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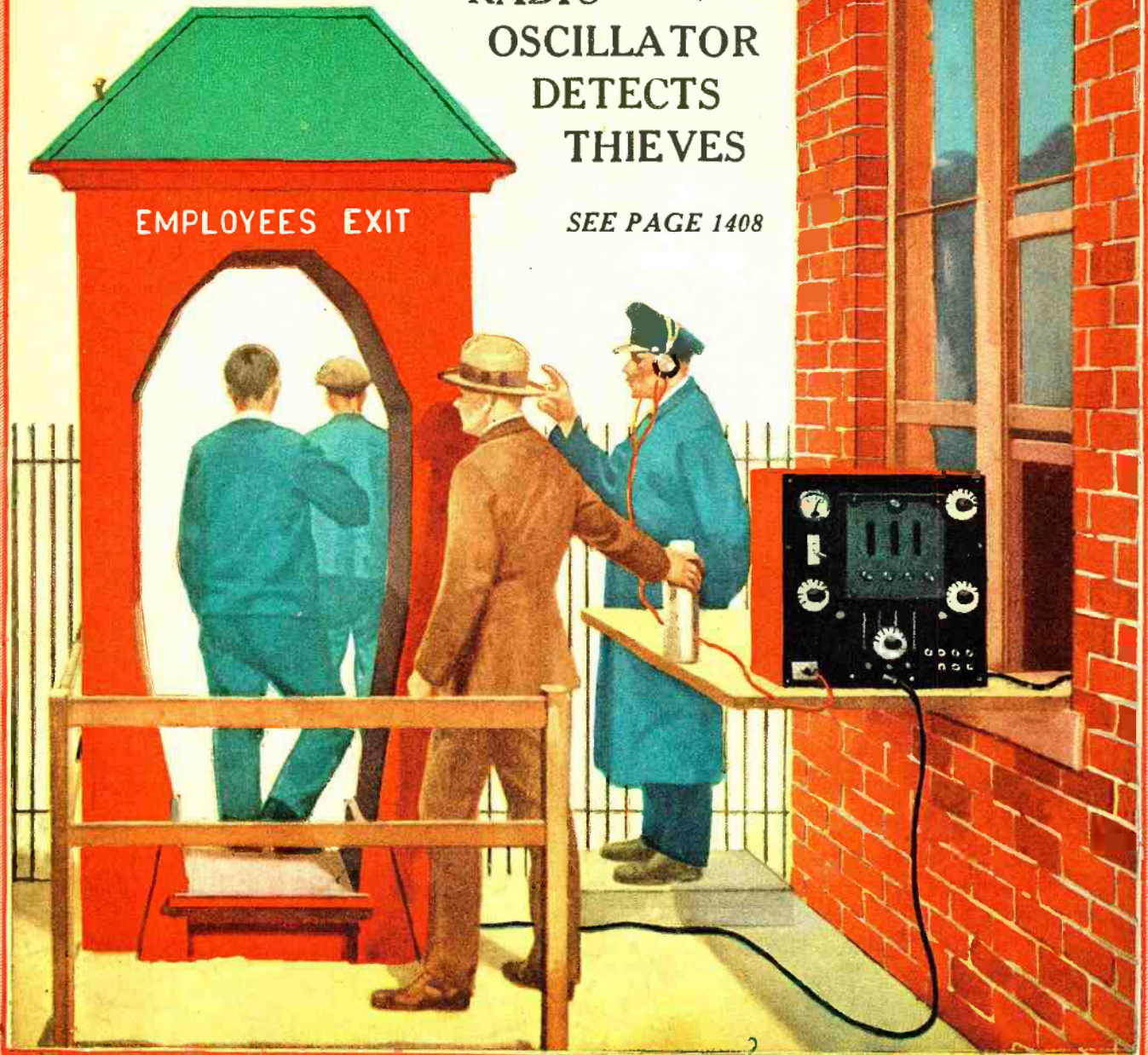
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RADIO NEWS

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VOLUME 7

CONTENTS APRIL, 1926

NUMBER 10

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A New and Convenient Method of Assembling Radio Sets, By Joseph Riley.

This article will bring out for the first time a novel method of radio construction, eliminating much of the drudgery of wiring and connecting, and obtaining superior results. Every constructor and experimenter should read this.

* * *

More About Vacuum Tubes, By Dr. Charles B. Bazzoni.

A continuation of this interesting series on laboratory methods, telling of the remarkably simple methods used to produce the high vacua, which have made possible radio as we know it.

* * *

Static Forecasts Forest Fires, By S. R. Winters.

An interesting article telling how Uncle Sam's foresters have made the static demon give warning of the "dry spells" which necessitate special vigilance over our National Forests.

* * *

Changes in the Polarization of Radio Waves, By Dr. Greenleaf W. Pickard.

An article on an interesting phenomenon which radio waves share with light waves, and its application to make radio transmission more effective for direction and distance.

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The Radio Watchman at the Gate

By Dr. K. SCHUETT



In nearly every large manufacturing plant trouble has been experienced with employees carrying home small pieces of metal, instruments, etc. In Germany a large manufacturing plant has prevented this by installing a radio detective, as explained in this article.

DURING the past few years, and especially since the war, it has been found necessary by the management of many large factories to maintain a close inspection of their employees when the latter pass from work: as otherwise the dishonest element, always found among them, would be certain to seize the opportunity to carry away tools and valuable small articles of manufacture, either completed or partially so. It is obviously impossible, because of the time and labor which would be required to do so, to make a search by hand of the entire working force; and mechanical processes of examination ("irisking") although such can be devised, require apparatus entirely too expensive, and are ineffective to produce the desired certainty of results.

However, two German scientists, Drs. Geffchen and Richter, of Leipzig, have recently worked out the details of an electrical apparatus by means of which, without any physical contact, it is possible to make an effective search of every person leaving the premises; and to determine with certainty, and instantaneously, whether he is carrying with him any object of a metallic nature.

THE COIL AS A DETECTIVE

This examination is effected by the change of pitch in a telephone headset, which is worn by the person who is charged with the duty of carrying out the inspection. The workmen leave the factory grounds through a wicket gate; as shown in the illustration, which is taken from a photograph of the main exit of a German factory, where the apparatus described in this article is in successful operation. The wicket, or framework surrounding the gate, through which the workmen must pass in single file, is

constructed to enclose and support a coil of many turns of insulated copper wire—the "gate-coil" shown in the diagram of the circuit, on this page. A condenser, C₃ in the diagram, is so adapted to the coil that they form an oscillating circuit, inductively coupled to a circuit containing a generator of audio-frequency currents (No. 1). This circuit is brought to oscillation in the same manner that the carrier-waves, of radio broadcast stations, with their higher frequency, act upon a radio receiving set tuned to a critical point.

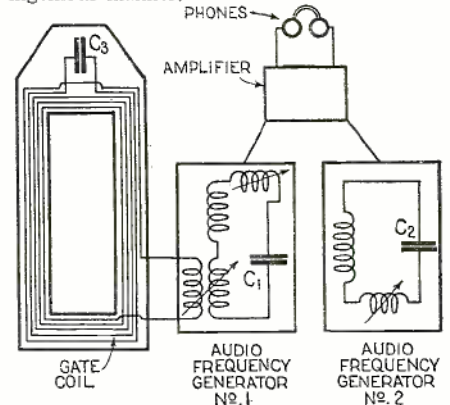
The number of oscillations per second (the frequency) in such a closed circuit depends upon: first, the size of the condenser and its consequent capacity; and second, upon the size of the coil, or more properly, upon its inductance. If the latter is increased by adding more turns the frequency is diminished, the oscillations will fall to a lower frequency, and consequently a telephone receiver connected in the oscillating circuit will give a note of proportionately lower pitch.

"MAGNIFYING" THE CHANGE IN PITCH

The inductance of the coil can also be increased if a piece of iron, steel, or other metal is introduced within it, because this makes an alteration in the lines of magnetic force emitted from the coil. This principle, the use of which in the construction of transformers is familiar to all constructors of radio sets, is utilized in the detecting apparatus connected to the gate coil, to learn whether those who pass through it have any metallic substance concealed on their persons.

It will be obvious that the change effected in the inductance of the coil by a piece of metal which is small in size, in comparison with the dimensions of the electrified wicket-gate, may be practically nil. It may be often

as small as one-hundredth of one per cent. The resulting change in the pitch of the note heard in the telephone set would in this case be entirely too small to be detected without the aid of some further electrical appliance. This, however, is provided in the following ingenious manner.



Above is shown a schematic diagram of the radio gate watchman, which is fully explained in the accompanying text.

In a second oscillating circuit, connected with another generator of audio-frequency impulses (No. 2), oscillations are brought about, having almost exactly the same frequency as those produced in the circuit connected to the gate coil. Now, if these two series of oscillations are caused to act simultaneously upon the telephone, with proper adjustment, a note is produced in the telephone, differing in pitch from both. It is a great deal lower. This phenomenon is akin to that produced by playing two organ notes of low pitch which do not harmonize; the "beats" resulting measuring the differences of their frequencies.

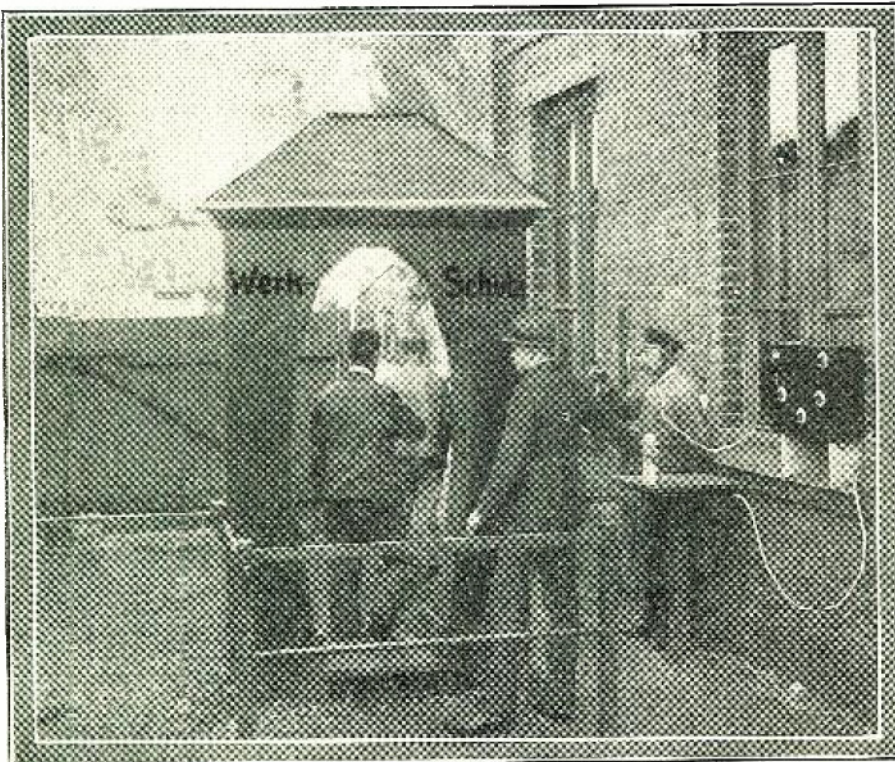
What happens is that a wave at one of its amplitudes (highest points) is weakened by the second sound wave, and at another amplitude is strengthened by it, so that the times at which the sound strikes most forcibly upon the ear occur at greater intervals; and this produces the effect of a greatly-lowered pitch. The periodicity of the beats, which constitutes their pitch, becomes of course highest as the frequencies of the two sound waves tend to become equal, and it falls with great rapidity when their difference is very slightly increased.

Thus, if we tune the two circuits of our detector apparatus to bring about a beat of definite pitch, and then introduce into the gate coil a piece of metal, the frequency of the gate-coil circuit is lowered. The result is that the beats heard in the telephone suddenly change in pitch: and they revert to the original sound only when the piece of metal is again removed from the field of the coil.

OPERATING THE RADIO DETECTIVE

In the illustration which accompanies this article, the apparatus with the amplifiers which produce the audio-frequency oscillations is shown at the right, standing on the window ledge. The attendant beside it wears the telephone headset, which is connected to the two circuits as described, and notes the change of sound, if any, as each man passes. The degree of sensitiveness to the presence of metal, attained by the use of this apparatus, is astonishing. Even watches and keys

(Continued on page 1493)



This illustration shows workmen passing through the "gate coil" of the radio detective, which indicates by a change of tone in the headset if any metal is passing through the coil's field.

The Radio Watchman at the Gate

(Continued from page 1408)

can be detected with certainty; in practice the apparatus would be set to an adjustment a little less than critical, so that the smaller bits of metal need not cause signals in the phones. In order to prevent the purpose of the detector being defeated by the presence of lunch cans, thermos flasks, or other property of the workmen, a shelf is provided at the side of the wicket, as shown. The employe leaves any metal articles before passing through the wicket; and then returns to get them, before leaving through the main gate.

If the detector shows the presence of an undue amount of metal on a person passing through the gate, he may be then searched with more care. A small "searching coil" is provided for this purpose, which acts on a similar principle to the larger circuit. By moving this coil over the body of the person searched, the location of any piece of metal is determined accurately in an instant. This auxiliary coil may be made so sensitive that it will respond with certainty not only to coins in the pockets, but also to the presence of a stick-pin in the cravat or of metal fillings in the teeth; and that without actually coming in contact with the person thus searched.

Book Reviews

TUNING COILS AND METHODS OF TUNING. By W. James, Assistant Editor of *Wireless World* and *Radio Review*. Stiff paper cover, size 5½ x 8½ inches. 75 pictures and explanatory sketches. 128 pages. Published by Liffé & Sons, Ltd. Price 2/6 (with postage, this comes to about 70c).

An extract from the author's preface states: "Formulas and examples of their use will be given only when they are essential for correct understanding of the subject." We find this decision to be well carried out.

This is probably the most complete book available on the one subject of inductances, practically every form taken by inductance being mentioned.

One very noticeable exception is the toroid. This form of winding is coming into more general use in the United States and is worthy of treatment. "Astatic" and "binocular" coils are not described, either. However, this deficiency may be compensated for by a study of the article on inductance appearing in the February, 1925, issue of *THE EXPERIMENTER* magazine, where these three forms of winding are pictured and described.

"Inductance" is treated mathematically, theoretically and practically.

"Spade" tuning is described at considerable length. We do not believe this form of varying the inductance of a coil by placing a metal plate in variable relation to the coil has been used in American receivers since the "Mignon" line of apparatus entered and left the American market some years prior to the advent of broadcasting. A tuner of English manufacture using the principle appears on page 43 of the July, 1925, issue of this magazine.

The author's paragraph, "Spade tuning introduces no serious losses, provided the spade is carefully designed," should cause experimenters to invent many new ways of adapting our present and multitudinous circuits to include this form of inductance variation as a possible solution of some unsolved problems.

The text is so written that anyone can readily understand it.

Not being an ephemeral book, it is certainly worth binding in more permanent form.

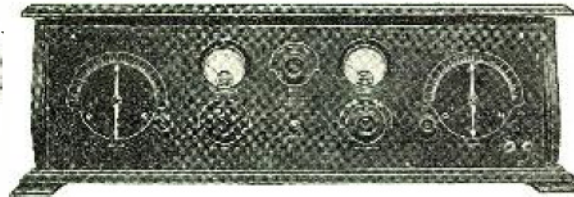
THE HOME CONSTRUCTOR'S WIRELESS SETS. By F. H. Haynes, Assistant Editor of *Wireless World* and *Radio Review* magazine. Counting postage, the price is about 50c.

The contents page lists complete constructional details for a Simple Crystal Set, Single Valve Set, a Note Magnifier (Audio Frequency Amplifier), High-frequency Amplifier and Detector Set and a Power Amplifier. This seems to cover the range of essential units in more general use.

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- (4) Metallic shieldings provided at points deemed advisable.
- (5) Seven tubes are used to give still greater volume and fine tone musical reproduction.
- (6) All the important component parts are encased in a metal container, and factory sealed to prevent any damage and to prevent competitors from copying the new features.
- (7) We believe it is impossible to trace the circuit and design by taking this receiver apart outside of our factory.

The exact function of the seven tubes of the Universal Super 8 is not revealed at this time as the manufacturers desire to keep all details a secret until full patent protection is afforded. Full operating instructions are supplied with each Universal Super 8, however. Patents are applied for covering some of the features of the Universal Super 8.

Either the old or the new type tubes are used in the Universal Super 8, and special provision is made for bias batteries, specified by some tube manufacturers.

Obviously this receiver will not be made on a large production scale, due to the time needed in building each one individually. Orders are now being taken on a custom-made basis as each set is laboratory tested in Long Island by an expert radio engineer to insure its perfection.

It is believed that the new design embodied in the Universal Super 8 gives the finest musical reproduction, tone, selectivity, audibility and maximum range that can be obtained by any receiver using seven tubes. Judging from the interest in our other multiple tube receivers, we believe the demand for this new design is going to tax our capacity the year around, and, as above stated, orders are now being taken in rotation. Prices quoted on application.

This receiver is not regenerative and is not a super-heterodyne.

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