

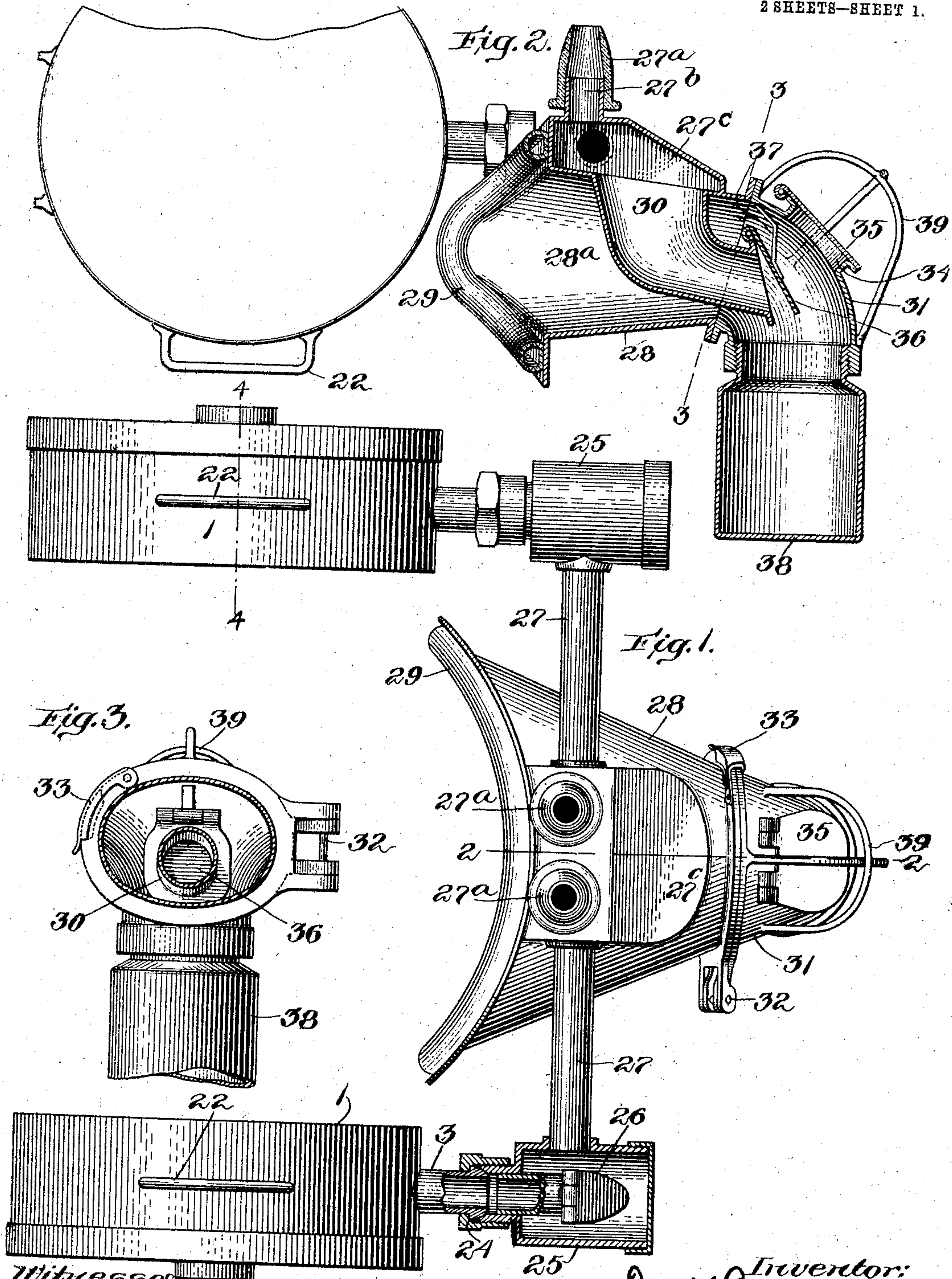
No. 780,709.

PATENTED JAN. 24, 1905.

D. CRAIG.
RESPIRATOR.

APPLICATION FILED JAN. 11, 1904.

2 SHEETS—SHEET 1.



Witnesses.

Arthur J. Randall.
Joseph T. Brennan.

Inventor:
David Craig,
by Roberts & Nitchie,
Attorneys.

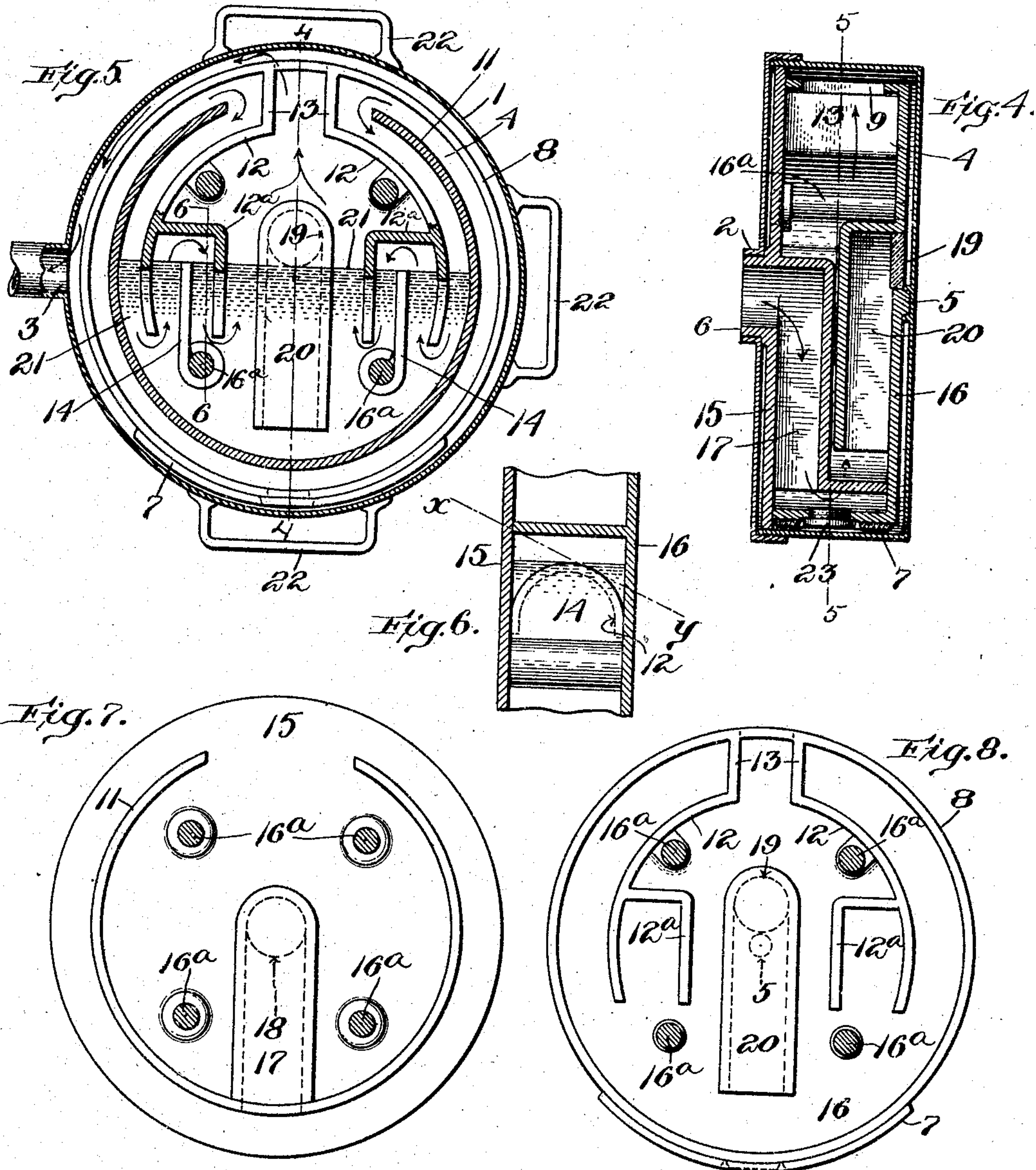
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Arthur J. Randall,
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Inventor:
David Craig,
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UNITED STATES PATENT OFFICE.

DAVID CRAIG, OF MELROSE, MASSACHUSETTS.

RESPIRATOR.

SPECIFICATION forming part of Letters Patent No. 780,709, dated January 24, 1905.

Application filed January 11, 1904. Serial No. 188,478.

To all whom it may concern:

Be it known that I, DAVID CRAIG, a citizen of the United States, and a resident of Melrose, in the county of Middlesex and State of Massachusetts, have invented new and useful Improvements in Respirators, of which the following is a specification.

My invention relates to respirators for cleansing air, and has for its object to provide an improved article of this nature of simple construction, efficient, light, and compact and suitable to be carried upon the person without inconvenience.

My improved respirator comprises a mask adapted to be applied to the head of the user over the face and to be connected by a valve-controlled supply-pipe with an air filter or strainer. Each inhalation either through the nose or mouth of the user forces air through the strainer and supply-pipe into the mask, from which it is delivered to the nose or mouth of the user, and each exhalation discharges the air from the mask through a valve-controlled outlet.

In the best form of my invention the mask comprises a nose-compartment and a mouth-compartment. The nose-compartment is provided with suitable means for making an air-tight connection with the nose, such as a pair of nipples adapted to be inserted in the nostrils. The nose-compartment also has an air-inlet adapted to be connected with the air-strainer or the like and an outlet controlled by a valve. The mouth-compartment also is so fashioned as to make an air-tight fit over the mouth of the user and is also adapted to communicate with the air-strainer and has a valve-controlled outlet. The outer end of the mouth-compartment is preferably provided with a removable cover, so that the user may open the mask to talk or for other purposes.

In its best form the cover consists of an outer section or extension of the mouth-compartment, with which it is separably connected. Preferably the outlet of the nose-compartment opens into the mouth-compartment.

Any suitable strainer may be used with the mask; but the improved construction of

strainer herein shown is particularly applicable and constitutes a feature of my invention. This consists of an outer shell or casing provided with an air-inlet and an air-outlet, the latter adapted to be connected with the supply-pipe above referred to. The inner receptacle is preferably movably mounted within the outer casing and balanced automatically to maintain an upright position. The inner receptacle is also adapted to hold a cleansing or straining agent and is preferably interiorly divided by walls or partitions, so as to provide a tortuous air passage-way which communicates at one end with the air-inlet of the outer casing and at its other end with the air-outlet of the outer casing.

In the accompanying drawings, Figure 1 is a plan view, partly in section, of my improved respirator. Fig. 2 is a section on line 2 2 of Fig. 1. Fig. 3 is a section on line 3 3 of Fig. 2. Fig. 4 relates to the strainer hereinafter described and is a section on line 4 4 of Figs. 1 and 5. Fig. 5 is a section on line 5 5 of Fig. 4. Fig. 6 is a section on line 6 6 of Fig. 5. Figs. 7 and 8 are details of the inner receptacle of the strainer hereinafter described.

In the drawings, 1 represents the cylindrical shell or casing of the strainer of my improved respirator. Said casing is made with an air-inlet 2 and an air-outlet 3. Within casing 1 is arranged a cylindrical receptacle 4, one face of which is made with a trunnion 5, journaled in casing 1, and the opposite face of which is made with a hollow boss or trunnion 6, journaled in the outlet 2 of casing 1. Upon its under side receptacle 4 carries a weight 7, of lead or the like, so that however casing 1 is turned on the axis of receptacle 4 said receptacle automatically maintains an upright position and does not turn with casing 1. The outer cylindrical wall 8 of receptacle 4 is continuous and unbroken except for an outlet-opening 9 at the top thereof. Within and parallel with wall 8 receptacle 4 is made with a segmental wall 11, whose ends terminate near the top of the receptacle. Within said wall 11 the receptacle 4 is also made with two segmental walls 12, parallel with wall 11, which

are connected at their upper ends with wall 8 at each side of outlet 9 by short straight extensions 13 and which extend downwardly a little below the middle of the receptacle 4.

5 Near their lower ends the walls 12 are made each with an inwardly and downwardly projecting branch 12^a, between which and the lower end of the wall 12 is arranged a short straight wall 14, whose upper end is clear of the adjacent part of branch 12^a. For convenience in manufacturing the inner receptacle 4 is made in two main parts, one consisting of a disk 15, integral with walls 8 and 12. The two disks 15 and 16 are clamped rigidly

10 together by screws 16^a, on two of which the walls 14 are mounted. Integral with disk 15 is a pipe 17, terminating at its upper end in the hollow trunnion 6 and at its lower opening into the space between walls 8 and 11.

20 Disk 16 is made with an opening 19 just above its center, which serves as an overflow-outlet. Pipe 20, which is preferably integral with disk 16, leads from opening 19 downwardly into the lower part of the interior of the space within receptacle 4, inclosed by the wall 11.

25 Wall 11 and disks 15 and 16 constitute a holder for a body of cleansing or filtering fluid, such as water. (Shown at 21.) The overflow-opening may be closed, if desired, by a plug of cork or the like. Each end of wall 11 is sufficiently high to prevent danger of water spattering over even when the device is given a sudden movement or jerk.

30 Casing 1 is provided with loops 22, by means of which the strainer can be attached to the head of the user by straps.

When the air is drawn through the strainer, it route is through pipe 17, from the discharge end of pipe 17 upwardly around both ends of wall 11, downwardly around the lower ends of walls 12, upwardly around the upper ends of walls 14, downwardly around walls 12^a, thence upward into the middle of receptacle 4, and thence through opening 9 to outlet 3,

40 as indicated by the arrows. As will now be clear, the air passing around the ends of walls 12 and 12^a is brought into intimate contact with the body of water 21 and cleansed of dust and of impurities or particles of material carried by the air.

50 The swiveled receptacle 4, balanced by the weight 7, maintains an upright position at all times regardless of the extent to which casing 1 is rotated angularly on its axis.

55 The lower edge of wall 12 and extension 12^a are of the curved shape shown in Fig. 6, so that when the strainer is rocked sidewise far enough, for example, to bring the water-level on the line *xy* no difference will be made in the distance between the water-level and the lower edge of walls 12 and extension 12^a, and therefore the resistance offered to the passage of the air through the strainer is not varied

when the head is moved about and the water is disturbed. Thus the strainer may be rocked about in different directions without affecting its operation.

The water within the pocket made by wall 11 is admitted through outlet 9 or 19 before receptacle 4 is mounted in casing 1, and it will be apparent that when the strainer is in its normal position the level of the water cannot be any higher than the bottom edge of opening 19, so that in filling said receptacle the appearance of the water at opening 19 is an indication that a sufficient quantity has been admitted. The depending pipe 20, leading from the opening 19, is not essential, but is serviceable as a blowpipe in cleaning the receptacle 4 of any sediment that may accumulate in the bottom. A blast of steam or air admitted through opening 9 will discharge through this pipe and clean out the receptacle, when otherwise it would be necessary to take the receptacle apart for the purpose of cleaning the receptacle. When the strainer is in use, the opening 19 is preferably closed by a removable plug.

In order to remove any water that may collect within wall 8, an opening is provided through the bottom of said wall that is closed by a removable stopper 23.

My improved respirator, as herein shown, comprises two strainers like that above described adapted to be worn one on either side of the head. The outlet 3 of each strainer is connected by a coupling member 24 with a chamber 25, within which is a check-valve 26, controlling the inlet of said chamber and closing toward the strainer. The ends of outlet-pipes 3 are capable of turning in the coupling members 24, so that they may be angularly adjusted to fit the head of the wearer. Each chamber 25 is fixed to and communicates with the end of a pipe 27, and each pipe 27 at its other end is fixed to and communicates with a compartment or chamber 27^c upon the top of a mask 28. The latter is made with a mouthpiece 29, made of any suitable airtight compressible material, such as rubber tubing, so as to fit tight against the face of the user and around the mouth, as shown in Fig. 2. Preferably the mouthpiece 29 is enlarged at the part which bears against the chin, as shown in Fig. 2. This enlargement is provided the better to insure a tight fit of the mouth-compartment upon the mouth of the wearer, particularly when the chin is moved. The enlargement of the mouth-compartment at this point affords a larger degree of compression and expansion than would be possible if it were of the small size which is sufficient for the upper part. From the top of the compartment 27^c project two nipples 27^b, on each of which is mounted a flexible tip 27^a, to be inserted in the nostrils of the

user. Opening into the bottom of compartment 27^c is a pipe 30, the lower end of which is within a compartment 28^a of mask 28 and is provided with an outwardly-opening check-valve 36.

Mask 28 comprises an inner main section, open at its outer end, and an outer section 31, connected to the inner main section by a hinge 32 and a latch 33, forming a cover for the opening of the inner section. Said outer section or cover 31 is also made with an outlet 34, controlled by a check-valve 35, so that when the outer section 31 occupies its closed position, as shown in Figs. 1, 2, and 3, valve 35 opens to permit the discharge of the air exhaled by the user and is closed at other times. When the operator desires to talk, the outer section 31 of the mask is freed from latch 33 and swung on hinge 32 to one side, which leaves the inner section 28 of the mask open. In order that the nose of the user may continue to be supplied with air from the strainer when the mask is opened, the lower end of pipe 30 is provided with the outwardly-opening check-valve 36, which opens and closes when the user breathes through the nose. Preferably the check-valve 36 is made with an arm 37, which is engaged by the outer section 31 of the mask, and thereby held open when the latter is closed. Therefore when the mask is closed valve 35 serves for both nose and mouth breathing; but when the mask is opened the outer section 31 is disengaged from arm 37 and valve 36 is freed. The advantage of this feature is that of the two valves 35 and 36 but one of them is in action at a time, and therefore breathing is rendered easier than it would be if both valves 35 and 36 were in action at the same time. To the lower end of the section 31 of the mask is removably fastened a receptacle 38 to receive moisture condensed from the breath of the user, said receptacle being shown as exteriorly screw-threaded and screwed into the interiorly-screw-threaded lower end of the section 31. Valve 35, which is upon the exterior of the section 31 of mask 28, is protected by a shield 39.

As shown in Fig. 1, the mask 28 and strainers, together with their connections, are arranged in the form of a yoke adapted to embrace the head of the user, with mouthpiece 29 against the lips, tips 27^a within the nostrils, and the strainers at each side of the head. The respirator so constructed and arranged is held securely in place by means of straps (not shown) connected with the loops 22 and passing around the back of the head, over the head, and under the chin.

The construction above described provides a light and well-balanced device, one capable of effectively filtering the air and of special value to persons employed in such work as the grinding of needles or other industries

which render the air laden with particles of matter, dust, or other impurities harmful to the health of the worker. By providing a separate nose-compartment and mouth-compartment the inclosed space which contains air already once breathed is reduced to a minimum—a great advantage over devices which have a large chamber covering both the mouth and nose. The construction above described also offers the least possible obstruction to the sight of the wearer.

What I claim is—

1. A mask for respirators and the like comprising a mouth-compartment; a nose-compartment; and a valve-controlled inlet and outlet for said compartments, the outlet of the nose-compartment opening into the mouth-compartment.

2. A mask for respirators and the like made with a mouth-compartment, and a nose-compartment; the mouth-compartment being adapted to connect with the mouth of the user, and comprising an inner and an outer section separably connected together; the nose-compartment being adapted to connect with the nose of the user; and valves to control the flow of air through said compartments.

3. A mask for respirators and the like made with a mouth-compartment, and a nose-compartment; the mouth-compartment being adapted to connect with the mouth of the user, and comprising an inner and an outer section separably connected together; the nose-compartment being adapted to connect with the nose of the user; an inlet and an outlet for the nose-compartment, said outlet opening into the mouth-compartment; a valve for controlling said outlet; an outlet for the mouth-compartment, and a valve for controlling the outlet of the mouth-compartment.

4. A mask for respirators or the like comprising a mouth-compartment, and a nose-compartment, the mouth-compartment being open at its outer end and provided with a removable cover; a valve-controlled inlet and a valve-controlled outlet for the nose-compartment, said outlet opening into the mouth-compartment; and a valve-controlled outlet for the mouth-compartment located in said cover.

5. A respirator comprising a mask made with a mouth-compartment and a nose-compartment, the mouth-compartment adapted to connect with the mouth of the user and consisting of inner and outer sections separably connected together, and the nose-compartment adapted to connect with the nose of the user; an inlet and an outlet for the nose-compartment, the latter opening into the mouth-compartment; a valve controlling said outlet; an outlet for the mouth-compartment; a valve controlling said outlet for the mouth-compartment, and means to hold the valve of the nose-compartment outlet open when the outer

section of the mouth-compartment is closed, and to free said valve when said section is opened.

6. A respirator comprising a mask made with a mouth-compartment and a nose-compartment, the mouth-compartment adapted to connect with the mouth of the user and consisting of an inner and an outer section separably connected together; two inlets and an outlet for the nose-compartment, said outlet opening into the mouth-compartment; a valve controlling said outlet; nipples communicating with the nose-compartment; an outlet for the mouth-compartment; a valve controlling said outlet; a pair of strainers; and pipes connecting the strainers each with one of the inlets of the nose-compartment.

7. A strainer for respirators or the like, comprising a receptacle adapted to contain a cleansing or filtering liquid; an inlet-opening and an outlet-opening in said receptacle; and a tortuous air-passage connecting said inlet and outlet, which dips below the normal level of the liquid in the receptacle and which also opens into the liquid-holding part of the receptacle below said level.

8. A strainer for respirators or the like, comprising a receptacle adapted to contain a cleansing or filtering fluid; an inlet-opening and an outlet-opening for said receptacle; and a tortuous air-passage connecting said openings formed by downwardly and upwardly projecting walls alternately arranged, the former projecting below the normal level of the fluid, and the latter extending above the lower edges of the former.

9. A strainer for respirators or the like, comprising a receptacle adapted to contain a cleansing or filtering fluid; an inlet-opening and an outlet-opening for said receptacle; and a tortuous air-passage connecting said openings formed by downwardly and upwardly projecting walls alternately arranged the former projecting below the normal level of the fluid, and the latter extending above the lower edges of the former, the lower ends of all of said walls terminating above the bottom of the receptacle whereby matter filtered from the air is collected together at the bottom of the receptacle.

10. A strainer for respirators or the like comprising a casing made with an air-inlet and an air-outlet, and a receptacle movably balanced within said casing, said receptacle made with an air passage-way therethrough adapted to contain a filtering medium, and communicating at one end with the inlet of the casing and at its other end with the outlet of the casing.

11. A strainer for respirators or the like comprising a casing made with an air-inlet and an air-outlet, and a receptacle movably balanced within said casing, said receptacle made

with a tortuous passage-way therethrough communicating at its ends with the inlet and outlet of the casing and adapted to hold a filtering agent or the like.

12. A strainer for respirators or the like comprising a casing made with an air-inlet and air-outlet, and a receptacle movably balanced within said casing, said receptacle made with partitions providing a pair of tortuous passage-ways therethrough communicating at their ends with the inlet and outlet of the casing.

13. A strainer for respirators or the like comprising a cylindrical casing made with an air-inlet and an air-outlet; a cylindrical receptacle rotatably balanced concentrically within said casing and made with partitions to provide a pair of tortuous passage-ways therethrough communicating at their ends with the inlet and outlet of the casing.

14. A strainer for respirators or the like comprising a casing made with an air-inlet and an air-outlet, a filter-receptacle movably balanced within said casing having staggered walls providing a tortuous passage-way through said receptacle, said passage-way communicating at one end with the air-inlet of the casing and at its other end with the air-outlet of said casing, the edges of the walls being curved to maintain a substantially uniform hydraulic resistance to the passage of air through the strainer.

15. A strainer for respirators or the like comprising the casing 1; the receptacle 4 rotatably balanced within said casing; the air-inlet 17 leading from the exterior of the strainer to the air-passage within receptacle 4; said air-passage formed by walls 11, 12, 14 and 12^a; outlet 9 in said receptacle discharging into casing 1; and outlet 3 in said casing.

16. A mask for respirators and the like comprising mouth-compartment 28^a provided with mouthpiece 29; nose-compartment 27^c provided with nipples 27^a; outlet-pipe 30 provided with valve 36; cover or outer section 31 for the mouth-compartment removably secured to the mouth-compartment 28^a and provided with valve 35; receptacle 38 adapted to receive condensation from both compartments; and an air-inlet opening into the nose-compartment.

17. A strainer for respirators or the like comprising a cylindrical casing made with an air-inlet and an air-outlet; a cylindrical receptacle within said casing, said receptacle being provided with the retaining-walls 11 extending upwardly and inwardly to retain the filtering fluid within the receptacle, air-passages leading from the air-inlet over the tops of said walls 11, and thence downwardly through the liquid-space in the receptacle to the air-outlet.

18. The combination with the exhaust-com-
partment of a mask for a respirator of the
character herein described, of a receptacle
communicating with the interior of said com-
5 partment and adapted to receive moisture of
condensation from the breath of the user, sub-
stantially as described.

19. A strainer for respirators or the like
comprising a casing; a receptacle movably
10 balanced within said casing containing a fil-

tering medium and provided with a passage-
way from the air-outlet through the filtering
medium.

Signed by me at Boston, Massachusetts, this
24th day of December, 1903.

DAVID CRAIG.

Witnesses:

ROBERT CUSHMAN,
JOSEPH T. BRENNAN.