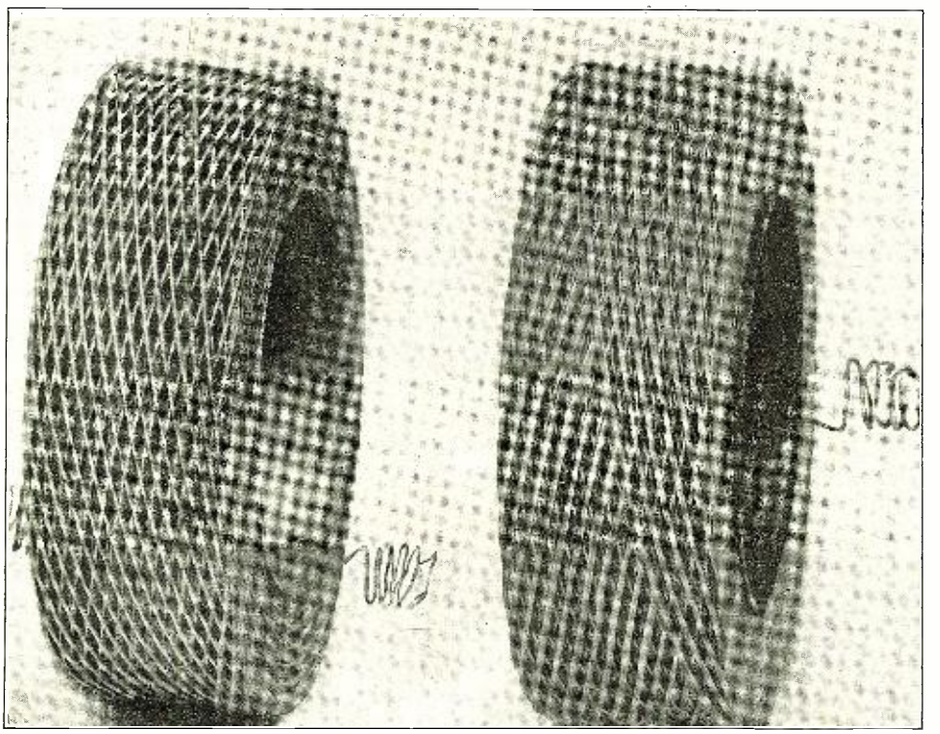
A New Inductance

By PIERRE H. BOUCHERON

*Some Interesting Facts Concerning the Birth of the Honeycomb Coil From Which Was Devised a Strikingly New Inductance Known as the Duo-Lateral Coil.**

EDITOR'S NOTE—*With this issue, we present to our readers some facts covered by a personal interview with Mr. Thomas P. Giblin, originator of the Universal coil, and who has lately invented a decided improvement upon the so-called honeycomb inductance.*



To the Left of This Photograph is Shown the Regular Honeycomb Coil, While to the Right is the Duo-lateral Coil. By Comparing Them Closely, the Different Manner of Winding May Be Seen. A Great Future is Predicted for This Type of Inductance.

ALL great and important inventions are not always the result of years of patient study and research work. In fact many inventions are actually stumbled upon or discovered by accident, and the well-known Universal or honeycomb inductance is an example.

Contrary to popular belief that the honeycomb wound coil is a new invention, it is approximately fifteen years since it was first conceived and samples actually made. As far as radio is concerned this is indeed startling, for certainly little was known at that time concerning multiple-layer inductances suitable for the high frequencies of radio.

The unique machine which winds this type of efficient inductance is manufactured by an eastern company, who are primarily makers of textile winding machines which include the winding of everything from fine silk thread to heavy rope as well as wire. Who would believe that this famous inductance coil was in any way connected with the ordinary cotton yarn winding machine?

HISTORY OF THE H. C.

The machine which to-day winds the honeycomb coils was first devised about fifteen years ago, and its mechanism was such, of course, that it could wind wire as well as thread. Unfortunately this machine had at the time a rather limited demand, for it could be used only for the peculiar winding of wire similar to the cross wind yarn packages which is used in the textile trade to-day. Probably many of our young amateur friends have seen their mothers using yarn wound in this manner, and it is strange that the idea of winding inductances thusly did not become apparent to them at the time. As a matter of fact, however, as will shortly be seen, it was a former amateur who finally thought of the idea.

While the inventor was developing this textile machine he made various samples of this product, showing just what the machine could do in order to demonstrate its possibilities. At the time he wound open coils, which he termed basket winding, and which later was given the name of "honeycomb" or Universal coil. There was, of course, no startling demand for such a coil at the time; it was simply a novelty and was put aside by the company in a show case among other novel windings of various kinds.

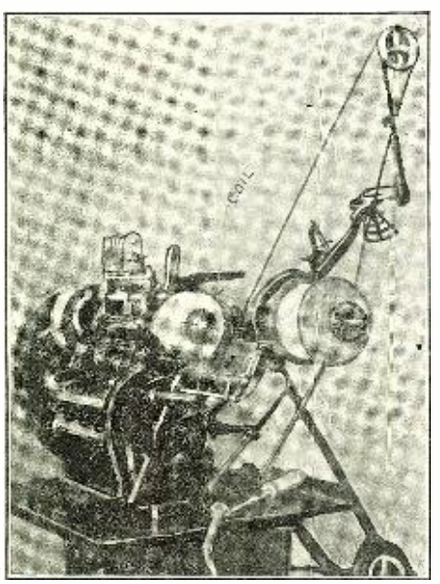
HOW DISCOVERED.

It was shortly after the United States entered the War that the "bank" form of winding made its entry into commercial radio apparatus. As is well known, this winding was literally snapt up on account of its small distributed capacity within a minimum space area. Its great fault, however, was that inductances made after this fashion had to be wound by hand, which proved very costly. The sudden overwhelming demand for efficient radio receiving apparatus of all types suitable for war work forced leading radio engineers to try to find a means of manufacturing banked windings in a much more rapid manner.

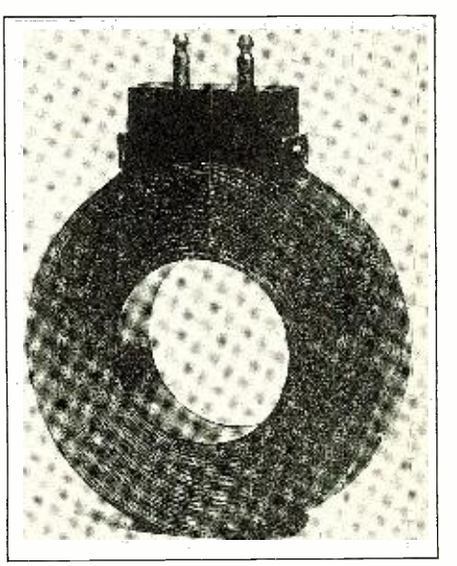
Accordingly a Signal Corps radio engineer stationed at a large eastern university for the purpose of research work connected with government radio apparatus, visited a textile winding company for the purpose of ascertaining whether a machine could not be devised and built for the express purpose of manufacturing bank windings in large quantities.

Mr. Thomas P. Giblin, an electrical engineer, and at that time a real and enthusiastic amateur, being connected with the Universal Winding Company, took up the matter of this proposed bank winding machine and after careful study and experimentation with mechanical experts decided that such a machine could not be developt in the limited time at the disposal of the Government; the primary consideration being to manufacture great numbers of receiving instruments as soon as possible in order that they be of use during the emergency.

The radio experts were distinctly disap-



This is the Machine Which Winds the Duo-lateral and Other Types of Basket-Wind Coils. Coils Are Wound in from Five to Fifteen Minutes!



Showing the Completed Duo-lateral Coil on a Special Mounting Designed for Efficiency, and Which May Be Plugged In and Out of Its Receptacle.

*Photographs by courtesy of Electrical Products Mfg. Co., Providence, R. I., and Pacent Electric Co., N. Y.

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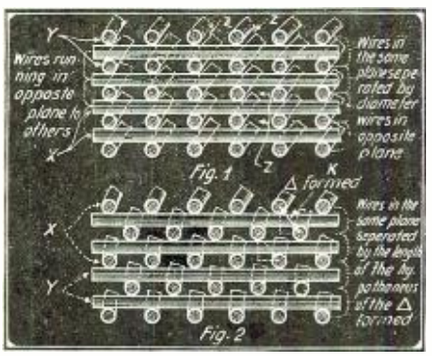
pointed, and it was then that Mr. Giblin, anxious to put into practise an idea he had conceived for some time, gathered up the various samples of the basket wound coils made some fifteen years back, and a week later again showed them to the Government men, whereupon discussions as to its possibilities immediately arose. Mr. Giblin then promised to develop larger coils of the same basket winding suitable for radio test purposes. Just about this time, however, the pressure of war work became too severe and the proposition was laid aside and remained dormant until the end of the year of 1918.

Shortly after the Armistice was signed one of the large radio manufacturers became desirous of bringing out some startlingly new radio apparatus suitable for amateur work. Thereupon, one of their engineers was sent to the winding company for the purpose of testing various wire coils or inductances. Among these coils was again shown the now famous basket wound coil, and from an immediate test made upon it this gentleman quickly saw the possibility and advantage of using the coil for radio work. During his visit it was unfortunately impossible to make a coil large enough to be practical for radio inductance work. Mr. Giblin, however, was this time not to be sidetract in his belief that this method of winding would prove effective for radio work, and, therefore, continued his experiments, so that about February, 1919, he developt the first practical honeycomb coil.

After a number of exhaustive tests at the Bureau of Standards, leading radio colleges, as well as large radio manufacturers, several designs were perfected, making this type of winding most suitable and effective for short and long wave reception. Several months after this the fame of the honeycomb coil had traveled far and wide, and today it is indeed a small hamlet that does not possess one or more amateur installations making use of the honeycomb inductance. As an example of the highly successful commercial value of the honeycomb coil, it has been estimated that from July, 1919, to April, 1920, something like 80,000 coils were distributed thruout the world. At present over 12,000 coils are being sold each month.

Photograph of Mr. Giblin's Original Amateur Station Located at Pawtucket, R. I., Where the First Honeycomb Coils Were Tested Under Actual Receiving Conditions, the Event Taking Place Several Years Ago. Note Several of These Coils on Top of Cabinet in Right Hand Side of Picture.



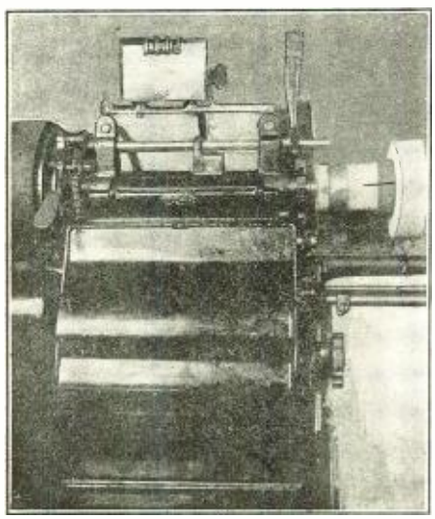
In This Diagram, Fig. 1, Shows the Cross-section of a Honeycomb Coil, While in Fig. 2 is Shown the Cross-Section of the Duo-lateral Coil. Note the Difference in Separation of Turns.

HISTORY OF DUO-LATERAL.

The inventor, however, was not fully satisfied with the characteristics of the coil, so that he has recently brought forth a new type of inductance called the *Duo-lateral inductance*, which by far exceeds other coils in efficiency. Altho this type appears somewhat similar to the honeycomb coil, it has decided electrical advantages, and these advantages are made possible thru its peculiar mechanical construction.

Recent experiments at the laboratories of reputable colleges, as well as at that of a nationally known electrical company, have proved that this coil, in comparison with other similar types, *has 15% less distributed capacity, 12% more inductance as well as the 7½% less high frequency resistance and natural period.* Not only this, but it is much smaller in size for given inductances than any machine-wound coil on the market today. Radio men, and particularly amateurs, who are always looking for the last word in radio, may readily appreciate the meaning of these statements. Of course, these inductances can be wound to any size, and shaped in any desired inductance. This is on account of its mechanical construction, whereby greater inductance can be secured, and owing to its regulated construction it is a very strong compact unit. As an instance of its performance, a reception test was recently conducted with the Mexico City radio station on a wave-length of 4,500 meters, which showed the signals to be 100% *louder* than other types of inductances!

In order that the reader understand just how the duo-lateral coil differs from the honeycomb, the following explanation is perhaps not untimely: In Fig. 1 we have an orthogonal* cross section of a regular honeycomb inductance. It will be readily seen that each layer of wire is in the same plane of the one beneath or above it. These layers are separated *solely* by the diameter of the wires running in the opposite plane. In Fig. 2 is shown a cross-section of the duo-lateral coil. In this case, however, the wires of adjacent layers running in the same plane are separated by the length of the hypothenuse of the triangle thus formed, so that in reality the layers of wires are separated a comparatively much greater distance than the layers of honeycomb coils, and thus a decided advantage is gained by further *reducing the effective distributed capacity.*



Another View of the Coil Winding Machine Described in This Article.

Again in Fig. 1 and 2, the distributed capacity is reduced between X and Y layers because of the fact that the layers (X and Y) cross one another at angles. The distributed capacity is again reduced between layers in the same direction (such as all of X or all of Y) because they are separated by the diameter of the wire such as Z. In Fig. 2, the distributed capacity is still further reduced between layers in the same direction (such as all of X, or all of Y) because they are separated by *more* than the diameter of the wire since the illustration shows this distance to be equal to the hypothenuse of the right triangle K formed which is considerably greater than the distance Z in the honeycomb coil.

POSSIBILITIES.

The excellent photographs which accompany this article will show to the reader in a graphic and instructive manner just what these inductances look like; the machine that makes them, as well as a typical receiver fitted with the coils. Mr. Giblin, who in connection with Mr. McAvoy has organized a company devoted to the production of this unique inductance, is very enthusiastic concerning its future and possibilities.

The coil has attracted the attention of the "Big Three" (the three largest radio manufacturing companies.) The well-known Dr. J. H. Rogers is at present using them in connection with his underground circuit; not only that, but he is also making use of it in his experiments to determine whether or not Mars is signalling to the earth. In one experiment Dr. Rogers was using large inductance coils which, owing to the large surface they presented to surrounding influences, pickt up all manner of disturbances, such as induction from trolleys, power lines, etc. By making use of this latest type inductance, these undesirable conditions were absolutely eliminated, on account of the very small surface which the coils present to local interference. Signals barely audible, and in some cases inaudible, are easily readable with the duo-lateral coil. Indeed, this is undoubtedly the greatest step forward in the radio art since the introduction of the vacuum tube.

This very latest development in the way of compact and highly efficient inductances is certainly considered a boon to the advancement of the radio art. It replaces the former large, awkward and certainly inefficient loading coils and tuning coils of the bygone days. In fact, by means of several of these Duo-Lateral Coils, together with one or two variable condensers and a vacuum tube unit, it becomes possible to receive a high range of signals and cover exceptional distances. In brief, such a combination represents the ultra-efficient in radio receiving with or without amplification.

* *Meaning at right angles to the "lay" of one set of wires.*

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SOME INTERESTING DATA FROM U. S. GOVERNMENT DEPARTMENT OF COMMERCE BUREAU OF STANDARDS.

Honey Comb Wind

Turns in coil 620
Inside Diameter ..... 2″
Outside Diameter ..... 4⅛″
Axial Length ..... 1″
Pure Inductance.....25.06 Milli-henries
Distributed capacity.
14.6 Micro Micro-farads

Duo-Lateral Wind

Turns in coil..... 665
Inside Diameter ..... 2″
Outside Diameter ..... 4⅛″
Axial Length ..... 1″
Pure Inductance.....30.00 Milli-henries
Distributed capacity.
13.5 Micro Micro-farads

Computing both coils for the same ratio of turns, the characteristics become:

For Inductance

$$\frac{30.00 \times 620}{665} = 27.97 \text{ Milli-henries}$$

$$\frac{27.97}{25.06} = 1.12 \text{ or } 12\% \text{ more inductance}$$

For Capacity

$$\frac{13.5 \times 620}{665} = 12.59 \text{ Micro Micro-farads}$$

$$\frac{12.59}{14.6} = .86 \text{ or } 14\% \text{ less distributed capacity}$$

It will thus be noted that a considerably larger number of turns can be wound in the Duo-Lateral wind in the same space factor, than in the Honey Comb wind.