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The Magnoscope, an Electrical Stethoscope.

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The magnoscope,[1] an electrical stethoscope, has undergone a number of improvements since its first demonstration in 1924.[2] As it is now, we have a firm belief that it will be useful for teaching purpose as well as for practical work and research. Below will be given a brief description of the apparatus, as it has been in use for some time past, and of some oscillograms taken by the same.

(I) Description of the apparatus.

The apparatus which was used in taking the oscillogram of the heart sounds consists essentially of an electromagnetic pick up system,

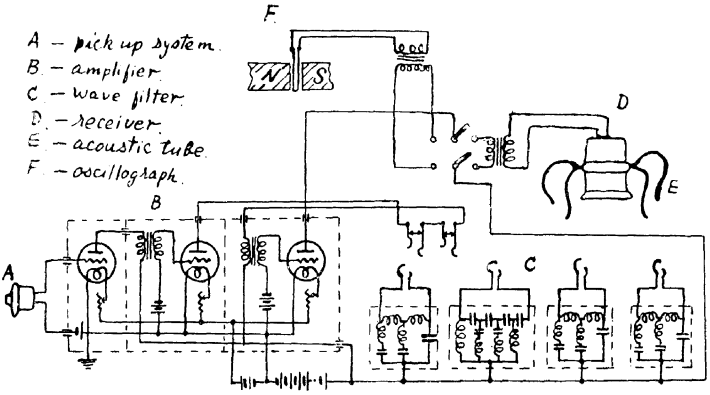

Fig. 1.
Connection diagram of the standard set.

1) Sato and Nukiyama; Amer. Journ. of Diseases of Children, May, 1925, Vol. 29, p. 618.

2) Its first demonstration in the 56th Regular Meeting of the Tohoku Medical Society, Sendai, Dec. 1924.

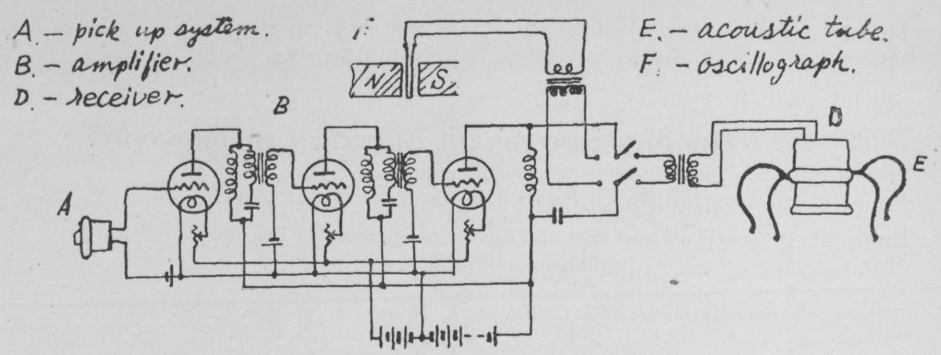

Fig. 2.
Connection diagram of the ampli-filter set.

3-stage triode valve amplifier and an oscillograph. In some cases electrical wave filters[1] were inserted between the second and the third valve and in other cases the amplifier was replaced by the "ampli-filter." Fig. 1 shows the connection diagram of the standard set consisting of the amplifier and the wave filters, while Fig. 2 shows that of the ampli-filter set which gives more satisfactory result in detecting small sounds.

Special care has been given in design and construction of the pick up system. It is a four pole electro-magnetic transformer with no

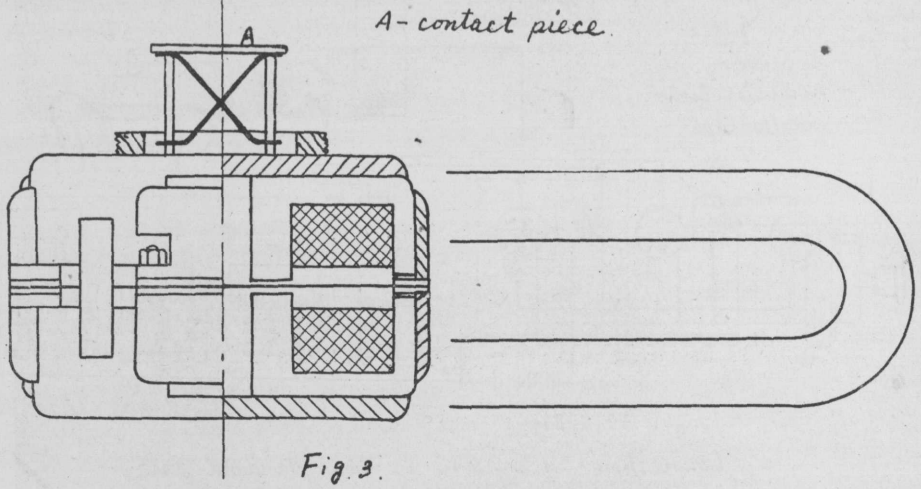

Fig. 3.
Electromagnetic transformer.

1) A. Sato and H. Nukiyama. The Magnoscope, second report. Journal of the medical Apparatus, Japan. Jan. (1927).

permanent flux in the vibrating armature. As most of the undesirable effects, such as distorsion, frequency transformation, phase transformation and the time lag will generally have their origin in the pick up system, we should go into the study of the electro-mechanical behavior of this electro-mechanical transformer, in order to give the comprehensive information about the apparatus. This is entirely omitted here. Fig. 3 shows in full scale one example of the pick up system which we have developed recently.

(II) Oscillograms.

To take the oscillogram of heart sounds we used a step down transformer of the ratio 1/30 in the output plate circuit and supplied the output current to the vibrator of the oscillagraph supplied by the Yokokawa Electric Work. Fig. 4 and Fig. 5 are the oscillograms of the

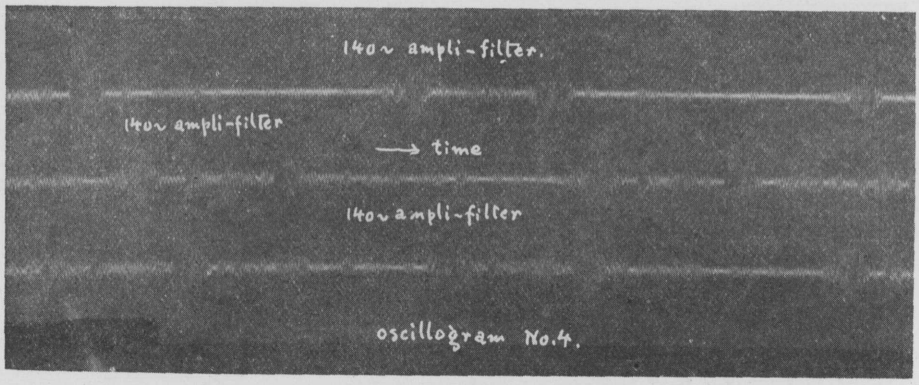

Fig. 4.
Oscillograms of heart sounds by the standard set.

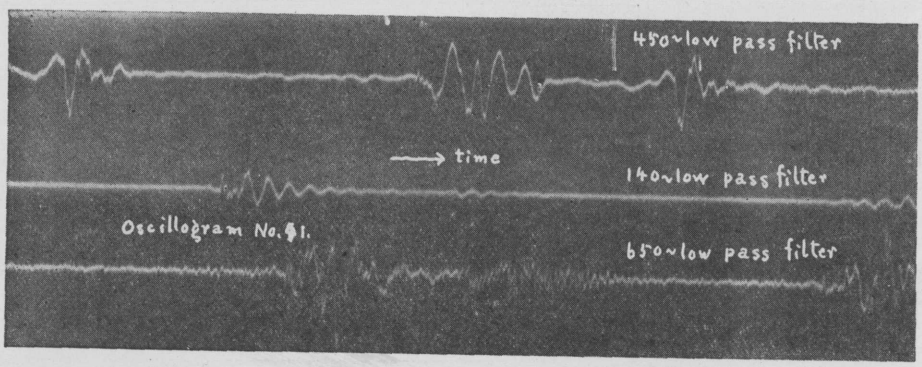

Fig. 5.
Oscillograms of heart sounds by the ampli-filter set.

normal heart sounds taken with the standard set and the ampli-filter set respectively. It should be pointed out that the oscillograms in Fig. 4 taken with the 140 cycle low-pass filter correspond approximately to the curve generally known as the phonograms of the heart sounds. If we compare our oscillograms with the known phonocardiograms, we are lead to the conclusion that in the known phonocardiogram, the higher harmonic part of vibrations which would actually give most of the energy for sound sensation is made inappreciable.

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