

HORN SPEAKERS

One of the most recognisable parts of a vintage radio for most people is the horn speaker. These came in a range of distinctive designs and shapes, often quite ornamental.

The earliest radio receivers employed coherer detectors, and the messages were read by means of paper tape morse recorders. Coherers soon gave way to electrolytic and magnetic detectors which, whilst more reliable, produced insufficient energy to operate recorders.

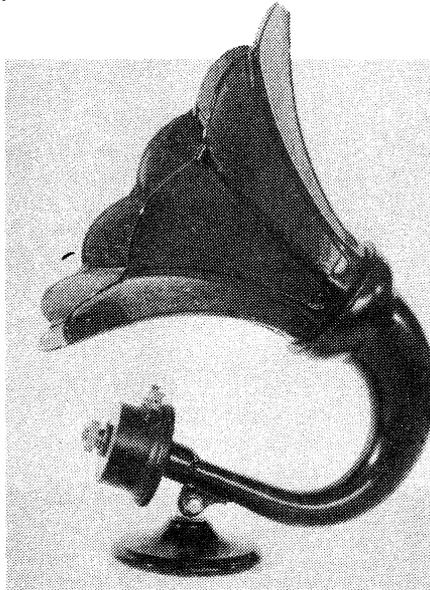
The most sensitive and practical instrument in common use at that time was the telephone earpiece, which proved to be very suitable for these new receivers. Although messages now had to be transcribed, in all other aspects the telephone receiver was most satisfactory, and of course, has been in extensive use in radio reception to this day. Logical developments were to use a headband, as already used by telephone operators, and to fit two earpieces so that both ears could be used.

Headphones were hard to improve on for single operator communications work. They were efficient, gave some protection against outside distractions and kept the messages private. Had radio not evolved into public entertainment, it is likely that for direct audio communications, the headphone would have remained pre-eminent, just as it has in the telephone.

Headphones inadequate

With the advent of broadcasting in the early 1920's, listening requirements changed radically. To cater for groups of listeners, it was possible to connect extra pairs of headphones, but this was clumsy and restrictive.

Placing headphones in a dish or bowl could reinforce sound sufficiently to cover a small area, but the obvious solution was suggested by the gramophone and megaphone. Coupling a headphone unit into a horn, in the same manner as the soundbox of an acoustic gramophone, gave a considerable increase in volume and quality.

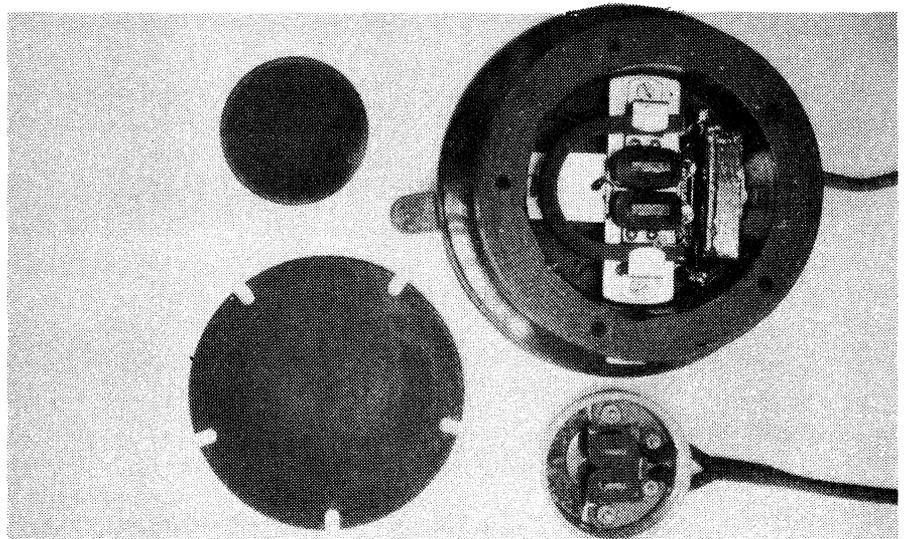


A classic 'Morning Glory' horn speaker with mahogany petals. This one came from the British Amplion company, which specialised in this pattern.

Horns have never been bettered for efficient loudspeaker operation. By acting as a kind of acoustic coupling transformer, the horn matches the comparatively heavy diaphragm to the far less dense surrounding air, and, to this day, horns are commonly used where large volumes of sound are required. A factor in the practicality of talking pictures in the late 20's was the experience gained with radio horn speakers.

Although Western Electric had experimented with a horn loaded loud speaking telephone as early as 1907, the large scale manufacture of radio horn loudspeakers commenced in 1922. For the next five years, literally dozens of manufacturers flooded the market with all kinds of horn speakers of every conceivable shape, size and material.

Some of materials used were aluminium, steel, diecasting alloy, ebonite, wood, papier mache, plaster of paris and ceramic. Early horns had bells which varied from a few inches in diameter to more than 22" (560mm) across – but to perform satisfactorily by today's standards, a wide range horn needs a mouth of at least twice even this diameter. Only a dedicated enthusi-



The relative sizes and similarities of the magnets and diaphragms of a headphone and a 'Claritone' horn. The black object alongside the horn's magnets is a capacitor, used to improve tonal quality.



Not a piece of a vintage motor cycle, despite the name plate! The knurled knob is the diaphragm spacing control.

ast would accept such a monster (two for stereo) and this is one reason for the unpopularity of bass horns domestically.

Shape important

The exact shape of the flare is important. Although any horn will work, the most effective type follows what is known mathematically as an *exponential* curve. All this means is that along the length of the horn, for each unit increase in length, the cross sectional area of the horn doubles.

The early gramophone makers had discovered this characteristic, but whether the original concepts were scientific or aesthetic is debatable. They found that the classic 'morning glory' horn, named after a popular American flower which nature has evolved with an exponential flare, was superior both acoustically and visually to the straight sided cone. Some horns were made complete with petal-like segments, leaving no doubt about the floral origins.



An American Atwater Kent model L. It has a spacing adjustment collar under the base.

Incidentally it is not only flowers that have evolved the exponential curve. Many shells, including that of the snail follow the same law.

One very practical radio loudspeaker system used the horn of the family gramophone, which would have been gathering dust as interest centred on radio entertainment. The soundbox, or what we would now call the pickup unit. Not only was this recycling an attractive proposition to owners who were faced with an otherwise unused piece of equipment, but a cabinet gramophone would have produced results equal to those from a good sized radio horn.

A horn with a straight axis was clumsy, and various forms of folding were adopted. The traditional graceful curved neck and wide bell became the symbol of early radio, but there were many other forms.

Some British manufacturers disguised their speakers to look like ornaments, such as Dresden figures or Confucius. At least one American model used a bugle-like multi folding horn, inspired by a motor car bulb horn! As the ultimate concession to nature, a couple of American manufacturers incorporated large sea shells in their speakers. An idea borrowed from the gramophone industry was building horns into cabinets.

Horn construction was more metal fabrication than electronic engineering, so it is not surprising that some unlikely firms diversified into speaker manufacture. One such was the well known A.J.S. company of the UK, who took the opportunity to cover a recession in the motor cycle industry.



A British 'Claritone'; adjustment is by means of the lever projecting from the base.

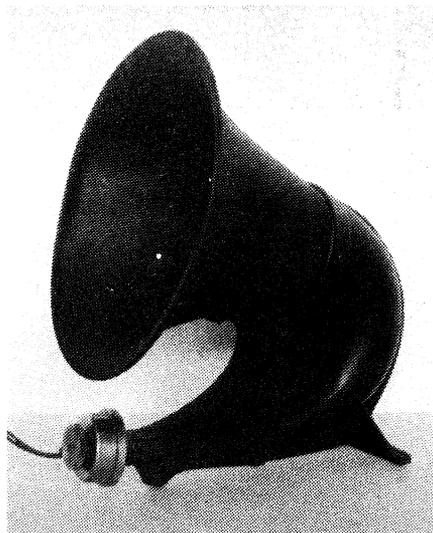
Drivers

Initially, conventional headphones were used as horn drivers, but the need for increased power handling soon led to specialised driver units being produced. Generally, they were simply oversized headphones and standard practice was to provide adjustable diaphragm to magnet spacing. Operation was a compromise between sensitivity and power handling. Maximum sensitivity results from minimum spacing between the diaphragm and magnets, but volume is then limited by the diaphragm hitting the magnet pole pieces.

Specialist magnet materials were not available, and to improve on carbon steel magnets, some units used electromagnets energised from the radio's filament battery.

For maximum sensitivity the driver coils were usually connected directly into the anode (plate) circuit of the audio output stage. This meant that anode current flowed through the windings – potentially capable of causing demagnetisation with units having a permanent magnet. The polarity of terminals of horn speakers and headphones was therefore marked, to ensure that they were connected so this current would reinforce the field from the permanent magnet.

Later, when radios with built-in speakers arrived, horns were often used as extension speakers, giving them a reprieve. This has increased the chances of these very collectable items still being found today.



A German 'N&K' horn; the adjuster is at the end of the driver unit.