Mainly about Construction

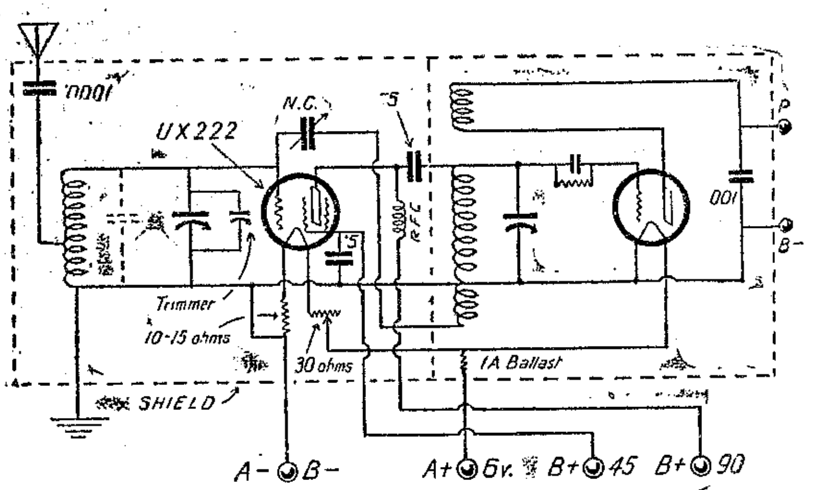
BY "MEGOHM"

Adapting the Browning-Drake to the Shielded-Grid Valve

THE March number of "Radio" describes a method of using the UX222 shielded-grid valve in the R.F. stage of the Browning-Drake by a few simple changes. The main proviso is that the R.F. and detector stages must both be completely enclosed in copper screening boxes, the top, bottom, and sides all being of metal.

Many constructors will fight shy of the screening, but it is well worth the trouble, even when only ordinary grid, thus giving greatest efficiency for the regeneration on the r.f. transformer. These changes are shown in the diagram.

"The primary of the r.f. transformer is shorted out because of the valve's very high impedance. This direct coupling (really an auto-transformer) requires a parallel feed system consisting of the ½ mfd. condenser and choke coil, thus keeping r.f. current out of the B supply. The valve's plate is connected directly to the stator of the second tuned circuit.



R.F. and Detector Stages of Browning-Drake showing adaptation of Shield Grid Valve

valves are used, as both quality and selectivity are gained by its use, and if the screens are roomy, so that a space of at least 1½ inches exists around and above all coils, and 1 inch at the bottom in the case of vertical coils, practically no damping of the circuit will result.

Those who have constructed the short-wave receiver with shielding as specified will have experience of the benefits it gives, and will have found also that working in sheet copper is a comparatively simple and satisfactory process, and not the difficult operation that it might appear beforehand.

"The requisite changes include (1) shorting out the primary of the r.f. transformer and substituting a ½ mfd. condenser and r.f. choke, (2) shielding the r.f. stage, (3) inserting a ½ mfd. condenser between the valve's plate and a connection to ground, and (4) putting a 10 or 15 ohm resistance in the filament circuit to reduce from 6 to 3.3 volts. A neutralising condenser is used to balance the very small capacity betwen the valve's plate and control

"As this puts the plate-screen grid capacity across the second tuning condenser, it may be necessary to put a 15 mmfd. condenser across the first tuned circuit, as shown by dotted lines. In many cases, however, especially if the .0001 mfd. series antenna condenser adds enough capacity, the trimmer condenser will take care of any difference between the two singly-controlled tuning condenser settings throughout the waveband. A few experiments will determine whether it is needed in a given installation.

"Suitable shields and instructions for their use may be secured from the Browning-Drake Corporation. The ½ mfd. condenser between the shield grid and ground is essential when using this valve.

"The 10-15 ohm resistance in the filament circuit not only cuts the 5 volts used with the 300-A or 240 detector to 3.3 volts for the screened grid tube, but also supplies biasing current. If a 3-volt supply and —99 valve is used as a detecior, this resistance is not

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FACTS ABOUT CONDENSORS

A CONDENSER is described as being of a certain capacity—i.e., .0005 mfd. The farad is the measure of capacity. The property which a condenser has of holding a charge of electricity is called its capacity. An excellent example of this property of the condenser is that of a spiral spring. If a metal weight is attached to the end of the spring, the spring will be extended to a certain length until the weight of the metal is exactly equal to the force exerted by the spring in the opposite direction.

DIELECTRIC STRAIN.

IN the same way, if one plate of a condenser be charged with a certain electrical force, the dielectric or intervening material between the two plates of the condenser will be strained electrically until the condenser exerts an electrical pressure equal and opposite to the electrical force applied to it.

The two plates of a condenser are conductors of electricity and receive the electric charge upon them. They are separated from each other by non-conductive material called the dielectric, which may be composed of mica, glass, or of air. There may be more than two plates to a condenser—and generally are—dependent on the capacity required, but between the plates there must be a dielectric.

CAPACITY OF CONDENSERS.

WE find that the capacity of a condenser depends upon the area of the plates of which it is formed and the material of which the dielectric is composed. But there are other things which affect the capacity of the condenser. We say that the capacity of a water tank is of so many gallons, meaning that it will hold so many gallons of water when completely full. We do not fill a condenser with eectricity in the same way. We apply an electrical pressure to the plates of the condenser, causing a state of strain to be set up upon the dielectric between the plates. The thicker or higher the water tank the greater the amount of water it will hold, and the greater its capacity. But, in the case of a condenser, the thicker the dielectric, or the greater the distance between the two plates, the less will be the state of strain upon the dielectric, and the less the capacity. The thinness of an india rubber tube will allow of its greater expansion when 1lb. pressure of water is applied to it. The thinner the dielectric the greater will be the state of strain existing in it, and the greater will be the capacity of the condenser.

The capacity of the aerial circuit has its effect on the wave-length to which that circuit is tuned. You will remember that in my last article I talked of tuning and coupling, and I said that to facilitate the tuning of the aerial and closed circuits a variable condenser could be added to the circuits. By varying the capacity of the condenser in such a circuit the tuning of that circuit is controlled.

If a condenser is inserted in the aerial circuit—shall we say between the aerial and the tuning-coil—we reduce the capacity of the circuit, and, therefore, the wave-length. The aerial itself has a capacity which can be increased by increasing the number of wires forming the aerial, and if a condenser is inserted in series with the aerial the total capacity of the circuit is not thereby increased as might be supposed, but decreased, and an increase of capacity causes a decrease of wave-length of the aerial.

TUNING THE AERIAL.

ON the other hand, the aerial itself has inductance, and if an inductance is inserted in the circuit the total

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necessary.

"When the receiver is completed and connected up it may be neutralised by setting the dial at about 20 on the scale and turning the tickler in either direction until a distinct click is heard in the loudspeaker or telephones. Adjust the tickler coil until this circuit is not oscillating. A test to determine whether or not the set is oscillating is to place the finger on the terminal of the ½ mfd. blocking condenser, which, if connected to the grid of the second tuning circuit (to get at this condenser the top of the shield on the r.f. compartment will have to be removed), a distinct click will be heard if this circuit is oscillating. Now turn the tickler back to where oscillating just ceases. Turning the trimmer condenser will then throw this circuit into oscillation if the neutralising condenser is not properly set. The neutralising condenser should be then set until the above test is satisfactory and the trimmer condenser has no effect on oscillations produced in the second circuit. It will be found that this trimmer condenser is almost at a minimum value.

"Too much cannot be said in favour of using the screened grid valve as a radio frequency amplifier. The amplification obtainable is tremendous, and the operator can easily get down to the noise level with little or no difficulty."

Dealing with Distorted Reception

SEVERAL CAUSES AND THEIR CURE

LISTENERS who reside at considerable distance from any main broadcast station may be inclined to think that those at closer quarters have little to complain of, and that "everything in the garden is lovely." Such a view is to some extent a mistake. Certainly here in Wellington we have the evening session on six nights a week, uninterrupted by howling of any description. That is something to be thankful for. But midnight is a popular time for city people to retire, and the time after 10 p.m. may be filled in with reception of Australian stations. It is at this time that everybody in New Zealand is on somewhat of an equality with regard to conditions, the isolated set owners having, if anything, the best of it, for the howling valves in populated centres detract greatly from the pleasure of listening until, one by one, a sufficient number of oscillators has retired to bed, leaving reception more or less unmarred. Then there is the "silent night"—anything but silent with regard to oscillators, but it affords the writer a splendid opportunity of studying the interference problem.

In many suburbs of Wellington reception of musical programmes from distant New Zealand stations on the silent night is useless from an entertainment point of view, so in order that oscillators may indulge in their nocturnal wrist exercise, others are debarred from receiving programmes that would otherwise be available. It is quite evident that a set requiring continuous movement of the dials is not getting any reception that is of any value, except as "something instead of nothing" to the operator.

MOREOVER, it is quite evident to the experienced listener studying interference from howling, that a set requiring a heroic struggle with the dials for perhaps a quarter of an hour cannot be one of any magnitude, as the owner of a four or five valve set will be able to tune in any New Zealand station in half a minute or less, and that without howling—if he knows how, and uses only ordinary care, even if the set is not a neutralised one. Everything appears to point to the one and two-valve sets being the creators of a large proportion of the disturbance in the ether.

But it must not be thought from this that the writer wishes to discourage the use of small sets—far from it, for beginners must learn. But everybody would like to have such beginners as careful of other people's rights as they would have to be when learning to drive a motor-car. But there are large sets, too, that do their share of interfering, frequently in ignorance, for often a listener who knows nothing about radio will have a set installed, and is informed that it "cannot possibly annoy the neighbours," when otherwise is actually the case.

It is not always the constant moving of dials that is the most annoying. There is the set owner that tunes-in a station and leaves the set oscillating, with the result that his neighbours receive that station to the accompaniment of a continuous whistle, which is, to say the least, extremely irritating. The wet finger test on the aerial terminal will give an indication of such oscillation by the two clicks—one when the finger touches the terminal, the other when it is taken off.

DISTORTION FROM INTERFERENCE.

NOW the purpose of this article is to emphasise the great amount of distortion caused by interference from oscillating and radiating sets. When listening to distant stations and getting full volume on the loudspeaker, the writer has frequently experienced the effect of one violently-interfering set practically "wiping out" reception for a few moments. Then there is the cumulative effect of a certain amount of radiation from a number of sets all receiving a distant station—the joint effect is a general weakening of volume, at bad periods reducing it to such an extent as to be worthless for entertainment. But this is not all.

DISTORTION PRODUCED IN THE SET.

NO matter what good quality reception a receiver is capable of giving, quality is impossible where there is much interference. An oscillating valve communicates a reflection of its mutilated and distorted signals to other receivers close at hand, and though its influence may be only slight, quality is affected. But suppose we have a receiver that, under best conditions, is not capable of producing quality with the volume it is expected to give. With outside distortion added to such reception, the result may be anything but pleasing.

A listener naturally likes to think he has made a good bargain when purchasing his set—and quite likely he has. But the stumbling-block in radio reception is the thirst for volume—the desire for signals to "roar in." Certainly a receiver that brings in the music with tremendous volume will give good and pleasing quality if it is toned down to a reasonable strength, but it is necessary that this should be done. Raspy or gritty tone is to be avoided at all times—it is bad for the nerves. A smooth, mellow tone is soothing and restful.

TRACKING UP CAUSES OF DISTORTION.

DURING the past few years the writer has been up against this problem of good reproduction, continually making improvements to produce

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