

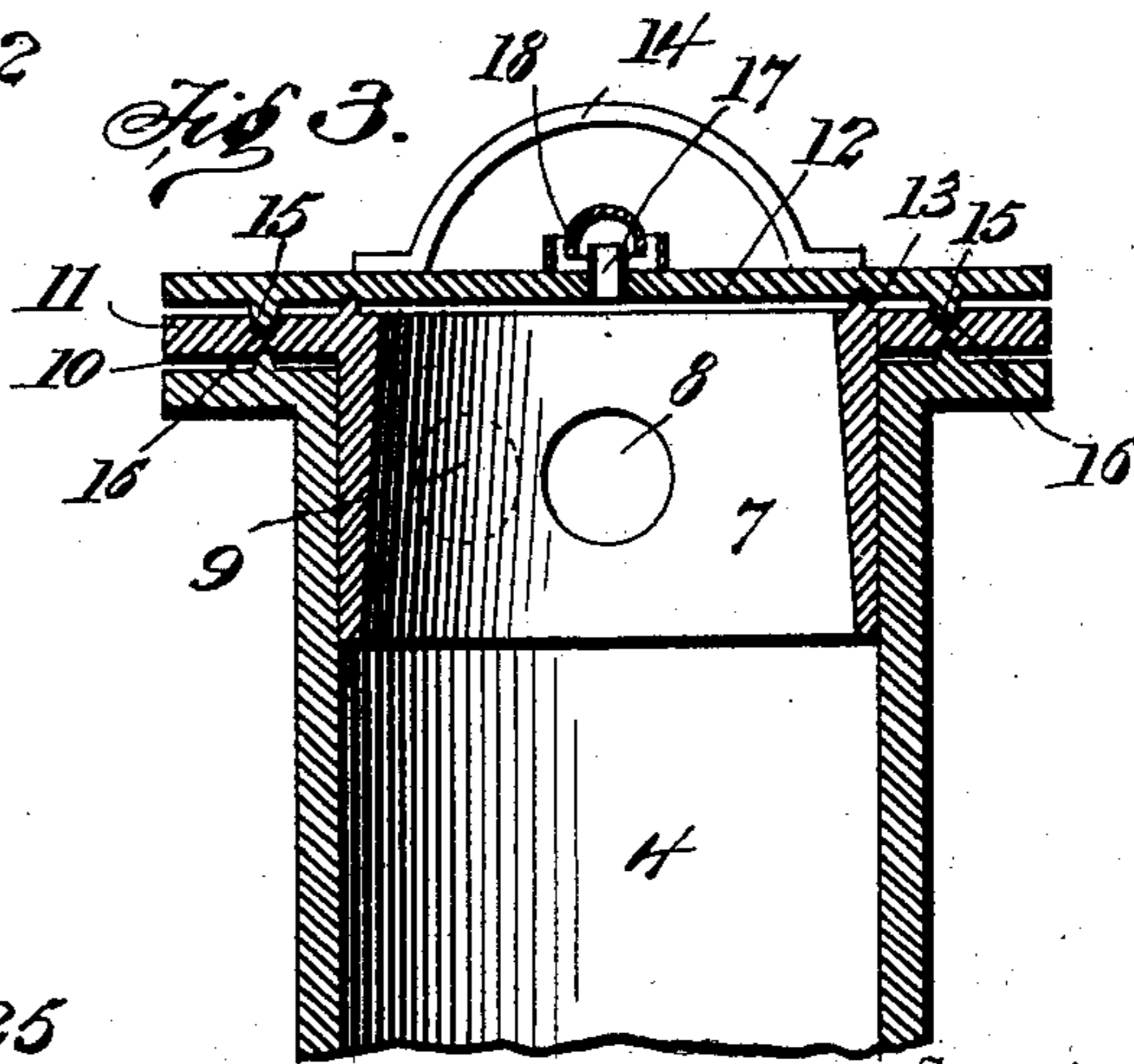
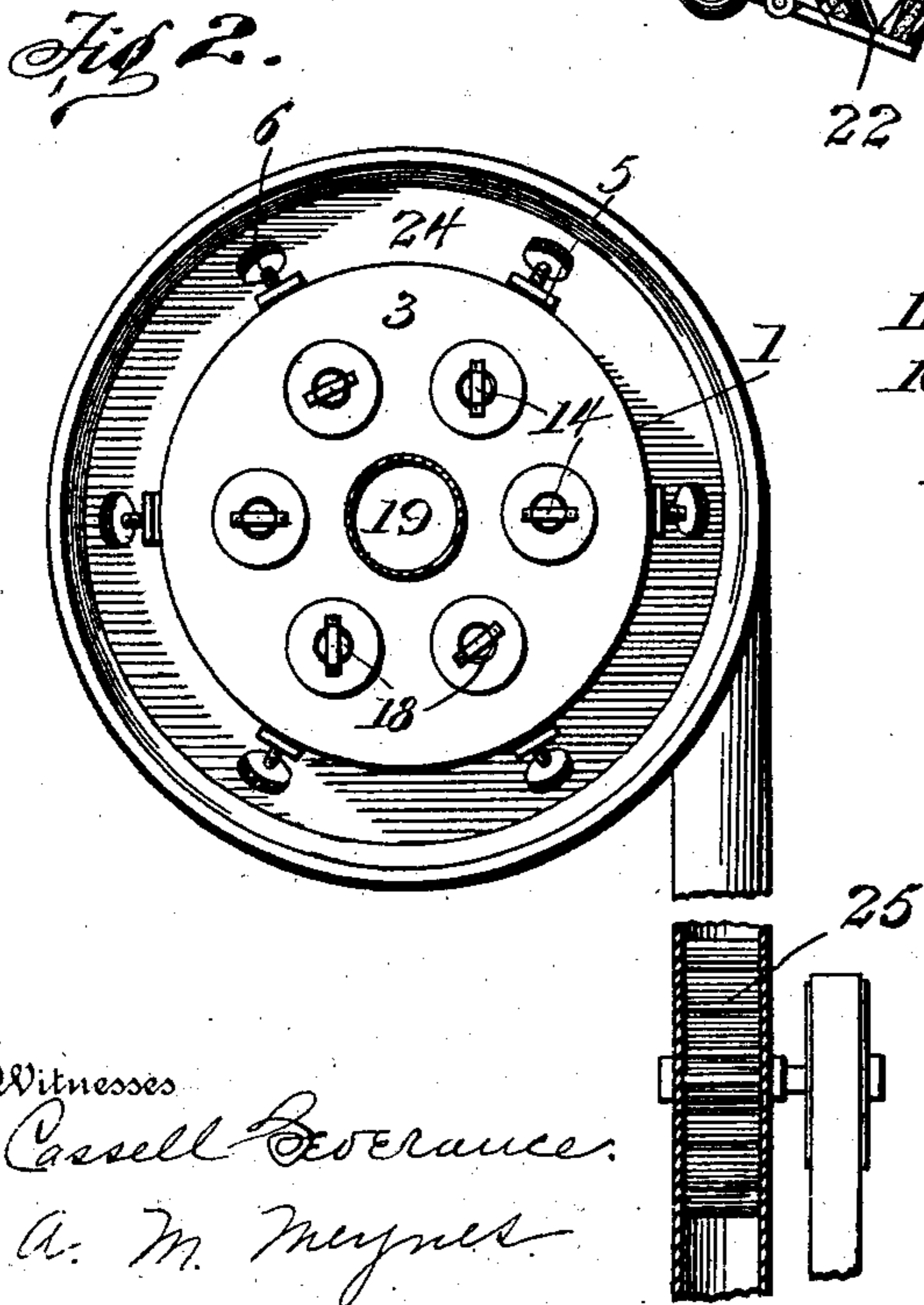
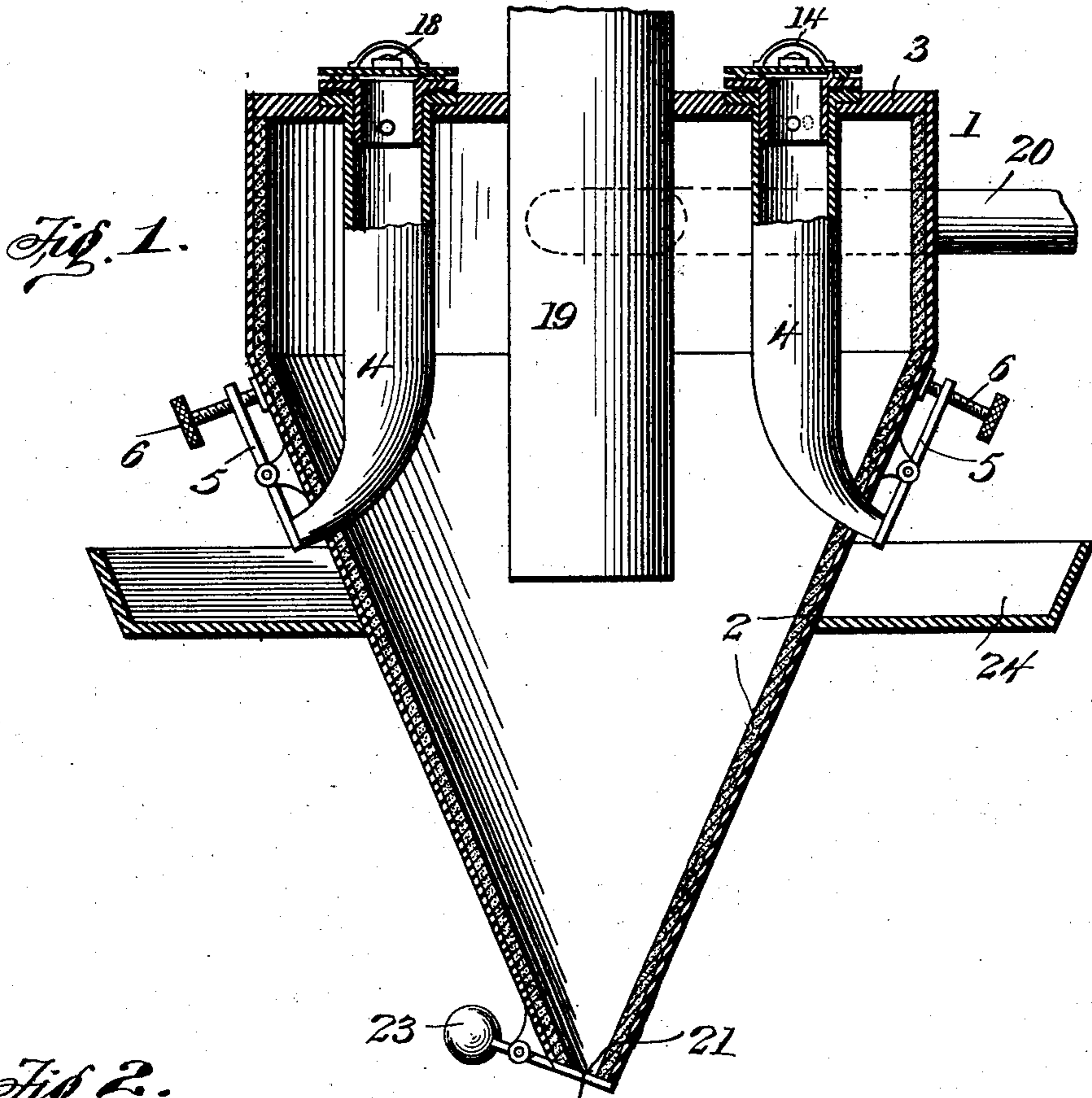
No. 694,024.

Patented Feb. 25, 1902.

A. P. O'BRIEN.
NITER OVEN.

(Application filed June 6, 1901.)

(No Model.)



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UNITED STATES PATENT OFFICE.

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NITER-OVEN.

SPECIFICATION forming part of Letters Patent No. 694,024, dated February 25, 1902.

Application filed June 6, 1901. Serial No. 63,445. (No model.)

To all whom it may concern:

Be it known that I, ANDREW P. O'BRIEN, a citizen of the United States, residing at Richmond, in the county of Henrico and State of Virginia, have invented certain new and useful Improvements in Niter-Ovens; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to improvements in niter-ovens, and particularly to that style of oven which is capable of collecting dust which may pass through the oven with the heating agency on its way to other parts of the apparatus with which the oven may be connected.

It consists in an oven formed in a cylindrical or cylindrical and conical shape, a series of niter pots or receptacles arranged in the said oven, and means for introducing the heating agent into the said oven, so that any dust or particles carried thereby will be given a whirling movement and so that the said dust or foreign particles may be collected in the bottom of the oven and will not pass out of the same with the blast or draft which carries the gases from the oven.

It also consists of a niter-oven formed of a suitable shape and having a series of niter-pots arranged therein, the tops of which project through the top of the oven, while the lower ends extend through the lower walls of the oven, means for closing the lower ends of the niter-pots, and a niter-cake pan arranged about the oven below the outlets of the said niter-pots for receiving the contents thereof from time to time.

It also consists in certain other novel constructions, combinations, and arrangements of parts, as will be hereinafter fully described and specifically claimed.

In the accompanying drawings, Figure 1 represents a vertical central cross-section through a niter-oven constructed in accordance with the present invention. Fig. 2 is a top plan view of the same. Fig. 3 is an enlarged detail sectional view through the upper end of one of the niter-pots.

In connection with certain metallurgical operations—as, for instance, the production of sulfuric acid, in which the initial step of the process consists in roasting certain ores,

as sulfur compounds or pyrites—it is common to use means in connection therewith for producing nitric acid, the nitrate of soda or the nitrate of potassium being placed in what are known as “niter-pots,” together with sulfuric acid, and heated by means of sulfur dioxid (SO_2) as it passes from the roasting-furnace, the same being applied to the niter-pots by means of an oven, the said sulfur dioxid passing from the said oven to a Glover's tower or denitrificator and other chambers of the apparatus. The nitric acid is thus produced in the niter-pots in a gaseous state and passes out of the oven, together with the sulfur dioxid, on its way to the Glover's tower. The great difficulty with this kind of apparatus heretofore has been that in burning pyrites, especially of fine ore, great quantities of fine “fine-dust,” so called, is carried along by the draft, and this dust is found to be very injurious to the proper working of the Glover's tower, so much so, in fact, that some manufacturers have ceased using fine ore and use the more expensive lump ore or brimstone. By the present invention this injurious dust can be automatically collected and removed from the draft coming from the furnaces and passing through the niter-oven, so that the same cannot enter the Glover's tower. The flow of heated sulfur dioxid can, however, be used to heat the niter-pots and produce the nitric acid.

This invention also provides superior means for taking care of the sodium sulfate or niter cake which is produced in the niter-pots, forming the chief residue of the chemical action taking place therein.

In employing my invention in practical form I construct the niter-oven of a suitable casing of metal, lining the same with brick or other material, as at 2. The oven is preferably of a conical shape for about two-thirds of its length at its lower end, the remaining one-third being preferably cylindrical. The oven is closed at the top by a suitable cover or top plate, as 3. Arranged within the oven are a series of niter-pots, which preferably project through the wall of the oven—say about one-half way down the same. The lower ends of the niter-pots are formed with discharge-openings, which are adapted to be closed by gates or valves,

which are pivoted to the oven and are held in their closed positions by adjusting-screws 6 6. The construction of the upper ends of the niter-pots, together with the covers for closing the same, forms an important feature of the invention. In the upper end of each niter-pot a flanged sleeve, as 7, is located, which extends some little distance into the top of the pot and is formed with an opening, as 8, which may be brought to correspond with the corresponding opening 9, formed in each niter-pot. By turning the sleeve this opening may be closed or opened, according as the aperture 8 is brought into or out of coincidence with the aperture 9. An annular rib or knife-edge, as 10, engages the under side of flange 11 of said sleeve, forming therewith a gas-tight joint. Resting upon the top of the sleeve or collar 7 is a cover 12, which engages an annular flange or knife-edge 13 upon the upper edge of the sleeve 7, so as to form therewith a gas-tight joint. The cover 12 is formed with a handle 14, by which the cover may be turned or lifted from position. Upon the under side of the cover 12 are arranged dowel-pins 15 15, which engage correspondingly-formed recesses 16 16 in the horizontal flange of the sleeve 7. Through the agency of these dowel-pins the sleeve 7 may be rotated in the top of the niter-pot by turning the cover 12. When the niter-pot has been charged and nitric-acid gas is being evolved therein, the sleeve 7 is turned so that the aperture 8 coincides with the aperture 9, and the gas is permitted to escape into the oven.

When it is desired to open the niter-pot and insert a new charge therein, the cover 12 is first turned so as to move the sleeve 7 and remove the aperture 8 from the aperture 9 for closing the outlet for the gas into the said oven. The gas and sulfur dioxide passing through the oven will thus be prevented from escaping through the open top of the niter-pot and a new charge may be inserted at the top of the pot. The residuum in the niter-pot may be discharged therefrom at any time by opening the gates or valves 5.

The covers 12 12 are preferably formed with inlet-openings, as 17, which are guarded by means of lutes 18. The acid which is to act upon the nitrate of sodium and nitrate of potassium in the niter-pots may be inserted through said luted openings in the cover by means of a hose or tube from any suitable reservoir from time to time as required. The gas in the niter-pots, however, cannot escape through said openings on account of the guarding-lutes. Entering the top of the niter-oven 1 is an outlet-tube 19, which projects some little distance into the said oven, preferably more than one-half way down the same. The outlet passes out through the center of the top 3 and leads to a Glover's tower, Gay-Lussac tower, or other chambers of the apparatus in connection with which the niter-oven is used for conveying the nitric-acid gas and sulfur dioxide from the said oven.

The sulfur dioxide for heating the niter-pot in the oven is introduced into the oven from the roasting-furnace by means of a pipe 20, which enters the said oven tangentially at a point near the top of the oven, or at least at a considerable distance above the lower open end of the exit-pipe 19. The sulfur dioxide thus entering the oven will receive a whirling movement, passing around the inner periphery of the oven a number of times before it can reach the inverted mouth of the exit-pipe. By this means the injurious dust entering with the sulfur dioxide will be collected in the oven and will drop to the lower end thereof, so as to be entirely separated from the heating-gases passing through the oven. The lower end of the oven is preferably provided with an outlet-opening, as at 21, which is closed by a weighted gate or valve 22. The weight 23, secured to the said valve, normally holds the same in its closed position. This valve may be operated at any time for discharging the dust and foreign substances which collect in the bottom of the niter-oven. Arranged outside the niter-oven and below the open discharge ends of the niter-pots 4 4 is a niter-cake pan 24, which is made of a suitable size to receive the discharge of sodium sulfate from the niter-pots. This sodium sulfate is in liquid form when the niter-pots are being heated and readily flows out of the lower ends of said pots when the gates 5 are opened. In order to force the sulfur dioxide through the pipe 20 into the oven 1, a fan or other blast-producing mechanism, as 25, may be located at a suitable point in the said pipe 20.

From the above description it will be observed that my apparatus is well adapted for use in depriving the sulfur dioxide coming from roasting-furnaces on its way to a Glover's tower or other apparatus of the injurious dust which is commonly carried thereby and that the dust will be automatically collected therefrom and may be removed from the oven from time to time. When the weight of the dust in the oven exceeds the weight of the counterbalance 23, the valve or gate 22 will be automatically opened for discharging the dust from the oven. The construction of the niter-pots is also advantageous, since the heat of the sulfur dioxide can be utilized to produce nitric acid, the said heat and acid gas being prevented from escaping from the oven when it is necessary to recharge the niter-pots and the nitric-acid gas being permitted to escape from the niter-pots into the oven when the soda in the pots is being treated with sulfuric acid.

The apparatus will also be seen to be admirably adapted for taking care of the niter cake or sodium sulfate produced in the niter-pots by the action of the sulfuric acid on the soda. When the niter-pots are heating in the carrying out of this process, it is common in the niter-pots heretofore used for the sodium sulfate to boil over, and when the niter cake or sodium sulfate is allowed to

remain in the ovens heretofore used it will harden like cement and require the shutting down, at least temporarily, of the whole works to remove the same. Any such difficulty is obviated by the present construction, since the niter cake is permitted to run while in a liquid condition from the niter-pots into the niter cake pan 24 outside the oven. The niter cake can thus never interfere with the use and operation of the oven and the niter-pots.

It will be observed that minor changes in the construction of the apparatus may be made without departing in the least from the spirit of my invention.

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

1. A niter-oven comprising a casing having an inlet and an outlet pipe, one or more niter-pots arranged in said oven projecting at their lower end or ends through the walls of the said oven, and means for opening or closing communication between the niter pot or pots with the interior of the oven, substantially as described.

2. A niter-oven comprising a casing for receiving heated products from ore-roasting furnaces, an outlet-pipe leading from the said oven, a series of niter-pots arranged in the oven and projecting through the top thereof at their upper ends while their lower ends project through the said walls of the oven, means for closing both ends of the niter-pots, and means for collecting the residue discharged from said niter-pots, substantially as described.

3. A niter-oven comprising a casing having a conical portion projecting to an outlet-opening, niter-pots arranged within the oven, means for introducing a blast of heated products from a roasting or other furnace tangentially into the said oven whereby the niter-pots will be heated and dust or other injurious particles may be removed by centrifugal force and gravity from the said blast, and an outlet-pipe leading from said oven, substantially as described.

4. A niter-pot and dust-collector comprising a casing formed with a conical lower portion, and having a discharge-opening at its lower end, an outlet-pipe for introducing heated gases from a roasting-furnace in a tangential manner into said oven near its upper end, an exit-pipe extending into the oven from the top and to a considerable distance below the inlet-opening whereby the dust brought in by the blast into the inlet-opening can be separated therefrom and collected in the bottom of the oven, and niter-pots so arranged as to extend for the greater portion of their length through the said ovens whereby they are subjected to the heat of the incoming blast, substantially as described.

5. A niter-oven comprising a casing and a series of niter-pots arranged therein, sleeves

at the upper ends of the niter-pots having openings coincident with the openings in the walls of the said niter-pots, covers for closing the said pots and resting upon the said sleeves, and means for regulating the flow of the residuum from the lower ends of the said niter-pots, substantially as described.

6. A niter-oven comprising a casing partially cylindrical and partially conical, niter-pots extending from the top of the oven and projecting at their lower ends through the walls of the conical portion of the oven, valves or gates secured to the oven-casing and adapted to close the discharge ends of the niter-pots, adjusting-screws for holding the said valves in their adjusted positions, means at the upper ends of the said pots for opening or closing communication between the interior of the pots and the interior of the oven, substantially as described.

7. A niter-oven comprising a casing, a series of niter-pots arranged therein, a sleeve movably mounted in the upper end of each niter-pot and provided with an aperture registering with an aperture in the wall of each niter-pot, a cover resting upon the sleeve and provided with dowel-pins adapted to engage recesses in the flange of the said sleeve whereby the sleeve may be turned by turning the cover, sealing-ribs introduced between the upper ends of the niter-pots and the flanges of the said sleeves, and between the sleeves and the covers for preventing the escape of gas at these points, and luted openings in the covers of the niter-pots whereby liquids may be introduced into the said pots without the escape of gas therefrom, substantially as described.

8. A niter-oven comprising a casing, a series of niter-pots arranged therein adapted to receive nitrate of sodium or nitrate of potassium and sulfuric acid for producing nitric acid, the lower ends of the said pots extending through the walls of the oven, a niter-cake pan arranged around the oven below the discharge ends of the said pots for receiving the niter cake therefrom, said oven operating to apply the heat necessary to the said pots for the carrying out of the process going on therein, substantially as described.

9. A niter-oven comprising a casing having a conical portion, a series of niter-pots arranged within the casing, extending through the top thereof and having a tapering outlet projecting through the conical sides thereof, means for closing the projecting ends of the niter-pots, and means for introducing a blast of heated products from a roasting or other furnace into said oven, whereby the niter-pots will be heated, substantially as described.

In testimony whereof I hereunto affix my signature in presence of two witnesses.

ANDREW P. O'BRIEN.

Witnesses:

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J. W. GOODE.