C. F. HOPEWELL.

VIBROSCOPE.

APPLICATION FILED MAR. 8, 1911.

**999,225.** Patented Aug. 1, 1911.

Fig. 1.

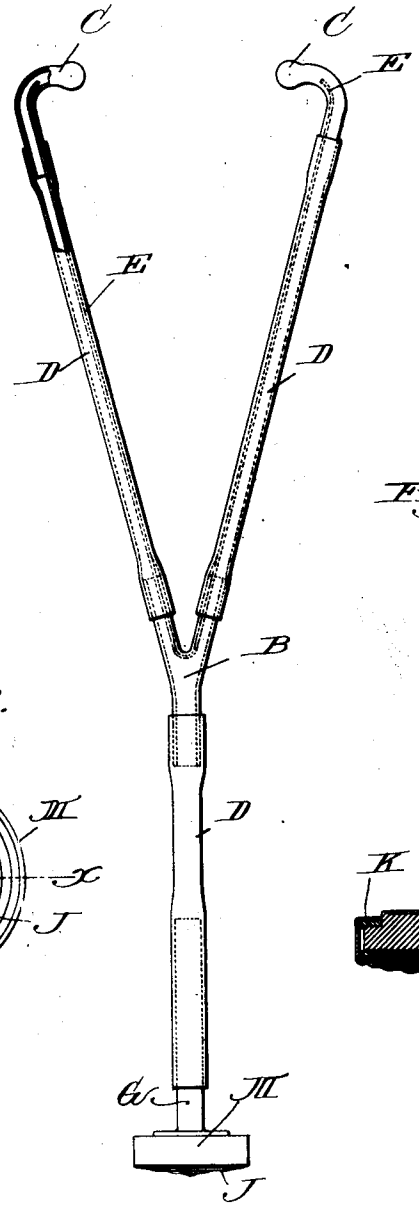



Fig. 2.

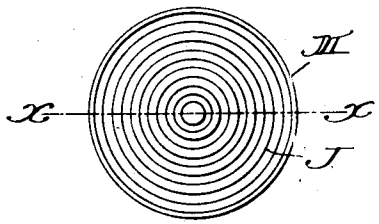
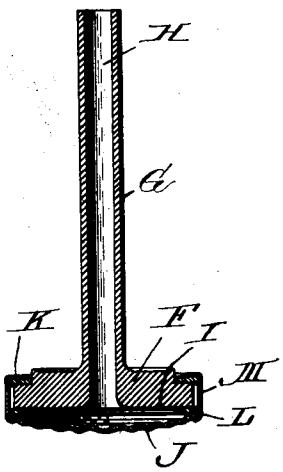



Fig. 3.




Witnesses:
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# UNITED STATES PATENT OFFICE.

CHARLES F. HOPEWELL, OF NEWTON, MASSACHUSETTS.

## VIBROSCOPE.

999,225. Specification of Letters Patent. Patented Aug. 1, 1911.

Application filed March 9, 1911. Serial No. 613,313.

*To all whom it may concern:*

Be it known that I, CHARLES F. HOPEWELL, a citizen of the United States, residing at Newton, county of Middlesex, State of Massachusetts, have invented an Improvement in Vibroscopes, of which the following description, in connection with the accompanying drawing, is a specification, like characters on the drawing representing like parts.

This invention relates to an instrument the object of which is to enable the auditor to detect and localize abnormal or other vibrations particularly occurring in machinery or mechanical devices, and such an instrument may properly be called a vibroscope.

The object of the invention is to provide a construction of head for such an instrument which would insure the sounds to be detected being magnified, so that they may readily be heard by the ear, and at the same time to provide a construction which may be strong, durable, and of a simple character.

The nature of the invention will more fully appear from the accompanying description and drawings, and will be particularly pointed out in the claims.

The drawings show a vibroscope embodying the invention particularly adapted for use in connection with machinery, but also adapted for any purpose, such, for example, as the ordinary stethoscope.

In the drawings, Figure 1 is a side elevation of the entire device; Fig. 2 is an end view of the diaphragm on the face of the head; Fig. 3 is a view of the entire head taken in cross section on the line $x$—$x$ of Fig. 1.

The vibroscope comprises a head portion, a wye B, and binaural tips C, these parts being united by rubber tubing D in the usual manner, and except for the features hereinafter specified these parts may be of any usual or suitable construction. A spring member E is preferably employed to secure a yielding but definite relative position between the wye B and the binaural tips C. This spring member consists of a flat spring of the form shown.

The head member is shown in detail in Fig. 3 and comprises a base portion F and a stem portion G, and has a central aperture H extending therethrough to the face of the head. This face I of the head is preferably flat. J is a thin diaphragm convex in shape and provided with a series of concentric corrugations. This diapraghm may be formed of any suitable material capable of responding to the vibrations of the body to be tested, but it is preferably formed of some thin elastic sheet metal, such as steel.

The diaphragm is secured to the head and on account of its convexity forms a chamber between itself and the flat face of the head. The face of the head is made flat in order to render this chamber of comparatively small dimensions so that the air inclosed therein when set in vibration by the diaphragm transmits the vibrations more directly and delicately to the ears of the auditor.

The convexity of the diaphragm tends to stiffen it, and for this reason it is concentrically corrugated so as to insure its ready vibration. The convex form of the diaphragm enables it, however, to be placed against a variety of surfaces and projections on machinery and other devices the vibrations or sounds in which it is desired to detect and which could not be done if the face of the diaphragm were flat.

The diaphragm must be secured to the head in such a manner that its vibrations will not be imparted directly to the head, which is preferably made of metal or a material through which the sound might be transferred independently of the air. As a preferred way of securing this connection non-vibrant gaskets K and L are placed on each face on the head projecting slightly beyond the periphery thereof. These gaskets are preferably made of cork, but may be of any suitable non-vibrant material. The diaphragm rests against the outer gasket and a metal rim M surrounding the periphery of the head clamps the parts together, one edge being sprung or bent over against the gasket K, and the other edge against the diaphragm.

Having fully described my invention what I claim as new and desire to secure by Letters Patent is:

1. A vibroscope head presenting a substantially flat face, a thin convex concentrically-corrugated sheet metal diaphragm, means for securing said diaphragm to said head to form a chamber therebetween, and means for preventing the vibrations of the diaphragm being imparted to the material of the head.

2. A vibroscope head, a thin convex concentrically-corrugated diaphragm, means for securing said diaphragm to said head to form a chamber therebetween, and means for preventing the vibrations of the diaphragm being imparted to the material of the head.

3. A vibroscope head, a thin convex concentrically-corrugated diaphragm, a pair of annular non-vibrant gaskets, one located on the rear face of the head and one located between the front face of the head and the diaphragm, and means for clamping the said parts together whereby the vibrations of the diaphragm are not imparted to the material of the head.

4. A vibroscope head, a thin convex concentrically-corrugated diaphragm, a pair of annular non-vibrant gaskets, one located on the rear face of the head and one located between the front face of the head and the diaphragm, a rim surrounding the periphery of the head and bent over at each of its edges to clamp the parts together, whereby the vibrations of the diaphragm are not imparted to the material of the head.

In testimony whereof, I have signed my name to this specification, in the presence of two subscribing witnesses.

CHARLES F. HOPEWELL.

Witnesses:

BESSIE G. MORRIS,

THOMAS J. DRUMMOND.