

air is then deflected sideways, and the dust, which can not turn the corner, strikes the glass; the velocity then falls, the pressure and temperature rise, resulting in the water being evaporated and the dust left sticking to the glass. The record obtained consists of a linear deposit of dust on the cover-glass the same length as the slot. This can be mounted on a microscope slip and examined, or kept for reference and future comparison. Dr. Owens described this instrument fully in a paper read before the Royal Society on February 23, 1922, when he exhibited samples of dust obtained from wind which had crossed the North Sea, and was therefore Continental in origin. He also showed dust obtained from expired air, which, since Tyndall's famous experiments made in 1868 and 1869, had been regarded as optically pure, that is, free from all dust. More recently Dr. Owens has obtained records of haze in Villa Real de San Antonio, in the south of Portugal, on a hot, dry, sunny day, which showed that the haze consisted entirely of particles of common salt. Air containing such numbers of salt crystals would be peculiarly liable to the formation of fogs, since a sudden fall of temperature under such conditions would probably result in condensation on the salt particles and fog. The great danger of sea fogs makes any means of predicting their occurrence most valuable. Perhaps the most useful application is for the examination of smoke pollution in cities, and of factory and mine dust. When the record is obtained the particles of dust can be placed under the microscope and their nature and number examined. The method of counting the number of particles is very simple: A volume of, say, 50 cubic centimeters of air is drawn through the jet, and the number of particles of dust counted microscopically, by means of an eye-piece micrometer ruled in squares; the total number divided by 50 gives the number per cubic centimeter. In London, during a smoke fog on Sunday, January 22 last, the number of smoke particles per cubic centimeter amounted to 21,800, the average diameter of which was unusually large, being 0.85 of a micron, a micron being 1-1000th of a millimeter, or 1-25,400th of an inch. This was a bad fog. The number of particles during an ordinary winter's day in London, without fog, would be about 6,000 and these would average in diameter 0.5 micron, but the number falls much below this in the summer when the domestic fires are out. The number of particles per cubic centimeter in the air of London on Tuesday, May 23, last, was 1,400. At the recent International Conference on Geodesics and Geophysics held in Rome, the Meteorology Section, under the chairmanship of Sir Napier Shaw, voted a sum sufficient to provide about twelve of these instruments for distribution to different countries, so as to obtain information from widely separated sources on the condition of the atmosphere as regards suspended impurity."

**TOO MANY CONTRAPTIONS IN THE AUTO?**—The aviator, according to a British writer, is responsible for the extraordinary multiplication of instruments on the dash of a current automobile. The editor of *The Scientific American* (New York) thinks the idea is a sound one, both as regards the origin of the practise and in its implication of the utter folly thereof. He goes on:

"Instruments on the dash are, of course, inevitable. Nobody wants to drive without a speedometer, an ammeter, and an oil gage. But why a clock? Why an assorted collection of dials that make the inner elevation of one's petroleum-buggy resemble the control board of a central power-station, or an overcrowded pawnshop window? Why the present mad race for a multiplicity of nicked protuberances in the cockpit of the road cruiser?"

"Perhaps the answer is to be found in a recent advertisement which considerably tickled our risibilities. The better part of an expensive page was devoted to picturing the supreme delight with which an owner might look upon the automatic cigar-lighter that exclusively features the advertiser's machine—how from his proud station in this car he might look down with amused contempt upon the unfortunate driver whose machine leaves him at the mercy of the match-box when he wants a smoke. We have no doubt that somewhere there exists a man who would buy the X Y Z car to get the cigar-lighter. But are there enough of him to advertise to? We have no doubt that some folk will prefer the car with fifteen knobs and dials to the one with only fourteen. But is not the general catering to this idea the result of a misdirected sales enterprise? Wouldn't our cars be more comfortable if they did not look quite so much like an instrument-maker's laboratory?"

## BOOTLEGGING AIRPLANES

"**T**HE FLYING CONTRABANDIST" is the title under which *The Aerial Age* (New York) reprints an editorial from the *New York Times*, inspired by the forced landing near Croton-on-Hudson of an airplane carrying whisky from Canada, with the escape of the pilot in a waiting automobile, which, it says, "makes a story of unusual interest." A bootlegging airship has not been reported before, but it doesn't follow that it is a novelty to the illicit trade in rum. The writer continues:

"Fiction has surrounded the smuggler with an atmosphere of romance, mainly because he must be daring and his occupation involves him in bodily risk. There would be a gap in literature if the contrabandist were left out. Such was the unknown from Montreal, who seems to have arrived at the rendezvous too late to transfer his prize to the 'agents,' and had to plane down to an inhospitable hill, where he came to grief with a crash that involved most of his consignment.

"This fashion of scorning the Mullan-Gage Law of the State of New York is not likely to be a success at present. The exhaust of an airplane and the whir of the propellers make too much noise, and everybody follows the flight of a strange ship with curious eye. The airplane is still a spectacle. In this case mounted troopers of the State came in hot haste to the wreck to seize the contraband and nab the lawbreaker. It might have been hard to empanel a jury to convict him if he had been apprehended. In course of time there must be a State police driving airplanes as well as riding horses. Then suspicious planes will be 'held up' or followed by 'traffic cops' lying along aerial routes connecting such cities as Montreal and New York.

"In that day there will be an air code as thick as a volume of the Supreme Court reports. Flying will be strictly regulated, and there will be aerodromes every few miles, with lighthouses at night. Planes will carry numbers to identify them, and they will be darting in all directions, carrying passengers and perishable freight. Rogues, as well as honest men, will be in the air, and the flying police will often have difficulty in distinguishing them. The automobile long ago became a vehicle useful in crime, and the airplane will also be. All kinds of portable, ill-gotten goods will be coursing through the air, and thief-taking will become more a problem than ever.

"Flying can not be regulated too soon for the protection of the public. Commercial aviation is developing rapidly. With better safeguards for passengers, more of them are traveling through the sky. Air limousines now fly thousands of miles without accident. Merchants who want a new market are patronizing the air-carriers. Spring fruits and vegetables can be delivered fresh hundreds of miles away. Mullica, down in sandy South New Jersey, is planning to ship asparagus by plane to Boston every afternoon. But the bootlegger will certainly use the plane to carry his outlawed goods."

**ARTIFICIAL NATURAL GAS**—Natural gas is properly called methane and is a compound consisting of one atom of carbon united to four atoms of hydrogen. According to the German technical papers, this is now being manufactured for commercial purposes, being delivered in steel carboys under a pressure of 125 to 150 atmospheres. The caloric value of methane is three times as great as that of hydrogen and twice as great as that of the best illuminating gas. It is entirely free from sulfur compounds and the dangerous cyanogen compounds, and for this reason it does not injure plants nor tarnish silverware as ordinary illuminating gas does. Best of all, perhaps, from the consumer's point of view, is the fact that by its use the latter is freed from the various annoyances connected with the ordinary city supply. The normal carboy having a content of ten gallons holds from five to six hundred gallons of compressed methane, which corresponds in caloric value to 12 hundred gallons of the best illuminating gas furnished in cities. It can be easily used to supply most incandescent lamps, whether these are suspended or fixed on stands. The methane can also be readily used in most forms of cooking and heating apparatus as well as to supply laboratory burners.

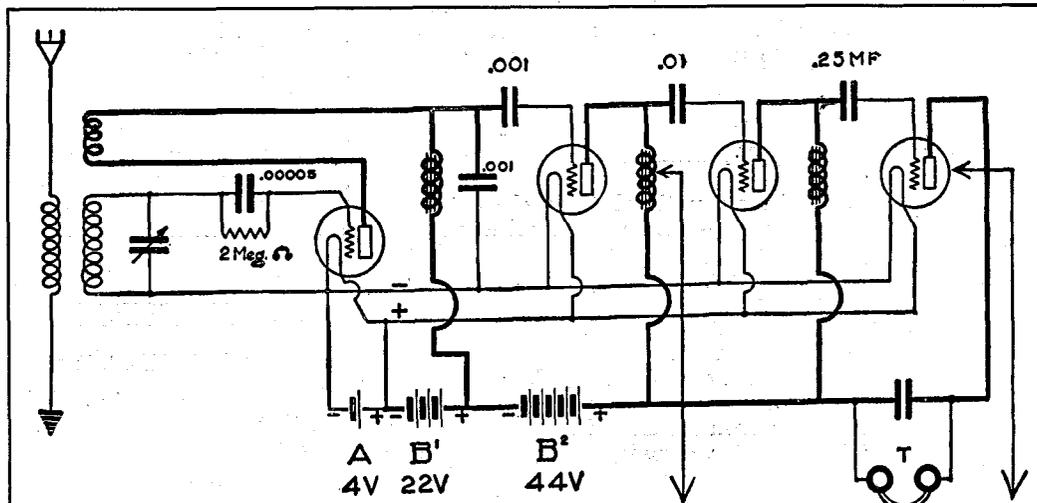
# RADIO DEPARTMENT

## THE THUNDER OF OUR HEART-THROBS

**U**NDER THE PICTURESQUE TITLE, "The Thunder of Our Heart-Throbs," an article in *Popular Radio* (New York), written by J. C. Gorman, tells of the amazing amplification of sound that may be effected by putting together "in cascade," as it is called, a series of the extraordinary little talking lamps called electron tubes, or triodes.

An illustration reproduces a photograph of Major-General George O. Squier's demonstration that the triode amplifiers, utilized in connection with his system of "line radio," can so enhance the sound of the heart-beat that it may be transmitted to any distance, and trumpeted as a very tempest of sound, to be heard by an auditorium full of medical students or physicians.

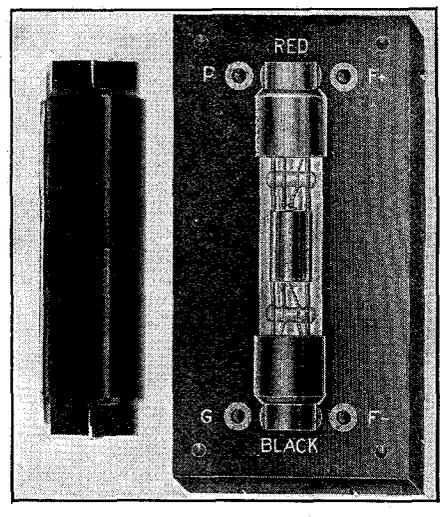
An interesting summary is given of some other achievements of the amplifying tube, and in particular a detailed account of the operation of a modified form of triode recently developed, and especially designed for use in both radio-frequency and



Illustrations by courtesy of "Popular Radio," New York.

IT MAKES A HEART-BEAT "A TEMPEST OF SOUND."

At the side is the new coil (on the left) and tube (on the right) reproduced half-size, and above is shown in diagram the method of connecting up the tubes and coils. "These instruments are supplemented by the use of four mica condensers which store up the instantaneous voltage supplied by the combined action of the preceding tube and coil. The next tube and coil take this voltage and step it up and supply it to the next set of tube and coil, and so on."



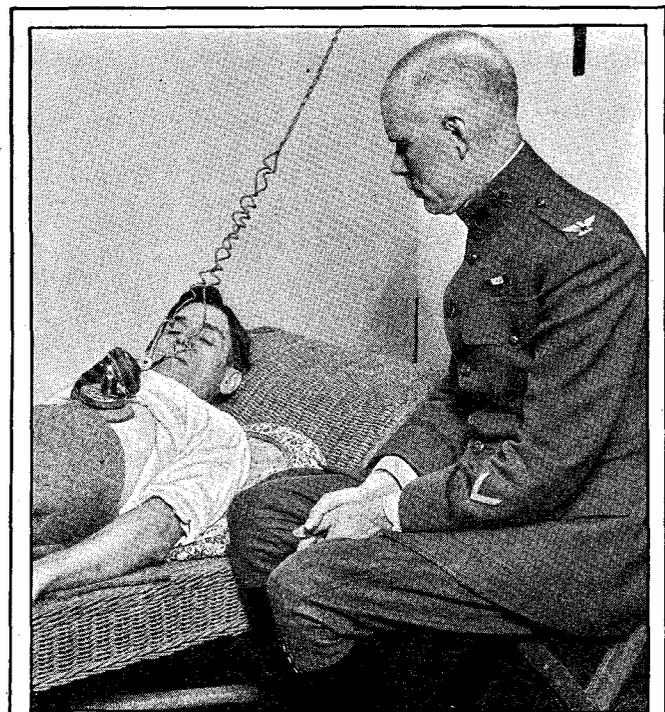
audio-frequency amplification. For the amateur who perpetually invokes his receiving apparatus to "speak louder" —and that in-

cludes most of us—the new tube suggests possibilities that are distinctly worth investigating. Here is what Mr. Gorman has to say about amplifying tubes in general and the new Myers tube in particular:

"The vacuum tube or audion has opened up so many fields of usefulness and is of such commanding importance that it may properly be given first place over all other recent inventions of the twentieth century. Without it, our transcontinental telegraphy or telephony would be virtually impossible, and even transoceanic radio communication would be sadly crippled. The device has entered practically every field of scientific usefulness, and its contributions to each of these fields are of almost inconceivable value.

"One of the most important applications of the audion is its use as an amplifier. It is employed in the medical profession as an amplifier of the sounds of heart-beats and for detecting ailments that affect the working of other human organs. It is used to make the deaf hear. It is used in electrical research laboratories for amplifying and measuring the feeblest of electric currents. It is used in ordinary telephony to strengthen weakening voice currents which have traveled great distances. It is used by college professors to amplify the tiny sounds that insects make. It also makes possible our modern radiotelephony in its perfected form to-day."

After naming Dr. Lee De Forest as the inventor of the audion, or triode, and the originator of the method of amplification by the use of series of audions "in cascade," the writer continues:



LISTENING TO THUNDEROUS HEART-BEATS.

General Squier—a Colonel when this picture was taken—is here listening to heart-beats made audible at practically any distance from the patient's bedside.