

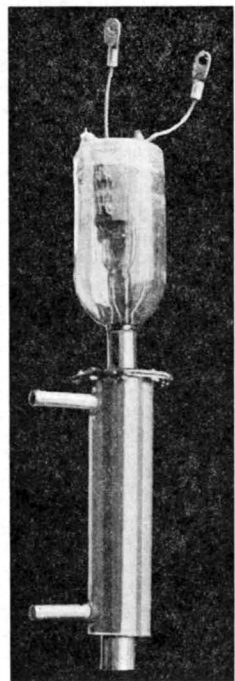
Helium Tubes

By F. S. McCullough

HELIUM tubes are now playing a great part in the high frequency art today. Seventeen of the largest broadcasting stations use these tubes each evening. These are the first stations in the world to use the helium atom as a carrier of radio frequency currents. It has been practically impossible to separate the helium atom heretofore from other gases. The helium in these tubes is by far the purest in existence. There is practically no other gas mixed with it, otherwise the tube would become inoperative. These little carriers also cool the tube.

A great many experiments have been carried out in connection with emission of electrons from hot bodies using filaments and plates within a glass bulb, which could be exhausted of air by means of a vacuum pump. The filaments were heated by a battery and means were provided for the measurement of the electrical charge on the plate. With the air inside the bulb at normal atmospheric pressure, the temperature of the filament was gradually

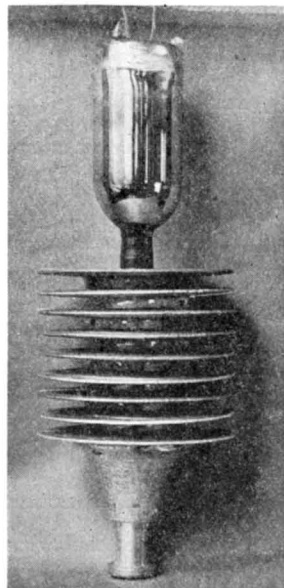
increased by increasing the current passing through it. It was found that the plate received a positive charge of electricity, which increased until the filament was at a yellow heat. When the temperature was raised above the value the charge decreased, until at white heat, the charge became small. The pressure of the air inside the bulb was then reduced gradually. The charge diminished still further until it reversed and went negative, and this negative charge gradually increased as the exhaustion of the bulb continued. Later it was found that the



degree of electrification of the plate and also its sign depended largely on the nature of the gas inside the bulb. It was noticed

that the presence of oxygen tended to reduce the charge received by the plate.

The electron theory assumes that an atom of an element consists of a positive nucleus or core, around which revolves a number



of electrons. Little is known of the positive core, although its mass is great compared to that of the electron. Thus, a difference between gold and lead is probably that there are more electrons per atom in one than in the other. If we could alter the number of electrons in an atom, we could probably active substances, examples of atoms emitting some of their electrons and therefore changing their character.

Tungsten plays a very important factor in electron tubes. Take for example a tungsten filament at low temperature. No electrons are emitted. As the filament becomes red hot, about 1000°C ., a very small number of electrons is emitted, which increases further as the filament is heated. The maximum currents are obtained just before the filament melts, which is about 3270° . Gases have been used in tubes. Hydrogen for instance has a great cooling effect but it decreases the electron current. The writer, however, found that by putting pure gases in tubes and keeping them in a free state, entirely different results occurred. All of the known gases have been

used in a pure state and it was found that there were a number of factors to contend with. First, the cooling effect was always kept in mind, so a metal air-cooled tube was built and used to carry out extensive experiments. During these experiments, it was found that when the tube containing

the gas kept cool, the gas itself was able to retain it in equilibrium and not become inactive. Helium proved the best because it was capable of excellent cooling and gave a great deal more space current. These helium tubes have been used for six months without any failures.

Experimenters Section

20 Meter Tests, November 22nd and 30th

MEMBERSHIP in the Section is open to anyone interested in radio experimentation in company with others.

It is not necessary to have a radio laboratory, most of the work can be done with the equipment of an ordinary amateur station plus the willingness to stick to it.

Joining the Section

The business of joining the section is extremely simple—just address a request to Experimenter's Section, A.R.R.L., 1045 Main Street, Hartford, Conn.

The Service of the Section

The Experimenter's Section offers the following services:

A list of men who are interested in your problem.

A list of problems that are in need of work at present.

Outlines suggesting the best way of attacking your problem.

All of these are kept up to date and are available on request of those who have enrolled their names in the Section.

Laboratory Sheets

Several additional laboratory sheets have been made out. They will be mimeographed and sent to the members who signed up for them.

Observers for NAA

Careful observers who can receive 15 words per minute are wanted for some observations to be made on the transmission of NAA and possibly some other stations. The wavelength is 2650 meters, the signal I. C. W.

Please communicate direct with this section in the regular form indicated below.

Power Line Interference

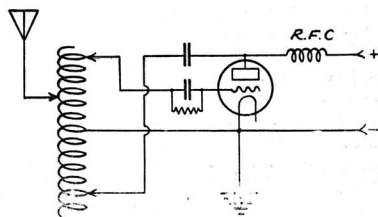
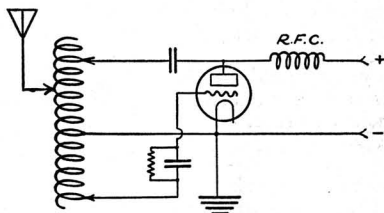
Our item on page 38 of the May issue has brought immediate response. The New Bedford Gas & Edison Light Company of New Bedford, Mass., has stated that they will be very glad to receive the cooperation of any amateur in their neighborhood. They will welcome any practical ideas on the location of line interferences and will be

glad to try the methods out and report upon them. We also have a letter from W. R. G. Baker of the Radio Engineering Department of the General Electric Company stating that they are doing work of this kind and will be very glad to receive additional information of any kind. Several residents along the line of the electrified portion of the New Haven railroad have written us statements that any town along this line offers a good field for experimental work on line interference. In addition to this we have letters from various portions of the country where Cottrell precipitators are used in depositing soot and smelter dusts. It appears that these precipitators at times cause very severe interference.

At the present time we are therefore long on experimental fields and short on suggestions as to the method of attack. Assistance is invited.

The Hartley Circuit

Mr. E. B. Redington of 2XQ at Union College, Schenectady, N. Y., raises the



question of whether there is any advantage in favor of one of the two clip arrangements shown here. The Editor has en-