al nuts will clear the wooden baseboard.

Wiring.

SO much for the layout. The next procedure is to wire up the components.

For this purpose it is preferable to used covered wire. Glazite is quite suitable although by far the easiest to handle is No. 18 SWG bare tinned copper wire and use pieces of spaghetti covering cut to the quired length to insulate wires that are likely to touch. If valve sockets provided with terminals are used, then the whole assembling can be done withiut the use of a soldering iron. Connections to the terminals can be done by two nuts at the back of each binding post, although a soldering lug and a small touch of solder makes a far more substantial job.

By referring to the diagram it is quite a simple matter to follow the wiring. A point to point connecting scheme will, howeve , make any possibility of error very small. The filament wiring should be completed first. Join the second to the left hand terminal at the back, marked A—B—C+, to the right hand terminal on the rheostat.

The wire is cut to length, and a length of insulating sleeving slipped over before the terminals are tightened up. The same procedure is necessary with all the wiring, and even if two wires touch, there is no fear of a short circuit. The left hand t minal of rheostat is connected t one filament terminal of each socket. The remaining three filament terminals are connected together by one piece of wire which also is run to the first terminal on the strip on the left. This completes the filament wiring.

The third terminal marked C—1 runs direct to terminal marke' 1 bias or F— on the first transformer. In the same way C—2 is connected to the centre tap on the secondary side of the second transformer. The fifth terminal marked B+1 is connected to B+ on the primary side of the centre transformer. The centre terminal on the output transformer joins directly to B+2 or the sixth terminal on the extreme right of ebonite strip.

Lastly, the grid and plate wires are connected to their respective places on the transformers. Grid of first transformer to grid of first valve. Plate of first valve joins to terminal marked P on primary side of centre transformer. The two terminals marked G on the secondary side of the centre transformer are joined to the two grids of the last two valve sockets.

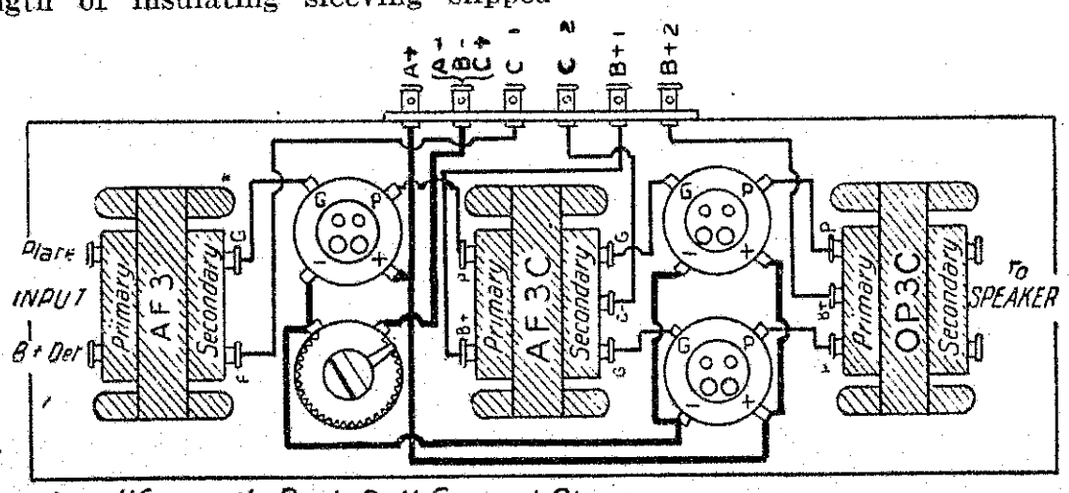
Finally, the plate terminals of these two sockets are connected to the two terminals marked plate on the primary side of the last output transformer. This completes the construction of the amplifier, and it is all ready to connect to the batteries and have a trial run on the local station as received in a crystal receiver.

This amplifier, it may be added, will give good distortionless volume when used in conjunction with any of the numerous gramophone pick-ups available. Join the pick-up with necessary volume control to the input side of the amplifier. Providing the speaker will reproduce faithfully, then it will be astonishing to hear notes during a piece of music that were never heard before on the record as played on the ordinary gramophone.

Either two, four or six-volt valves can be used in this amplifier, and below is a table showing the recommended grid bias and plate voltage for the numerous valves on the market. If ninety volts alone is to be used, then B+1 and B+2 should be joined together and run to B+90. Grid bias must *always* be used with this amplifier.

Two Volt Series.

First Stage			Second Stage (Push-Pull)		
Plate voltage		Grid bias C-1	Plate voltage		Grid bias C-2
PM I LF	90 volts	3 volts	PM2	90-150	12-20
A209	90 volts	4½ volts	B205	90-150	12-20
			B203	150	35
Four Volt Series					
PM3	90 volts	4½ volts	PM4	90-150	12-20
B409	90 volts	4½ volts	B406	90-150	12-20
B415	90 volts	3 volts	B403	150	40
Six Volt Series.					
PM5	90 volts	4½ volts	PM6	90-150	12-20
B609	90 volts	4½ volts	B605	90-150	12-20
B615	90 volts	4½ volts	B603	90-150	16-40
UX201A	90 volts	4½ volts	UX201A	90-180	12-25
			UX112	90-180	12-30



Amplifier with Push-Pull Second Stage

THE Munich station relays a complete opera at least once every week throughout the nine-and-a-half months during which the opera season lasts.

The Effect of Direction

Important Considerations in Erecting the Aerial

MANY a wireless listener is quite unable to select from a number of possible positions the most favourable one in which to suspend the aerial. For many town and suburban dwellers it is a case of erecting an aerial in a limited or restricted position or not at all.

At the same time the more fortunate amateur will generally find that there exists around his residence several possible positions in which an aerial can be erected.

There is no doubt that direction has a great deal to do with reception, and in considering the qualities of different outdoor types it will be found that there are merely two, the L and the T.

The L Type.

THE ever-popular L type—that is, with a lead-in at one end—attains directional properties in consequence of the fact that the "fall" ends of the transmitted radio waves tend to travel through space more easily than they do at lower levels.

Therefore at distances of several miles from a broadcasting station the upper portions of the waves are slightly in advance of the lower parts. The waves, in fact, bend outwards, roughly in the shape of an inverted L.

The ideal state of affairs would obtain when the L shape of the waves coincided with the L shape of the aerial. This, however, is never attained, there being only a tendency to do so.

From these facts its becomes evident that the inverted L type will always receive best when it points in the direction in which the waves are coming, that is, when the lead-in of the aerial is taken from the end nearest the broadcasting station.

This type of aerial, which points at an angle away from the direction of travel waves, is less effective in directional properties, its effectiveness decreasing as the angle which the aerial subtends to the direction of the waves increases. Thus it will be seen that an inverted L type aerial which runs exactly at right angles to the direction of travel of the radio waves is the least efficient of any, so far as directional properties go.

The T Type.

COMING now to the T type aerial, which is decidedly less popular than the former type, it will be apparent upon reflection that a T type aerial really consists of two inverted L type aerials combined together. Thus an aerial of this nature cannot be as directional in properties as a small inverted L-aerial can. A T type aerial is directional in two opposite directions at the same time. Thus if the T-aerial runs due north and south it will receive most efficiently stations which are situated at those points of the compass.

If, on the other hand, the aerial runs from east to west, the northern and southern stations will come in least efficiently.

The directional properties of an overhead aerial tend to increase as the proportion of the length of the downward lead to the horizontal portion of the aerial is increased (that is the higher and shorter the aerial), and in some instances this effect can be very marked, especially in the reception of distant stations.

Other Considerations.

NATURALLY at very close ranges to a broadcasting station the lie of