

Moving Pictures From WAX – 'Phonovision'

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reviews some
**Historical TV
experiments**

'Phonovision' – the first electrical TV recordings

The first television broadcasts in Britain began in the late 1920's when pictures were transmitted by the BBC using the Baird system. This television system was based on a mechanical approach to the problem of generating and displaying the picture. Each picture was built up from only 30 lines. It was crude even by the standards of the late 1930's when television as we know it first went on the air on a regular basis.

In the early days before 1930, the experimental work done by such pioneers as J L Baird served as a proving ground for the television that we have in our homes today. To Baird, though, must go the credit for the first electrical recordings of television signals and, in 1927, this invention (which he called 'Phonovision'), was announced. The signal from his camera was recorded directly onto wax discs during the process.

How could wax discs be used to record television pictures in the 1920's when today we have to use advanced techniques and equipment? The answer is that the Baird system was quite different to today's systems and only used 30 lines to make up each picture, whereas we now use 625 lines per picture. The 30 lines of Baird's system were only repeated 12½ times every second to give the illusion of movement but today the picture is shown 25 times every second. Consequently, the Baird TV signal contained much lower frequencies than today's television signal. This allowed the television signal to be transmitted in a voice channel on the medium waveband and also to be recorded onto wax discs.

Features of the recordings

The 'Phonovision' recordings had to be played at high speed (250 revolutions per

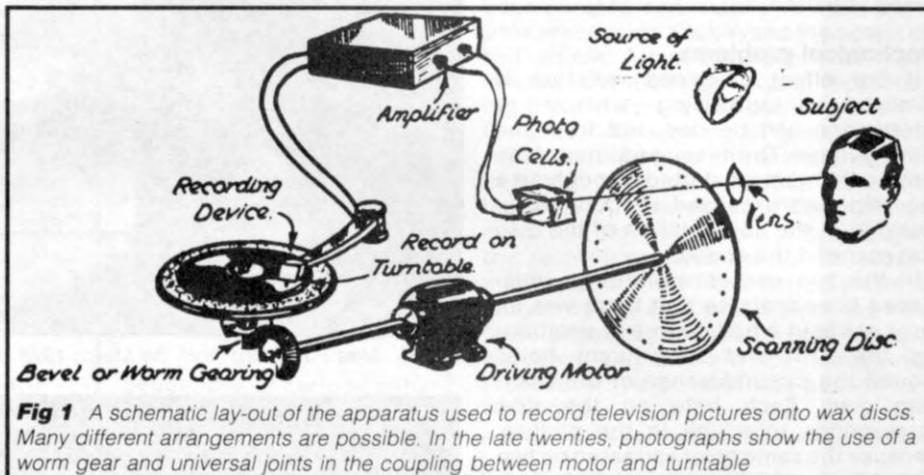


Fig 1 A schematic lay-out of the apparatus used to record television pictures onto wax discs. Many different arrangements are possible. In the late twenties, photographs show the use of a worm gear and universal joints in the coupling between motor and turntable

minute) to give the Baird standard of 750 pictures every minute. We can say directly that there were three 30 line pictures recorded on each turn of the wax disc. It is quite from studying the video signal that the main scanning disc rotated once for each picture (at 750rpm). Hence for each revolution of the wax disc being recorded, the scanning disc made three revolutions.

The direct consequence of such a high speed is that the recordings were very short-lasting, on average, just under one minute at 250rpm.

It is clear that 'Phonovision' was not in itself practical and the general public would not have accepted 'vision-only' recordings that only lasted one minute.

Synchronisation – keeping the picture steady

Unlike the 30-line transmissions of the time, 'Phonovision' recordings were intended to overcome the problem of synchronising the camera in the studio with the home display. Synchronisation

was and still is all important in television in order to keep the displayed picture correctly framed.

When the wax discs were recorded, the scanning mechanism indirectly rotated the recording turntable through a gearing arrangement. This meant that it was only necessary to have an identical linkage between the playback turntable and the display scanning disc when replaying a 'Phonovision' disc. Having an identical linkage would ensure that a perfectly stable picture would appear on the display.

This was fine in theory and the process was well publicised at the time but, in practice, all the 'Phonovision' discs suffered badly from serious picture distortion.

Recording speed variation

The earliest discs unfortunately suffer from fast fluctuation in the recording speed. This variation appears on the discs themselves and repeats every three pictures (one turn of the disc) randomly varying in size throughout the

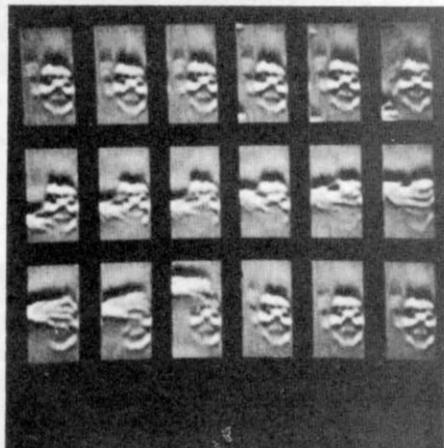


Fig 2 18 frames from the September 1927 disc

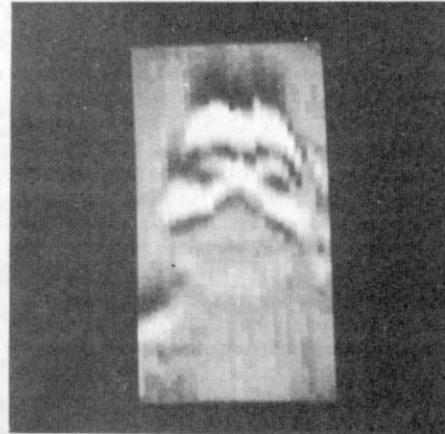


Fig 3 A single frame from the September 1927 disc

recording. The speed variation gets less towards the end of the recording, which is the innermost part of the disc.

An eye-witness remembers a 'Phonovision' recording session with the Columbia engineers discussing the disc being cut slipping on the smooth surface of the recording turntable. The very high recording speeds and the use of a heavy cutter arm on the disc increased the possibility of the disc slipping on the turntable and could have caused the speed variation.

Mechanical problems

If the effect of speed variation is removed, a surprising amount of information can be deduced from the picture shape. The misplaced lines of the picture that remain shifted throughout a recording were caused by poor workmanship in the construction of the disc that scanned the scene.

In the two earliest recordings, misplaced lines indicate that there was an error of about a half degree in positioning the 11th and subsequent holes around the circumference of the scanning disc. Each hole on the disc corresponds to a line in the picture. Because the same error appeared on two recordings which were dated four months apart, it is apparent that the same apparatus was used in both recordings.

Large displacement of the lines is evident in the latest of the 'Phonovision' recordings. This March 1928 recording shows great distortion and it is difficult to understand that it was due to poor construction of the scanning disc (particularly because earlier recordings show much less line shift). The shift may be due to vibration in the coupling shaft and bearings that link the scanning disc and the gearing arrangements.

The Major Radiovision disc - not 'Phonovision'

There has been some confusion about what constitutes 'Phonovision' as generated by Baird's late 1920's experiments. In 1935, a double-sided 30-line television disc was manufactured by the Major Radiovision Co. Ltd. and sold through the London store, Selfridges, for 7/6d. This has been claimed to be a 1928 'Phonovision' recording and is the easiest of all to buy, but for the serious collector it is important to establish the truth.

Table 1 summarises the main features of all the discs that have been studied from that period. The evidence shown here indicates that it is extremely unlikely that the Major Radiovision recording was made in 1928. It seems more likely that it was made during 1934-35 and may be as early as 1932. Another similar recording on a Major Radiovision disc has been associated with the 1934 period. The higher quality of these recordings excludes them from being copies of the earlier discs and the quality difference surely reflects the improvement in recording techniques and materials from 1927 to 1935. Despite the higher quality, the subject material of the later discs is of little interest today, showing as it does motionless cartoons of objects and people.



Fig 4 'Miss Pounsford' from the March 1928 disc

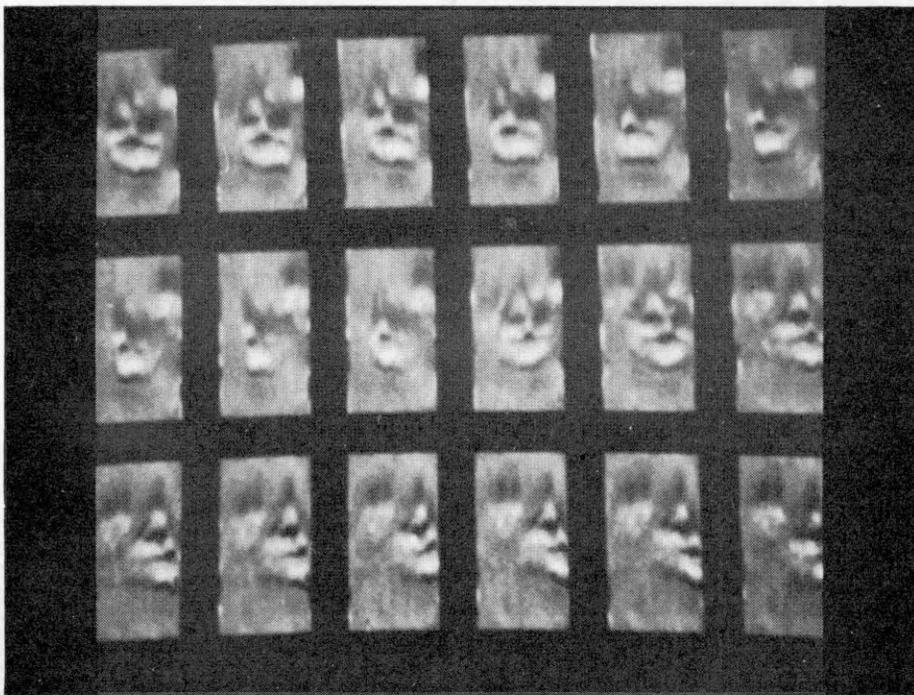


Fig 5 18 Frames from the March 1928 disc

'Alive' pictures

What material did Baird use for these 'video discs'? Although we might expect to see engineering test patterns, we have been treated to pictures of 'live' subjects. One disc (September 1927) *Figure 2*, shows the face of a ventriloquist's dummy moving from side to side. At one point a hand comes into view, covers the dummy's face and quickly disappears. A few seconds later the fingers re-appear, 'wagging' in a life-like manner beside the face.

A recording made a few months later (in January 1928) shows the head of a man. There is very little side-to-side movement and the subject only moves to and from the camera into a pool of light. Lighting in this and the previous recording seems to come from above the subject and is angled steeply down-

wards. The nose, forehead and chin appear in succession as the face comes into the light. The last feature to come into view is the man's shoulders.

A later disc (March 1928) *Figure 5*, is entitled 'Miss Pounsford' and is signed by Baird himself. This recording does not suffer from the speed variation that plagued the earlier discs. However, the scene is badly distorted by the static pattern already mentioned. Once this effect is removed, the detail and movement become clear showing a view of a lady's head and shoulders. She turns from side-to-side, opens her mouth and shows the ringlets in her hair when she turns her head.

Assessing 'Phonovision'

In order to reproduce 'Phonovision' pictures, the signal from the wax disc is



Fig 6 Label of the September 1927 'Phonovision' recording



Fig 7 Label of the March 1928 'Phonovision' recording

Table 1 — Summary of Features

	Recordings dated 1927-1928	Major Radiovision and its sister disc
Playback speed	250rpm	78rpm
Duration	1 minute	5 minutes
Scene content	Various heads clearly in quite agile motion	Sequences of cartoon stills — no movement
Picture quality	Very poor requiring a lot of enhancement	Extremely good with very little enhancement needed
Identification	Consistent sequence of catalogue numbers	No catalogue numbers
Synchronisation	Directly from turntable rotation	Derived from the video signal

'recorded' into a home computer. A program is then run to remove most of the distortion and the result is shown on a modern TV display. The inherent limitations of a small computer mean that only a few seconds of the recording can be processed at a time, but the capability certainly exists today to process the entire contents of one disc and display the end product as a movie. The cost and effort of the process would, however, be considerable and details of such complex processing are beyond the scope of this article. A more comprehensive account of the methods used in reproducing these pictures was published in the October 1983 issue of 'Wireless World'.

This recent study of historical recordings and their reproduction does not illustrate the power of the computer as much as it emphasizes the poor quality of the recordings. It would not be recommended that the 30-line Baird system is judged by the sole evidence of the wax discs because they were made for test purposes only and are not necessarily representative of what was possible at that time.

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