Mainly about Construction

BY "MEGOHM"

CONDENSERS

There are some parts of a wireless circuit in which condensers are essential, and others in which they are not essential though very desirable. Many beginners in radio observe their more advanced friends putting condensers into their sets here and there, without any apparent regard either for their position or their capacity value, and the newcomer is often at a loss to know just where and when a condenser is going to be of use to him.

The more "optional" places for condensers are across the windings of the L.F. transformers, across the high-tension battery, and as a shunt on the 'phones or loudspeaker.

By-pass Condensers.

As a general rule, any piece of apparatus in a wireless circuit which has a high resistance (or "impedance" to be more correct) should have a "by-pass" condenser connected across it in order to provide an easy path for the high-frequency currents.

Of course, the ease of passage of the high-frequency currents through the condenser depends upon the capacity of the latter, and in special cases (as, for instance, in the case of the tuning condenser) the value of the condenser has to be chosen or adjusted very carefully; it is not, in other words, merely a "by-pass" condenser.

The first place for a by-pass condenser is across the primary winding of the first intervalve transformer. The current which is intended to flow through this winding is the rectified current from the detector, but there is a small H.F. current as well. This will not pass through the primary winding of the transformer if a suitable by-pass condenser is provided. A common value for this condenser is 0.001 mfd.

Across the H.T. Battery.

The next position for a by-pass is across the high-tension battery. The resistance of the H.T. battery is a matter for conjecture; in a new battery it is comparatively small, perhaps 50 to 100 ohms, but in a battery which has been in use for some time, the resistance is apt to rise very considerably. The effect of this resistance is much more serious in a multi-valve set and in certain special types of circuit, when the one H.T. battery is common to all the valves. The internal resistance of the battery and its ill-effects can be overcome, however, by the simple expedient of placing a large capacity condenser across its ends.

By "large capacity" in this connection is meant a condenser of anything from 0.1 mfd to 2.0 mfd.—the larger the better. This condenser is sometimes referred to as a "blocking condenser." It is certainly worth while to include it, even when the battery is new, and you will often be surprised at the improvement in reception.

For these large capacity fixed condensers it is often convenient to use "paper condensers," that is, condensers made up with sheets of tinfoil and insulating sheets of paper. The best type of large-capacity fixed condenser are the Mansbridge condensers; Mansbridge condensers are made by the T.C.C. amongst others, and are comparatively cheap. In this connection it may be well to mention that many amateurs get the impression that any old condenser will do for a blocking condenser, particularly across the H.T. battery. It is, however, just as important to have a condenser which is perfect in insulation here as at condenser.

Finally we come to the condenser shunted across the 'phones or loudspeaker. At first sight a telephone condenser might seem to have a by-pass action, and to be therefore undesirable. But as a matter of fact, it acts as a storage condenser, and in this way materially improves the reception. Signals can, of course, be heard without a telephone condenser, but it should be remembered that there is always a certain amount of capacity in that part of the circuit even in the absence of an actual condenser.

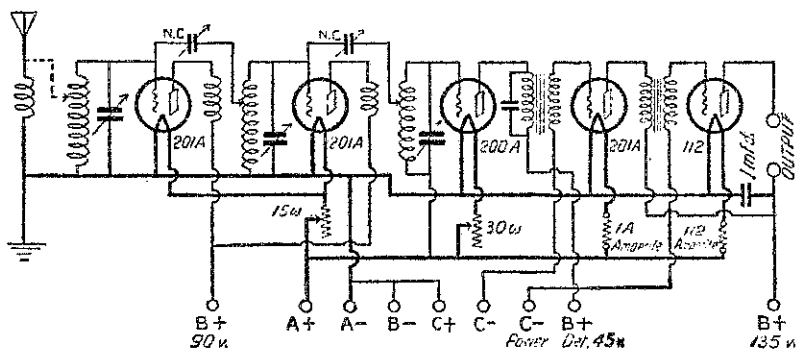
Owing to the fact that the 'phones and the H.T. battery often occur in proximity in the circuit, some amateurs place a single large capacity condenser right across the two, but this is not the best practice. It is better, as already indicated, to place a large condenser across the battery, and a smaller one across the 'phones.

The small B batteries do not have great enough amper-hour capacity to be suitable for use with multitube sets. You will get much better results if you use the larger type. Besides, you will find them more economical in the long run.

SELECTIVITY AND HOW TO OBTAIN IT

ADDRESS BY MR. PRESTON BILLING

Now that we have a high powered broadcast station in our midst, the remarks which are to follow will be found of assistance generally to listeners. Commencing with the aerial itself, it is impossible for any receiver to be selective when it is connected to a long aerial. Aerials of this type, especially now the stations to which we listen are so powerful, are to be avoided. I would personally recommend those experiencing trouble in this direction to limit the aerial length, inclusive of earth wire and lead in wire, to 80 feet in all. The choice of this length will, of course, result in a shorter distance between the poles, allowing for, say, 30ft. masts, the length of wire between them would be, say, up to 50 feet. The aerial should make entrance to the house through a porcelain tube, and once inside the house, it should be kept as short as possible. If the set can be placed near the point of entry of the aerial, so much the better.



Layout of a five-valve Neutrodyne set, as recommended by Mr. Preston Billing in a talk to listeners from 2Y.A.

The regulations require that a lightning arrester be installed. These may be fitted outdoors or indoors as preferred—personally, I prefer the latter type.

The Earth Lead.

This is a point which is often neglected. Use an insulated wire of reasonably heavy gauge, bearing in mind also that this lead must be kept as short as possible. Run one end of this wire to the nearest cold water pipe and clean the pipe with a piece of carborundum cloth or a file. Next place the clamp in position and screw up tight after attaching the earth wire. Just make sure you really have a good earth connection for, although you may have attached the wire to the water pipe, have a look and make certain that the pipe does not completely encircle the house services are returning to earth.

The Receiver.

The receiver is by far the most important item of the whole installation. There are many makes of excellent receivers on the market, but here again both the selectiveness and the power of them are dependent on the number of valves used and the type of circuit in use. I am not going to enter into the respective merits and demerits of the various types of receivers, for if one has already purchased a ready-made receiver there will be little or no chance of putting any alterations into it to make it more selective, and resort will have to be made to one or more forms of what are known commercially as wave traps. If the receiver is to be in use close to a broadcast station then it would be advisable to see that it is one of the shielded variety. This procedure will be found advisable, as there is the risk that the tuning inductances themselves may act as miniature antennas, in any case shielding will have the effect of cutting down interference from domestic electrical devices.

The design of the radio-frequency transformers and the material upon which the turns are wound have a good deal to do with the selectiveness and the strength of the reception. If your receiver is a factory-built one by a reputable manufacturer, you may rest assured the coils therein are of satisfactory design, in fact, many of the modern coils are as selective as they can be made without destroying their tonal properties. If you wish to construct a set of these coils for use in a neutrodyne circuit the following particulars are given. If these instructions are carried out a very fine receiver should result—see circuit diagram for wiring.

How to Make the Coils.

Procure some sheet celluloid about 1-32nd of an inch thick, cut a strip off the sheet equal to 2½in. wide, procure a wooden former such as that when one thickness of the celluloid is wound around it the overall diameter will be three inches, allow a lap over of about half an inch—making the ends fast by painting the joint with a mixture of celluloid and Amyl-Acetate mixed. Next proceed with the winding, which should be done with 24 gauge double silk covered wire. Commencing from one end about half an inch from the edge wind, in place fifteen turns and bring out a tap. Proceed with the winding until there are wound on a total of sixty-four turns, inclusive of the 15 turns previously wound. The two ends can be secured in place by drilling two small holes and passing the wire ends through each at their respective ends. Prior to removing the coil from the former, coat sparingly with the mixture mentioned; allow to stand a while before removing from the former, when the coil will be found to come away readily and keep its shape on removal. This completes the secondary coil.

The primary coil is made in a similar manner, except that the overall diameter will be 2¾in. and the width of the strip will be 1¼in. It is secured in the same manner, and the winding is commenced at a similar distance from one edge and wound in the same direction. Five turns only are wound in place, and these are spaced equally so that the five turns occupy the space required by the 15 turns of the secondary winding. Eventually the primary coil is placed directly beneath these 15 turns.

Generally speaking, the beginner is advised to buy reputable coils.

The method of mounting these coils will be left to the ingenuity of the constructor. They are usually fastened to the variable condensers and set at an angle of slightly under 55 degrees. This angle must be set accurately if the receiver is to be neutralised without difficulty, as if one coil is of a lesser diameter than the other it will be necessary to space the primary with thin strips of sheet celluloid of 1-8 of an inch thickness. These are secured in place with the amyl-acetate solution. Three coils are wound in this manner to complete the set. These coils when built into the circuit given with this article will be found very selective and very powerful.

Increasing Selectivity by Means of Wave Traps.

Much has been written with regard to this subject, and many of the so-called wave traps have been tried mostly with disappointing results, for, whilst they partially eliminate the unwanted signal, they considerably diminish the volume of the station it is required to listen to. There have been only one or two devices which have come under my notice which will really increase the selectiveness of any set, and, at the same time, actually increase the signal strength from the station you desire to listen to.

Radiating Receivers.

This form of nuisance seems to be on the increase, and I would like to give a little advice to those who may be in doubt as to when their set is reradiating. The three-coil Armstrong receiver, whether of the two-circuit or single circuit variety, is a positive offender, and a good deal of trouble comes from amateur sets constructed on this principle, and operated by owners who know nothing about them. In addition to the above mentioned set there are various forms of Neutrodynes and Browning-Drake receivers which are just as likely to cause annoyance to your neighbours if they are not correctly neutralised. If users of these home-made sets would make certain of their neutralising adjustments there would be fewer squealings on the air. Any receiver which is believed to be radiating can be cured by adding one stage of neutralised high-frequency amplification ahead of the existing set. If one must go on using the type of circuit first mentioned, then bear in mind the following hints: (1) Do not use too high a B battery pressure. (2) Keep the det B positive voltage as low as is consistent with good results. (3) Use a small size tickler coil, and keep it as far as possible from the secondary coil. Violation of these instructions simply bring in distorted signals, which are mushy and useless to the listener, and, in addition, the owner of a good receiver is debarred from having a good evening's entertainment. Owners of small valve sets are frequent offenders through straining their receivers to work loudspeakers with two and three valves.

In conclusion, Mr. Billing stated that he would be pleased to answer any inquiries which may be addressed to me, care of this station. Queries to be brief and to the point, written in ink, on one side of paper only, and clearly endorsed with the name and address of the inquirer.

NOTES

Constructors who are about to make a low-loss coil for a crystal set should read the instructions for making such appearing under the Browning-Drake heading in this page.

"Megohm" thanks those readers who have sent in suggestions for subjects to be dealt with in this column. These suggestions give a good indication of the items most required, and of course, the same requirements have been mentioned by several, but those who have written are assured that practically everything asked for is noted for treatment in due course. Several useful ideas are now under experiment for description as soon as completed.

A number of inquiries regarding details in the construction of the 112-volt B accumulator have been answered by post. After the first few charges the current may be strengthened considerably without doing any harm. Recent experiment shows that it takes about three weeks' daily charging before the lead plates begin to hold their charge for twenty-four hours. During the first week no useful work must be expected, and during the second and third weeks a charge must be given immediately before use, but may only last two or three hours. After three weeks the improvement is rapid, especially with frequent and regular use. This forming is a little tedious, but well repaid in the end, as the battery will stand "sporting" without harm, and will give long service without even renewal of the acid.

A number of correspondents have written asking where they can procure sundry supplies. A much-needed article for constructors is an eighth-inch threaded brass bolt half-inch long, with countersunk head and hexagonal nuts to fit. These can be purchased from Messrs. R. W. Mills and Co., Ltd., Jervois Quay, Wellington. The bolts are 3s. and the nuts 1s. 9d. per gross. Brass washers, the smallest with 3-16th inch hole are supplied by the same firm at 2s. 3d. a gross. Messrs. Geo. W. Wilton and Co., of Upper Willis Street, Wellington, supply test tubes, chemicals, and pure aluminium sheet. This information is for the benefit of country readers who are sometimes in a difficulty to know where to procure supplies.

By courtesy of Messrs. John Chambers and Son, Ltd., of Cable Street, Wellington, "Megohm" has tested one of the Carborundum Company's carborundum crystal units with battery and potentiometer. In operation there is a fairly critical position of the potentiometer at which greater clarity and an increase in volume are noticed. This fact makes the unit very suitable for amplification in any way, either as detector in a multi-valve set, or as the crystal in a reflex set, where the finding of a suitable crystal sometimes constitutes the most difficult part of the work. Used without the stabilising unit, the crystal alone is excellent, giving smooth tone and good volume with continuous reliability, as it requires no setting and there is no adjustment to fiddle with. The price of the crystal alone is 7s. 6d. and the complete stabilising unit 17s. 6d. This firm also stocks a carborundum resister (2s. each) in 50,000 and 10,000 ohms, with noiseless action, which proved very suitable when used in the detector circuit of a B eliminator.

CHOOSING A LOUDSPEAKER

It is an unfortunate fact that many amateur constructors, after having made quite a good job of a set, will go and spoil the whole thing by using an unsuitable loudspeaker. If there is bad distortion, it is a common occurrence to find that the whole trouble is due to the loudspeaker. This state of things is found, whether the set be home-made or from a well-known manufacturer's store. The main trouble is usually due to the fact that the set, quite good if properly treated, is installed in a corner "out of the way, and is fitted with a small loudspeaker—mainly so as not to attract attention, or to give a small volume.

Overloading Troubles.

This is all right as long as a small output from the set is all that the loudspeaker is required to carry, but if the set is capable of giving a large output, and the loudspeaker is being "pushed," distortion is bound to follow. The same occurs if a small loudspeaker is expected to fill a large room or to provide sufficient volume for occasional dancing.

The safest way to ensure satisfaction, unless small volume and a small room are to be coupled together, is to use a medium-sized loudspeaker, whether loud or small volume is required. A medium loudspeaker will give good round tone on both loud and weak speech and music, and if less volume is required the set can be detuned or a valve cut out.

There are, of course, many types of loudspeaker, and it is best for the listener buying one for the first time to have a demonstration—a comparative demonstration—before he completes the purchase. He should hear various types and makes of loudspeakers under the same conditions—if at all possible, on his own set—before he finally makes his choice. He will probably be surprised at the difference between the various tones that the different loudspeakers produce.

Whatever he does he should not buy his loudspeaker upon recommendation

(Continued on page 15).