VACUUM TUBE USED AS RADIO DETECTOR

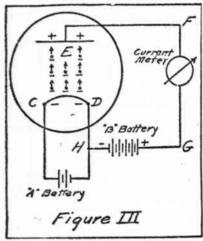
Emission and Control of Electrons for Its Operation.

Readers of the radio column are urged to clip each article and paste it in a file book. The articles printed are continuous and the entire series will be valuable for reference.

The greatest advances made in the past few years in the radio art have been due in one way or another to the use of vacuum tubes. In view of this fact a more careful consideration of them will be of interest.

All of these tubes, known by a variety of names, such as radiotron, audion, seriotron (trade names of the manufacturer) depend upon the same fundamental principles for their op eration. For the sake of simplicity of brevity these will be referred to in this column simply as vacuum tubes. A vacuum tube can be made to function as a detector, as an amplifier, or as an oscillator.

The vacuum tube depends on the emission and control of electrons for its operation. The electron is the smallest subdivision of matter which mankind recognizes and it cargies the smallest known charge of negative electricity. For years previous to electron research it had been held by scientists that matter was built up of distinct particles or units which they called atoms and molecules. At first the molecule was assumed to be the smallest quantity of matter that could have a separate existence or take part in chemical action, but more vigorous research pointed to the fact that the molecule is made up of still smaller elements which are termed atoms; that is, a molecule may be composed of several atoms. Then for a time it was assumed that the atom was the very smallest quantity of an element that could exist, but later researches have revealed that atoms may be further subdivided into particles



called electrons. The apparent mass of an electron is about one-eighteenhundreth part of that of an atom of hydrogen which is the smallest of the chemical atoms.

According to the electron theory an atom consists of a definite number of electrons grouped around a nucleus having a positive charge and so long as none of the component electrons are driven from the atom. the latter possess no detectable charge. The positive charge on the nucleus is said to be exactly neutralized by the negative charges on the electrons grouped about it.

Suppose now that by some means an electron can be detached from the atom. Then the atom becomes what is known as a positive ion and it exhibits the properties of a positively charged body, or in other words since an electron which carries a negative charge has been removed from the atom- which has equal positive and negative charges, the portion of the atom now remaining has a deficiency of negative charge and acts like any positively charged body.

On the other hand if some force can be brought to bear that will add apelectron to a normal atom which is neutral as far as electrical charges are measured, the result will be a negative ion, which will possess all the properties of a negatively charged body. An atom then which has a deficiency of electrons is called a positive ion and one having excess of electrons is called a negative ion.

Since each electron carries a negative charge of electricity an electron represents a certain quantity of electricity. Forcing electrons to move from one point to another causes electricity to flow. The ability of any medium to conduct electricity or allow a current to flow through It depends upon the number of free electrons available as carriers of charges,

It has been known for many years 1.

that the space surrounding a piece of heated metal is a conductor of electricity. It has been demonstrated more recently that this is due to the release of electrons and that if an incandescent metal be placed in a bulb exhausted of all gases, pure electrons will be liberated from the incandescent metal.

In a vacuum tube such as we are using at the present time, the piece of metal used to furnish the electrons is called the filament and is usually How This Device Depends on made of tungsten and sometimes is coated with oxides to increase the electron emission. For convenience the filament of a vacuum tube is heated by a battery current and it is this heat furnished by the battery current that constitutes the force that disrupts the atoms of the filament and diberates electrons.

Fig. III is a spherical glass bulb from which all the air and gases have been exhausted and having mounted in it a filament C-D which can be heated to incandescence by the "A" battery connected to it, and the metallic plate E. When the filament C-D is heated to incandescence by the "A" battery connected across its terminals electrons are emitted. Connecting the cold plate E to the incandescent filament C-D by means of the circuit E-F-G-H which includes a current meter and a "B" battery, with its negative side connected to the filament lead at H and its positive side connected through the current meter, the plate becomes electrically positive with re-

spect to the filament. Since like charges repel and unlike charges attract, there will be a movement of electrons from the filament to the positively charged plate, and the current meter will show a deflection which indicates that a current is flowing in the circuit E-F-G-H.

Increasing the "B" battery voltage causes an increase in the current flowing in the circuit E-F-G-H, the plate circuit, until the positive charge on the plate E is so strong that all of the electrons given off by the filament are attracted to it. Assuming that the temperature of the filament is kept constant and that the plate voltage has been increased to the point where all of the electrons given off by the filament are attracted to it. any further increases in the "B" buttery voltage will not cause any increase in the current in the plate cir-

Increasing the temperature of the filament will increase the total number of the electrons emitted.

Radiophones on German Trains.

Wireless telephone instruments will be installed on a number of important German express trains, and receiving instruments will be placed in hotels and embassles, according to an announcement made recently. Experiments conducted in a moving freight car have shown that the wireless system works well, the men engaged in the testing of the instruments being able to hold conversations with friends in Berlin. The tests were made under the observation of engineers, military attaches and the diplomatic representatives of the United States and

The voltages applied to the plate circuits of amplifying tubes are not extremely critical and one voltage control will suf-The detector tube, however, is often very critical and an efficient potentiometer will

work wonders in controlling it. Apparatus used for the reception of broadcasting is exactly the same as that used for the reception of code signals. The transmitting equipment, however, is different

The use of a single wire for reception is advantageous because it lessens the amount of objectional interference in the way of static. It is equally as good as a multiple wire system for reception.

Defective "B" batteries will often cause rouring in the telephone receivers.

The electron often talked about is the smallest known quantity of negative electrical energy. 'a motion it makes up the electric current.

A "soft" vacuum tube is used as a detector tube and a "hard" vacuum tube as an amplifier. The terms "hard" and "soft" refer to degree of evacuation. Radio vaves travel at the same speed as light, namely

186,000 miles per second. A wavemeter is an instru-

ment used for checking up the wave lengths of sending and receiving stations. Gas pipe or water pipe sys-

tems may be used for grounds. the latter being more advisable Lightning protection secured by grounding the antenna when not in use is essential and is required by the underwriters.

Instruments and Notebooks of David

Hughes, Pioneer in Wireless, Found in London.

Instruments and notebooks of great historic and scientific value to the student of wireless telegraphy have recently been unearthed in London and are now in the archives of the British museum. They were the property of David Hughes and the books are a complete record of his experiments in wireless telegraphy forty-three years ago-in 1879.

For twenty years they have been stored in a furniture warehouse in London and were brought to light through the efforts of A. A. Campbell Swinton and Col, H. G. Lyons of the Science museum.

The notebooks are many in number and are said to be a complete record of Hughes' work in wireless, including drawings and a description of his invention of the microphone. Among the electrical instruments ofser

RADIO OF 1879 DISCOVERED | made microphones, unquestionably the work of the inventor's own hands and with which he carried on some of his experiments 'n vireless telegraphy.

There are also drawings made by Hughes and descriptions of the several instruments, all making a complete record, together with what the museum already has acquired of the earliest scientific inquiries in an art that today is attracting the earnest attention of the whole world

Set That Will Not Freeze. Jean Lecarne, a French engineer,

connected with Vallot observatory, at the summit of Mont Blanc, in the Alps has invented a radio instrument which is not affected by low temperatures. He proposes the use of such sets by mountain climbers and other adventurers.

Fear of Lightning. "Lightning shy" radio fans have been worried about the possibility of dangers to the houses from the effect

SOILS IMPROVED BY COVER CROPS

Used for More Than 100 Years by Farmers Who Found Practice Profitable.

THREE PURPOSES OF LEGUMES

Universal Rule to Plant in Time to Secure Good Growth Before Freezing Weather-Of Especial Value to Truckers.

(Prepared by the United States Department of Agriculture.) Planting cover or green manurel crops is a matter which requires attention in September in most parts of the United States, says the United States Department of Agriculture.

Clover, vetch, and other legumes serve the triple purpose of adding humus to the soil, accumulating nitrogen, and preventing soil erosion. With some tender berry and fruit crops they also serve to protect the roots from severe winter weather. Outside of the nitrogen-forming plants, rye is largely used as a cover crop sown in the fall and plowed under in the spring to add organic matter to the soil. The cover-crop problem varies largely with locality, but for overwinter purposes there is one rule which is universal, and that is to get the crop in the ground in time to secure good growth before freezing weather.

A Practice of Long Standing. The use of clover or some other legume to enrich the soil is generally considered a cardinal argricultural practice in the humid sections of the United States. It antedates by threefourths of a century the monumental discovery that legumes store up nitrogen from the air. The belief that clover was a valuable improver rested first on experience, and later experience was substantlated by the discovery of the relation between the legumes and the nodule bacteria.

Other legumes, as the cowpea, the Japan clover and bur clover in the South, and crimson clover on the Atlantic coast, have come into use in the territory, not well adapted to red clover. The various vetches are held in widespread favor, different varieties being employed according to climate and crop conditions.

The time of planting and the best crop to use is a matter which local conditions must dictate. Along the



north Atlantic coast it is considered best to get these crops in from the first to the middle of August, while in the extreme South the planting may be deferred to early October. In the extreme North hairy vetch is favored as a legume cover, or green manure crop, but rye is also largely planted. From middle Pennsylvania to the north Alabama line crimson clover gives good results. In the extreme South bur clover, vetch, and crimson clover are used, as well as velvet beans and cowpeas.

Broadcasting Seed Is Favored. Methods with cover crops vary greatly. In the South they are customarily sowed between rows of cotton at the sow the winter crop between corn ways done with orchards. Data col-

of agriculture. Cover crops are of especial value to small gardeners and truckers, who often find it both difficult and expensive to obtain stable manure. They add the humus which is so necessary to maintain a good physical condition of the soil.

PROBLEMS OF AVERAGE FARM

One of the Most Important is to Arrange Work to Obtain Profit From Each Department.

To arrange the work of the farm so problems of the average farm. Where be provided. silos are added to the farm buildings a change of farm management must is required for pasture, more stock can be kept on the land, more land must be used for corn, or at least sufficient corn must be planted to fill the silo. Less labor is required to feed the stock, but more must be provided during the short season of silo filling.

to Soil, Even When All of Her Milk Is Sold.

PUBLIC MARKET AIDS BUYER AND PRODUCER

May Be Open Space Where Farmers Sell to Consumer.

Some Cities Have Erected Sheds Along Street Curbs-Supplementary Agencies to Assist in Efficient Distribution.

Open retail markets constitute the simplest and least expensively operated of all types of public markets. In its simplest form a market of this type may be merely a designated length of curb, a section of a broad street, a vucant lot, where, under slight supervision, farmers may group their wagons and sell to consumers.

In its highest development such a market may consist of a paved tract with ralsed walks covered with substantial sheds to protect teams, wares, buyers, and sellers from the weather. The shed may even be of a type that in bad weather may be made practically into an enclosed building by the use of rolling doors. A few cities have erected sheds along street curbs for the protection of open markets, but for the most part curb markets are unprotected and sheds are constructed only in markets situated on special market tracts.

The essential feature of a retail market is the restriction of purchases to consumers as distinguished from



Open Retail Markets Benefit Buyer and Producer.

dealers. Such a market, if it is a "producers' market," furnishes an opportunity for direct dealing between producers and consumers. Open retall markets may also admit hucksters, or wagon and push-cart peddlers as salesmen. These dealers are usually admitted under certain restrictions.

The United States Department of Agriculture has given much ..ttention to the subject of public markets, their establishment and operation, as an economical and satisfactory meeting place for the country producer and the city buyer. A new Department Bulletin, No. 1002, entitled "Open Types of Public Markets," is now available for distribution, and copies Cover Crop Should Make Fair Amount | may be had free by writing to the Deof Growth Before it is Turned partment of Agriculture, Washington,

D. C. The bulletin discusses the function of public markets, their ownership and control, establishment and operation. It says that public markets are not agencies to replace other means of distribution of farm produce—they are supplementary agencies to aid, under favorable conditions, in efficient distribution.

SUCKERS ON CORN HARMLESS

Many Farmers Have Mistaken Idea That Earless Stalks Are Hindrance to Growth.

Many farmers are possessed with the idea that the suckers or earless if needed. Add the yorks of five eggs, last picking. It is also common to stalks which grow from an ear-bearing stalk of corn, are a bindrance to rows before harvest. Wherever clean the best growth of the latter; cultivation is practiced the soil is and valuable hours are sometimes likely to be in shape for broadcast- spent removing them. But experiing the seed. If convenient, it can be ments during two successive years on harrowed in. In orchards a light har- Nebraska farms demonstrated that rowing or disking may be employed corn with the suckers left undisturbed if the ground is free from sod. Care outyielded that from which the suckmust, of course, be taken not to injure ers had been removed. Their leaves, the roots. The crop is usually plowed like the others, would seem to perunder in the spring, but this is not al- form useful office in absorbing nutritive elements from the atmosphere lected in all parts of the United States for the benefit of the ear on the main eggs. Peel three large onions and cut shows a general benefit from this form stalk.

BEES ARE VERY PROFITABLE and cook until soft. Add one tenspoon-

Common Honey Gatherer Is by Far Best Carrier of Pollen-Scatter Through Orchard.

The common honey bee is by fur the best carrier of pollen and it will pay the fruit grower, to keep bees, even though he may not care to go into the honey business. Bees, however, are a very profitable .ide-line for the orchardist, especially if alfalfa fields are available to work on after the blooming season of fruit that each department can be made to has passed. About one hive of bees turn a profit is one of the important to an acre of bearing orchard should

Preferably the hives should be reattered as widely as possible throughout follow. Less hay is needed, less land the orchard during the blooming season. Experiment and experience have shewn that little reliance can be placed on the efficacy of wind and of insects other than the honey bee in effecting the transfer of pollen from tree to tree, or in fact from flower to flower.

GROW CLOVER TO FEED COWS HORSES NEED LIBERAL FEED

Animal Returns 75 Per Cent of Feed Oats Are More Acceptable, but Corn, Kafir or Barley, With Bran Are Good.

Keep the cows and grow clover to Work horses need a liberal allow-Alicia Hortense, "poker is not such feed them on. A cow will return 75 ance of feed. Oats are more than acper cent of her feed to the soil, even ceptable, but if corn, kafir or barley when all her milk is sold, and the is used, horses will stay in better conclover plant will do even more, for it dition if they can be furnished with a small allowance of wheat bran: Bran not only is a good conditioner but it beat with a flush, a full house and also furnishes protein and mineral fours."-Richmond Times-Dispatch. atter which the horse needs.



We are not always glad when we For the heart in a tempest of pain May live in the guise of a laugh in the eyes
And the rainbow may live in the rain.

-J. W. Riley.

BRAN DISHES AND OTHERS

A few spoonfuls of bran may be mixed with any dry breakfast food,

with no noticeable difference in the taste. Buan is a good broom for the aliment ary canal and in various dishes may be mad€ most appetizing.

Bran Layer Cake .- Take one quarter cupful of butter, add one unbeater egg and fill up the cup with sweet milk, stirring enough to mix. Sift to gether a tablespoonful of cornstarch, one cupful each of flour and sugar, and a teaspoonful each of baking powder and salt. Add one-half cupful of bran and mix with the liquid. stir until smooth and bake in two layers, using a cooked cream or jelly for filling. It may risc be baked in a loaf, adding spice to taste.

Bran Jelly .- Sift bran into boiling water, stirring till it is like gruel. Cook slowly two hours, strain through a fine sleve and repeat. Mix a tablespoonful of graham flour with a little cold water, add to the boiling liquid and cook until it is smooth. Add a little salt, pour into wet molds and set away to harden. It will make a delicate jelly which may be served with fruit or milk. Fine for a delicate stomach.

A bonny clabber desert is one which It is wise to teach the children to enjoy. Set a pan of rich new milk away to just become thick. Place on ice until well chilled and serve with grated maple sugar or with a sprinkling of brown sugar with nutneg or cinnamon. A child's luncheon with a piece of whole wheat bread and butter will make a good meal, even for an adult. Thick sour cream, when it is obtainable, makes the most delicious salad dressings. Whip it with a Pover beat er; when stiff, add lemon or pineapple juice and such other seasonings as are appropriate to the salad which is to be served. The usual boiled salad dressing is made especially rich and tasty by the addition of a half-cupful of rich, sour cream, beaten stiff and added to three tablespoonfuls of boiled dress-

Rhubarb Pudding .-- Place sufficient sliced bread buttered to serve the family in a baking dish, cover each slice with chopped rhubarb, sprinkle with sugar and nutmeg and repeat until the dish is full. Add boiling water and bake until the rhubarb is well cooked and the bread saturated with the juice. Serve on a plate direct from the dish either hot or cold, with any desired

To be what we are, and to become what we are capable of becoming, is the only end of life.
The pleasantest things in the world are pleasant thoughts, and the great art in life is to have as many of them

as possible.-Bovee. SAVORY DISHES

Now that the mushroom is growing in the fields a few dishes to remind us of its worth are in season: Scrambled Eggs and Mushrooms.-Break into

small pieces one pint of fresh well-cleaned mushrooms. Sprinkle with salt and let them stand 30 minutes. Put into a saucepan two tablespoon-

fuls of butter; add the mushrooms and their juice; cover and cook eight minutes after they begin to simmer. Season with pepper and more salt beaten slightly, to the stewed mushrooms. Stir until the eggs are set. Serve on toast.

Corn Fritters .- Put the contents of a can of corn through the meat chopper, add two well-beaten eggs, two or three tablespoonfuls of milk and two tablespoonfuls of flour. Add onehalf teaspoonful of sugar, salt and pepper to taste. Fry by spoonfuls in hot fat or butter, browning well. Fresh corn may be used, omitting the milk

Curried Eggs.—Take six hard cooked them in thin slices, put them with two tablespoonfuls of butter in a saucepan ful of curry powder, one clove of garlic, one-fourth of a teaspoonful of ginger, one-half teaspoon'ul of salt, one tablespoonful of flour, one-half pint of stock or water; cool. Take three cupfuls of cooked rice, avrunge around the edge of the platter, cut eggs in slices and place over the rice; over this pour the sauce and serve very hot. Garnish with green pepper or sprigs of pars

Mutton With Dumplings. - Take three pounds of the breast of mutton, simmer until tender, then set aside to cool; skim off all the fat, return the mutton to the liquid, add one or two onions finely chopped, salt, pepper and a little curry powder if liked. Just before serting time drop dumplings into the not stew. If dropped from a teaspoon these will cook in eight .ninutes A few peas added to the stew vill change the flavor and improve the dish.

Undesirable Son-in-Law.

"Daughter," said the old man sternly, "I positively forbid you marrying this young scapegrace! He is an inveterate poker player!" "But, papa," tearfully protested

an awful habit. Why, at your own "That's where I got my information, daughter. I'll have no daughter of mine bringing home a man that I can't

"What Shall I Take Along?" Cool Frocks for Summer

111115 B THE question that looms up for for the plaited skirt. The coat has settlement, now that vacation only one fastening, at the neck, but days are here, is: "What Shall I Take is provided with a narrow belt with Along?" The average woman he short hanging ends. Either of these learned the mental and physical re- suits, or both of them, will serve for freshment that follow her little sum- nearly every need of the tourist. mer journeyings and will not allow Midsummer calls out, along with herself to be burdened with a lot of satin butterflies and gauze-winger "things." Besides, the clothes of to- dragon flies, the sheerest and level! day are far from bulky and one can est afternoon dressee that grace the

enjoy, above all things, going on dress inborn love of daintiness and color.

go very well equipped and still travel year. They are scattered everywhere light with no cumbersome luggage. for women find an opportunity it Some fair vacationists appear to these airy fabrics to indulge their parade, and there are plenty of places | For several seasons past, as manuwhere they can spend their days dress- facturers have broadcasted ador bly



Two Clever Models in Tailored Suits.

ing and undressing to their heart's | pretty frocks of organdle, swiss, voils a visit to the country, or perhaps a retreat to the wilderness, and gladly we leave behind us everything that will

not be positively needed. When the wardrobe is brought down to the irreducible minimum, the tailortraveling and general vacationing. Ex-

content. But vacation, to most of us and other sheer materials, they have mortals, means a sight-seeing journey, stimulated a demand for them that is now universal. As the days grow hot, color combinations that are cool-looking come to

the fore in these thin dresses. Two of them, as shown here, reveal this bit of welcome artistry on the part of the ed suit is its main dependence, designers. White organdle and dark Wherever we go the suit goes too, blue swiss, dotted with white, is a fatogether with blouses, and one may miliar and well-loved combination-an choose a street or sports model for old friend in a new guise, which appears in the dress at the left amples of these two styles are shown picture. The dress is made of the



Cool-Looking Summer Dresses.

clever part is to trim the hat with gay or corsage when carried.

ground, is a piece of original and good | banded. lesigning. Its short loose coat, with ong revers at the front, fastens with and looks very cool. The skirt is plain and short enough to suit the most seasoned globe-trotter. Navy blue twill is a perennial favorite and vindicates its choice everywhere. In the other suit a plain homespun makes the sleeveless coat with a cape, bound with a striped material which is used

Home Millinery.

hats. Beads or embroldery cover up

a multitude of spots. A good buck-

iere. The dark blue model, trimmed | swiss with apron overskirt, collar, cuffs vith braid, as pictured in the fore and sash of organdle, appliqued and

Our old, distinguished, midsummer acquaintance—the black and white three buttons below the waistline combination-appears in the dress of white volle with inlays of checked tissue, on the lady taking tea.

this year's effects and thus make it Blouses of silk that are hopelessly up-to-date. Grapes, quills and cire worn under the arms or even spotted ribbon are all good touches, not to

often make over into good-looking mention beads and embroidery.

Party Bags Are Dainty. One of the most charming accesram frame of becoming shape is first required. The silk should next be sories for the dance costume is the leaned and pressed and then drawn dainty party bag of soft silk or chifsmoothly over the hat. It is usually fon, with flowers forming the flat botgood plan to cover the crown and tom portion. The sides of the bag brim separately. Even a straw that are fulled into this ornamental part, is faded can be covered this way. The which gives the effect of a small nose,