5. My loudspeaker vibrates.

A.: You are probably giving it too much volume. Try adjusting the diaphragm or use a filter.

C. C. (Hikuranga).—What valves shall I use in the short-wave set described in the 1930 "Guide"? I am using 222 screen grid, and a 4-volt accumulator.

A.: Mullard, detector 4DX, first audio, P.M.3, second P.M.4. Philips, detector 415, first audio 409, second audio 406 for quality, or 409 for volume. Osram, L410, in all stages, or P410 if quality is desired.

L. S.B. (Eketahuna).—What valve would you suggest for my —— receiver?

A.: A two 221A's, detector 200A, last stage 112A.

2. My set fades on Auckland. Will a new valve improve that?

A.: Probably not. It is an atmospheric phenomenon.

3. When tuning the filament current control to halfway volume is at a maximum. Why?

A.: Because at this point the valves are heated to their optimum temperature, and further increasing the current is likely to damage the valve.

4. Is the enclosed diagram correct?

A.: If you are using 112A you should use 9 volts, grid bias.

A. T.C. (Wellington).—Can you supply me with a three-valve circuit?

A.: You can either add another valve to your existing receiver, as shown in our issue of August 8, or construct "Round the World Three," described on March 7.

LISTENERS must attach this coupon to all queries sent to the Technical Editor (Box 1032, Wellington). Questions arriving without it are likely to go astray or be delayed.

Name of set .....

Number of Valves .....

Name .....

Address .....

.....

.....

Nom de plume .....

To be kept in subsequent inquiries.

Date .....

Please Note:—

(1) Be specific and brief, tabulating, if possible.
(2) Write legibly, and on one side of the paper.
(3) We do not design circuits, but accept suggestions for feature articles.

Solving trouble, as different from advice, is difficult by correspondence and while letters are given every consideration, answers are not necessarily correct—they are only our opinion based on the matter supplied, which may be quite inadequate. Intricate and involved specifications cannot be supplied without a specialist's fee.

IMPEDENCE (Christchurch).—When the gramophone pick-up is plugged into the set I cannot get enough volume. Would an impedence transformer improve this?

A.: An ordinary inter-valve transformer would be better.

2. Can tone be improved?

A.: From the table of your valves it appears that the last two 45's are not balanced. Consult your dealer.

T. M.L. (Kilbirnie).—I intend building Pentode's crystal and valve with three-valve performance. Has the set been redescribed?

A.: No; the original circuit is still perfectly satisfactory.

2. Could another stage of audio be added?

A.: Yes; as was described about a month ago.

Winding the Optimum Coil

A Correspondent Asks Questions

Answered by "Cathode"

A CORRESPONDENT has raised certain points in connection with the papers on coil design which were printed in these columns some time ago. As these little difficulties are such as may have been encountered by other enthusiasts, it has been considered worth while bringing the answers to the queries into some degree of prominence.

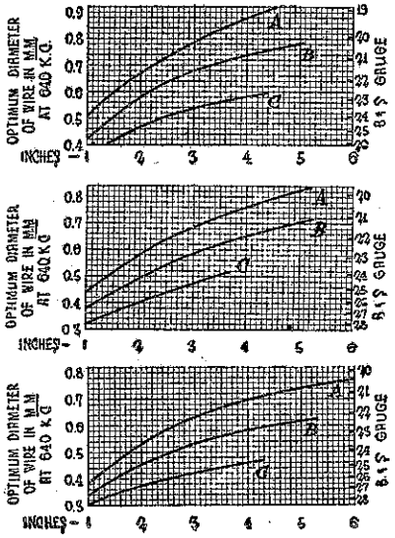

Fig. 1.—Details on page 27.

The first question reads as follows: "In constructing any inductance coil, what is the best or most efficient ratio of length of winding to diameter of coil?"

Now, in strictest theory, given a coil of certain diameter, the resistance decreases (i.e., the efficiency improves progressively as the length of the coil is increased, provided that the optimum diameter of wire is always used. In practice, however, apart from the inconvenience of such bulky coils, there is no real improvement in efficiency after the length of the coil equals its diameter. In fact, a very efficient coil will result from a winding length three-quarters of the diameter. Thus we may say that for practical purposes efficiency is greatest when the winding length is equal to the diameter, while a reduction of the winding length to three-quarters the diameter makes a more compact coil, and has but little effect on the coil resistance. This point is well illustrated in the charts appearing herewith.

Our correspondent next asks the number of turns of 24 s.w.g. to wind on either a 3-inch or a 2½-inch former and the most suitable winding length in each case; the tuning condenser is to be of .0005 mfd. maximum capacity.

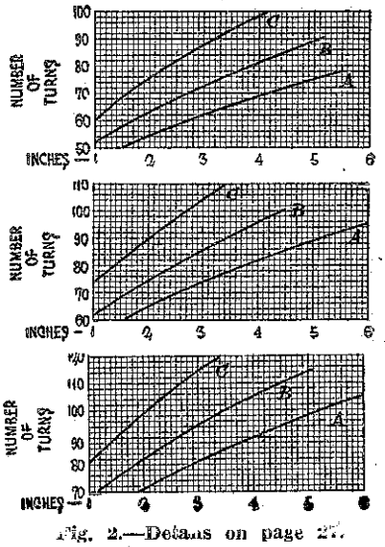

Fig. 2.—Details on page 27.

From information given in the issue of the "Radio Record" of August 23, 1929 (Vol. III, No. 6), we know that for a tuning condenser of this size an inductance coil of 200 microhenries is necessary. For a .00035 mfd. condenser, 280 m.h. would be more suitable, while a .0003 or .00025 mfd. condenser would call for an inductance of 340 m.h. Aiming at maximum efficiency, reference must be had to the charts. Fig. 1. Knowing that 24 s.w.g. has a diameter of 0.5585 millimetres, a line may be drawn across the 200 microhenry chart at this point, and it will be seen that it cuts line A (3-inch diameter coils) at a point corresponding to a winding length of 1¼ inches, while it cuts line B (2½-inch diameter coils) at a point equivalent to a winding length of just on 2 inches. Reference to Fig. 2 shows that to give the required inductance with the diameters and winding lengths decided upon, the 3in. coil would need about 45 turns (the chart does not extend quite this far), while the 2½in. coil would call for 60 or 62 turns, which would, of course, be spaced over the previously ascertained winding length of 2in.; the 3in. coil will not accommodate the necessary turns in the space of 1¼in., so that here a close-wound coil is the most efficient.

Our correspondent submits a suggested circuit for a crystal receiver in which he proposes to use this coil; he will find this circuit quite successful.

The third query submitted is as follows: Given the inductance required, the size of the wire to be used, and the size of former, how does one arrive at (a) the number of turns to wind on, (b) the length of the former to space out the winding over?

These two points have really been covered in the practical instance just given. It may be noted that choosing a gauge of wire and then ascertaining the optimum dimensions of the coil for that particular gauge is a rather "back-to-front" proceeding, and will frequently lead, as in the instance just given, to a coil of unsuitable shape. A much sounder process of design is to first decide upon the most suitable and efficient shape and dimensions for the coil, then ascertain from the charts the number of turns to obtain the required inductance with those dimensions, and the most efficient wire diameter; the nearest gauge to the optimum diameter can then be chosen for winding the coil.

THE next query is whether the efficiency of a tuned circuit is improved at all by increasing the ratio of inductance to capacity. It is, of course, although with a crystal receiver it is probable that the damping imposed on the circuit by the crystal would nullify any benefit which might otherwise be gained. When the tuned circuit is in the plate circuit of a valve the advantage of using a preponderance of inductance is readily understood. The amplification depends on the magnitude of the plate load, and since the impedance of a tuned circuit depends on the magnitude of a factor L over Cr (where L is the inductance, C is the capacity and r the high-frequency resistance), so the amplification increases as the inductance L is increased. The improved amplification is paid for by a decrease in selectivity.

Lastly, our correspondent wishes to know how the "Shape Factor" curve in the above-mentioned article is arrived at. This is actually a derivation and plotting of Nagaoka's constants for inductance calculation, but the development of the formulae is somewhat outside the scope of these columns.

Correction

THE photographer's name appearing under the photo. of "Uncle Jim," of 2YA, last week should have read "Pem."