No. 704,762.

Patented July 15, 1902.

J. SEYMOUR.

GAS AND AIR MIXER.

(Application filed Dec. 4, 1901.)

(No Model.)

5 Sheets—Sheet 1.

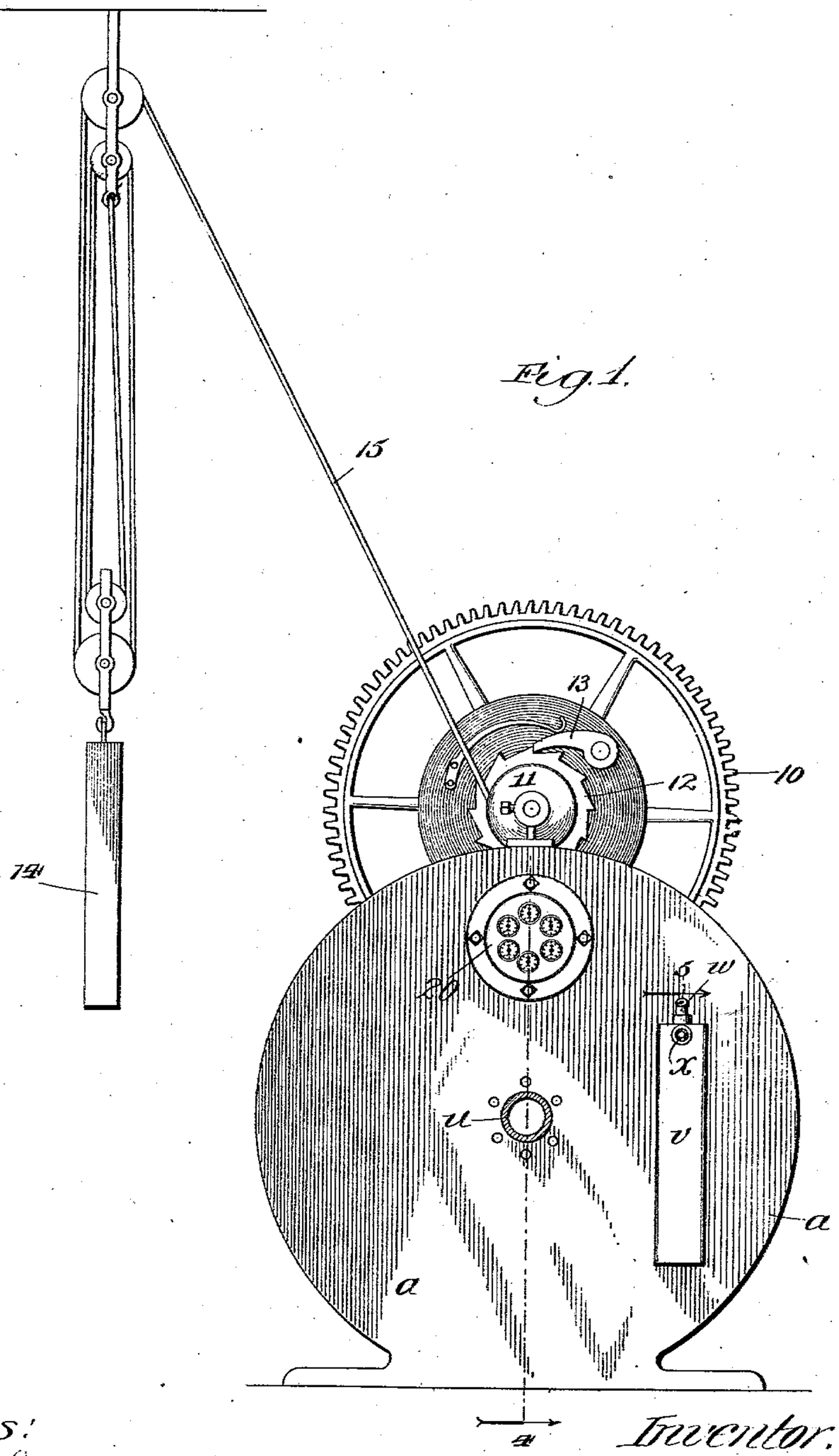

Fig. 1.

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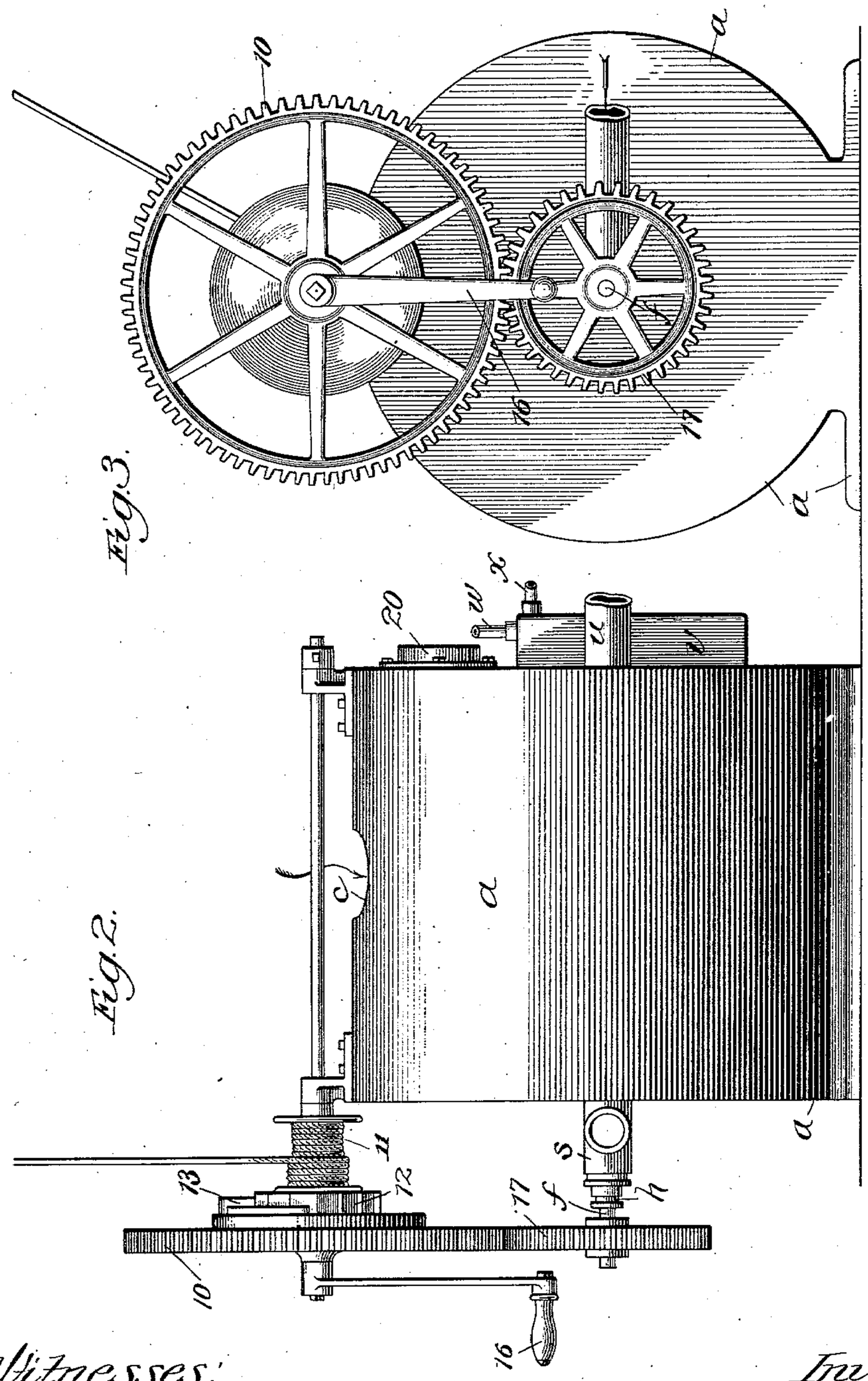

Fig. 3.

Fig. 2.

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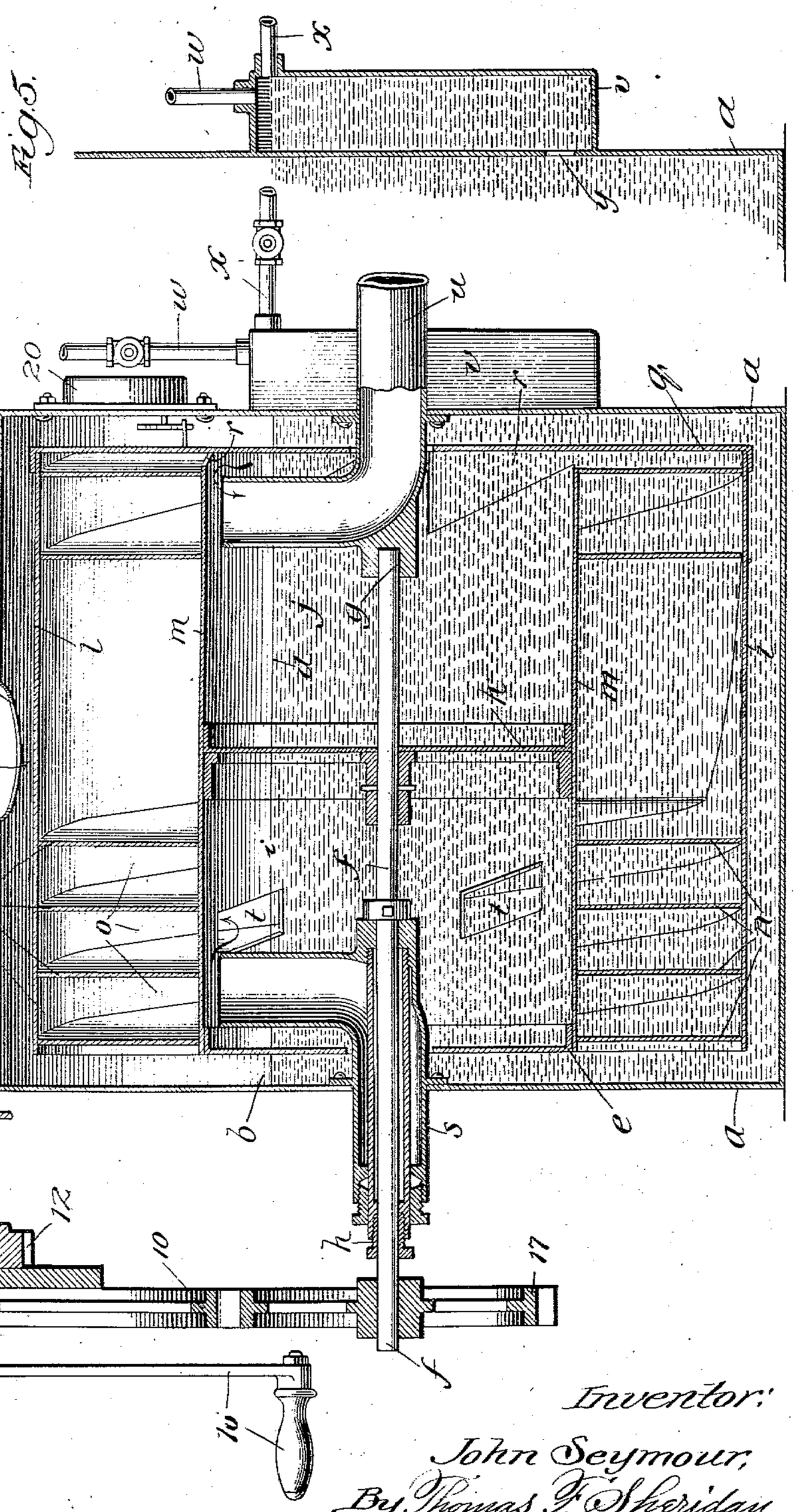
(No Model.) 5 Sheets—Sheet 3.

Fig. 5.



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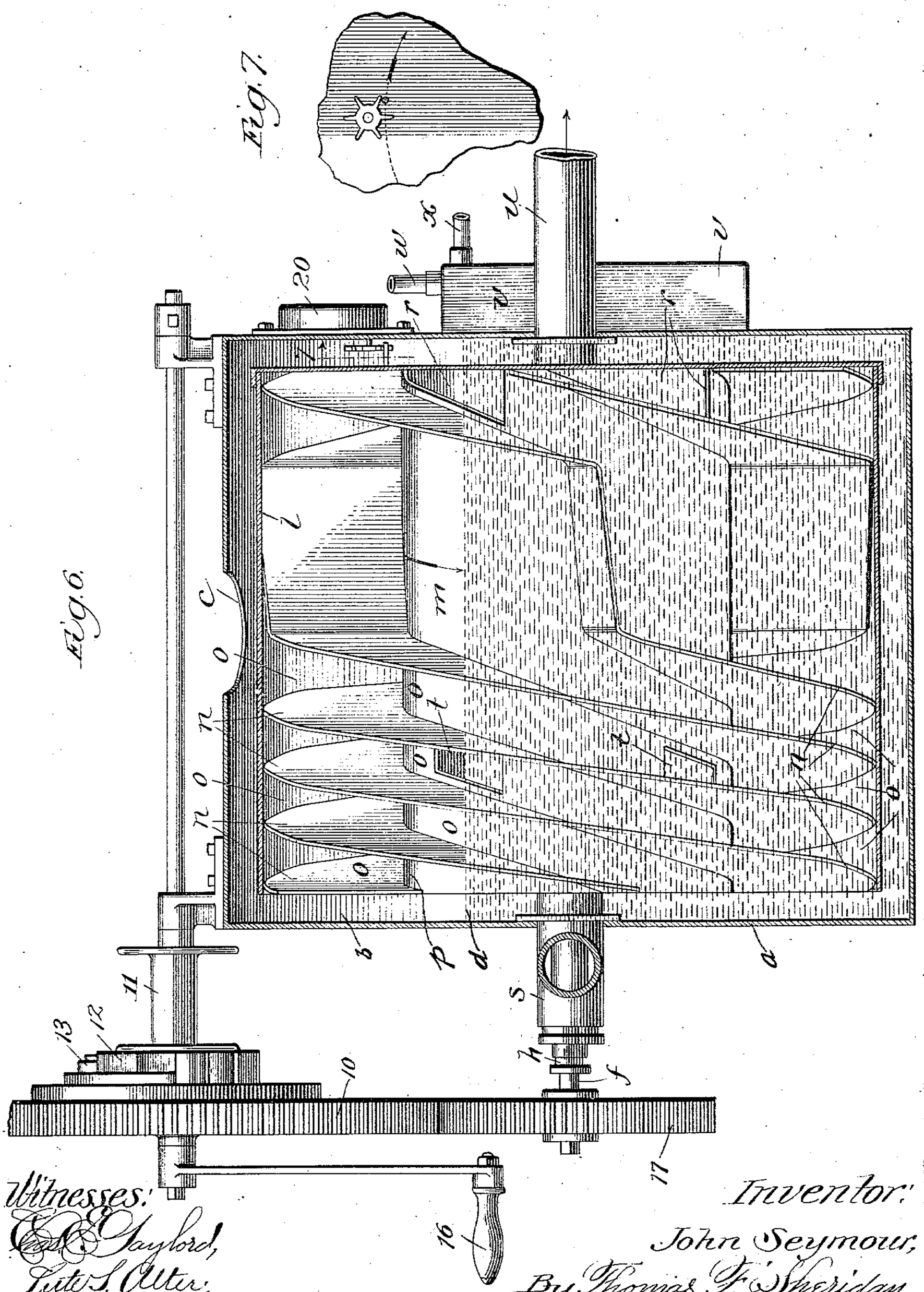
(No Model.) 5 Sheets—Sheet 4.



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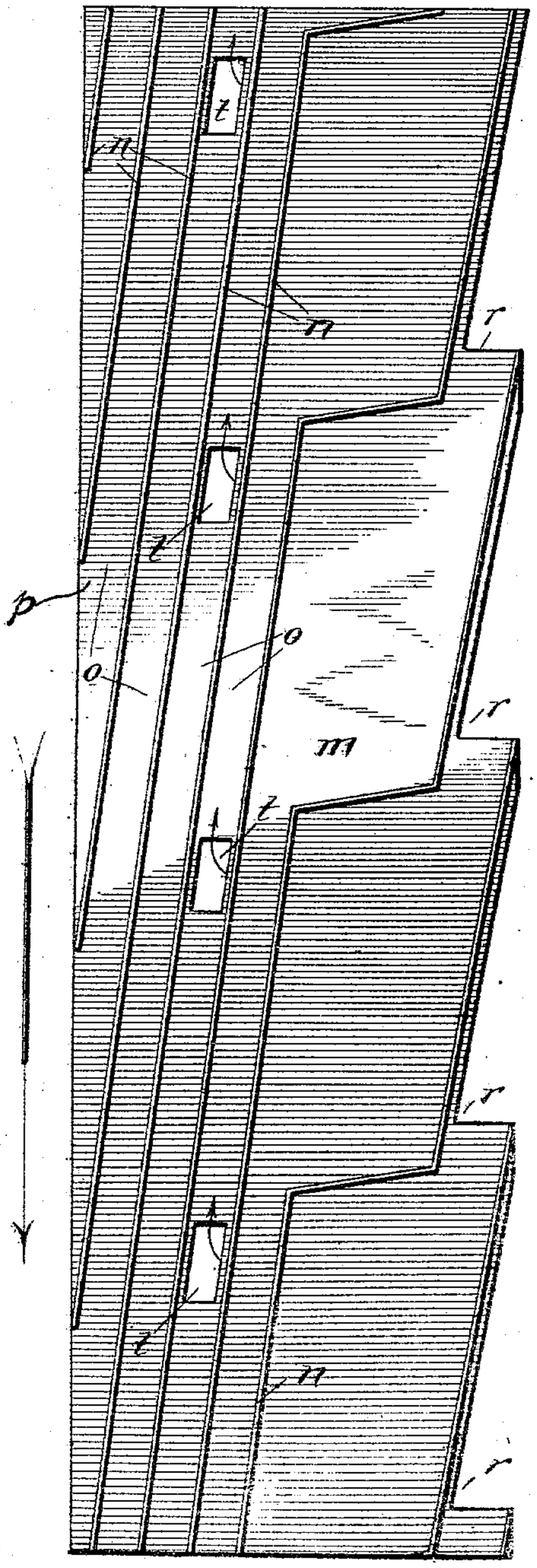
(No Model.)

5 Sheets—Sheet 5.

Fig. 8.



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UNITED STATES PATENT OFFICE.

JOHN SEYMOUR, OF TORONTO, CANADA.

GAS AND AIR MIXER.

SPECIFICATION forming part of Letters Patent No. 704,762, dated July 15, 1902.

Application filed December 4, 1901. Serial No. 84,701. (No model.)

To all whom it may concern:

Be it known that I, JOHN SEYMOUR, a subject of the King of Great Britain, residing at Toronto, in the Province of Ontario and Dominion of Canada, have invented certain new and useful Improvements in Machines for Mixing Gases and Air, of which the following is a specification.

This invention relates particularly to machines or apparatus adapted to mix gas and air in any desired proportions and at the desired rate and amounts, and especially to the arrangement and construction of the devices, as will more fully hereinafter appear.

The principal object of the invention is to provide a simple, economical, and efficient apparatus for mixing gas and air.

A further object of the invention is to provide a machine of the desired size with a plurality of devices acting in sequence for measuring the air, feeding the gas thereto, and mixing it as it passes through the machine, so that it may be withdrawn therefrom in the desired proportions and quantities.

Further objects of the invention will appear from an examination of the drawings and the following description and claims.

The invention consists principally in the combination of an outer casing, an inner movable part provided with a mixing-chamber, and means for feeding a gas to the mixing-chamber to thoroughly mix the gas with air during the operation of the movable part.

The invention consists, further, in the combination of an exterior casing providing an air and liquid-sealing chamber, a rotatable part movably mounted in such sealing-chamber and provided with a mixing chamber or chambers, each of which is provided with a gas-inlet, and means for feeding gas to the machine, so that it may be mixed with the air during the rotation of the movable part.

The invention consists, further, in the combination of an exterior casing providing an air and water-sealing chamber, an interior rotatable part providing a gas-supply and liquid-sealing chamber on its interior and a plurality of mixing-chambers on its exterior, means by which such movable part may be rotated, and means for feeding the gas to the mixing-chambers as the part rotates.

The invention consists, further, in the combination of an exterior casing providing an air and water-sealing chamber, an interior cylindrical rotatable receptacle providing an axial gas-supply and water chamber and a plurality of mixing-chambers each connected with the interior gas and water chamber and open at each end thereof, means by which such interior part may be rotated, an axial gas-supply pipe, and an axial exhaust-pipe connected with the interior of the rotatable part.

The invention consists, further, in the combination of an exterior receptacle providing an air and liquid-sealing chamber, an interior cylindrical receptacle providing an axial gas-supply and water chamber at one end, an axial mixture-exhaust and water chamber at the other end, and a plurality of peripheral helical mixing-chambers communicating with the gas-supply chamber and open at one end to the air-chamber and at the other end to the mixture-exhaust chamber, a gas-supply pipe connected with the gas-supply and water chamber, a mixture-exhaust pipe connected with the mixture-exhaust chamber, and means by which the rotatable receptacle may be operated to mix the air and gas.

The invention consists, further and finally, in the features, combinations, and details of construction hereinafter described and claimed.

In the art to which this invention relates it is well known that in cases where it is desired to use gas for heating, cooking, or laboratory purposes or for use in connection with artificial burners of the well-known Welsbach type it is desirable to provide a mixing apparatus whereby the required quantities of air may be measured and mixed with the gas in the desired proportions in a slow, gradual, and satisfactory manner in order to obtain the highest efficiency and best results. To this end my invention particularly relates, and it is designed to remove objections in present processes and methods and to provide a satisfactory and economical apparatus for carrying out the same, all of which will be appreciated by those skilled in the art.

In the accompanying drawings, Figure 1 is an end elevation of the complete machine constructed in accordance with these improve-

ments; Fig. 2, an enlarged side elevation of a portion of the same; Fig. 3, an end elevation showing the left-hand end of Fig. 2; Fig. 4, an enlarged longitudinal sectional elevation taken through the apparatus on line 4 of Fig. 1; Fig. 5, a sectional detail taken through the line 5 of Fig. 1; Fig. 6, a similar view to that shown in Fig. 4, but only partly in section; Fig. 7, an interior sectional detail looking from the line 7 of Fig. 6 in the direction of the arrow, and Fig. 8 a developed plan view of the peripheral surface of the interior rotatable part shown in Figs. 4 and 6.

In constructing a machine in accordance with these improvements I make an exterior casing *a*, which is practically cylindrical in contour, as shown in Figs. 1 and 3, and which is provided with a base portion, as shown in such figures. This receptacle provides what I prefer to term, as shown in Figs. 4 and 6, an "interior" chamber *b*, forming an air-supply chamber at the upper portion, and the inlet of which is arranged at the top at *c*. The lower part of this chamber is filled with water up to a line *d*, as shown in such figures, and acts as a liquid seal.

To measure out the quantity of air desired for mixing purposes, I provide an interior rotatable cylindrical receptacle *e*, having an axial supporting-shaft *f*, upon which it is mounted and which in turn is journaled at *g* and *h* in the fixed inlet and exhaust pipes, hereinafter referred to. This interior rotatable receptacle *e* is provided with an axial gas-supply chamber *i* at one end and what I prefer to term an "axial exhaust-chamber" *j* at the other end, which also contains water for sealing such chamber, separated from each other by means of a partition *k*. This rotatable part has two annular cylindrical walls *l* and *m*, between which is arranged a series of peripheral helical air-measuring chambers *o*, formed by a plurality of substantially helical blades *n*. These helical air-measuring chambers *o*, as shown particularly in the developed surface plane of Fig. 8, are open at one end, *p*, to the air-chamber and at the other end are closed from all communication with the air-supply and liquid-sealing chamber by means of the end wall *q*, but have communication with the exhaust-chamber by means of the openings *r*. From this description of construction it will be seen that as the cylinder *e* is rotated in a direction coincident with the arrows shown in Fig. 6 the liquid practically forms a seal in each and all of these helical annular chambers and drives the air along until it is forced into the exhaust-chamber. It is highly desirable that some means be provided by which gas may be fed to these helical annular mixing-chambers in desired quantities and at the desired time or times. In order to accomplish this result, a gas-supply pipe *s* is provided, connected at one end with a suitable source of gas-supply and opening into the gas-supply chamber *i*, as shown in Fig. 4, and above the liquid seal. The interior annular wall *m* is provided with a plurality of perforations *t*, communicating with and opening from the interior gas-supply chamber into each and all of the helical air-measuring chambers, so that as the part rotates and the proper opening comes up above the level of the liquid seal the gas will immediately enter such chamber through such opening to mix with the measured air while the part rotates and as long as such perforation remains above the level of the water seal. As soon as the perforation passes below the level of the water seal the gas is cut off thereby, and the liquid during the rotation of the part drives the mixture of air and gas through the helical chamber until it is forced into the exhaust-chamber. The mixture being forced into the exhaust-chamber *j* is withdrawn therefrom and through the bent exhaust-pipe, which has its opening arranged in such exhaust-chamber and above the level of the water seal. There being a plurality of these helical annular mixing-chambers arranged in series relation, each opening into the air-chamber at different points on the cylinder, they practically form a means for furnishing a continuous supply of air and gas mixture to the exhaust-chamber, so that it may be withdrawn therefrom in a continuous manner.

To supply water to the liquid-sealing chamber, one end of the structure is provided with a box *v*, having a water-supply pipe *u* and an overflow-pipe *x* and communicating with the liquid portion of the sealing-chamber by means of the perforation *y*, all of which acts to regulate the supply of water and keep it at the desired level. Any desired means may be used for rotating the movably cylindrical part. I prefer, however, to use the mechanism shown in the drawings, which consists of a driving-gear 10, which is loosely mounted upon the drum-shaft *z*, a drum 11, secured to such shaft and provided with a ratchet 12, which, by means of a spring-pressed pawl 13, serves to communicate power and motion to operate the driving-gear by means of a weight 14 and cable-cord or similar element 15. When such drum is rotated in one direction, it moves the driving-gear therewith, but permits the drum to be wound in the other direction by means of the crank-handle 16 without operating such gears. This driving-gear is connected with a spur-gear 17, secured to the shaft *f*, upon which the rotatable cylindrical part is mounted and by which it is rotated. It will be seen, therefore, that when the weight is free to move the parts are operated in the manner and for the purposes above described.

From the foregoing it will be seen that the weight 14 serves to regulate the speed of rotation of the parts and the pressure at which the mixture may be supplied, all of which will be understood and appreciated by those

skilled in the art. Each of these machines may be provided with a usual registering device 20, arranged to be operated by the rotatable cylinder, (see Figs. 2 and 6,) which will keep a record of the amount of gas and air mixed.

I claim—

1. In a machine of the class described, the combination of an outer casing providing a liquid-sealing chamber, a part rotatably mounted therein provided with a gas-supply chamber and having one or more air-measuring chambers arranged around the periphery of such chamber and through which air is fed for mixing with gas, and means for feeding gas to the machine to mix with the air during the operations of the same, substantially as described.

2. In a machine of the class described, the combination of a receptacle providing a liquid-sealing chamber, a movable part rotatably mounted in such chamber and provided with a gas-supply chamber and with a series of helical air-measuring chambers, and means for feeding gas into such air-measuring chambers to the air as it is measured by such chambers and during the rotation of the movable part, substantially as described.

3. In a machine of the class described, the combination of an outer casing, an inner movable part provided with a mixing-chamber therein an air-measuring chamber in such movable part communicating with such mixing-chamber, and means for feeding gas to the mixing-chamber during the operation of the movable part to thoroughly mix the gas and air, substantially as described.

4. In a machine of the class described, the combination of an exterior casing providing an air-supply and liquid-sealing chamber, a rotatable part movably mounted in such sealing-chamber and provided with an air-measuring chamber or chambers, each of which is provided with a gas-inlet, and means for feeding gas into such air-measuring chambers during the rotation of the movable part, substantially as described.

5. In a machine of the class described, the combination of an exterior casing providing an air-supply and liquid-sealing chamber, an interior rotatable part providing a gas-supply and liquid-sealing chamber on its interior and a series of air-measuring chambers each having an inlet-opening communicating with such gas-supply chamber, means by which such movable part may be rotated, and means for sealing and opening the inlet-openings of the air-measuring chambers as the parts rotate, substantially as described.

6. In a machine of the class described, the combination of an exterior casing providing an air-supply and water-sealing chamber, an interior cylindrical rotatable receptacle providing an axial gas-supply and water chamber and a series of air-measuring chambers, each connected with the interior gas and water chamber and open at one end thereof to the air-supply, means by which such interior part may be rotated, a gas-supply pipe and a mixture-exhaust pipe connected with the interior of the rotatable part, substantially as described.

7. In a machine of the class described, the combination of an exterior receptacle providing an air-supply, and liquid-sealing chamber, an interior cylindrical receptacle providing an axial gas-supply and water chamber at one end and an axial mixture-exhaust chamber at the other end and a plurality of peripheral helical air-measuring chambers communicating with the gas-supply chamber and open at one end to the air-chamber and at the other end to the mixture-exhaust chamber, a gas-supply pipe connected with the gas-supply and water chamber, a mixture-exhaust pipe connected with the exhaust mixture-chamber, and means by which the rotatable receptacle may be operated to mix the air and gas, substantially as described.

8. In a machine of the class described, the combination of an exterior receptacle providing an air-supply and liquid-sealing chamber, a rotatable cylinder located therein having an inner cylindrical wall providing an axial gas-supply chamber at one end and an axial exhaust-chamber at the other end, an outer cylindrical wall secured to the inner wall, a plurality of helical blades interposed between both of such cylindrical walls and forming a series of helical air-measuring chambers opening at one end into the air-supply chamber and at the other end into the mixture-exhaust chamber, a series of perforations extending through the inner cylindrical wall forming a communication between each of the air-measuring chambers and the gas-supply chamber, a fixed gas-supply pipe entering the gas-supply chamber with its outlet above the liquid seal therein, and a fixed exhaust-pipe entering the mixture-chamber above the liquid seal, substantially as described.

9. In a machine of the class described, the combination of an exterior receptacle providing an air-supply and liquid-sealing chamber, a rotatable cylinder located therein having an inner cylindrical wall providing an axial gas-supply chamber at one end and an axial exhaust-chamber at the other end, an outer cylindrical wall rigidly secured to the inner wall, a plurality of helical blades interposed between both of such cylindrical walls and forming a series of helical air-measuring chambers opening at one end into the air-supply chamber and at the other end into the mixture-exhaust chamber, a series of perforations extending through the inner cylindrical wall forming a communication between each of the air-measuring chambers and the gas-supply chamber, a fixed gas-supply pipe entering the gas-supply chamber with its outlet above the liquid seal therein, a fixed exhaust-pipe entering the mixture-chamber above the

liquid seal, and a water-box on the walls of the exterior casing communicating with the liquid portion of the chamber and provided with liquid supply and overflow pipes, substantially as described.

10. In a machine of the class described, the combination of an exterior casing providing an air-supply and liquid-sealing chamber, a rotating cylinder mounted therein and provided with axial gas-supply and mixture-exhaust chambers and a series of helical peripheral air-measuring chambers, each communicating with the air-supply gas-supply and mixture and exhaust chambers, a shaft upon which such rotatable cylinder is mounted and by which it is moved extending out through the exterior casing, a supply-pipe for the gas-supply chamber, an exhaust-pipe for the mixture-exhaust chamber, and gear and weight mechanism connected with the rotatable supporting-shaft for the same, substantially as described.

11. In a machine of the class described, the combination of an outer casing provided with an air-inlet opening, an inner rotatable part provided with a mixing-chamber therein, a series of air-measuring chambers in such inner rotatable part each having an inlet-opening communicating with the air-inlet of the outer casing and an outlet-opening communicating with the mixing-chamber in such rotatable part, means for sealing and opening the inlet-openings of the air-measuring chambers, and means for admitting gas to the mixing-chamber, substantially as described.

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