S. H. RUBIN.

STETHOSCOPE.

APPLICATION FILED JUNE 30, 1919.

**1,344,655.** Patented June 29, 1920.

Fig.1.

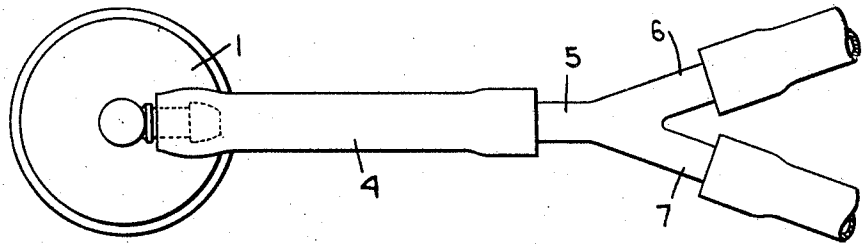



Fig.2.

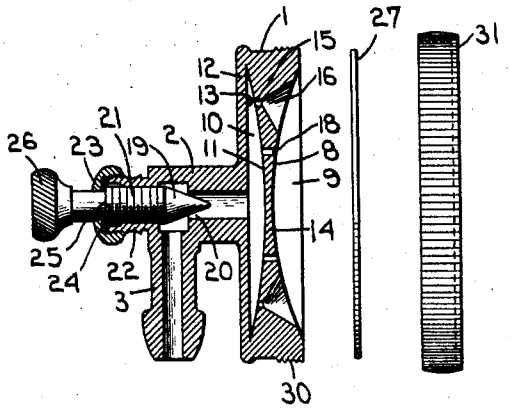



Fig.3.

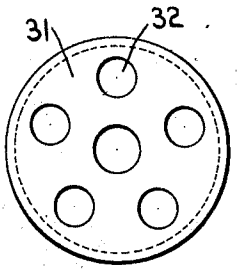



Fig.4.

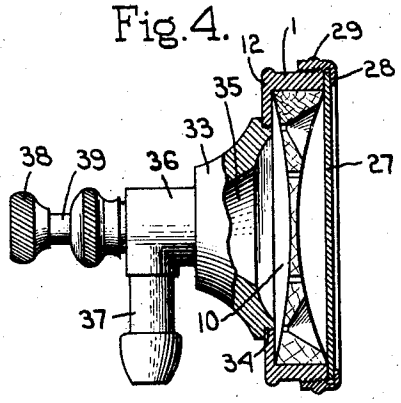
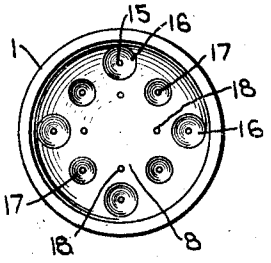



Fig.5.




Inventor.
Solomon H. Rubin
by Heard Smith & Tennant
Attys.

# UNITED STATES PATENT OFFICE.

SOLOMON H. RUBIN, OF ROXBURY, MASSACHUSETTS.

## STETHOSCOPE.

1,344,655. Specification of Letters Patent. Patented June 29, 1920.

Application filed June 30, 1919. Serial No. 307,699.

*To all whom it may concern:*

Be it known that I, SOLOMON H. RUBIN, a citizen of the United States, and resident of Roxbury, county of Suffolk, State of Massachusetts, have invented an Improvement in Stethoscopes, of which the following description, in connection with accompanying drawing, is a specification, like characters on the drawing representing like parts.

This invention relates to improvements in stethoscopes and the principal object thereof is to provide an instrument which will more distinctly detect and transmit sound.

Another object of the invention is to provide a stethoscope which will reduce the effect of interfering sound waves and enable the operator more distinctly to detect the condition for which he is exploring.

Another object of the invention is to provide a stethoscope adapted to be employed under varying conditions requiring different sound receiving apparatus.

Another object of the invention is to provide a stethoscope with a non-conducting contacting face to be applied to the body whereby the chill which occurs from the use of a metallic instrument in cold weather may be avoided.

Another object of the invention is to provide a stethoscope of the character above described with a diaphragm which will amplify the sound waves transmitted to it from the body.

Other objects and features of the invention will more fully appear from the following description and the accompanying drawings and will be pointed out in the annexed claims.

In the drawings:

Figure 1 is a plan view of the back of the stethoscope embodying my invention,

Fig. 2 is a vertical longitudinal sectional view of one of the preferred forms of stethoscope embodying my invention showing, adjacent the head of said stethoscope, a diaphragm and a cap adapted to be detachably secured to said head,

Fig. 3 is a front elevation of a desirable form of cap,

Fig. 4 is a view partly in vertical section of a modified form of the stethoscope in which the head includes a bell shaped member which may be detached and used alone,

Fig. 5 is a front elevation of the head showing the apertures having countersunk walls leading to the resonance chamber.

The stethoscope illustrated in Figs. 1, 2 and 4 of the accompanying drawing comprises a head 1 having an elbow extension 2 provided with a nipple 3 to which a tube 4 of the usual transmitter is connected. The transmitter may be and is of a usual type including a Y member, one branch 5 of which is connected to the tube 4 while the other branches 6 and 7 are connected by flexible tubes to the usual ear piece (not shown).

The head 1 desirably is in the form of a cylindrical metallic or wooden plate, the outer portion of which has a concave face 8 providing a receiving chamber 9 adapted to be placed adjacent the body. The head 1 is also provided with a resonance chamber 10 having a concave face 11 reversely arranged to the face of the receiving chamber. The back 12 of the head desirably presents a flat face 13 for the rear wall of the resonance chamber 10, said back being welded, soldered or otherwise secured permanently to the head 1.

The elbow extension may be and desirably is integral with the back 12. The wall 14 which separates the receiving chamber from the resonance chamber is provided with minute perforations 15 preferably located in the periphery of a circle at a considerable distance from the center of the head. The walls of said perforations preferably are countersunk to provide conical recesses 16 having their apexes leading to the apertures 15 whereby the area of the wall of the receiving member is increased. Other series of perforations 17 and 18 may also be employed with or without the countersunk portions above specified.

The members of each series of perforations through the wall between the receiving and resonance chamber are at equal radial distances from the center of the chamber so that the pulsations of circular sound waves expanding from an axial line through the center of the sound receiving chamber will pass through all of the perforations of a series at the same time. The portions of the sound wave thus transmitted through the perforations are reflected from the flat surface of the back of

the resonance chamber against the concaved forward surface thereof and thence through the passage leading to the transmitter. By reason of this construction what may be termed as selective waves are transmitted through the perforations to the resonance chamber and thence to the transmitter and many interfering sound waves are suppressed so that the sound which enters the receiver although greatly decreased in volume is more distinct and enables the physician to determine more accurately the conditions which he is exploring.

In order further to control the volume of sound thus transmitted an adjustable valve is placed in the passageway leading from the resonance chamber to the transmitter. Preferably the valve is in the form of a conical or needle valve 19 which extends through the elbow axially toward the passage leading from the resonance chamber and coöperates with the circular valve seat 20 at the end of said passage. The valve 19 is provided with a screw threaded stem 21 which engages complementary screw threads in the extension 22. The extension 22 desirably is provided with a cap 23 screwed upon the end of the extension 22 and a washer 24 of fibrous material clamped between the cap and the end of the extension adapted to engage a shoulder 25 at the end of the screw threaded portion of the stem to prevent the valve from being withdrawn beyond a certain distance. The valve stem may be provided with a milled head 26 for convenience in operation.

In order to adapt the instrument for a greater variety of uses, particularly when the transmission of an amplified volume of sound is desirable, means are provided for securing a diaphragm across the otherwise open face of the sound receiving chamber.

In the construction illustrated herein a diaphragm 27 of hard rubber, metal or other suitable material is provided which may be secured upon the head of the transmitter by an annular retaining ring 28, as illustrated in Fig. 4, having a screw threaded flange 29 adapted to engage peripheral screw threads 30 upon the head 1.

A cap 31 of rubber or fibrous material may be provided to cover the receiving face of the stethoscope to protect the body of the patient from chill of the metal portions against him in cold weather. The cap preferably is provided with apertures 32 which permit the entrance of the sound waves into the sound receiving chamber and when a diaphragm is used act as chambers which amplify the transmission of the sound waves.

It will be understood that the instrument however may be used without the diaphragm or the cap or with the diaphragm retained upon it by the ring 28 as illustrated in Fig. 4 or without the diaphragm and with the cap 31 or with the diaphragm and the cap as above described, according to the requirements of the examination which is to be made.

In the use of the instrument the countersunk portions 16 leading to the apertures 15 serve to enlarge the capacity of the sound receiving chamber and also serve to prevent the plugging up of the apertures by the flesh of the patient when the instrument is pressed firmly upon the flesh.

In Fig. 4 a modified form of stethoscope is illustrated in which a wall between the receiving and resonance chambers is of wood which is adapted to increase the resonance of the device. The rear wall 12 of the resonance chamber is recessed and a bell shaped member 33 removably attached to it by a screw threaded connection. The chamber 35 of the bell-shaped member has an elbow extension 36 provided with a nipple 37 leading to the transmitter. A conical needle valve similar to the valve 19 desirably is provided for controlling the volume of sound allowed to pass to the transmitter, the needle valve being actuated by a milled disk 38 upon the stem 39 of said valve.

In this form of instrument the head portion 1 containing the sound transmission and resonance chambers may be removed and the bell 33 employed as a stethoscope, this being particularly useful when it is desired to explore a small area and to receive a greater volume of sound or in the examination of infants.

When the head 1 is used in connection with the bell 33 as illustrated in Fig. 4 the resonance chamber 10 is supplemented by the chamber 35 of the bell 33, otherwise the operation of the stethoscope illustrated in Fig. 4 is the same as that illustrated in the remaining figures. The diaphragm 27 or the cap 31 may be applied to the form illustrated in Fig. 4 in the same manner as to the form illustrated in Figs. 1, 2 and 3 as above described.

It will be understood that the embodiment of the invention disclosed herein is illustrative and not restrictive and that various changes may be made within the spirit and scope of the following claims, for example the elbow shaped extension with its valves may be omitted and the transmitter caused to communicate directly with the bell or the resonance chamber, that modifications in the form of the receiving resonance chamber may be made, that the cap may be formed with or without perforations and that various other changes may be made without departing from my invention.

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

1. A stethoscope comprising a head and

a transmitter, said head having a sound receiving chamber, and a resonance chamber located behind said sound receiving chamber, the wall between said chambers having minute perforations located at a distance from the center of said chamber and a passageway leading from said resonance chamber to said transmitter.

2. A stethoscope comprising a head and a transmitter, said head having a sound receiving chamber and a resonance chamber, the wall between said chambers being provided with reversely concave faces, a series of minute perforations located at equal distances from the center of said chambers and a passageway leading from said resonance chamber to said transmitter.

3. A stethoscope comprising a head and a transmitter, said head having a sound receiving chamber and a resonance chamber located behind said sound receiving chamber, the walls between said chambers being provided with minute perforations having countersinks leading from the sound receiving chamber to said perforations and a passageway leading from said resonance chamber to said transmitter.

4. A stethoscope comprising a head having an L-shaped extension, a transmitter connected thereto, said head having a sound receiving chamber provided with a concave face, a resonance chamber behind said sound receiving chamber, minute apertures leading through the walls of said chambers located at distances from the center thereof, a passageway leading from said resonance chamber to said transmitter through the extension of said head, and a conical valve adjustably mounted in said elbow adjustable to restrict the volume of sound transmitted through said passageway.

5. A stethoscope comprising a head, and a transmitter, said head having a sound receiving chamber and a resonance chamber located behind said receiving chamber, apertures through the wall between said head and said resonance chamber, a bell detachably secured to said head communicating with and forming a part of said resonance chamber and a passageway leading from said bell to said transmitter.

6. A stethoscope comprising a head, and a transmitter, said head having a sound receiving chamber and a resonance chamber located behind said receiving chamber, apertures through the wall between said head and said resonance chamber, a bell detachably secured to said head communicating with and forming a part of said resonance chamber, an elbow extension on said head having a passageway leading to said transmitter and a conical valve located in said elbow extension adapted to restrict the volume of sound passing through said passageway.

7. A stethoscope comprising a head and a transmitter, said head having a sound receiving chamber and a resonance chamber located behind said sound receiving chamber, the wall between said chambers being of wood and having perforations located at a distance from the center of said chamber and a passageway leading from said resonance chamber to said transmitter.

In testimony whereof I have signed my name to this specification.

SOLOMON H. RUBIN.