

Oral script explaining the Boulitte Electrocardiograph

The Boulitte Electrocardiograph is one of the first commercial, medical instruments to observe the electrical activity of the human heart.

The cardiograph produces an ECG on film, an electrocardiogram, often simply called a heart film.

The electrocardiograph as shown here, is the last version made by the French company Boulitte around the 30th of the previous century. So, almost hundred years ago.

The instrument is portable and fits in a special suit case. It has been used for a long time in hospitals all over the world. In the period before, during and even after the 2nd world war. The electrocardiograph – here in this show case – has been used in the hospital of Enschede until 1950.

Let me first explain in global terms how the electrocardiograph works. Later on other interesting details will be mentioned.

Looking to the front of the instrument you see a projector on the right side and a film camera on the left. The projector sends a light beam through a telescopic tube in between. The light passes a magnetic field. Note the large coils of the electromagnets around the tube. In the middle of the tube a cylindrical housing - mounted vertically – can be seen. This housing encloses a thin, flexible and electrically conductive string. The vertical string just passes through the horizontal light beam. The string is fed with electrical signals from the human heart. This construction is called a string galvanometer as it measures electrical currents. Due to the electrical current through the string in the magnetic field, the string will vibrate.

The string must be - at the same time - extreme sensitive and flexible. It has been a great effort of physiologist Willem Einthoven in Leiden to develop such a wire having the desired properties. In 1901 he was successful. It is widely known as Einthoven's invention of the string galvanometer.

While the string moves it will draw a moving shadow in the beam. The shadow is captured on film. More specifically the beam is projected through a small horizontal slit of the camera.

The slowly moving film is illuminated by a horizontal line of light. Just at the point where the light beam is intercepted a shadow occurs. The continuing shadow of the moving string delivers exactly the heart signal on film.

The heart signal is obtained by electrodes on the body. According to experiments of professor Einthoven 3 electrodes – on arms and legs – are sufficient to get good results. The electrodes at that time greatly differ from the pasted electrodes used nowadays. In that time they consisted of large plates of lead wrapped around arms and legs with cloth wetted in a salt solution.

The three electrodes are connected by three long wires to the control panel of the instrument. This panel in front of the cardiograph has a volt meter and a separate switch for each electrode. Before any registration, the instrument has to be adjusted to optimize its functioning. This is done by a number of buttons on the control panel.

The switches are used to enable the registration between any pair of two electrodes. Each combination of two electrodes is – one after the other - connected to the string by setting the switches appropriately. This means that pairwise three ECG's are obtained to get a full measurement of the heart condition.

For a sharp projection on the film, an optimum arrangement of the mechanical parts and calibration of the electrical functions are needed.

In front of the light source, another black cylinder can be seen on which a special mechanical part is attached. This is the so-called chopper by which a thin plate is moved up and down in the beam of the light source. It blocks the light during a very short time period in a precise time sequence, which results in thin vertical lines on the film. These are time marks of the ECG.