

RADIO IN THE HOME

The Story of Reflex and Radio Frequency

By DAVID GRIMES

Chief Engineer Sleeper Radio Corporation; Consulting Engineer to Bristol Company and Mercury Radio Products Co.

OF all radio circuits that have held public attention during past years, perhaps the most interesting and most efficient is the famous reflex with its many possibilities. And yet, in a way, reflex is not a circuit, it is a system of amplification. It is for this reason that it has so many adaptations.

For those not entirely familiar with this fascinating arrangement, a few descriptive words will not be out of place. The reflex principle is one that permits a vacuum tube to be used in a dual role *simultaneously*. It allows the amplifying tube to be utilized for both radio and audio amplification at one and the same time.

"Wonderful," you remark, "and extremely clever. What will radio next produce? New ideas are occurring hourly!"

But we will have to disillusion you. There have been really very few new ideas recently in radio. Most of the ingenious circuits recently presented as "new" are quite old, relatively speaking.

The work during the last two years has been of a commercializing nature—attempts to reduce laboratory models to factory possibilities. Among these old circuits stands the super-heterodyne, the super-dyne, the neutro-dyne and, foremost of all, the reflex. After all is said and done, you know, the most popular circuits can all be reflexed at a saving of tubes and batteries.

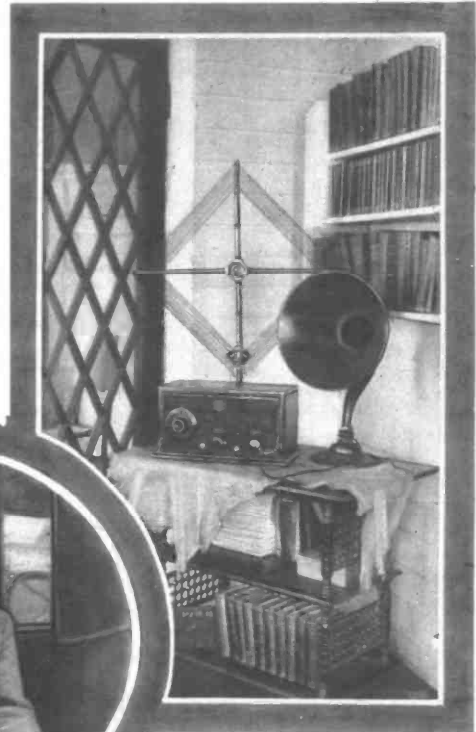
But, alas! Not even the reflex is new. It is the oldest of them all. It apparently even antedates regeneration. It was developed during 1912 and the early part of 1913. It is the result of work done by Wilhelm Schloemilch and Otto von Bronk, of Berlin, Germany, and is covered by a patent issued to them in this country on February 17, 1914.

This patent, No. 1,087,892, is a radio masterpiece. It is undoubtedly one of the most important patents ever issued by the government, and as time goes on its gigantic contribution to the art will be increasingly appreciated.

It seems peculiarly significant that during the World War this valuable monopoly

Circle—David Grimes, inventor of the Inverse Duplex

Right—The modern combination of all the patents spoken of in this article. David Grimes' own set in his home—A Sleeper Monotrol with Music Master horn



granted by our government should return and become the common property of us all. The patent is now owned by the United States Navy.

The sudden widespread interest in this patent has caused an unavoidable shortage of the printed copies. As a result, many thousands desiring patent information on the reflex have been unable to obtain copies of it. We, therefore, are showing several pages and drawings of this patent. A casual

glance at the patent will reveal four sketches, three of which, it will be seen, have nothing to do with reflexing. It is these four sketches that make this a masterpiece. Reflexing, alone, would not be sufficient to put it in this class, but it also covers radio frequency and tuned radio frequency amplification for the first time. In fact, the patent is primarily a radio frequency disclosure, Figure 4, covering reflex, being added somewhat as an afterthought or byproduct.

As this article is concerned only with the story of reflex, we will not discuss Figures 1 to 3. These will be taken up in a later issue, when we will tell the story of radio frequency amplification.

Referring, then, to Figure 4 in the Schloemilch and Von Bronk patent, it will be observed that the radio frequency is brought into the grid of the tube through transformer "g" from the aerial "f." From the plate of the tube it passes through the primary of a tuned radio transformer. A

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UNITED STATES PATENT OFFICE.

WILHELM SCHLOEMILCH AND OTTO V. BRONK, OF BERLIN, GERMANY.

MEANS FOR RECEIVING ELECTRICAL OSCILLATIONS.

1,087,892.

Specification of Letters Patent.

Patented Feb. 17, 1914.

Application filed March 14, 1913. Serial No. 754,287.

To all whom it may concern:

Be it known that we, WILHELM SCHLOEMILCH and OTTO VON BRONK, citizens of the German Empire, and residing at Berlin, Germany, have invented certain new and useful Improvements in Means for Receiving Electrical Oscillations, of which the following is a specification.

Our invention relates to means for receiving electrical oscillations by means of an arrangement by which the amplitude of the oscillations is increased to a suitable extent, and which permits the use of a detector such that the oscillations can be perceived more distinctly in a telephone receiver employed for perceiving the oscillations.

arrangement comprising a detector connected into the circuit of the tube itself, Fig. 3 is a like view showing an arrangement in which the amplitude of the oscillations is repeatedly increased by several tubes, and Fig. 4 is a like view showing an arrangement in which the amplitude of the oscillations is repeatedly increased by one and the same tube.

In the diagram shown in Fig. 1, *a* is the vacuum tube which contains the oxidized cathode which is heated by means of a filament. The tube further contains the anode and the auxiliary anode which is preferably in the form of a spiral.

crystal detector "e" is shown connected across part of the secondary circuit. This stunt of connecting the crystal across only a portion of the tuning circuit is done to

increase the sharpness of the tuning—the crystal being a resistance loss. The radio current is rectified by means of this crystal "e" and is transformed into audio current

Here are the title and diagrams from the original patent papers for the reflex circuit

in the condenser "p" and the transformer "o." From here it passes onto the grid as audio current through the transformer "g" and from the plate, as amplified audio, it passes through the audio output transformer "q" and into the telephone receiver "m."

This circuit arrangement will bear close study because of its perfectness even to the smallest details. Such things as bypassing condensers are all there. In fact, it is the standard one tube reflex we see so much today. The only addition that ten years have added has been the tuning of the grid circuit instead of the aerial circuit by what are now known as "fixed couplers." This was done shortly after Schloemilch's patent was issued.

The only regrettable thing in this reflex situation is the general tendency among some of our would-be radio inventors to take the circuit shown in Figure 4, arrange it on paper so that it looks different and then tack their own names onto it. Not content with this, they proceed to claim all credit for reflexing, never even mentioning the development here shown. So many of us try to travel to success on somebody else's ticket! How w (Continued on Page 34)

W. SCHLOEMILCH & O. VON BRONK.
MEANS FOR RECEIVING ELECTRICAL OSCILLATIONS.
APPLICATION FILED MAR. 14, 1913.

1,087,892. Patented Feb. 17, 1914.
2 SHEETS—SHEET 1.

Fig. 1.

Fig. 2.

Witnesses:
William H. Knight
Harmon Johnson

Inventors:
and *Wilhelm Schloemilch*
Otto von Bronk

By *Harmon Johnson*

W. SCHLOEMILCH & O. VON BRONK.
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Fig. 3.

Fig. 4.

Witnesses:
William H. Knight
Harmon Johnson

Inventors:
and *Wilhelm Schloemilch*
Otto von Bronk

By *Harmon Johnson*



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6 x 14	7 x 21	10 x 12
6 x 21	7 x 24	12 x 14
7 x 9	7 x 26	12 x 21
7 x 10	7 x 30	14 x 18
7 x 12	7 x 48	20 x 24

Story of Reflex and Radio Frequency

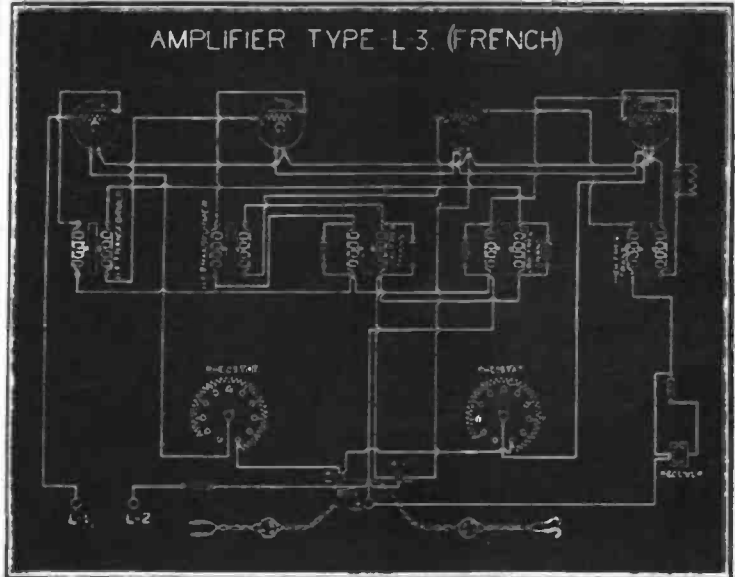
(Continued from Page 10)

many times have we seen the "So and So" reflex being described as the latest "Knock Out" set. Let's give credit where credit is due!

Along about the time that Schloemilch was working on this development, other discoveries were being made. Among these was the art of "cascade" connections—several tubes being used to give successive stages of amplification. The original reflex was a one-tube circuit. It remained for Marius La Tour, a French engineer,

granted patents Nos. 131,092 and 132,668. The first merely used a tube instead of a crystal for a detector and added one stage of straight radio frequency amplification ahead of the Schloemilch and Von Bronk reflex tube. The second patent, however, disclosed a cascade reflex, two tubes carrying both radio and audio.

The British patent, No. 132,668, is reproduced herewith, together with the drawing. Inasmuch as the reflex principle is a system of amplifier,



Above is the reflex diagram of the famous La Tour system and below the title page of the U. S. Army pamphlet describing it

AMPLIFIER TYPE L-3 (FRENCH)

FRENCH NAME :

Amplificateur L-3.

USE :

This amplifier is used principally for receiving on loops, though it may also be employed with an antenna and any ordinary receiver, working best in the range of wave-lengths between 200 and 1,000 meters. It makes use of 4 standard French amplifier lamps. The first 3 lamps act as high frequency amplifier and the fourth as audio amplifier.

to combine cascading with reflexing in what has since become known as the La Tour Circuit.

La Tour reasoned that if it were possible to reflex one tube, it would be possible to reflex several tubes in the cascade arrangement. After considerable experiment, he arrived at what he considered to be the best possible combination.

He made two filings in the French Patent Office—one in April and one in November in the year 1917. He also filed in England, where he was

La Tour has only shown the amplifying circuits. He has not shown the radio tuning circuit, merely indicating two connections at the extreme lower left of the drawing.

A careful study of this drawing will show you that La Tour has employed three stages of transformer coupled radio frequency amplification, a detector tube and two stages of audio amplification. His radio currents pass through tubes 1, 2, 3 and into the detector (tube 4). Here they are changed into audio currents and fed back into

For Radio Frequency

YOU MUST be able to get extremely loose coupling. The ordinary forms of coupler winding do not permit this. The

Simplex 180° Variocoupler

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Here is an instrument that is doing wonders. Let us tell you how to use it. Similar to the Variocoupler except that it is designed for the untuned primary.

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UV-200 2.75	DV-2 3.00	Marconi 3.00
UV-201 3.00	DV-6A 3.00	Moorhead 3.00
C-300 2.75	UV-199 3.00	5 v. Plain Amp. 3.00
C-301 3.00	C-299 3.00	6 v. Plain Det. 2.75

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CLINTON HILL STA.



tube No. 2 and then out through tube No. 3 into the telephones. This is known as straight reflexing.

You will, no doubt, recognize this as the basis of the several commercial multi-tube reflexes on the market today. This circuit, like the Schloemilch and Von Bronk, has been taken as a ticket to success by several people who have not been willing to give credit where credit is due. So we have today several multi-tube reflexes, all bearing the names of their would-be discoverers—the circuits being nothing more nor less than the La Tour developments.

This brings the development up to the writer's own contribution in con-

not very new. It dates back to the war.

The wonder of the reflex is that it did not become generally known in this country long before now. Radio frequency and reflex have been the practice in Europe all during the time when regeneration was the "craze" in America. *It does not annoy the neighbors*; it delivers excellent quality and is fairly easy to construct.

It has its kinks and peculiarities, but once these are mastered, the experimenter will be rewarded for his efforts.

Perhaps the war brought reflex to this country by sending our radio engineers to Europe. The United States

**AMERICAN EXPEDITIONARY FORCES
OFFICE OF THE CHIEF SIGNAL OFFICER**

Amplifier Type L-3 (French)

When requisitioning radio equipment, use the name of the apparatus given in this bulletin, and when it is necessary to replace units or parts of this set, use the unit number or part designation given herein.

RADIO APPARATUS DESCRIPTIVE BULLETIN No. R-23

March 23, 1918

nection with reflexing, the story of which you have probably read before. It was while working in connection with the La Tour that he came to the discovery of the inverse duplex, a system of utilizing the vacuum tubes for both radio and audio wherein the three inherent disadvantages of the reflex are overcome. This has all been told before, so there is no need to repeat it here. It is sufficient to say that it is a decided improvement in three different respects over the straight reflex. And even the inverse duplex is

Army pamphlet, which was the radio leaven, as far as reflex was concerned, is shown here. This is the famous Bulletin No. R-23, describing Amplifier Type L-3 (French). This was the army set built upon La Tour's invention and was the source of inspiration that resulted in reflex development in America. It was also this army bulletin that led to the inverse duplex invention.

Unquestionably one of the important reasons for the rapid growth of radio during the last two years has



Q What voltage should a new dry B Battery show?

Q How long can it be used with satisfactory results?

Q Should it be discarded when no longer serviceable in the detector circuit?

Q When should storage B Batteries be re-charged?

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Workrite Neutrodyne Jr. Grand, \$140.00

Send for complete catalog of Workrite sets and parts

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1834 East 30th St., Cleveland, Ohio
(Branch Office, 536 Lake Shore Drive, Chicago)

been the fact that the Schloemlich patent was owned by the government and was available to all. This has enabled many organizations to engage in radio manufacture, to the everlasting improvement of the art and greatly to the public's benefit. It has successfully checkmated any attempt to monopolize the field of radio reception and has opened it up to strong, healthy competition.

Most of the popular circuits of the day are based fundamentally on radio

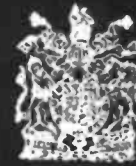
that the United States Navy owns the basic patent.

And even as we are writing, strong rumors are floating about that several combines have attempted and are attempting to obtain an exclusive license from the War Department on this important patent.

Patents are granted as a reward for accomplishment. We sometimes wonder what reward such a combine as mentioned above has coming to it for trying to "corner the market" at

132,668

PATENT



SPECIFICATION

Convention Date (France), Nov. 17, 1917.

Application Date (in the United Kingdom), Nov. 16, 1918. No. 18,836 1b

(Patent of Addition to No. 130,103. Convention Date (France), Apr. 15, 1916.

Complete Accepted, Sept. 25, 1919.

COMPLETE SPECIFICATION

Improvements in or relating to Audion or Lamp Relay or Amplifying Apparatus.

I, MARIUS LATOUR, of 10, rue Auber, Paris, in the Republic of France, Engineer, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:

5 This invention comprises an improvement in or modification of the invention claimed in my prior Application No. 3140 of 1918 in which is described in an amplifier with relay lamps wherein amplification is conducted in stages the use of a common source for supplying with current the plate-filament circuits of the lamps in various stages.

10 In my prior Application No. 3140 of 1918 an amplifier is described in which the frequency of the amplified signal is

The first page of the British patent for the La Tour reflex system

amplification or reflexing and, as such, come under this patent. It will not expire until 1931. By great good fortune we have the benefit of this seven years ahead of its time. The result is the super-heterodyne, the super-dyne, the neutro-dyne, the reflex, the inverse duplex and several dozen other combinations. All of these would fall by the wayside were it not for the fact

the public's expense. It would be ridiculous if the oil lease scandals were not so recent.

The radio public is at the present time in grave danger and cannot be too wide awake in the matter. The time is coming when we will have to organize to accomplish desirable legislation for protecting the air and other things radio.

QRM! QRM!

If you could read the dots and dashes you would constantly hear this frantic call. In wireless parlance it means that signals cannot be received because of

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Interference! The bane of the listener-in! And it causes language that has to be expressed with more dashes than dots. QRM—QRM—Everywhere!

That's old fashioned now. Pfanstiehl has made interference as inexcusable as smallpox. Here's how:



PRICE \$8.00

The
Pfanstiehl
Silencer

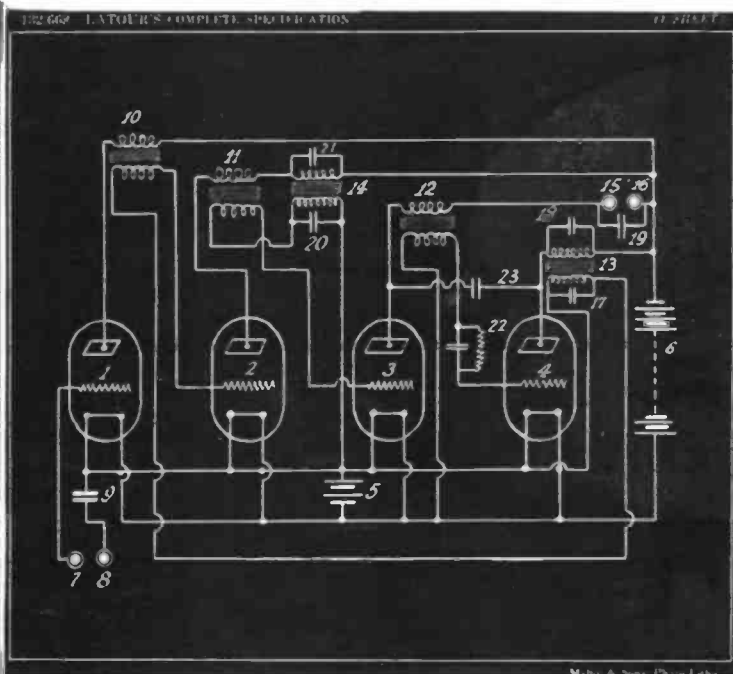
The Nineteenth Amendment to the Constitution of the United States—Prohibition of Interference. It doesn't require a law; it requires just one of these SILENCERS.

Pfanstiehl made and still makes:

- The original no-loss Reinartz coil.
- The original no-loss pure inductances.
- The original no-loss pure inductance universal

TUNING UNIT. And now
THE PFANSTIEHL SILENCER

PFANSTIEHL RADIO SERVICE CO.
Highland Park, Ill.



This Drawing is a reproduction of the Original on a reduced scale