

puts scattered somewhere between or about these extremes. It has been said, and probably truthfully, that, by giving a little special attention to the matter in a specific case, the by-products possible of production from a given animal can be made to exceed considerably in retail value that animal's whole yield of meat. That, naturally, is merely illustrative of a possibility, and not a feasible plan for actual adoption.

It is leather from hides, of course, which constitutes the one by-product of the industry with which we are most familiar, because it is the oldest and doubtless the most generally used. To undertake even to enumerate the uses to which the leather made from the hides of meat animals is put would be an almost endless task. From the hides of such animals, however, come several things besides leather—hair, gelatine, and, indirectly, lanolin, for instance.

As to hair, the industry's principal output comes, of course, from hogs. Every large meat-packing plant has a by-product of hog hair bulking into hundreds or thousands of tons annually. Temporary disposal of it consists in its being dried and put into bales, of about 300 pounds each. Eventually, however, it is thoroughly cleaned, and then "roped," the latter treatment being for the purpose of giving it curl. It is then disposed of for use in stuffing automobile cushions and for other similar purposes. The hair from beef animals naturally reaches the market mainly by way of the tanneries, and is in demand for various kinds of padding, stuffing for cheap cushions, for plaster bonding, and so forth. The tail switches of such animals, however, comprise a direct and quite important output of the packing plants. They accumulate to the amount of tons, and are disposed of for the manufacture of high-grade curled-hair mattresses. Wool is the hair product of sheep, of course, but it can hardly be regarded as having connection with meat packing, for the animals are ordinarily, if not always, sheared before being slaughtered. From this wool, both that which is sheared and that which remains on the skin, is obtained the valuable fatty mixture called lanolin, used in pharmacy as a base for unguents—face creams and such preparations.

Gelatine is a particularly important and valuable by-product of meat-packing plants. It is obtained not only from beef hides, but also from the bones and a number of other minor parts of the animal. It is in extensive demand, as is generally known, for the manu-

facture of many brands of jelly powders and other gelatine preparations used in the making of desserts and other edibles; but, as constituting a fact perhaps not so well known by the general public, it is also very extensively used in making ice-cream and marshmallows, for binding and stabilizing purposes, and by bakers and biscuit-makers for icings. Large candy factories and ice-cream makers, in fact, frequently order gelatine from the packing houses in hundred-barrel lots.

Because gelatine comes from hides and bones is, however, no legitimate reason for one to develop any squeamishness over eating it. In its manufacture it is purified and rendered absolutely clean. The first step is to thoroughly cleanse the bones and hides by the application of hot water and steam. This is followed by the process of crushing and boiling out the gelatine, which is held in small cells. The product, at this stage, is in liquid form. It is next distributed to a broad running belt and there maintained at a temperature of about 40 degrees Fahrenheit. It is thus congealed and brought to sheet form, after which it is thoroughly dried and crushed, to reduce it to the granular state—when, being in a form somewhat like sugar, but of a light buff color, it is ready for the market. About six different grades are made; the stronger the jelly surface which it will yield, the better the grade and the higher the price.

The bones which naturally accumulate about meat-packing plants in very large quantities also have by-product value in a number of different ways aside from their utilization in making gelatine. Hence, they are always saved; and, moreover, quite regardless of the purpose for which they are to be used, they are invariably thoroughly cleansed and carefully graded. They are extensively used in fertilizers and in stock and fowl foods, in each case to add phosphate value. The manufacture of these two by-products comprises a very important side-line business of the meat industry, nearly all large packing plants maintaining special departments to carry on this work.

Other waste than bones enters, of course, into the manufacture both of fertilizers and of stock foods. These consist of what is broadly termed "tankage"—miscellaneous scraps, refuse from entrails, blood, and so forth. Blood, which naturally is a very considerable waste output of the packing plant, is a particularly prominent ingredient of these by-products. First, it is

drained to a large tank or vat, and there, when the tank is fairly well filled, quite thoroughly cooked, by means of steam pipes; next, it goes into great desiccators, where it is dried by a method of steam heating, and, finally, it is ground and screened—whereupon it is reduced to the form of very fine powder, of a dark red color.

The meat scraps and entrail refuse are handled in very much the same manner. The bones which are to be used in these by-products are also ground to near-powder condition. Different feeds, as well as the fertilizers, naturally contain different proportions of the elements, and the mixing of the ingredients, which is usually done just before marketing and to meet specific requirements, is therefore done on a basis of scientific analysis. The desiccated blood, however, often finds a market without admixtures, either for use in its pure state or for use by outside fertilizer manufacturers.

It is a true saying that nothing goes to waste about an up-to-date packing plant. Here, therefore, must be mentioned another form of fertilizer product—namely, what is called "stick." It consists of a liquid or semi-liquid waste, produced in the washing and cleansing not only of the meat and other animal parts, but of the floors and rooms generally. This "stick" is rich in ammonia, of which it ordinarily contains about 11 per cent, and in other refuse elements useful in manufacturing fertilizers.

Hoofs and horns also bulk to a great quantity around the meat-packing plant. They are used, as perhaps nearly everyone knows, in the manufacture of glue, doubtless producing hundreds of barrels yearly. Not even the teeth of the slaughtered animals represent literal waste. They—like bones to some extent also—are used in manufacturing certain kinds of household cleansers, and in other ways common to the usage of bones.

The intestines of the various animals are also responsible for at least two by-products of considerable importance. The most of them, of course, are thoroughly cleaned and used for casings—for sausage and similar ground or chopped food. From sheep intestines, however, comes practically all the catgut used in surgery. The demands made upon surgery catgut are naturally very exacting, and the manufacturing process, besides necessitating care and skill, is a somewhat complicated and tedious one.

Every Lamp Socket a Radio-Phone

General Squier's Latest Application of Wired Wireless and What It Means in Radio-Phone Broadcasting

By S. R. Winters

EVERY electric lamp in the millions of American homes is a potential radio-receiving station. Displace one of the bulbs (or probably one of the sockets is already unoccupied) and insert the receiving plug at the end of the extension cord in the same fashion as an electric sweeper, flatiron, or other electrical appliance of the household. Forthwith, music or vocal speech is garnered out of space. Thus every city, with electric transmission lines, may negotiate its own broadcasting service and escape the babble of confusion imminent from the amazing growth of the distribution of music, lectures, and conversations broadcast through space.

The use of the common office or home electric lamp as a source of supplying the mysterious wave energy for the reception of radio-telephone communications is a fresh application of "wired wireless" or "line radio," a discovery of Major General George O. Squier a dozen years ago. The applications of this principle of radio-telephony and radio-teleggraphy, whereby high-frequency currents are guided along established telephone or telegraph wires instead of circulating unaided through ether, unfold with surprising swiftness. Hardly is the bulletin board of the Signal Corps, United States Army, cleared of one scientific contribution before another is crowding for recognition. Only recently, announcement was heralded of the development of a "superphone," whereby communications over ordinary telephone could be clothed in secrecy.

The demonstration to determine the efficacy of the electric lamp as a source of power for the interception of news, music, lectures, and speech was recently given in the office of the Chief Signal Officer of the United States Army. The performance was witnessed by Major General George O. Squier, Dr. Louis H. Cohen, a noted electrical engineer of the Signal Corps; R. D. Duncan, Jr., chief radio engineer, and S. Isler, assistant radio engineer, of the radio research laboratory of the Signal Corps, located at the Bureau of Standards.

There were other spectators who marveled at the simplification of radio-telephony in terms of a conventional electric lamp, a household convenience wherever the services of electrical illumination are entrenched.

The group of listeners do not employ head-telephones for the reception of music or speech over the electric light line. These are easily dispensed with in this instance. Likewise, towering antennae are not needed. The instruments consist of a radio-telephone receiver of a well-known type, with loud-speaking horn, which is suspended on the wall immediately above the receiving set proper. May it be said that any standard radio receiving outfit will readily lend itself to effective application for tapping electric transmission lines in this fashion.

This particular demonstration was conducted over a circuit one mile in length, with the radio transmitter at one end of the line and the receiving and amplifying equipment at the other, the latter being in the office of the Chief Signal Officer of the United States Army. Contact with an established electric transmission system may be made in one of two ways. The transmitting station can be connected between the two lighting mains of a city or the alternate of connecting the two mains to a condenser and employing them in parallel may be adopted. The latter procedure, according to Dr. Louis H. Cohen, an electrical engineer of the Signal Corps, probably offers superior advantages. The radio transmitter employed in the preliminary tests was of standard design as in use by the United States Army. The outfit was vested with five watts of power. The range of such a broadcasting service, quite naturally, is dependent upon the quantity of power employed at the transmitting station.

The receiving apparatus is provided with a detector tube, another unit for amplifying the music or speech being admitted. A high-frequency current, the backbone of "wired wireless" or "line radio," is introduced

and modulated in the same fashion that speech over a conventional telephone line is negotiated. These modulated electric waves are propagated along the lighting circuit and tapped off at any desired point. A radio receiving outfit is readily connected thereto. It should be stated that the transmitting outfit is connected to one point of the lighting main and one point at the ground. The use of an antenna is altogether dispensed with.

The simplicity of this latest invention makes it a strong bidder for widespread popularity in the millions of homes lighted by electricity. The housewife, tired of hearing the buzzing noise of the electric sweeper or having grown weary of applying heat to the flatiron, may substitute these household conveniences alternately with soothing music or knowledge on current subjects by merely plugging-in the extension cord which connects to the simple radio-receiving instruments. A broadcasting service in every city where a network of lighting system permits is the ambitious program outlined by the inventor for "line radio." Major General Squier is quoted as saying: "Wired wireless" or "line radio" will probably do more than any other thing to solve the problems confronting Secretary Hoover's radio conference. The congestion which has recently come about by the increase in the number of broadcasting stations promises to be relieved by this new use of "guided radio." The advantage of broadcasting over electric light wires is that it permits of a local service without exacting the penalty of broadcasting in space from the common antenna, which is now a subject for debate as to the confusion that is likely to result.

For the benefit of the absolute tyro it may be specified that the new system does not enable one to listen in on the broadcasting that is now being done. The lighting system takes the wireless impulses in tow only when it is properly in the broadcasting circuit to begin with, and this is not the case at present.