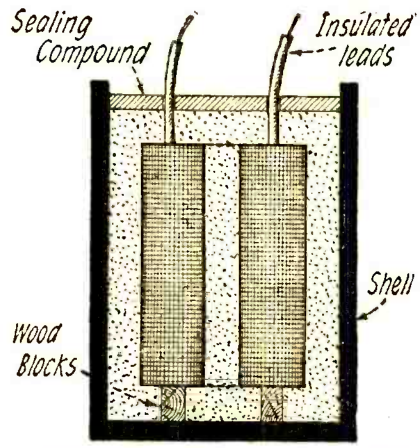
To avoid placing the transformers in the sockets incorrectly, do not arrange the contacts in a square or rectangular formation, but place the primary contacts closer together than the secondary contacts.

This idea is also useful in making comparative tests between different transformers, and also the best position in the circuit for different ratio transformers.

Contributed by C. T. Hagerstrom.

CORES FOR TRANSFORMERS

I have found that in building transformers and chokes, the core often causes more trouble than the windings.



A transformer with a closed core composed of powdered iron. This helps to simplify the matter of construction.

Whatever material is at hand must be used or expensive electrical sheet bought and cut. If ready-made core is used the windings must be made to "go in the space," often at a sacrifice of capacity. When used in radio work, sheet or wire cores can also cause trouble, strong lines of force traveling between transformers or chokes.

The solution of most of these difficulties is the use of powdered iron cores. This suggestion may at first sound preposterous, because of the apparent impossibility of obtaining the powdered iron for such a core; but in reality it is a simple matter, an excellent substitute for the unobtainable powdered iron being found in any machine shop, structural iron shop, or garage, this being the fine grindings from the abrasive-wheels. While this material may be ground from hard steel it is really very soft due to cooling from white heat at the wheel to normal at the floor.

This material has all the advantages of powdered iron and is far superior to sheet and wire core with the added advantage of low cost, most shops throwing it out as scrap. But above all, it is efficient, it fits the space meant for it, and it prevents stray flux.

To make use of this type of core it is only necessary to see that the coils wound about a fair sized central opening are of a size to leave at least ¼" space between them and the case on all sides, that they are firmly wound, well taped and impregnated with well insulated leads brought out. This unit is then placed in the shell, the end resting on two small blocks of wood which provide space for the core to completely enclose the coil. The shell can be a small tin can or a hard rubber, bakelite or fibre tube plugged at one end. The filings, which have been previously dried to remove all oil and moisture, are then tamped in around and on top of the coil, entirely surrounding it with a perfect path for the magnetic circuit. When the core has been well packed melted paraffin or other sealing compound is poured on and allowed to soak in, which completes the assembling of the transformer or choke.

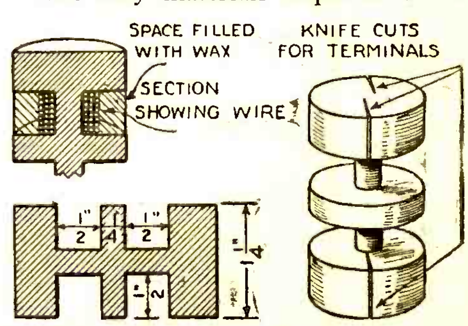
This type of core adapts itself readily to any kind of coil that the experimenter may have occasion to build, and has been tried out successfully on radio chokes and transformers and even on small welding transformers, living up to expectations in every case.

Contributed by Charles B. Neill.

A RADIO FREQUENCY TRANSFORMER

For those fans who want to experiment with a combination of tuned and untuned radio frequency amplification, with a view to a reduction of the number of controls on their receivers, here is an untuned radio frequency transformer that can be made easily, quickly and cheaply, and mounted anywhere in a jiffy.

The only materials required are a



By placing the turns of a transformer on a candle cut as shown above, a simple and inexpensive coupling device will be constructed.

tallow candle—regardless of previous condition of servitude—and a spool of enameled copper wire, any size from No. 24 to 30.

Cut off a piece of the candle, preferably a large-sized candle, to about three inches in length. Now cut two adjacent slots, as shown in the illustration, all the way around the candle, to a depth of about half an inch, being careful not to cut the candle in two, nor to break down the quarter-inch partition between the slots.

Now wind from 150 to 175 turns of wire in each slot, bringing out the terminals through small knife cuts at either end of the piece of candle. After winding, light the piece of candle that was left and drop the hot paraffin over the knife cuts and over the windings, to serve as a binder.

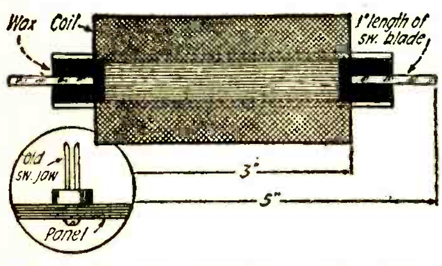
Some experimenting may be required to determine whether or not the leads to one side of the transformer should be reversed, but this is easily effected. To mount this transformer, hold a match under one end of it until it begins to melt and then stick it onto any part of the basewood that is convenient.

Contributed by Frank Savage.

FIFTY CENT CHOKE COILS FOR AMPLIFIERS

When the vibrator points stick and burn, and Henry starts bucking, the fond owner, after coaxing his pet to the nearest garage, is often told that a coil is burned out and is sold a new one on the spot. As a result I have been able to get coils with the secondaries in perfect condition for fifty cents each.

I have built several choke coil amplifiers, using Ford coils for the chokes,



A choke ccil amplifier made from Ford coil secondaries.

and have found them more efficient than transformers, and while the coils can be used as they are, they are rather bulky, and if the following directions are followed a neat appearing coil can be turned out that takes up very little room and can easily be mounted on the panel.

Remove the wood case from the coil and carefully chip off the wax insulation from the secondary, working very cautiously as the last of the wax is removed. It will be found that the secondary is wound in two pies separated somewhat more than an inch, with cardboard tube insulation between primary and secondary. After being sure the connection between the two coils of the secondary is in good condition, the two sections should be slid snugly together on the cardboard tube.

The primary and iron core should now be pulled out of the tube, and the ends of the tube cut off, leaving about one-half inch projecting from each end of the secondary.

The primary winding is now removed from the iron core, and the core itself is cut off so that it is a trifle shorter than the secondary windings. It should now be wound with tape to take the place of the wire removed and inserted in the cardboard tube. A little of the wax is now melted and poured in each end until a layer about one-eighth inch thick is formed.

Two pieces one inch long are sawed from an old switch blade. The two free ends of the secondary winding are now threaded through holes punched in each end of the cardboard tube and soldered to the pieces of switch blade. The two pieces are then inserted in the tube as far as they will go, taking care to have them in line, and hot wax poured around them until the cardboard tube is full. Several turns of Empire paper are glued around the secondary and the coil is finished.

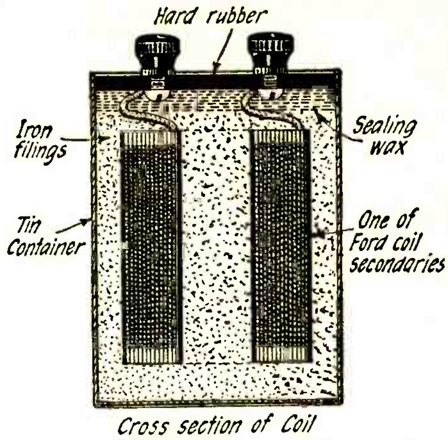
For panel mounting two switch jaws of the correct height are mounted at the proper distance on the panel, and the coil is snapped into place.

In my opinion a well designed choke coil amplifier will give more volume of sound than one constructed with transformers, and much less distortion.

Contributed by E. I. Henninger.

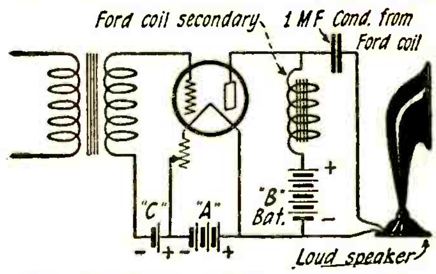
A POWER AMPLIFIER CHOKE COIL

Many who wish to build a power amplifier find it difficult to procure a choke coil of the proper size. Get an old Ford coil and carefully remove one of the secondary coils. Solder heavier wires to the terminal and completely cover these wires with spaghetti. Cut a circle about 1¾ inches in diameter from an old storage battery case or a piece of bakelite or hard rubber panel. Mount two binding posts on this and attach the terminals of the coil by soldering to the two screw heads. Bend a strip of tin to make a cylinder 1¾ inches in diameter; crimp one end, slip the hard rubber disk in against the crimped end and pour sealing wax or paraffin over the binding post screw heads. Take a permanent magnet to the nearest machine shop and with it gather up the fine iron filings around the emery wheel. Pack these filings tightly around and in the center of the coil, which is in the tin cylinder. Then fit a tin circle to the bottom of the cylinder and solder in place. Be sure the coil is entirely surrounded by the filings. The coil should also be tested for an open circuit before putting in the tin cylinder. The condenser which is included with the Ford spark coil should also be taken out and used in series with the plate of the tube and the loud speaker, as shown in the diagram. When using this circuit high



Details of the power amplifier choke coil made from Ford spark coil secondaries.

voltages may be used on the plate of the tube without fear of demagnetizing



How the choke coil is connected in the power amplifier circuit.

the magnets or burning up the windings of the loud speaker.

Contributed by George B. Hostetter.

A HOME-MADE AUDIO FREQUENCY TRANSFORMER

The accompanying photograph shows in detail the component parts and completely assembled audio frequency transformer, made from that old standby of the amateur, the discarded Ford spark coil.

Very little, if any, charge is made for the old coil by garage keepers.

The principle of utilizing spark coil secondaries is not new, but the method described herewith, which eliminates all guess work and simplifies construction, should commend itself to every novice or amateur.

The finished coils have been tested out in comparison with three of standard manufacture and deliver results to equal any of them.

Constructional details are as follows: Carefully remove the secondaries from the Ford coil; find both leads to each of them; each secondary has 35 layers of 350 turns each.

Take one secondary and starting with the outside lead remove 28 layers. This will leave a coil of 7 layers for the primary. From the other coil start at the inside lead and remove 7 layers, which will leave a 28-layer secondary.

(*Continued on page* 94)

VERNIER DIALS

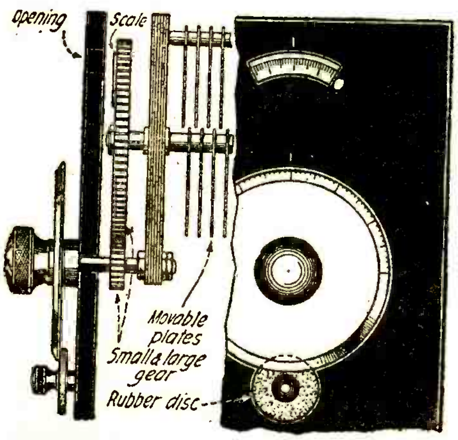
If your set is not equipped with Vernier dials, you can easily construct such dials from the instructions given in this article.

A DOUBLE VERNIER

While tuning in phone signals and C. W., I experienced considerable trouble in adjusting the secondary condenser. The following is a method I devised and have used for some time with good results.

Taking an ordinary 43-plate condenser out of its casing I mounted a large gear wheel on its shaft; the condenser in turn was mounted on the back of the receiving panel in the usual manner with the exception that no shaft protruded. A small gear wheel was mounted on a brass shaft and fitted through the panel so as to mesh with the large gear. This shaft may be centered on the cover of the condenser or other arrangements made for its rear bearing, the panel acting as front bearing. Upon this shaft a 3-inch dial and knob was attached. At the present stage it may be used and an adjustment of 5 to 1 secured. The gears were obtained from a telephone bell ringer, which served the purpose admirably owing to the numerous teeth on the gears.

For much finer adjustment, I fitted another shaft in vertical line with the condenser and dial centers, upon which was mounted a piece of rubber packing in such a manner as to bear friction against the under side of the dial. A small binding post knob was attached to this shaft which further allowed close adjustment, similar to the vernier attachments on the market today. You realize that the dial will turn several times before the condenser has made



This prize-winning suggestion for a double vernier control is very practicable and well described.

half a revolution and in order to know how your condenser is setting, a 180-degree scale is mounted on the large cog wheel and an opening cut in the panel to view the scale.

An illustration is herewith attached to make this description clearer and from the general plan the amateur may devise his own means for mounting the gears and condensers he may have on hand.

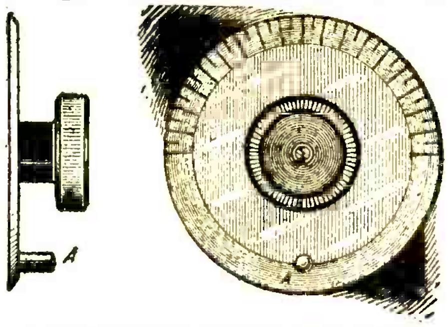
Contributed by Leo Cohen.

CONTROL KNOB

Modern radio has resolved itself into the use of dial indicators on the majority of control panels. While trying out various schemes, I happened upon an idea which I have not seen in any of the radio magazines.

The settings on condensers and variometers is sometimes rather critical and hard to attain with the present knobs unless they are rather large and, on compact sets, the use of large knobs is not to be desired on account of the space they occupy.

In any of the popular type of dials that are being offered today, drill a hole that will pass an 8/32 screw through the dial on the bottom side



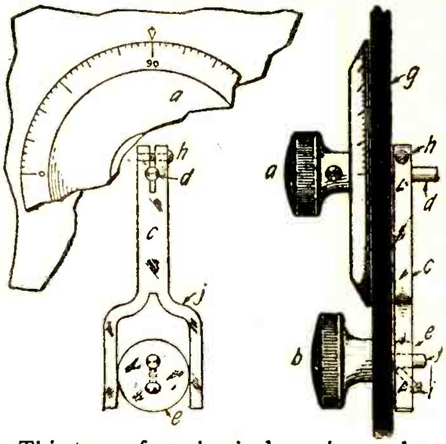
A boon for the amateur who experiences difficulty in making fine adjustments with the regular knob and dial is shown here.

about ¼″ from the edge, as shown in Fig. 1. Insert an ordinary knob similar to the type used on telegraph keys (¼″ in diameter and 1″ long). Fit this into the hole just made through the dial and a method of handling the instruments is obtained that is capable of the finest adjustments. For example, place the thumb on the old knob and the forefinger on the new one which has just been attached and give it a slight twist. The ease with which the instrument will respond is then easily noted over the old method.

Contributed by Ray T. Foster.

A FOOL-PROOF VERNIER ATTACHMENT

The following is a description of an easily constructed vernier attachment that is smooth in its operation and that has no back lash. The customary dial "A" is connected to the shaft "D" by a set screw, said shaft controlling a variometer, variocoupler, variable condenser or other instrument. Most of the instruments are placed about ⅜ of an inch, or more, from the panel, which gives ample room for this attachment. This vernier is made of a piece of brass "C," about ¼″x⅜″ and about 5″ long.



This type of mechanical vernier works very well. Its operation relies on friction and is controlled by a rotating cam.

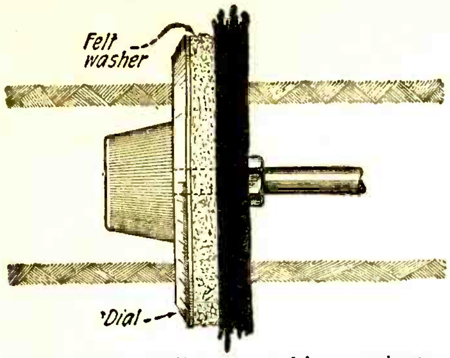
This bar is slotted 2″ along its length and bent to shape, as at "J." At the other end a hole is drilled, slightly larger than the shaft. The set screw "H" at the slotted end is adjusted so that the bar slightly drags on the shaft. The knob "B" has a short shaft, to which is fastened an eccentric piece of fibre. "G" is the panel. Rough tuning is accomplished by rotating the dial, after which a fine adjustment is made with the knob "B." In case there is not room enough at the back of the panel, this arrangement can easily be mounted on the front so as to be between the panel and the dial.

Contributed by Bodo Ta-Bell.

A SMOOTHING DEVICE FOR DIALS

The radio enthusiast who has been annoyed by noise originating from his dial scraping on the panel, when he finds it necessary to turn same, will find this hint valuable. By simply glueing a piece of felt ⅛″ thick, on the inside of the dial this nuisance will be abated. It is wise to make this washer about ½″ smaller in diameter than the dial itself. This will prevent the felt from being seen from the front. By making use of such a washer it is also possible to prevent the condenser or anything else, from moving out of place.

When attempting this trick, first take the dial off the panel. Glue on the washer, put the dial back on the panel and after seeing that it fits tight against the panel, make it fast by screwing down the little set screw, incorporated in the dial for this purpose. It will be surprising how smooth and noiselessly the dial may be revolved. The revolv-



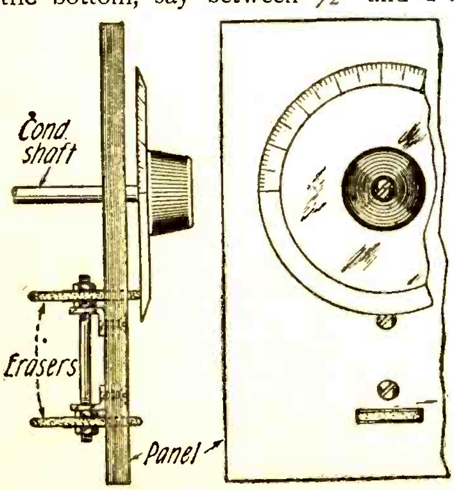
The noise of dials scratching against panels is very annoying. Here is a good means of preventing it.

ing of the dial will not cause the felt to loosen and become annoying. It is a practical idea and the one who is interested enough to try it out, will wonder how he ever got along without it, and it will mean but a hardly noticeable expense.

Contributed by C. A. Reberger.

A RUBBER TIRED VERNIER ATTACHMENT

This vernier can be used in conjunction with condensers, variometers, tickler coils or any other apparatus requiring a fine adjustment and controlled by a dial. The materials required for the construction of this vernier are: two 5c. round erasers, (with metal centers) one brass rod threaded at both ends with necessary nuts. The threaded rod should be of such a diameter that it will slip easily through the holes in the erasers. Two right-angle brackets drilled for the rod and machine screws are used as shown in the sketch, and two 6/32 flat-headed machine screws and nuts to fit same. The drawing clearly shows the idea of construction, but a few words will not be out of place. A slot slightly larger than the width of the eraser is cut in the panel at a convenient distance from the bottom, say between ½″ and 1″.



A very good idea in the way of verniers. By way of suggestion, the lower eraser could as well be a wooden or hard rubber disc.

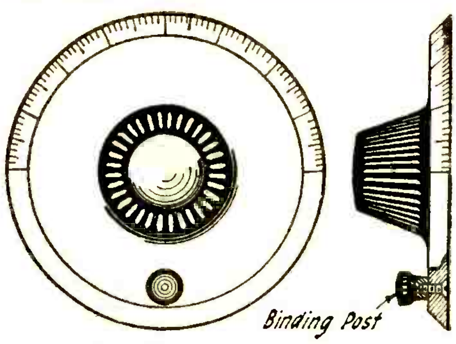
This slot should be long enough to allow the eraser to protrude about ⅜″ without rubbing the sides of the slot. Then, in line with this slot, a similar one is cut in the panel, behind the dial and near to its edge, as shown in the sketch. Holes to mount the angle brackets are drilled and countersunk to accommodate the flat-headed machine screws.

The erasers are held in place by locking one nut against another on the shaft. If the upper eraser is too large and causes the dial to be placed too far from the panel, it may be cut down by using a sharp razor blade. As the size of panels and dials vary, no dimensions are given here.

Contributed by Sidney Bamford.

AN EFFECTIVE DIAL ATTACHMENT

Many people have difficulty in accomplishing the delicate tuning necessary to pick up DX broadcast stations.



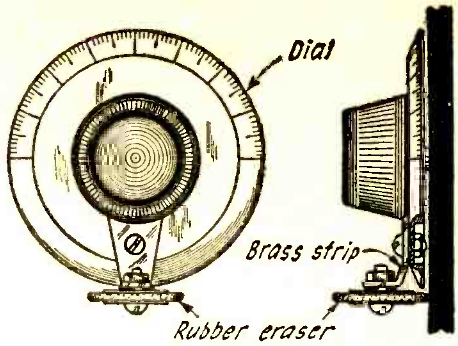
A small binding post mounted close to the periphery of a knob and dial will serve as a vernier control.

If a binding post cap, of the moulded type, is mounted on the dial near the circumference, as shown in the accompanying sketch, it will prove very effective in making fine adjustments. All that is necessary is to drill a small hole through the dial into which a machine screw of the correct size and length to take the binding post cap can be fitted and screwed up tight against the dial facing.

Contributed by Louis Sussman.

A FIVE-CENT VERNIER

Any number of vernier attachments have been described in various radio periodicals, but most of them are either too complicated in construction or have a mechanical drawback. The vernier attachment I am to describe cost me 5c and as can be seen from the illustration, is simplicity itself so far as operation is concerned. The following parts are necessary for its construction: Two small brass bolts taken from dry cells, two nuts to fit these bolts, a scrap of sheet brass and one 5c round eraser. The drawings are self explanatory. Fine adjustment is made by rolling the eraser with the thumb. This vernier does not require any hole in the panel and the knob and dial may be moved to



A sidewise movement of the thumb on the eraser affords a very fine adjustment of the position of the dial.

another set without removing the attachment. *Contributed by Andrew Tou.*

A "SILVER" DIAL

As many amateurs wish to construct as much of their apparatus as possible I am presenting this hint so that any beginner may, with ease, make silver dials.

Secure a sheet of stiff brass, cut it to the shape desired with whatever diameter is wished, and clean it top and bottom with steel wool until it is bright. Having drilled the shaft and supporting screw holes for the knob, make a solution of sulphuric acid and rain water, using three parts of acid to one of water. Pour the acid into the water slowly, employing a porcelain bowl as container. Dip and wash the disc in this solution. Melt some tinfoil in a clean pan and, when the foil has completely melted, dip the brass disc in it, allowing it to remain for about 15 seconds. Place it in a pan of water to cool.

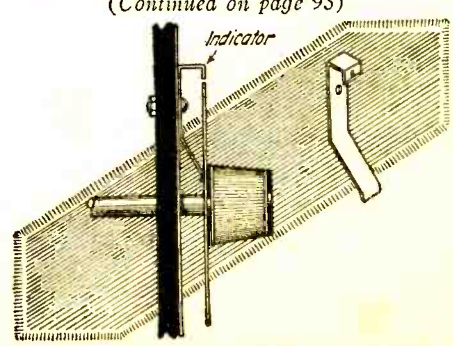
The finish is made by rubbing surfaces with a small piece of clean cloth until the "silver" shines up brightly. The marking may be done with a pen and good ink, or indentations may be stamped in the brass disc before silvering. This treatment may be applied to all the brass work on the set with a resulting neatness in appearance. It would be well to give each part a heavy coat of lacquer or good varnish to prevent tarnishing.

Contributed by W. C. Utz.

COMBINED INDICATOR AND SHIELD

The accompanying drawing is of a

(*Continued on page* 93)



By grounding this indicator which rubs against the inside of the dial, body capacity effect is eliminated.

Lightning Protectors

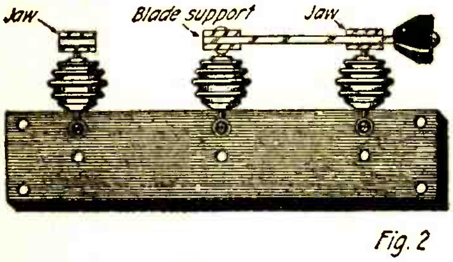
(*Continued from page* 49)

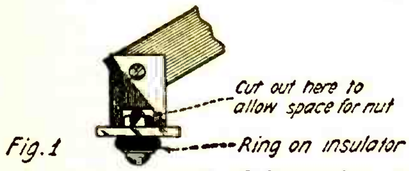
the base by 1/8-inch brass bolts, nuts and washers. The jaws and blade are attached to the other end of the insulators in like manner. Looking down on the finished switch, it should resemble Fig. 2.

Contributed by Martin Walter, Jr.

LIGHTNING SPARK GAP

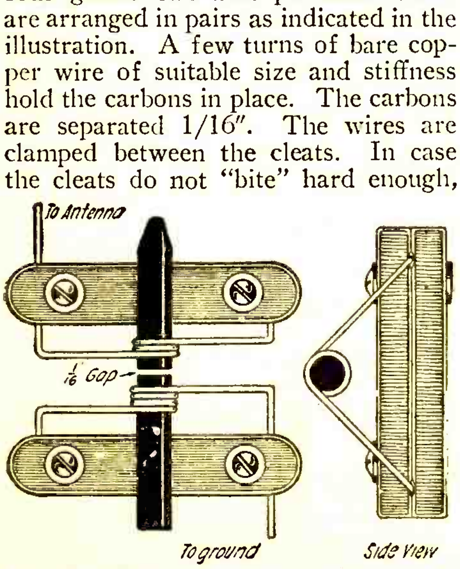
The protective device shown in the drawing is easily constructed and will conform to the rules of the underwriters for receiving stations. It will also provide added protection to the lightning switch of the transmitting station.





A simple method of improving the efficiency of a lightning switch.

It consists of two short pieces of carbon such as are thrown away daily from street-lamps. Some of these are copper plated, which are preferable; four glazed two-wire porcelain cleats are arranged in pairs as indicated in the illustration. A few turns of bare copper wire of suitable size and stiffness hold the carbons in place. The carbons are separated 1/16″. The wires are clamped between the cleats. In case the cleats do not "bite" hard enough,



A lightning spark gap is easily made with four porcelain cleats and two pieces of carbon.

wind the wires with tape. The whole outfit need not cost over fifty cents and most of the material can be found in any amateur junkbox.

Contributed by Harris C. Harvey.

Loud Speakers

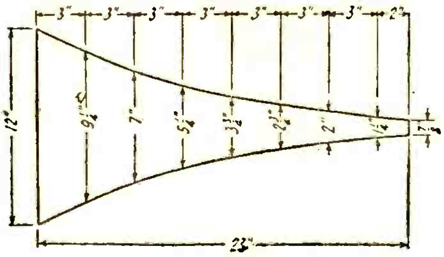
(*Continued from page* 53)

AN INEXPENSIVE LOUD SPEAKER

Any loud speaker consists of two fundamental units: First, a means of changing electrical energy into sound; and second, a means of amplifying the sound so produced. The first unit is, in most cases, an electro-magnetic telephone or other device operating on similar principles such as an electrodynamic or moving coil instrument. The amplifying member is, almost universally, some form of horn.

In an instrument where low cost of construction is to be considered a phone should be used which is well adapted for the sound producing mechanism. It should be a modified electro-magnetic device that is capable of clear reproduction, and can handle all the energy from an ordinary receiving set without distortion.

The horn can easily be constructed at home. A square horn was selected in the present case because it was easily made and gave best results. No greater



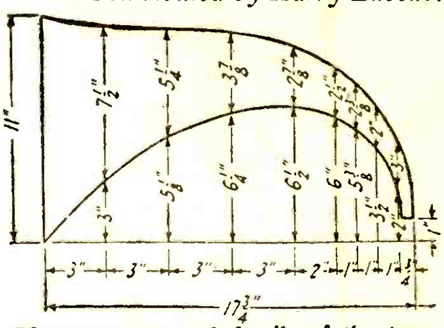
Measurements and details of the sides of the loud speaker horn.

endorsement for the square horn is necessary, considering that some of the best phonographs on the market are using it. The pattern is shown in Fig. 1. It can be made of fibre or cardboard about 1/32 to 1/16 inch in thickness. The top, bottom and two sides are cut out as indicated and are fastened together on the outside with gummed art tape. This tape has great adhesive qualities and makes the horn look attractive when finished. It can be secured 1/2 inch or more in width and comes in black and other colors. The cardboard can be bought in various shades and can be made to harmonize with the color scheme of the room.

The connection between the phone and horn must be air tight or the volume of the loud speaker will be greatly reduced. To secure this, a single phone-adapter, of which there are many on the market, is used. The author used a rubber adapter. These are equipped with a brass insert, which is fastened in the horn with a mixture of paraffin and sealing wax. Then the phone with the rubber part can be taken off if desired.

The tone chamber of this horn is about two feet long. This is about as small as can be used with safety. A horn of this size will respond to all tones and will provide ample volume, whereas a smaller one will not function on low notes and will give the music a sharp ring instead of the natural mellow sound.

Contributed by Harry Lubeke.



Measurements and details of the top and bottom of the loud speaker horn.

Loop Antennae

(*Continued from page* 51)

of the cross support beginning at the first or inner saw-cut. No. 22 D.D.C. wire is wound tightly in a clock-wise direction to the outer edge. The loop is then turned over and the wiring continued in an anti-clock-wise direction back to the first saw-cut on the opposite side. Two binding posts are fastened to the cross supports to which the ends of the wire are connected. A strip of wood is fastened across the two opposite legs of the cross supports. A hole is bored of corresponding size in the center of the bottom protecting piece and a dowel is inserted to permit the loop to revolve.

Contributed by Cecil Guyatt.

A USEFUL LOOP ANTENNA

The following device, if properly made, will prove to be a great help to the amateur experimenter:

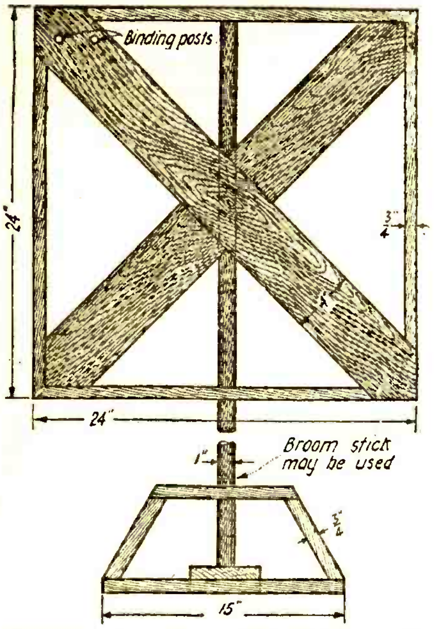
This antenna can be used primarily as a direction-finder by simply turning the frame until the distant station can be heard the loudest. Incidentally, amateurs will find this sort of loop antenna very easy to move, and it can be taken in the automobile with a portable set when you go camping.

First, get some boards 3 x 3/4 for the stand, and some 4 x 3/4 for the frame. All measurements are given on the diagram. By following the drawing it will be easy to assemble it. After it is assembled it is stained. Then apply one or two coats of varnish.

The winding consists of twenty-five turns of No. 18, single cotton-covered wire. Binding posts are attached to both ends of the wire in a convenient manner for connection purposes.

After the wire and binding posts are on, give it one more coat of shellac to hold the wire in place.

In simple language the theory underlying the design and action of such a loop or coil antenna is as follows: In the first place the ordinary antenna, whether indoor or outdoor, acts pri-



Secure a few pieces of well-seasoned hard wood and build yourself a useful loop antenna as Mr. Weiss has done.

marily as a condenser. The earth or ground connection constitutes one plate and the wire or wires of the antenna the other plate. On the other hand, the loop must be considered as practically nothing but an inductance, consisting usually of one or more turns of wire in spiral or box form.

Contributed by Carlyle Weiss.

Crystal Detectors

(*Continued from page* 35)

DIFFERENT TYPES OF CRYSTALS

Detectors using galena or lead-sulphide are almost entirely used to-day to the exclusion of other kinds of crystals. Although galena is more sensitive, it is considerably more difficult to keep in adjustment. Some other kinds of crystals are easier to adjust even though they are not quite so sensitive. Galena or lead-sulphide require a very slight pressure of the cat-whisker.

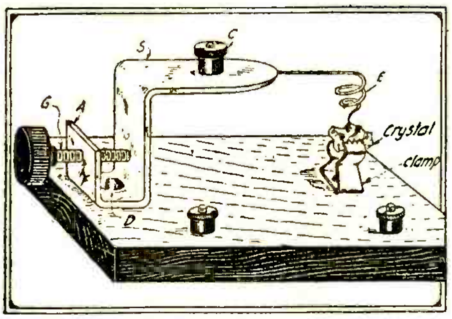
Another type of crystal detector is one which combines the rectifying effects of two different crystals; one of bornite and the other of zincite. The bornite crystal takes the place of the cat-whisker. With this arrangement it is invariably possible to find a sensitive spot quite easily.

Another form of crystal detector is one which utilizes carborundum. This is not so sensitive, but is very stable in operation; a rather heavy contact is used and an ordinary steel phonograph needle mounted on the detector-arm is employed. The sensitive spot in the carborundum crystal is found by jabbing the point in various spots until the loudest response is obtained.

Contributed by John Doe.

SIMPLE GALENA DETECTOR

This detector is easily made and is well suited for galena. S is a strip of metal bent and cut as shown in which a small hole is drilled at F and a small



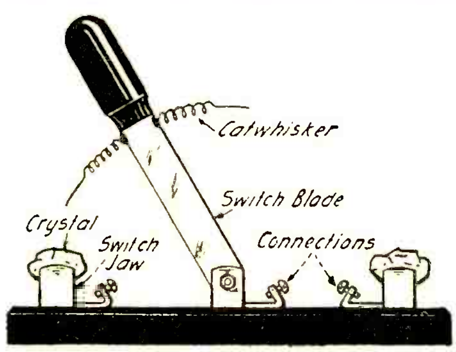
Here you are beginners. This detector will cost but a few cents.

nut A soldered on to admit tension screw G. S may be placed between washers at D so it may be moved sideways. The crystal is held in a light clamp as shown and contact made by the fine wire E which is soldered to S. The adjusting is done by knob C and the tension screw. No dimensions are given as an idea of the size may be obtained from the drawing.

Contributed by Julian Parvin.

AN UNUSUAL DOUBLE CRYSTAL DETECTOR

I have been experimenting with crystal detectors and found the one illustrated to be very simple and convenient. To make this detector I used a single pole double-throw switch. The two contacts were spread slightly; in one I inserted a piece of radiocite and in the other a piece of silicon. On each edge of the knife-blade I soldered



This is a clever idea. A single pole double throw switch is converted into a double crystal detector in the simple manner shown.

a cat-whisker. Connections were taken from either contact on the center of the switch. In this way I could change from one crystal to the other.

Contributed by Sidney Barenblatt.

A DUST-PROOF CRYSTAL DETECTOR

Obtain a bottle with a hole in the bottom such as sold in novelty stores as trick perfume bottles. Then buy a mounted crystal and heat a piece of wire and force into the lead mounting. The cat-whisker is a piece of brass wire about 24 or 26 gauge, twisted around a pencil to make a spring. File the end of the cat-whisker to a sharp point. This is put through the cork in top of the bottle and one wire of your set connected to it.

Contributed by James Mills.

Batteries

(*Continued from page* 16)

to the radio bugs, the writer of this being an ardent bug himself.

It frequently happens that the "B" battery runs down at an inconvenient time. If, when the first battery plays out, it should be put in some warm place, say on top of the steam radiator for from 24 to 36 hours, the compound becomes soft. This in some manner, recuperates the battery. After cooling, it is again ready for use. I was a little skeptical of the stunt so I tried it out on a "B" battery that was absolutely good. After a treatment of heat, I tested it out with the standard voltmeter and was surprised to note a reading of 22½ volts between terminals. This stunt only holds good where the zincs are not eaten through. The same idea is also applicable to dry batteries and flashlight batteries of the ordinary type. Should you have any batteries that are dead, this method of bringing them back is well worth trying.

Contributed by M. M. Hewitt.

A USE FOR WORN-OUT DRY CELLS

Many amateurs are at present using WD-11 tubes and No. 6 dry cells to light the filament.

When these cells run down below 10 to 12 amperes, on test, they are no longer suitable for this purpose and are, therefore, usually thrown away. Where such cells are used to operate three or more WD-11s, they soon accumulate and by saving them it takes but a short time to get together 15 or more of these used cells. But instead of throwing them away, connect them up in series (15 cells for 20 volts or about 1.3 volts per cell) to make an excellent "B" battery to supply the plate current to the tubes.

Since "B" batteries cost considerable, it is well worth while saving the dry cells, as these will last a long time, due to the comparatively small amount of current required for the plate supply. *Contributed by Geo. M. Lay.*

Condensers

(*Continued from page* 28)

of aluminum which is drilled and tapped to take a 1/8-inch machine screw with countersunk head, which screws into a tapped hole in the end of the adjusting screw E. Be sure that the head of the screw is countersunk a shade below the surface of the plate C, as it will otherwise bear on the mica and keep the plates further apart than is intended, thus causing the maximum capacity of the condenser to be considerably less than is desired.

By means of the machine screw, screw plate C tight against the end of screw E, which should be turned off square. Then run some solder around the joint on the upper end, so that it will not work loose.

The center hole in the ear-piece of the receiver should then be enlarged, if necessary, and tapped out to take the brass bushing F, which is screwed on the outside and tapped inside to suit the thread on the adjusting screw. To obtain fine adjustments, this thread should be as fine as possible.

All the pieces should then be assembled as shown in the diagram, particular care being taken here to make sure that plate C is absolutely parallel to plate A. This is important.

The diagram shows a type of panel mounting in which X is a piece of insulating material, such as hard rubber or bakelite, with a hole cut in it, into which the phone should be a "push in" fit. This sub-panel is attached to the main panel by means of four machine screws and spacing washers, as shown, one at each corner of the sub-panel.

A condenser such as this, if carefully made, will be very useful about the laboratory or work bench and will well repay the trouble of constructing it. This instrument may be used in any number of experiments, and its maximum capacity may always be readily calculated for different thicknesses of dielectric that may be used.

Contributed by T. A. Vincent.

A MERCURY VARIABLE CONDENSER

This unit combines the saving in space effected by the use of a mica condenser with the easy tuning of the well-known air dielectric condenser. It may be constructed very cheaply and every radio "bug" has the necessary tools. Parts 1, 3 and 4, in Fig. 1, are cut from some good grade of artist's cardboard. They should be about two and three-quarter inches in diameter and one-eighth inch thick. Part 3 has a hole about one and seven-eighth inches in the center. Piece 4 has an *iron washer* and machine screw in the center to form a contact for the mercury. Before putting another washer and a nut on the other side, the screw is sealed in the hole with a drop of sealing wax. Turn the nut down lightly on the wax. Apply heat to the screw until the wax begins to soften, then screw down with a wrench. Piece 3 is then glued to 4, making sure that the two pieces are joined well all around. This forms a shallow cup to hold the mercury. Procure some *pure* mercury. One dram should be sufficient. Pour it in the cardboard cup.

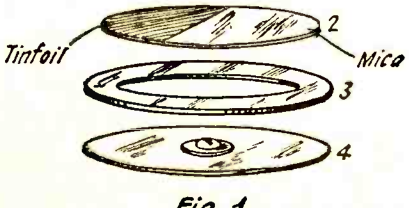


Fig. 1

The four principal sections of the mercury variable condenser in their correct positions for assembly.

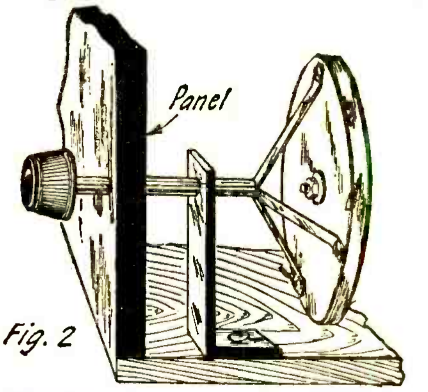


Fig. 2

Showing the manner in which the mercury variable condenser is mounted and supported.

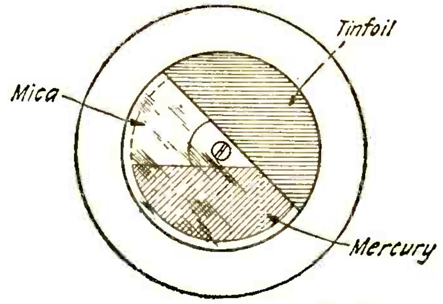


Fig. 3

Interior view of the completed mercury variable condenser.

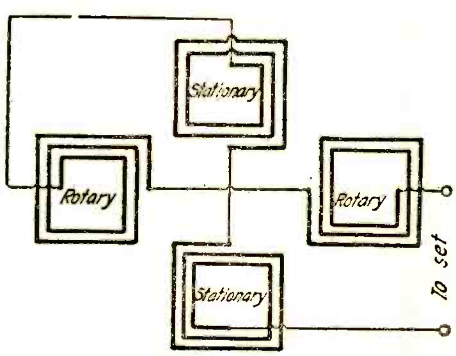
Before gluing the mica (2) in position, place a piece of glass over the mercury, hold condenser in a vertical position, and see if the mercury level is about one-eighth inch below the machine screw. When this is adjusted, the mica sheet may be glued in position. This piece should be very thin and about 2 inches in diameter. Glue it on top of piece 3, taking the same precautions in making the joint tight, and also making sure the screw does not press the mica. Cut out a piece of tinfoil, which will come within one-eighth inch from the machine screw when fastened to the mica, which may be done with glue or shellac. This forms the other plate of the condenser, which now looks like Fig. 3. Fasten a small piece of brass inside of piece 1, to make contact with the tinfoil; lead a wire from it through the cardboard, and glue the piece firmly on top of the mica. The condenser is held vertically in operation and as it is turned, the mercury stays at the bottom. When the tinfoil is also at the bottom, the full capacity is in effect, since the mercury is pressing close to the mica. Fig. 2 shows a good method of mounting. Three equally spaced holes are drilled close to the edge. Be sure that they do not go through the mercury chamber. Three strips of brass to form a tripod are attached thereto. It may be mounted directly on a panel, as shown, and flexible wire leads brought off from the contacts.

Contributed by F. L. Patterson.

Inductances

(*Continued from page* 48)

In laying out the forms, cut out four pieces 2 7/8 inches square, then mark out one as shown in Fig. 2, place the four pieces together and drill a 3/16-inch hole through the center of all four pieces, then place an 8/32 screw through to bind them and saw out with a scroll or hack saw; almost all the other parts can be left to the builder.



Method of connecting windings.

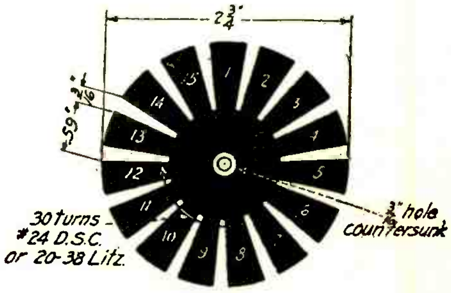


Fig. 2

Spider-web form.

Contributed by B. A. Engholm.

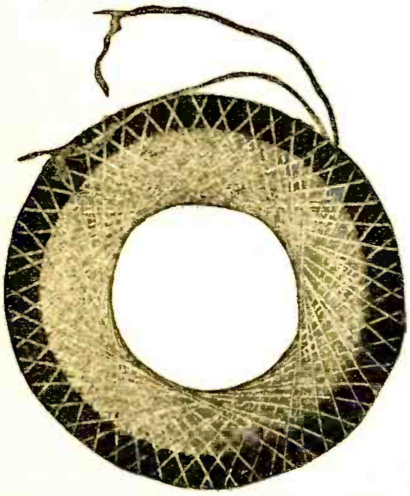
SIMPLE TRICK WHEN WINDING COILS

Many amateurs find difficulty in keeping the wire tight after a coil has been wound. Of course paraffin or shellac can be used, but because of the capacity effect or sometimes the home-made appearance, nothing is done to keep the wire in place. As every one knows, copper wire increases in length with an increase in temperature and it is this property that does the trick. Before winding the coil, place the wire near the stove until it has become quite warm. Then wind your coil, heating the wire again if it cools during the process. Be sure to fasten the ends securely to prevent them from pulling out. After the coil has cooled to room temperature, it will be found that the winding has become tight and smooth. A hundred feet of wire heated to about 100 degrees Fahrenheit will contract almost ½ inch when cooled.

Contributed by Frank Schubert.

AN EFFICIENT INDUCTANCE COIL FOR SHORT WAVES

There are several characteristics which an efficient unit inductance coil must possess. Some of the most im-



Showing the appearance of a complete short wave inductance coil. The wire is wound on a circular framework of insulating material.

portant of these are: Maximum inductance for a given amount of wire, a minimum distributed capacity, and a minimum resistance caused by losses from imperfect dielectrics in the field of the coil.

The coil which I shall describe possesses all of these features except the first; but, since it is to be used for short waves only, this will not interfere with its efficiency to a great extent. One of its desirable features is the ease with which it can be wound and the simplicity of the form upon which it is wound.

As can be seen from Fig. 1, the coil is wound upon a flat circular ring of suitable insulating material about ¼ inch thick. The ring is about ⅜ inch wide, and may be any diameter desired; although I have found that 5 inches is about right for the broadcasting wavelengths.

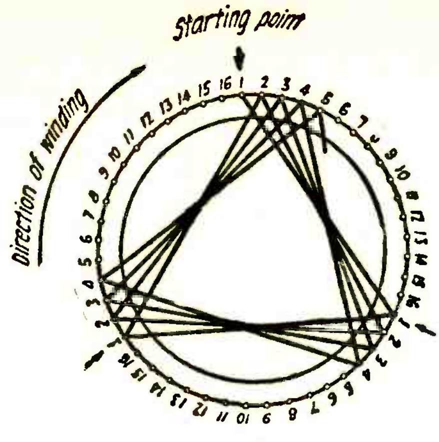


Fig. 1

Illustrating how the short wave inductance coil is wound.

The outside circumference of the ring is first divided into 96 parts. This is done by dividing the circumference by the radius. Mark every other one of the points left by the dividers. Next divide each space in half. Do this three more times and cut a notch at each of the 96 points.

No. 24 D.C.C. wire is about right for this coil. Secure the wire around the ring at one of the points which has been marked, calling this notch No. 1. Then stretch it across the next marked point. Do the same with the next notch No. 1. Then stretch it across point No. 2, as shown in Fig. 1, stepping each turn around a notch until all the notches are filled. Secure the wire around the ring at the last notch. This completes the coil.

The writer has thoroughly tested this coil for efficiency and has found that results are slightly better than those obtained with a spider-web coil. With it I can receive WWJ (Detroit) on a crystal in almost any kind of weather, although the results are not entirely due to the coil, as the same station is received very faintly with a spider-web coil.

Contributed by Edward Binns.

Switches

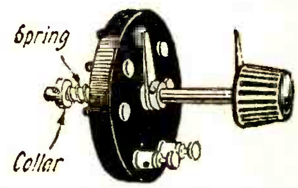
(*Continued from page* 84)

time. I have remedied this by attaching a brass plug, made of a piece of heavy wire, to the telephone cord by a piece of stout twine. When you wish to put the set into operation this plug is inserted into the jack, which is made of two brass strips, and is connected in the battery circuit. When the telephone plug is pulled from its jack, it will, at the same time, pull the wire plug, breaking filament circuit.

Contributed by Leo Chaviano.

AN EXCELLENT BACK PANEL SWITCH

Do you need a good back panel switch? Here is one that can be made from an old rheostat and will prove as good as any on the market. The resistance wire should be removed and holes of the correct size drilled through the rheostat form at regular intervals for the switch points. These switch points should be of the kind that are almost flush with the surface. The usual rheostat shaft is not long enough so a bar of the same diameter and three inches long should be obtained. The regular rheostat contact lever is slipped on the shaft to about the center and fastened by means of the set screw. The shaft should now be inserted so



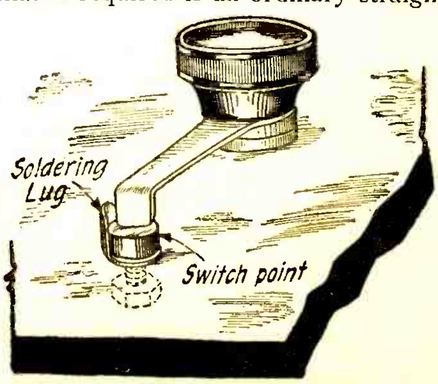
A clever design in back-of-panel switches. It is made from a discarded rheostat.

that the lever is on the same side as the switch points. A spring is placed on the end of the shaft protruding on the opposite side and compressed by the shaft collar, as shown in the sketch. This collar is secured by tightening the set screw in such a position that the spring exerts sufficient pressure to keep the lever snugly against the switch points. The switch is secured to the panel by means of the two screws that were originally employed as the rheostat binding posts. A knob and pointer, or a dial may be used as desired. This switch, if carefully constructed, will be smooth running and will eliminate switch points on the panel.

Contributed by Harold Hubbard.

THE SIMPLEST SWITCH STOP

In building a receiver in which switches and points are used, this little device will be found of value to the constructor. It will not be necessary to drill extra holes, as for the standard switch stop sold on the market. All that is required is an ordinary straight



A simple switch stop made of a soldering lug fastened under the switch point.

soldering lug which is placed underneath the first and last switch points with its tip bent upright. This makes an extremely neat switch stop which compares favorably with any that can be bought. As the switch point will be raised slightly above the others, it may be necessary to file down the face of it in order that the switch lever may slide upon it smoothly.

Contributed by James Waddell.

Sockets

(*Continued from page* 77)

are of different sizes, that it is necessary to connect up a new socket whenever it is desired to change tubes.

The drawing shows a socket which will hold any tube.

Simply insert the tube so that the pin fits in the little hole on the back part of the socket. Then tighten up the thumb nuts until the tube is secure. Connect the flexible cords with the small spring clips to their proper prongs on the tube, according to the marked binding posts on the front of the socket. The sketch shows how they are connected. Such a socket makes changing tubes easy.

Contributed by Carl Masson.

WD11 SOCKET

Now that the Westinghouse WD11 tube is available, many amateurs will want to substitute this tube for the six volt tube and eliminate the troublesome storage battery. The only difficulty is that sockets or adapters are not easily obtained.

Since the prongs of the WD11 tube are not all the same size nor do they have the same relative connections as the other tubes, as shown in Fig. 1, the making of a socket is more practicable and less difficult than an adapter, which requires the base of a burned-out tube.

Take a piece of hard rubber or other insulating material 2″x2¾″ or the exact size of the socket you wish to replace, if you want to substitute in a set already made. Using the standard socket for a pattern, drill four holes for binding posts and two holes for the fastening screws. Then instead of spring contacts for the prongs, take thin sheet copper or better still phosphor bronze strips and roll three of these strips an inch long around a 6-penny nail and one around a 20-penny spike. These tubes should fit the prongs snugly. Insert these four cylindrical tubes into the holes drilled at the proper places as shown in Fig. 2. Solder a piece of insulated wire to each of the tubes, under the hard rubber base and connect to proper binding post as in Fig. 2. This gives a receptacle for the WD11 tube which can be used in a new set or which will replace any standard socket without a change in wiring.

Contributed by A. H. Albert.

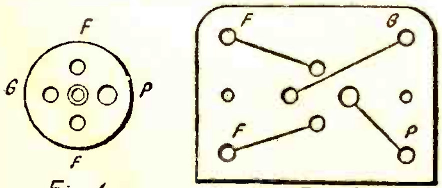


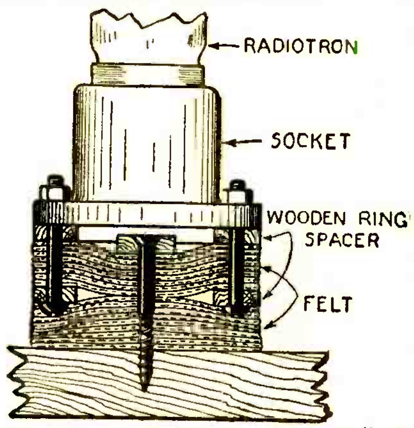
Fig.1 Fig. 2

If you have a WD11 tube, here is an easily constructed socket for its mounting. The base is made from a strip of good insulating material.

VIBRATION-PROOF TUBE MOUNTING

One of the bugbears of many receivers is the various noises that are set up in the tube by the vibration of the elements. Here is a method to eliminate these annoyances.

Two layers of felt discs are squeezed lightly to about ½ inch in thickness. Sheet felt may be used or the felt packing that comes wrapped around vacuum tubes. It should be noted that too much compression destroys the shock absorption properties of the felt. The two layers of felt discs are fastened to the baseboard by a wood screw and washer, the upper layer being bolted lightly to the socket by means of two small bolts through a ring of light wood or fibre. A second wooden ring next to the socket acts as a spacer, providing ample separation of the socket contact springs from the head of the wood screw. A fibre or wooden washer under the head of the screw provides a good grip on the felt, which should be rather loosely held. The tube should "wobble" easily with a slight force.



By the use of felt to take up vibrations, as shown, microphonic noises are eliminated.

Contributed by D. M. Lynch.

Vernier Dials

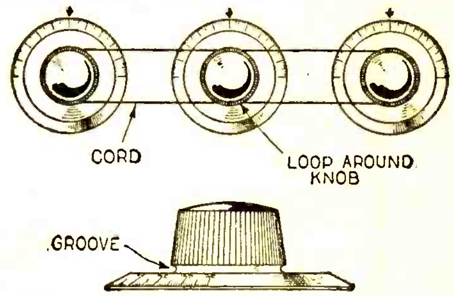
(*Continued from page* 88)

simple combined dial indicator and body capacity preventer to be used on metal indicating dials. It consists of a piece of spring brass bent in the shape shown with one hole drilled through it to allow a bolt or screw for fastening to panel. The lower part of the indicator is bent to scrape on the dial. The bolt passing through the indicator and panel is grounded and the indicator grounds the dial. The dial should have an enlarged center to prevent it from touching the shaft. Both indicator and the part of the dial with which the indicator comes in contact should be sandpapered.

Contributed by Nathan Leysu.

UNIT CONTROL FOR MULTI-TUBE SET

A very easily constructed unit control for multi-tube sets may be made of a piece of string, as shown in the accompanying diagram. A great many dials have at the base of the knob a small groove or cut, in which the string may be placed. If a set with three controls is to be equipped with this device, loop the string around the center knob in the groove and then around the other two knobs, making a 180 degree contact with each knob. The string is tied with sufficient tension so that when one knob is turned, the others will rotate also. For delicate adjustment, the center dial is held while the other dial is adjusted to suit. Of course, this system will work satisfactorily only when the tuning of the receiver is more or less broad. The dials will also have to be adjusted so that they have approximately the same readings.

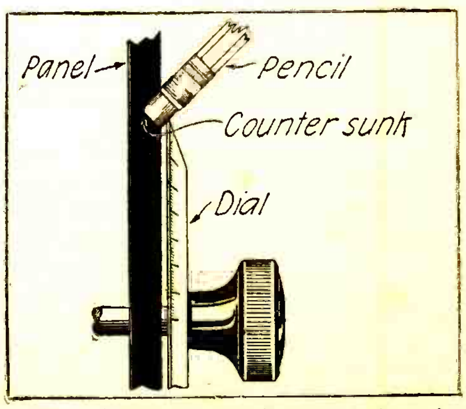


Only one hand is needed to tune a set using a string as shown above.

Contributed by Jos. A. Baehr.

THE COSTLESS VERNIER

This vernier is very easily made, allows for a very fine adjustment and



By twisting the pencil, the friction of the rubber against the periphery of the dial will turn it at a slow rate.

eliminates nearly all body capacity effects caused by the operator's hand. To provide this system, take a 3/8" drill and drill a hole (not clear through, but as shown in illustration) near the edge of the dial. This hole should then be countersunk to about the same angle shown. Now take a pencil with an eraser on the end, insert it in this hole and turn. One rotation of the pencil turns the dial but slightly, thus providing a means for fine tuning, a necessity in the average vacuum tube receiver of today.

Contributed by Harold Luther.

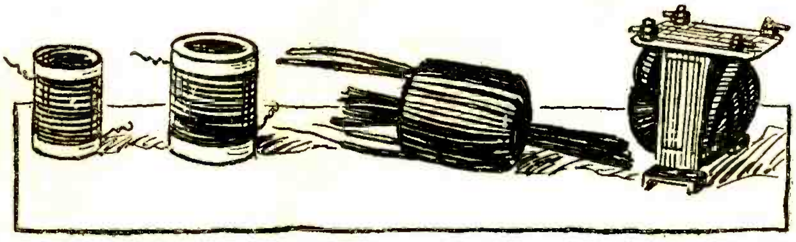
Transformers

(*Continued from page* 86)

The ratio in layers is 4 to 1, but due to the difference in circumference of the primary and secondary coils the ratio is approximately 4.2 to 1 which is about correct for the average vacuum tube.

Upon the ends of your primary and secondary windings solder a lead of heavier wire (No. 30 is about right), secure the leads to their respective parts by medical adhesive tape, and insert the primary into the secondary, being sure that the windings run in the same direction on both of them.

Cut lengths of empire tubing the length desired for insulation of leads. Split one end back about 1/4" into a crows-foot; these can then be slid over the leads and securely fastened to the coil by shellac or other means. The crows-foot is your insurance that the leads will not pull out during the assembling of the transformer, and also allows the core wires to be bent snugly against the leads.



An audio frequency amplifying transformer, constructed from parts of a Ford spark coil.

Insert a length of cardboard or fibre tubing in the core space as added protection to the primary winding.

Coat thinly with hot paraffin.

The iron core consists of the bundle of iron wires taken from the spark coil. These are bent around the coil so that the ends meet; do not overlap them. Insert one wire at a time and securely bend it around the coil. A small portion of wire ends should be clipped off with pliers to prevent lapping (see photograph).

Wind a layer of tape over the core wires on the outside of the coil to hold them securely.

The mounting consists of fibre end pieces, fibre rod through coil, celluloid plate for binding posts and a scrap aluminum strap for mounting to panel or table.

Transformers of other ratios may be easily constructed on the same principle by figuring ratio from original coil of 35 layers.

Following the procedure outlined here will give you an efficient, durable, compact and good looking unit.

Contributed by Otto C. Steinberger.

RADIO FREQUENCY TRANSFORMERS

I have found by experiment that the home-made radio frequency transformer is the only kind for the experimenter who wishes to build an efficient and selective radio frequency amplifier using from two to three or four stages of amplification.

Eight or ten such transformers as here described may be constructed in a short time at the work bench and will cover a large band of wave-lengths.

No. 40 cotton or silk covered wire may be used for both primary and secondary. Ford coil secondary wire may be used satisfactorily with ratio of primary and secondary windings 1-2, on short wave-lengths.

The winding forms are made from a Ford spark coil secondary spool, the wire first being removed and then the individual spools, used originally for winding the pies on the secondary, sawed out. They may be sandpapered and shellacked to improve appearance.

The primary is first wound on and the terminals fastened to binding posts, as shown in the drawing, this winding being covered with some insulating paper or cloth. The secondary is wound over this and the terminals fastened to the other pair of binding posts. The exposed secondary winding should be covered with paper or tape for protection.

Such transformers are easily constructed and serve well for amateur use.

Contributed by Cecil E. Rhode.

Miscellaneous

(*Continued from page* 70)

leak may be made with an old watch-case. Cut a piece of white drawing cardboard to the size of the watch face. This may be fastened on with small screws as the face was.

Punch the holes for the small short screws and draw heavy pencil lines around each to make good connection.

Connect wires to these screws on the back of the cardboard. The wires are brought out through the stem.

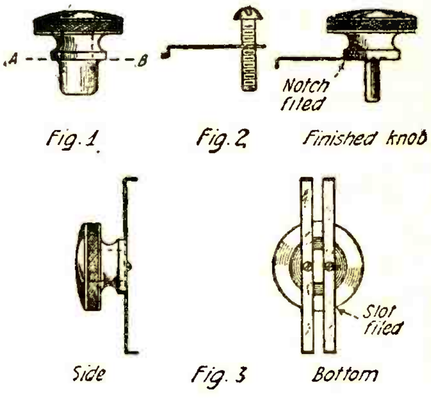
This compact grid leak may be secured to the panel by means of screws through the back of the case.

When finished it makes a good instrument and may easily be varied by removing the front glass.

Contributed by Frederick Metcalf.

BATTERY CAPS AS KNOBS

As teacher in a school where a large number of boys desired to build receiving sets, I needed quite a number of knob switches. We decided to make them and at first thought of turning them out of hard wood. Then filler caps from old storage batteries were suggested. The boys visited all the battery service stations in town and came back with about a hundred old filler caps or plugs. The ones best suited for our purpose were shaped as in Fig. 1. These were sawed off at A-B, which left a hollow knob.



Another solution for the high cost of radio apparatus. We have found how to secure panels and B batteries from the old storage batteries.. Now we can make knobs from the caps on the same battery.

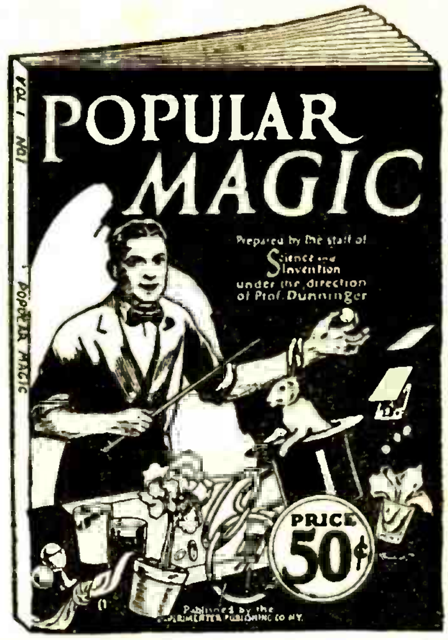
For the switch arm a piece of spring brass from the shell of an old alarm clock was cut the desired length and about 5/16" wide and soldered to an 8/32 bolt, as shown at Fig. 2 This was held upright in the center of the hollow knob and some old sealing wax from the top of a dry battery poured in around the head of the screw, holding it very securely. A series parallel switch may be made by fitting a wooden plug into the hollow knob, and fastening the switch arms on with small wood screws, as shown in Fig. 3.

As an added precaution against the arm becoming loose, a notch is filed in the base of the knob just the width of the arm so that when the screws are tightened, the arms are held firmly down into these notches or slots.

Contributed by Henry P. Holmes.

STEP INTO THE LIMELIGHT!

Surprise Your Friends With a Mastery of Mystery



Master this great book, 116 pages of Tricks, size 9 x 12 inches, compiled by the staff of SCIENCE *and* INVENTION Magazine under the direction of Prof. Dunninger, the man who mystified President Coolidge, Prince of Wales, etc.

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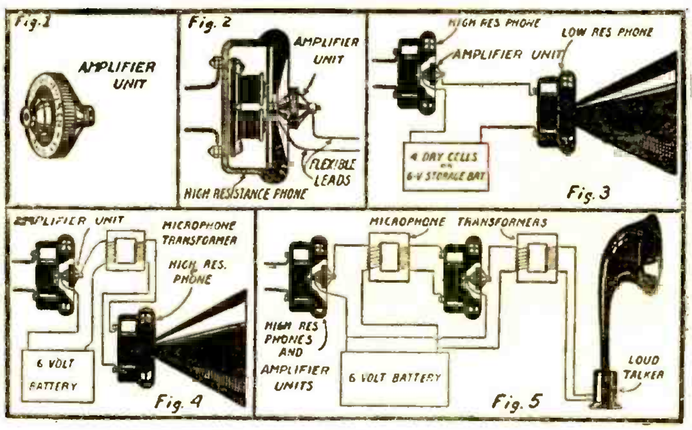

MICROPHONE Transmitter Buttons have been used for a number of years to make powerful sound transmitting elements. These very sensitive amplifiers offer every "Radio Fan" the means of building his own powerful speech amplifier. We offer herewith to the constructor these special *Amplifier Units.*

Fig. 1 shows the amplifier unit.

Fig. 2, shows how the unit is attached to a telephone receiver. The first procedure is to mount the unit on the diaphragm of a telephone receiver, which usually is a high resistance telephone, either 1,000 or 1,500 ohms.

Next we select the loud speaking telephone. If a low resistance telephone is available, it should have for maximum efficiency an impedance equal to the resistance of the amplifier unit, or about 10 ohms; it is connected up as shown in Figure 3. A 5 ohm telephone receiver is used in this circuit with a 6-volt storage battery.

Two telephones taken from a good double headset of 2,000 to 3,000 ohms which do not rattle on strong currents, are employed in Fig. 4, one at the receiving end, the other as loud talker. In this hook-up there is one instrument which must absolutely be used with this combination, the transformer. As stated before in connection with Fig. 3, the impedance of the telephone, if used in direct connection, should equal the resistance of the unit. But as the impedance of the telephone in Fig. 4 is much higher than the resistance of the unit, it may be 200 times as great, a transformer having a step-up ratio is used to match up the resistance of the unit with the impedance of the loud speaking telephone. In other words, the primary coil of the transformer should have an impedance (which is sometimes called "A. C. resistance") equal to the resistance of the unit, or about 10 ohms, and the secondary coil should have an impedance equal to the impedance of the high resistance telephone. This transformer may be purchased in any Radio Store and is called a microphone transformer or modulation transformer, designed primarily to use in radio transmitting sets. A 6-volt battery gives the best results. The current passing through the unit will vary from .1 to .25 ampere.

Fig. 5 shows a circuit for further increasing the volume of sound. This is simply two of the circuits, such as shown in Fig. 4, linked together. This arrangement is highly sensitive and the telephones on which the units are mounted should be packed in a box of cotton, as the slightest vibration or sound in the room will be picked up and heard in the loud talker. Any sensitive radio loud talker may be used in this particular circuit.

PRESS GUILD.
66 W. Broadway, New York City, N. Y.
Enclosed find 85c—$1.50 for which send me postpaid one—two amplifier units as advertised.
Name ....
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Town .... State ....

THESE and innumerable other interesting experiments are possible with these amplifiers. Every amateur should have at least one or two in his "Lab" or workshop. A four-page instruction pamphlet is sent with every unit.

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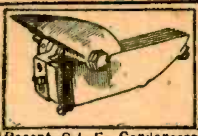
Dial Marker

The big little thing you have been waiting for. Just drill a hole in the panel and mount the marker above the dial. Nickel plated and polished

F7788 Dial Marker, three for ....$.10



Pacent S.L.F. Condensers

The famous Pacent SLF Condenser. The latest word in condensers. Sturdy, compact, take up less room than most others. Minimum insulation used.

F4432 .00035 mf. 17-plate $2.95

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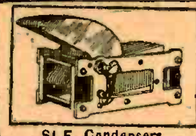


SLF Condensers

Lowest prices ever offered. Despite this low price, these condensers are made with precision aluminum stampings, hard rubber insulation. Money back if not satisfactory.

F3513 .00025 13 pl. ..$1.06

F3517 .00035 17 pl. . 1.20

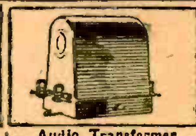
F3523 .0005 23 pl. . 1.35

"Guaranteed" Vacuum Tubes

We consider the "Guaranteed" tube one of the best on the market. Any tube replaced if defective, providing filament lights. Calibrated curve goes with each tube.

F701A 5 v. .25 amp.$1.25

F799 3 volt .06 amp. 1.25



Audio Transformer

This is the famous Pacent Audioformer. Nickel case is grounded to base. Extra high degree of amplification. Minimum distortion and reaction. Binding posts and solder lugs. Ratio 3½ to 1.

F2811 Mounted type $4.50

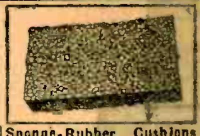
F2812 Unmounted .. 3.15

Audio Frequency Transformer

No better Transformer made. Highest class materials. Impregnated coils. Silicon steel stampings used. Save 50 per cent by assembling it yourself.

F1100 Ratio 4½-1..$1.40

F1150 Ratio 6½-1.. 1.40

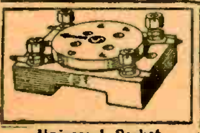


Sponge-Rubber Cushions

Get rid of tube noises due to vibration. Softest sponge rubber made. Size 2½"x3", ⅜" thick.

F8989 Sponge-rubber cushions, each $0.12

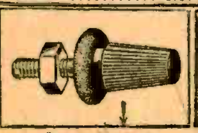
Six for 0.60



Universal Socket

Takes new "X" type tubes as well as old standard "UV" and "C" types. Made entirely of Isolantite. No capacity effect between plate and grid. New phosphor bronze wiping contacts. Standard mounting type.

F6514 ....$0.49



Rasco Vernier

Why use a vernier dial when a vernier attachment will do anything and everything a vernier dial accomplishes? Cleverest vernier made. Can be used with any dial. Soft rubber ring engages dial. Nothing to come apart.

F1450 Vernier......$0.12

FONEKUSHIONS

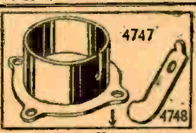
Made of sponge rubber. Make wearing your receivers a pleasure. Positively exclude all noises and make reception a pleasure. Sponge rubber will last for years. Light as a feather. Sanitary.

F3550 Fonekushions, set of two $0.35

Dial Button

Made in blue enamel and gold, to be worn in button hole. Every radio fan wants one. ⅜" diameter, best gold plate. Perfect reproduction of radio dial.

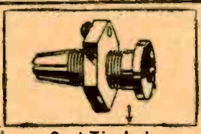
F7799 Dial Button, Each $0.25



Vacuum Tube Shell

Nickel plated shell for the man who builds his own. 4 holes to attach to subbase. Each shell comes complete with 4 phosphor bronze socket contacts. See illus. 4748.

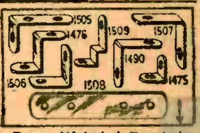
F4747 Vacuum Tube Shell and Contacts $0.16



Cord Tip Jack

Takes place of binding posts. Cord tip firmly gripped by jack. Made of brass, nickel plated. Screw to attach lead wire. No soldering necessary.

F1500 Cord tip jack, Each $0.15



Brass Nickeled Brackets

All Illustrations ¼ size.

F1505 Bracket, each $.05

F1507 Bracket, each .05

F1509 Bracket, each .04

F1476 Bracket, each .05

F1506 Bracket, each .05

F1490 Bracket, each .04

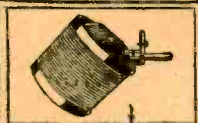
F1475 Bracket, each .03

F1508 Bracket, each .05

Microvern

THE vernier dial for extra sharp tuning. No backlash. Special finish permits logging of stations on dial. Beautiful appearance. Comes in gold or silver finish. State which wanted.

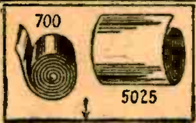
F3066 Microvern, any finish $1.76



Rasco 180° Variocoupler

Silk wire wound on bakelite tubes. Six taps. Wave length, 150 to 600 meters. For panel mounting. ¼" shaft. Your money refunded if it is not all we claim.

F3100 Variocoupler prepaid $1.05



Copper Ribbon

.0005" thick.

F700 ⅜" wide; F701 ¼" wide; F702 3-16" wide. All sizes per foot...$0.01

Copper Foil

.001" thick. 4" wide.

F5025 Copper Foil, per foot $0.10

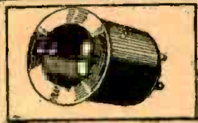
10-foot length 0.80

Rasco Clip Leads

Invaluable for experimental work. Clip lead hooks in a jiffy onto any wire, binding post or conductor. Safest experimental connection. Brass clips, 1 foot silk wire, green or red.

F7887 Clip Leads, ea.$0.12

Dozen lot 1.35



Adapter

Pacent Improved Adapter. Takes 199-type tubes. Fits standard 201A sockets. Phosphor bronze springs, short circuits impossible. Bakelite molded.

F6521 Adapter $0.36

PUSH-PULL

Push Pull Transformer for many new circuits. See any radio magazine. Made of best materials. Coils impregnated. Silicon steel laminations. Save 50 per cent by assembling yourself. Simple instructions furnished.

F1159 Push-Pull Transformer, ratio 6½ to 1 $2.95

Hard Rubber Panels

Highest dielectric strength as per Bureau of Standards. Beautiful high finish.

F7100 7x10x3-16" .$0.65

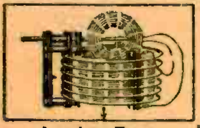
F7120 7x12x3-16" . 0.79

F7140 7x14x3-16" . 0.89

F7180 7x18x3-16" . 1.15

F7210 7x21x3-16" . 1.31

F7240 7x24x3-16" . 1.46



Low Loss Tuner

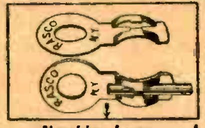
Same type as used in our LOLOS EXPLORER. Tunes from 200 to 600 meters. Hard rubber insulation throughout. Silver plated primary. Secondary D. C. C. Tickler silk insulated wire.

F2690 Tuner $5.00

"T" Wire Connectors

This big little article solves all troubles when making "T" wire connections. Made to take 1-16" square or round bus-bar wire. Can be attached with a pair of pliers.

F2975 "T" Wire Connectors, 12 for $0.10



Nosolder Lugs

Finally, a real solderless lug is here. Soldering positively done away with. Takes square or round bus bar, which it holds with a vise-like grip. Perfect connection. Just slide bus bar into slip-grip.

F3727 Lug, 25 for $0.20

Low Loss Coil

Same type as used in Freshman and other Tuned Radio Frequency sets. D.C.C. wire. 200-550 wave-length. 3" diameter, 1" wide, 5-16" thick 4 connections, 2 primary, 2 secondary.

F2629 Low Loss Coil $0.43

Binding Post Strip

Made of hard rubber, gold engraved lettering. Two nickel brackets for mounting. 7 hard rubber binding posts. "ANT"; "GND"; "A—"; "A+"; "B—"; "DET B+"; "AMP B+".

F870 Binding Posts $0.35

Tinned Nickel Lugs

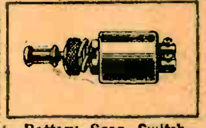
All our lugs are tinned.

F310 Brass Lugs for No. 8 screw, doz.......$0.10

F311 Copper Lugs for Nos. 6 and 8 screws, doz.0.10

F309 Copper Lugs for Nos. 4, 6 and 8 screws, doz.0.10

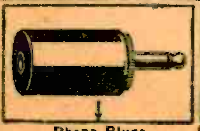
F308 Copper Lugs for 6-32 screw, doz. 0.10



Battery Snap Switch

This Switch is produced under high standards of workmanship. Action is positive. Solderless contact screws used. One hole mounting. Nickel-plated all over. Most serviceable switch made.

F7986 ....$0.36



Phone Plugs

Sold from 50c to 65c everywhere. Hard rubber composition shell and patented cord tip holder. Finest workmanship throughout.

F1030 Rasco Telephone Plug. Each $0.23

Bakelite Socket

Octagon shape. Four nickel binding posts, phosphor bronze contact springs. Best brown bakelite.

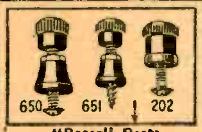
F6510 Bakelite socket $0.40

F6500 Tube Socket. Made entirely of composition. Best made. Each..$0.35

Binding Post Name Plates

Dia. ⅜". These styles: Phones, Ground, —, Output, "A" Bat. —, "B" Bat. —, Loud Speaker, "C" Bat. —, Aerial, +, Input, "A" Bat. +, "B" Bat. +, Loop, "C" Bat. +, New! "A" Bat. + "B" Bat. —.

F6000 Name Plates, Dozen $0.15



"Rasco" Posts

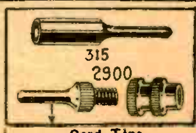
Made of hard rubber composition.

F650-51 Each $0.06

F202 Has nickel plated bottom, each $0.06

Dozen, each style...$0.70

F122 Initialed Binding Posts. Set of 8. Per Set $0.25



Cord Tips

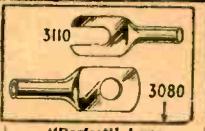
Standard phone cord tips, nickeled.

F315 Each $0.03

Separable Cord Tips

No solder required. Wire goes in ferrule. Shank holds it tight. Nickel plated.

F2900 Each..........$0.06

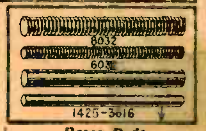


"Perfect" Lugs

These new and improved lugs are brass, nickel plated, flattened on top as shown. Made of a single piece of metal. Lead wire goes into tube.

F3110, F3080 "Perfect" Lugs. Each $0.02

Dozen lots 0.20



Brass Rods

Sold in 6 lengths only.

F8032 Rod 8-32" thread length $0.06

F6032 Rod, 6-32" thread length $0.06

F1425 Rod, plain, ¼" round, length $0.10

F3616 Rod, plain 3-16" round, length $0.06

Roberts Coils

Diamond weave coils, used in standard Roberts Circuit. Tunes 200 to 570 meters. Used in 2, 3, or 4 tube circuits. These are genuine Sickles Coils, not imitations. Set comprises two units, as illustrated.

F-8112, Roberts Coils $5.95

100-Ampere Storage Batteries

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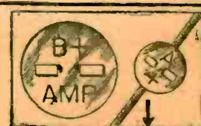

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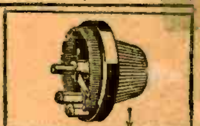

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