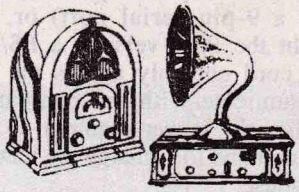
Vintage Radio

by PETER LANKSHEAR



The excellence of Hammarlund

Scandinavia has produced its share of notable pioneering radio engineers, the two best known being the Swedish born Ernst Alexanderson and from Denmark, Valdimar Poulsen. Also from Sweden came the subject of our attention this month, component and receiver manufacturer Oscar Hammarlund.

Very early in the history of radio, it was realised that there had to be better ways of generating RF than by means of high voltage spark discharges — best described as brutal inefficient and spectrum hungry. The aim was to generate a continuous single frequency or continuous wave (CW), something that spark could never do.

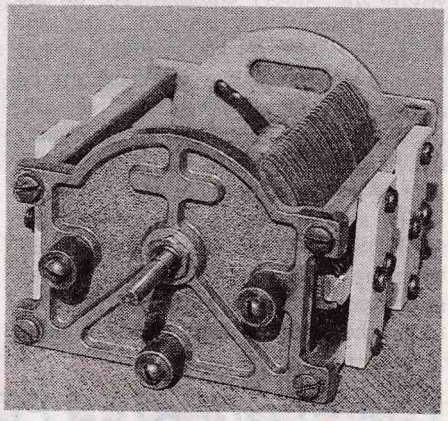
By the 1920's, high powered valve transmitters had become available, but prior to this there was the high frequency alternator which directly and efficiently generated as much as 100kW at frequencies up to 100kHz. Much of the development of these remarkable machines is due to Alexanderson, who went on to become the first chief engineer of RCA. During his long life, (he died in 1975 at the age of 97) he was awarded 344 patents, ranging from electric locomotives to television.

Poulsen was another leader in high powered RF generation, but his work was with arc transmitters. Alternators were understandably very expensive and very large, and consequently relatively few were built. Much more common was the arc transmitter, which generated remarkably pure waveforms by means of an electric arc working in a hydrocarbon atmosphere. By 1919, arc transmitters rated at one megawatt were in use. Incidentally, a graduate Australian electrical engineer, Cyril F. Elwell introduced the Poulsen arc to America in 1908 and subsequently played a large part in its development by the Federal Telegraph Company.

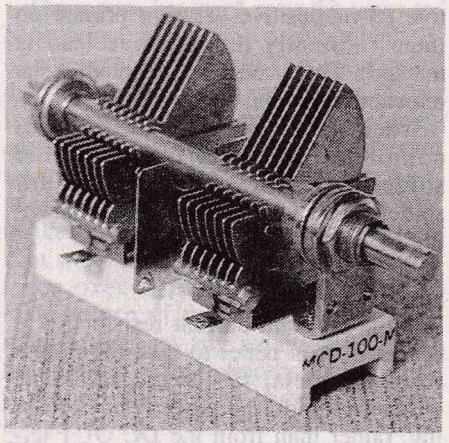
Important as Poulsen's contribution to radio transmission was, his most significant invention, through the lack of a means of amplification, was to remain undeveloped for a generation. But it is difficult to imagine modern technology without it — for it was, of course, none other than magnetic recording.

A third Scandinavian pioneering electronics engineer, Oscar Hammarlund, is rarely credited with his best known invention, the eversharp propelling pencil.

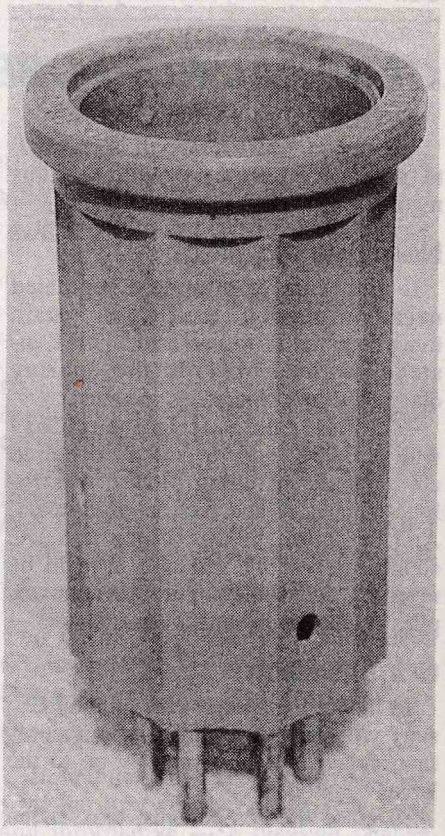
He was born in 1861 in Stockholm, and although his contributions to electronics were perhaps not as spectacular as those of Alexanderson or Poulsen, he was nevertheless a very inventive and skilled engineer, and the firm he founded set for the electronic in-



Hammarlund components made extensive use of Isolantite insulation and finely finished die castings. The splendid TCD split stator transmitter tuning capacitors were an established design by 1932, and the range remained in the catalogs for many years.



There was an elegant simplicity about Hammarlund design that withstood fashion changes. Although this dual 100pF MC-D-100-M variable capacitor is over 50 years old, it would not look out of place in modern equipment.



For generations of hams and shortwave enthusiasts, the Hammarlund Micalex plug-in ribbed former was the ultimate for small coil construction.

dustry, high standards of excellence in component design and quality.

Moved to America

Hammarlund completed his education with a distinguished academic record and, already demonstrating considerable engineering ability, he joined the well known Swedish firm of L.M. Ericsson Co. as a special tool designer and inspector of electrical instruments. However, it was not long before he was invited to go to America to do similar work for the Elgin Watch Company. This he did, in 1882.

Oscar Hammarlund's work with Elgin was noted by Western Electric and in 1886 he was appointed Superintendent of the W.E. plant in Chicago, a considerable responsibility for a 25 year old. Six years later, he went to the Gray Telautograph Co.

It is not always realised that Bell applied for the patents of the telephone only narrowly ahead of Elisha Gray. Gray was a capable engineer and in 1892 was developing the Telautograph, an instrument for transmitting writing electrically and therefore a forerunner of the fax machine.

It was in the process of investigating stylus problems for Gray that the automatic lead pencil was invented by Hammarlund.

Given his technical and engineering talents, it is not at all surprising that Oscar Hammarlund took a keen interest in the new technology of wireless telegraphy. In 1910 he founded a company to develop his ideas.

As the radio industry expanded, the outstanding quality of Hammarlund Manufacturing components made them up-market standard setters. But as well as producing fine components, the Hammarlund Company achieved an number of important 'firsts', including the first commercially produced shortwave superheterodyne communications receiver, the ancestor of a long lived line which were the finest of their type available.

Although catering for a different market from that of the budget conscious broadcast listener, the Hammarlund company had competition — one worthy rival being the National company under the able leadership of James Millen.

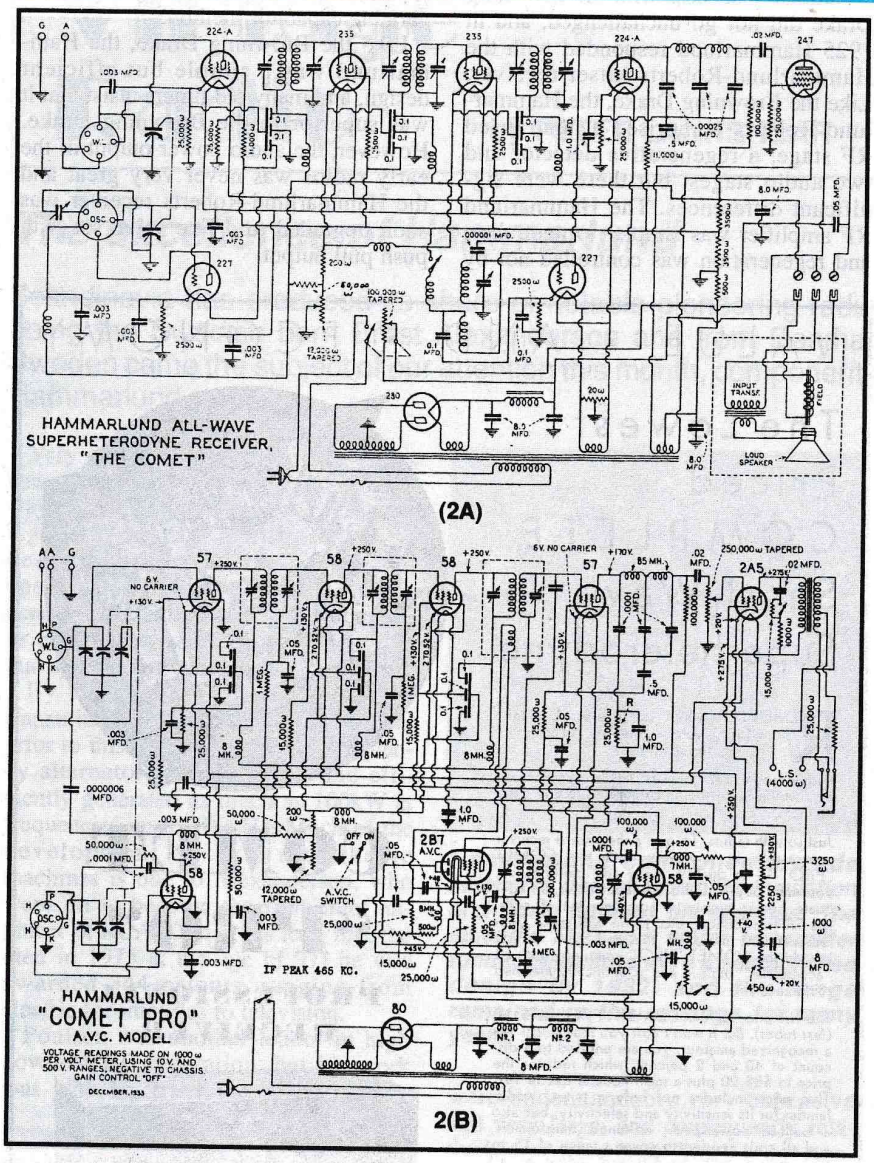
It will be recalled that in our November 1994 column, we described the very successful 1924 Browning Drake receiver and how it came to be closely associated with the National company, who produced a long series of very popular receivers, including in 1934 the landmark HRO.

Competing with National

National's success with the Browning Drake did not go unchallenged, and in 1925 Hammarlund responded with the Hammarlund-Roberts kitset receiver. Like the Browning Drake, the Hammarlund-Roberts comprised a neutralised RF stage, a regenerative detector and two audio stages; but there were significant differences. The Hammarlund RF amplifier was simpler to neutralise, and regeneration was controlled not by the 'regenaformer' variometer, but the superior, and more accurately adjustable variable capacitor method.

Like the Browning Drake, the Hammarlund was a simple but efficient design, and many old timers insist that it was superior to the Browning Drake. However, the audio power output of the early radios was never very great and the Hammarlund-Roberts receiver was soon upgraded to a five valve set with push pull output.

This advertisement appeared in QST for August 1933. The comments about purchasing a complete radio (but still less tubes!), was aimed at National, who kept the basic price of their FB7 competitive by selling coils and power supplies as optional extras.



The rapid development of the Comet series is evident from these circuits, with the original Comet (2A) introduced at the beginning of 1932 and the first Comet PRO available in April. By November 1933, less than two years later, the final version of the Comet PRO (2B) had appeared.

Following these successes, Hammarlund Roberts Incorporated as the firm was now called, produced more or less annually a series of receivers, optionally as kitsets or assembled and in cabinets. They tuned only the broadcast band and their circuits were typical of current practice. Most models had the prefix Hi-Q — referring no doubt to Hammarlund's highly efficient coils — and they naturally incorporated the company's premium quality components.

The first model was the 1926 'Hi-Q', a fairly conventional neutralised TRF with two RF stages, detector and two transformer coupled audio stages. The second two tuning capacitors were ganged. It was followed in 1927 by the 'Hi-Q Six', a similar set but with an additional RF stage and using grid resistors for stabilisation of the RF valves.

During 1928 there were at least six 'Hi-Q 29' models, by now using the new screen grid RF amplifier valves with either two or three stages, and with a choice of transformer or resistance coupled audio stages.

Several versions were fitted with mains power supplies. One, the 'Junior' was a hybrid, requiring a lead-acid battery for the valve filaments, but the AC models used the newly introduced indirectly heated valves.

Two Hi-Q 29's had the unusual and short lived Arcturus indirectly heated valves with 15 volt carbon heaters! One distinguishing feature of some of these models was the tuning of both windings of the RF coils, providing band pass coupling.

Last of the HI-Q line

For the 1930 season there were — surprise — the three 'Hi-Q 30' models, including AC and DC mains powered and a battery powered chassis. With six ganged tuning capacitors controlling preselector tuning and three tetrode RF stages, they were examples of the ultimate development of TRF technology. About the only significant feature absent was automatic gain control, but this was rarely seen in TRF receivers anyway. It is obvious from the illustration that these receivers were by now so complex that only experienced builders could tackle the kitsets.

The situation was now changing significantly. During 1930, RCA were obliged to release the superheterodyne patents and it was apparent that radical changes in the radio industry were taking place. At the same time, the Great Depression was paralysing commerce, so that in some respects 1931 was a year in limbo.

Hammarlund made some nominal changes to the Hi-Q 30, to produce the single model AC powered 'Hi-Q 31'. This was to be their last TRF, and the end of the Hi-Q series. Some years later there was a revival of the name in their HQ family of budget priced receivers, which were popular with amateurs worldwide.

There was, however, one field where the TRF was still practically unchallenged. Conventional superhets were considered to have serious shortcomings for shortwave work. Inadequate mixer and oscillator design meant that they were noisy and difficult to tune, and with the commonly used 175kHz intermediate frequency there were serious image problems. Converters were receiving some acceptance by shortwave broadcast listeners, but for amateur and communications work, the standard receiver remained the TRF with a tuned RF stage, regenerative detector and simple audio amplifier.

As has been mentioned in previous

columns, these simple receivers should not be underestimated. For CW (Morse code) reception, the oscillating detector is remarkably efficient. As late as the outbreak of World War II, Pan American Airways were still using similar receivers on their prestigious China Clipper flying boats operating on the San Francisco — Manilla — Hong Kong route.

Theoretically, there was nothing inherently wrong with the superheterodyne that proper design could not overcome. Wisely avoiding the temptation to produce yet another broadcast band only receiver in an over supplied market, Hammarlund in 1931 went to work instead on a shortwave superheterodyne.

Meanwhile in Chicago, during that same year, New Zealander E.H. Scott had produced his massive 12-valve 'All Wave Superheterodyne'.

Probably the first commercially made shortwave receiver, the beautifully made Scott did not have ganged tuning or double tuned IF transformers, features which were included in the new Hammarlund design.

The Comet

Called the 'Comet', Hammarlund's new receiver was announced at the end of 1931, and now there was no kitset option. Using 'in house' components made with Hammarlund precision, the Comet's quality was of the highest order, and with the extensive use of Isolantite insulation, efficiency and stability were good. Images were reduced by the use of what was then a high frequency IF of 465kHz.

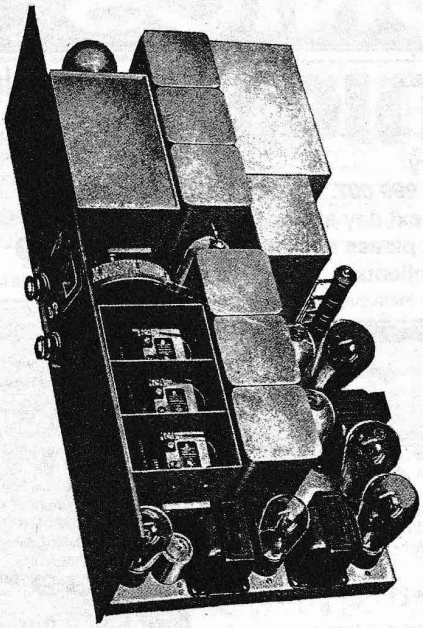
The circuit consisted of a 24A screen grid mixer, inductively coupled to a type 27 triode oscillator. There were five pairs of plug-in coils to cover the range from 550kHz to 21MHz. Tuning was assisted by means of an oscillator bandspread capacitor.

There were two IF amplifier stages using the new variable-mu type 35 tetrodes, and another 24A operating as a biased detector drove the recently introduced type 47 output pentode. One significant feature was what was called the 'IF oscillator' — known better today as a beat-frequency oscillator (BFO).

First of the 'pros'

The Comet was an instant success. Its performance was a revelation, and it was adopted by several large national and international organisations.

Inevitably its communications potential became apparent and by April 1932, the Comet had been adapted for communications work. Not that many modifications were needed.



The Hi-Q 30 was far more complex than most kitset TRF receivers. In this picture from 'Radio News' for December 1929, one of the shield covers has been removed to show how two three-gang tuning capacitors were coupled together as part of the complex tuning system.

Extra tuning capacitors were added and a metal front panel fitted. The main tuning capacitors were used for band setting and were no longer ganged but tuned independently, enabling the oscillator to be operated either above or below the signal frequency. To simplify operation, there was now ganged bandspreading for the aerial tuning and oscillator.

Finally, the audio stage was changed to an indirectly-heated type 27 general purpose triode. This developed less hum than the directly heated 47, and the reduced output was considered adequate for headphones or moving-iron loudspeakers.

If more audio was required, a self-powered unit containing a power pentode and moving coil loudspeaker was available, intended to be driven from the headphone socket.

Called the 'Comet PRO (for Professional)' the new improved receiver continued the success of the Comet. The company must at this time have severed its Roberts interests, as the name was now the Hammarlund Manufacturing Company.

Improvements were steadily made. By December 1932, the RF tetrodes and the triode oscillators had been replaced by the new 57 and 58 RF pentodes, and in the output stage, the 47 pentode was reinstated. The coils were now shielded and the oscillator was capacitively coupled to the mixer.

Throughout 1933, improvements continued, and by the end of the year, the top of the line PRO had a crystal filter, variable BFO, air tuned IF trimmers, an indirectly heated output pentode and automatic gain control.

Other manufacturers had understandably not taken the Hammarlund success lying down. Significant competition came from arch-rival National's superheterodynes. Their very expensive AGS was available within three months of the release of the Comet PRO, and at the beginning of 1933, amateurs could buy the economy priced National FB7 with an equivalent specification to the PRO.

The communications receiver had come a long way in two years, but time was running out for the Comet — because, as related in our November 1990 column, National's HRO was introduced at the end of 1934. Although expensive, the HRO was an instant favourite and so advanced that all competition, including the Comet PRO, was immediately obsolete.

The Comet was still a fine receiver, with thousands in daily use, but its days were numbered. Hammarlund set about developing the PRO into a line of superlative receivers, which remained in production for over 30 years and which became a benchmark for performance. But that story will have to wait until next month. ❖