

No. 702,557.

Patented June 17, 1902.

R. HOPE-JONES.

SOUND PRODUCING DEVICE SUITABLE FOR SIRENS, &c.

(Application filed Nov. 28, 1901.)

(No Model.)

2 Sheets—Sheet 1.

Fig. 1.

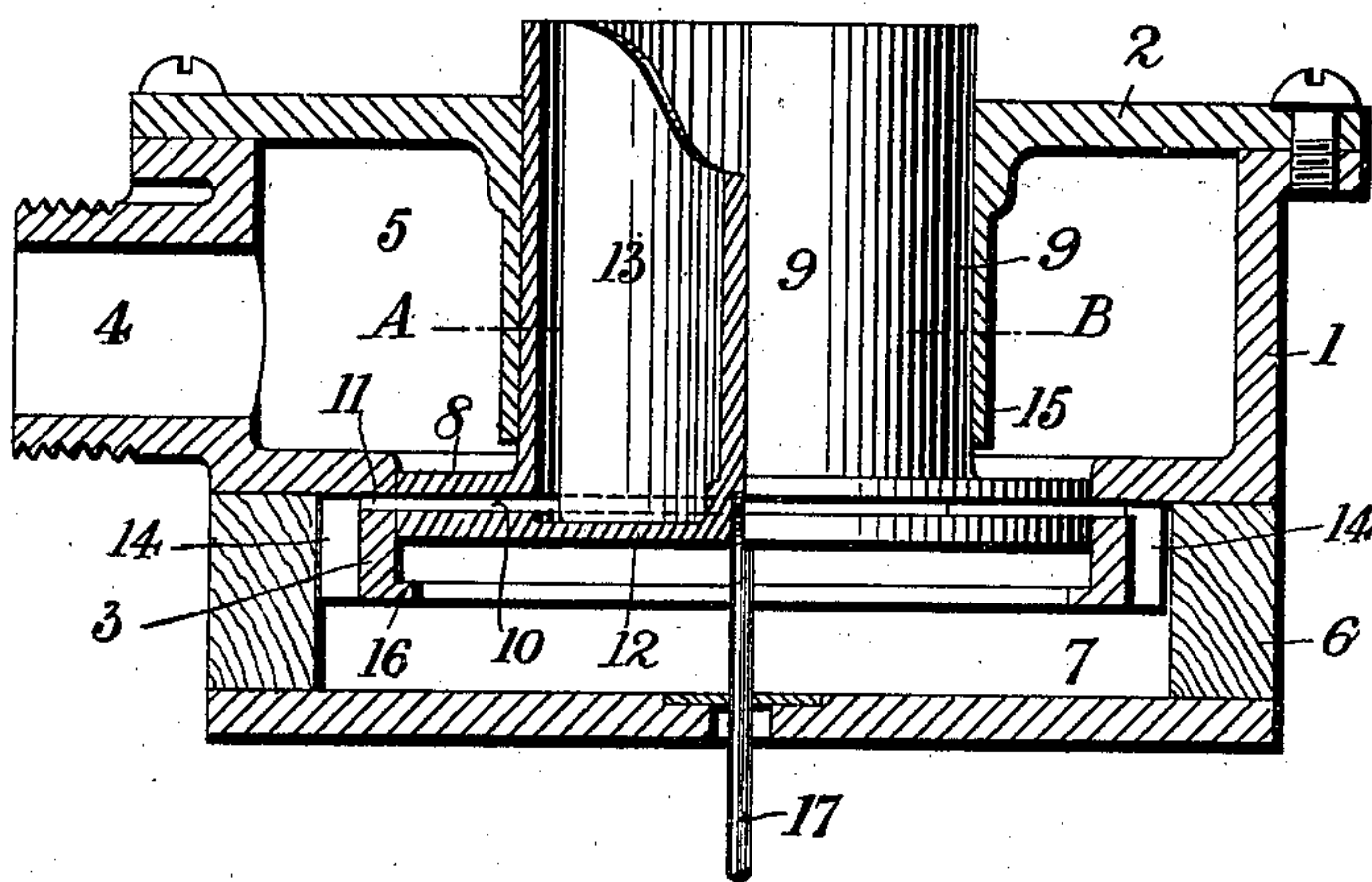
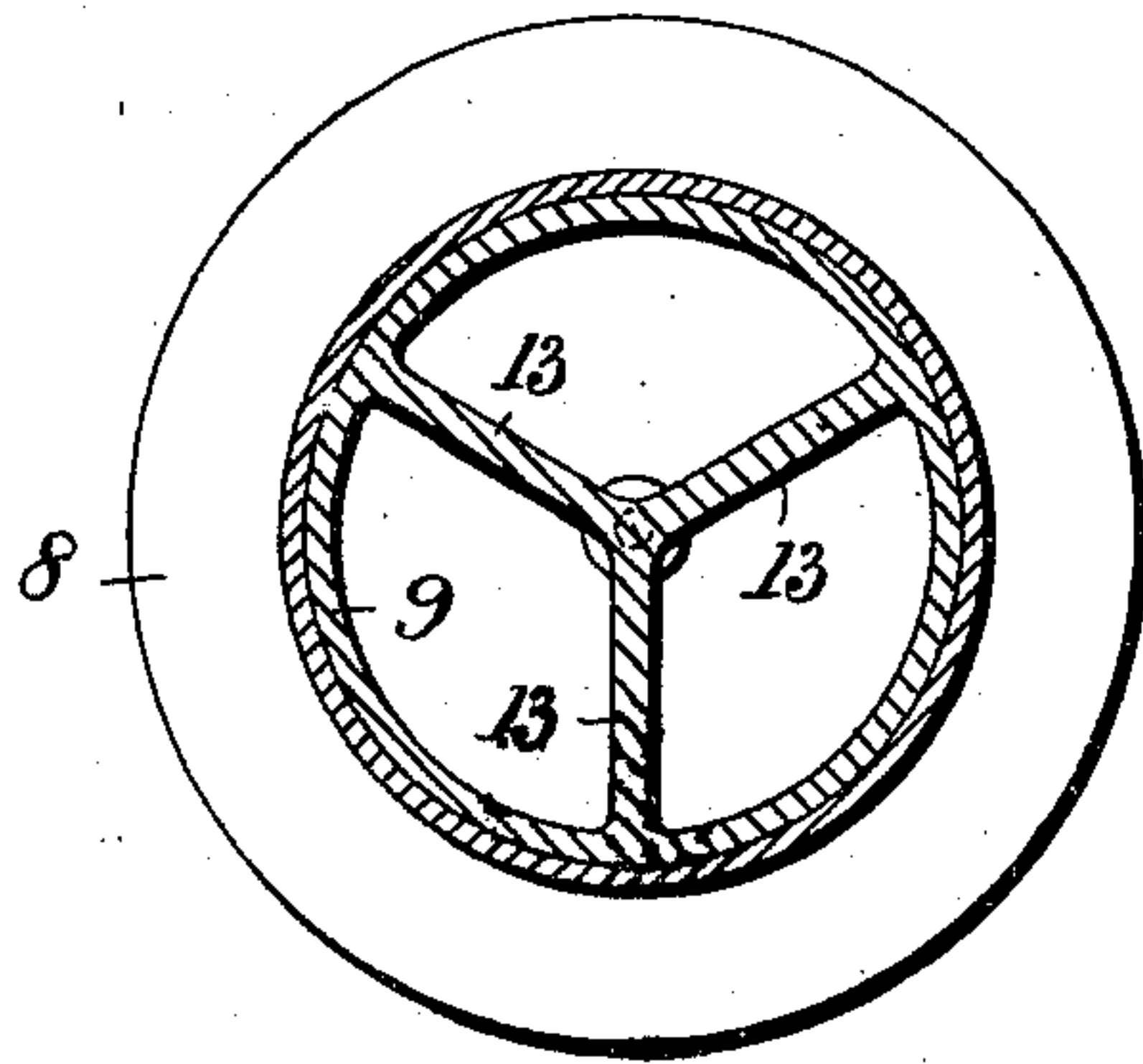


Fig. 2.



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No. 702,557.

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SOUND PRODUCING DEVICE SUITABLE FOR SIRENS, &c.

(Application filed Nov. 26, 1901.)

(No Model.)

2 Sheets—Sheet 2.

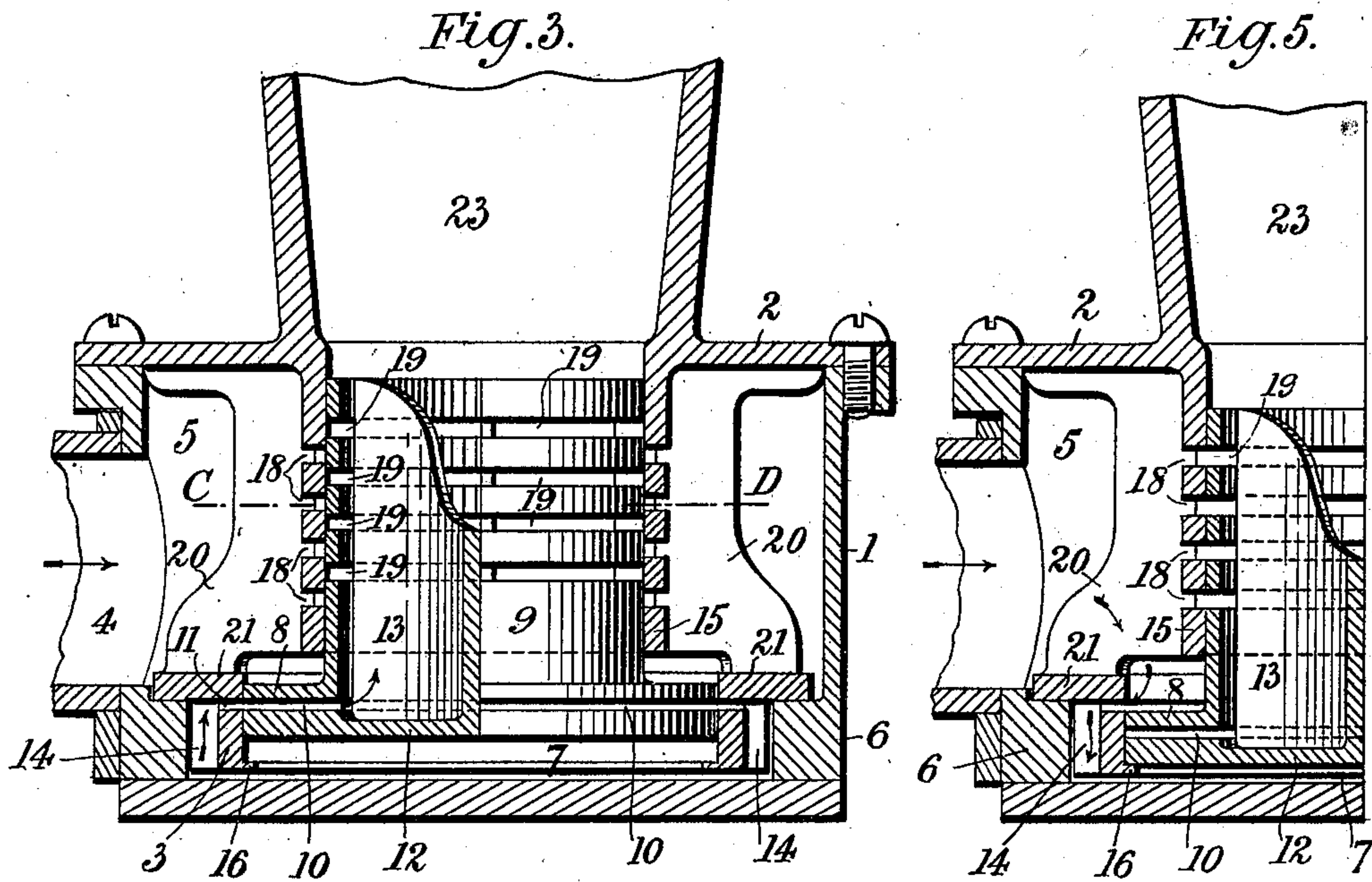
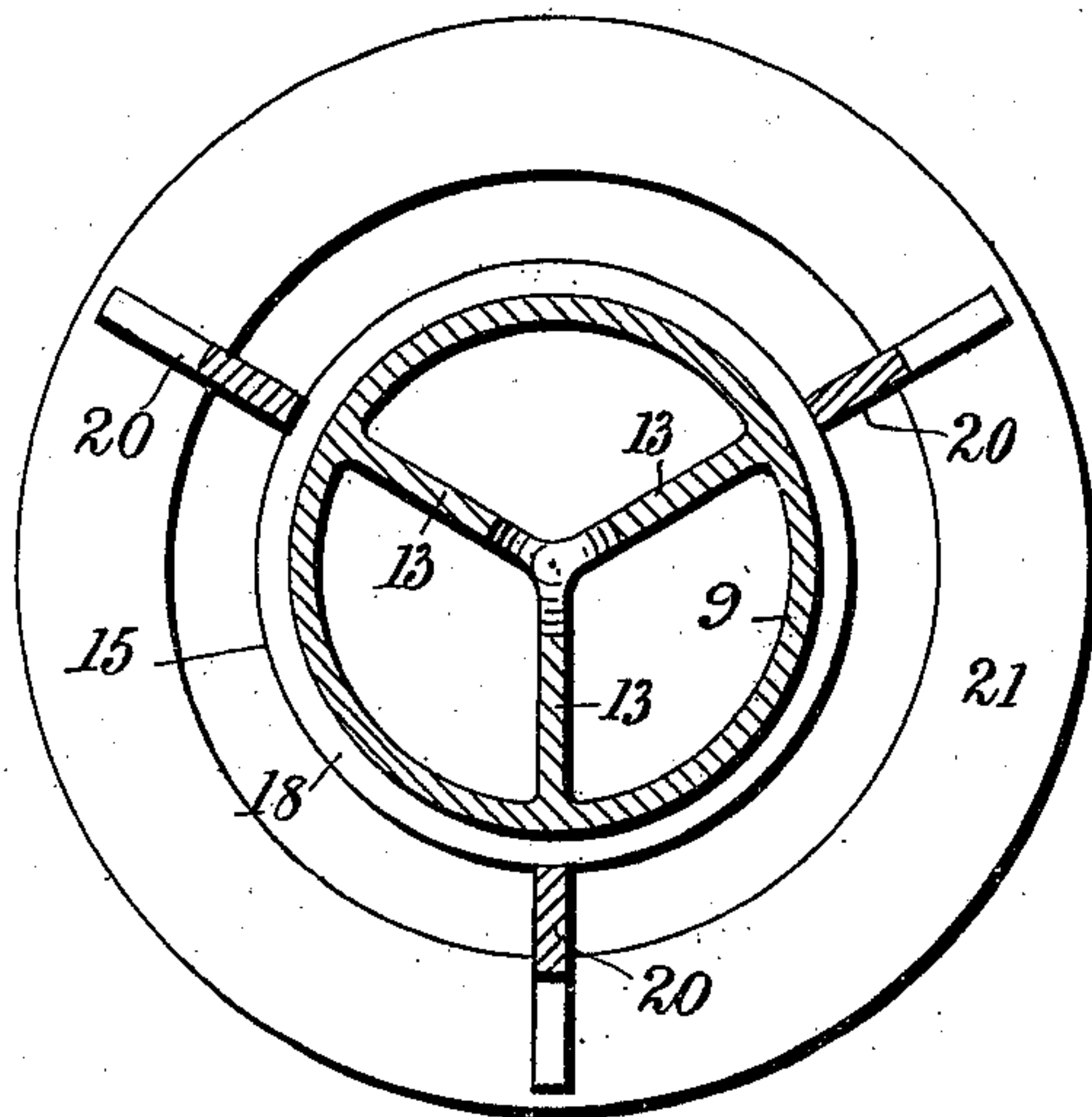


Fig. 4.



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UNITED STATES PATENT OFFICE.

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SOUND-PRODUCING DEVICE SUITABLE FOR SIRENS, &c.

SPECIFICATION forming part of Letters Patent No. 702,557, dated June 17, 1902.

Application filed November 26, 1901. Serial No. 83,725. (No model.)

To all whom it may concern:

Be it known that I, ROBERT HOPE-JONES, a subject of His Majesty the King of Great Britain, residing at Hereford, in the county of Hereford, England, have invented a certain new and useful Improvement in Sound-Producing Devices Suitable for Sirens and Like Instruments, of which the following is a specification.

My invention relates to an improvement in sound-producing devices suitable for sirens or like fog-signaling or position-locating devices.

In the course of experiments I have made in connection with sound-producing devices for organ and like work I have proposed the use of a device or diaphone in which the sound is obtained by the rapid vibration of a perforated piston in the interior of a similarly-perforated cylinder, which piston interrupts a column of air passing through the perforations of the cylinder, so that a series of puffs of air are discharged into a resonating chamber or trumpet. Difficulty, however, has been experienced with this arrangement for various reasons, among them being the fact that it will not always start automatically and is therefore unsuitable for signaling purposes.

The object of my present invention is to obviate these defects, and according to same I combine with the arrangement above described a vibrating engine whereby the piston is positively and automatically reciprocated, preferably by the same column of air which passes through the cylinder and piston and produces the sound, though it may be by separate means, and in carrying same out in the form of construction I prefer make the engine and sound-producing device in one part or apparatus.

In the accompanying drawings I show the vibrating engine both alone and combined with the sound-producing device in question.

In the drawings, Figure 1 is a sectional elevation of the engine, a portion on the right-hand side being in elevation. Fig. 2 is a section of the piston on line A B of Fig. 1. Fig. 3 is a sectional elevation of the combined engine and sound-producing device. Fig. 4 is

a section on line C D of Fig. 3, and Fig. 5 is a one-half sectional elevation of the apparatus shown in Fig. 3 to show a different position of the parts.

Referring first to Figs. 1 and 2, 1 is a casing provided with a suitable cover 2 and forming at its lower part a cylinder 3. A compressed-air or other suitable fluid supply pipe 4 communicates with the chamber 5 so formed. The casing 1 is attached to a second casing 6, (or formed in one with same,) which casing forms a chamber 7, into which the open end of cylinder 3 projects. 8 is a piston having a tubular part or guide 9, which latter passes through the cover 2, while the piston is capable of reciprocating in the cylinder 3. This cylinder has an annular passage 11 or a series of passages in its walls, and the piston 8 has a similar annular passage 10 or a series of passages communicating with its periphery and with its interior or tubular part 9. I prefer to form the passage 10 as a complete annular space, and this I do by connecting the lower plate 12 so produced, which forms the bottom of the piston, with the upper part and tubular guide 9 by means of webs 13. (Shown in Fig. 2.) The passage 11 in the cylinder 3 may also be formed in the same way by connecting the lower part of the cylinder to the upper part (in this instance the casing 1) by webs 14. It is desirable to limit the movement of the piston in both directions, so that, on the one hand, it may not rise too high and, on the other, it cannot fall when not in use to the bottom of the chamber 7, so as to be out of position when it is to start. The upper stop may be obtained by a tubular extension 15, carried by the cap 2, and the lower by a flange 16 on the cylinder 3. These stops, however, may be obtained by many other constructions. If the engine is to operate an independent sound-producing device, the piston may carry a rod 17, passing out of the chamber 6, to which the part in question can be connected.

In Figs. 3 to 5 the parts as far as the engine is concerned are the same, but with modifications necessary for combining therewith in one apparatus a sound-producing device. This sound-producing device consists of the

cylinder or tubular extension 15, having a series of annular passages 18 therein, adapted to correspond with similar passages 19 in the piston or tubular guide 9. In the case of the piston the rings of metal so formed are held in position by the webs 13, which are formed in one therewith, and in the case of the cylinder they are held by webs 20, which are formed in one with them, and also with a ring 21, forming the upper part of cylinder 3, which is thus in one piece with cylinder 15, cover 2, and also a resonator or trumpet (or connection for such part) 23.

In the operation of the vibrating engine the fluid under pressure enters the chamber 5 from passage 4, and after filling the former exerts the pressure upon the piston 8 and forces it down, the air beneath the piston in chamber 7 escaping by way of passages 11 and exhaust-passage 10 in piston 8 into the tubular part 9, the parts being in the position shown in Figs. 1 and 3. A continued movement of the piston, however, will close the exhaust-port and open the passage 11 to the fluid under pressure, as shown in Fig. 5, which will thus immediately rush into chamber 7 and acting on the large surface 12 of the piston will force it in the opposite direction until the exhaust-port 10 is again in correspondence with passage 11, when the pressure will be relieved and the cycle of operations be repeated, so that the piston will be kept in a state of rapid vibration. The vibration alone of this part will produce a musical note; but I prefer to combine with it some vibrating sound-producing device of a suitable character either by attaching same to the rod 17 or combining it therewith, as in Figs. 3 to 5, in which the air in chamber 5 in addition to operating the engine also passes through passages 18 and 19 when they are in correspondence, so that during the vibration of piston 9 a number of short puffs are sent up the resonator 23, the column of air in which is thrown into rapid vibration. The length and size of this resonator will therefore determine the periodicity of the motor, as it will be evident that the column of air therein will exert considerable influence upon the motion of the piston and will tend to make it move at a periodicity that will correspond or almost correspond with the natural periodicity of the resonator. Thus it will be seen that if the length of the column of air in the resonator be slightly increased the action of the reciprocating engine will be slightly retarded, while if the length be reduced the action of the engine will be accelerated.

It must be understood that the exact construction of the engine described may be varied without departing from my invention, though I deem the construction described an important one.

What I claim is—

1. The combination with a piston, means for positively operating same by fluid-pressure on both sides, and a surrounding cylin-

der, of two parts having passages in same, one of said parts being movable, a connection between it and the piston, and a chamber on one side of said parts containing fluid under pressure adapted to pass through the passages when they coincide the other side of the parts being open to the atmosphere substantially as described.

2. In combination a cylinder having a passage in the walls of same, a chamber for a fluid under pressure on one side of the cylinder, a second chamber to which the cylinder is open on the other side, a piston having a passage in same open to the atmosphere on one side and adapted to correspond with the passage in the cylinder at times for exhaust purposes and a sound-producing device carried by said piston and capable of being vibrated thereby, substantially as described.

3. A sound-producing device comprising a piston-engine, means for positively operating the piston of same in both directions, a vibrating sound-producing device operated by the engine, and a resonator the size of the column of air in which, is adapted to directly modify the periodicity of the engine substantially as described.

4. In a sound-producing device the combination with a resonator and a chamber for a supply of fluid under pressure of a series of passages forming a communication between the resonator and the air-supply, means for opening and closing such series of passages and a piston-engine connected to such means for positively operating same, substantially as described.

5. In a sound-producing device, the combination with a resonator, and a chamber for a supply of fluid under pressure, of a tubular part having a series of passages forming a communication between the resonator and the air-supply, a second part having a similar series of passages, a piston-engine connected to one of these parts to reciprocate same and operated by the fluid from the chamber above mentioned, and stops for limiting the movement of the reciprocating part so that it shall not move so far as to be put out of action when idle, substantially as described.

6. In a sound-producing device and in combination, a resonator, a tubular part having passages therein communicating with same, a cylinder having corresponding passages communicating with a supply of fluid under pressure, a piston carried by the tubular part, in communication with the air-supply, a cylinder for such piston, and suitable air inlet and exhaust passages, substantially as described.

7. The combination with a cylinder having a series of passages therein, a tubular piston having a similar series of passages, a chamber for fluid under pressure surrounding same, a piston 8 carried by the first-named piston, and having an exhaust-passage in same communicating with its periphery and with the tubular part, a second cylinder surrounding the piston 8 having a chamber in

same, and a passage adapted to communicate with it and with the chamber for fluid under pressure or the exhaust-passage in the piston.

5 8. In a sound-producing device, a cylinder having a series of annular passages, a chamber for fluid under pressure surrounding same, webs 20 connecting the parts of the cylinder between the passages, a second cylinder 3 carried by such webs and having a
10 passage communicating with its interior and the chamber for fluid under pressure, a tubular piston for the first cylinder having a series of annular passages, webs 13 connecting the parts of the piston between the pas-

sages, a second piston 8 carried by the first 15 piston, and having an exhaust-passage adapted to communicate with the passage in cylinder 3 and with its tubular interior, and means for limiting the movement of piston 8 in its cylinder substantially as described. 20

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

ROBERT HOPE-JONES.

Witnesses:

ALLEN PARRY JONES,
A. KNIGHT CROAD.