

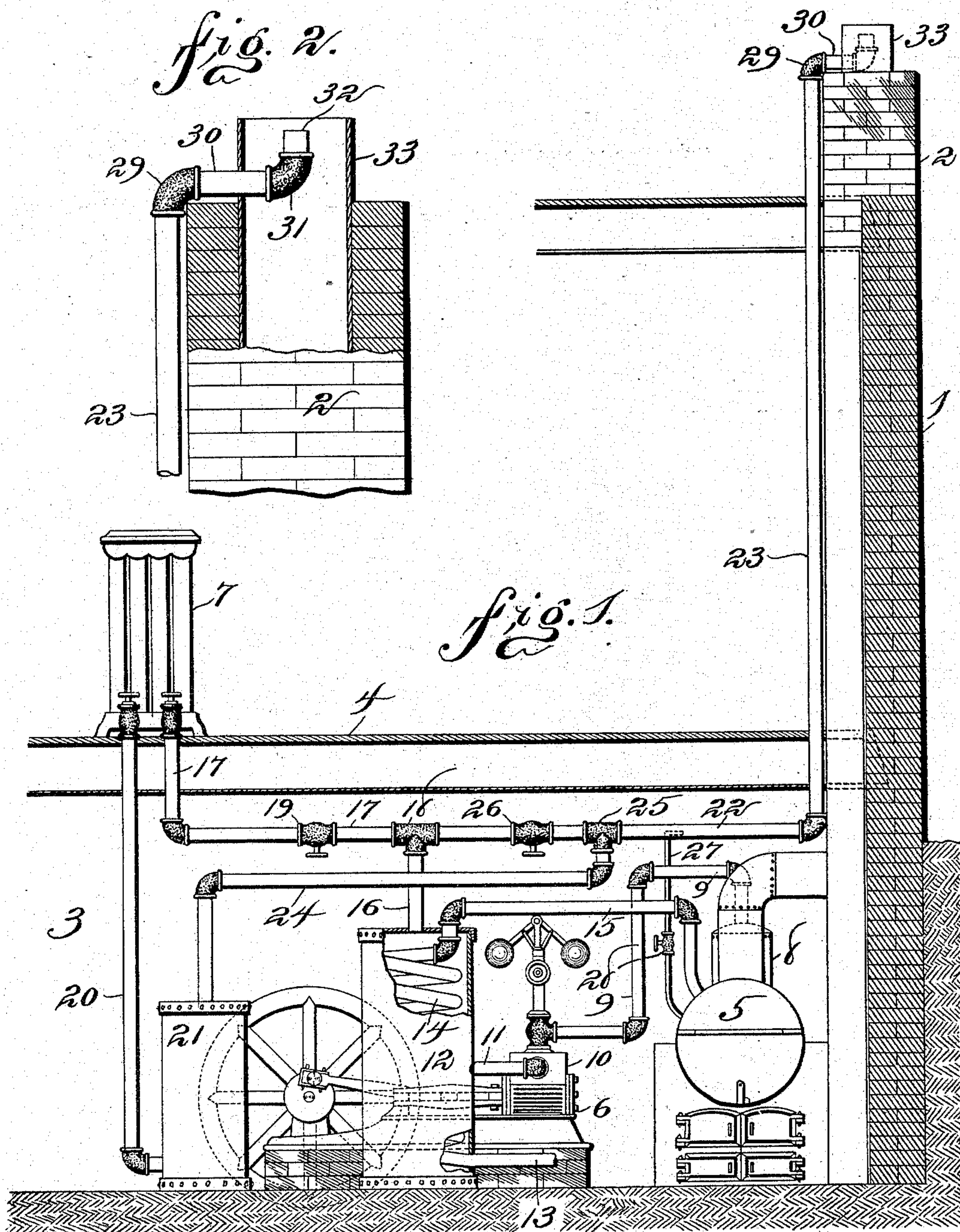
(No Model.)

2 Sheets—Sheet 1.

J. T. SANDS.  
APPARATUS FOR BLEACHING SMOKE.

No. 526,542.

Patented Sept. 25, 1894.



Witnesses:  
W. J. Sankey,  
M. P. Smith.

Inventor:  
James T. Sands,  
by Higdon Higdon Longan  
Attys



(No Model.)

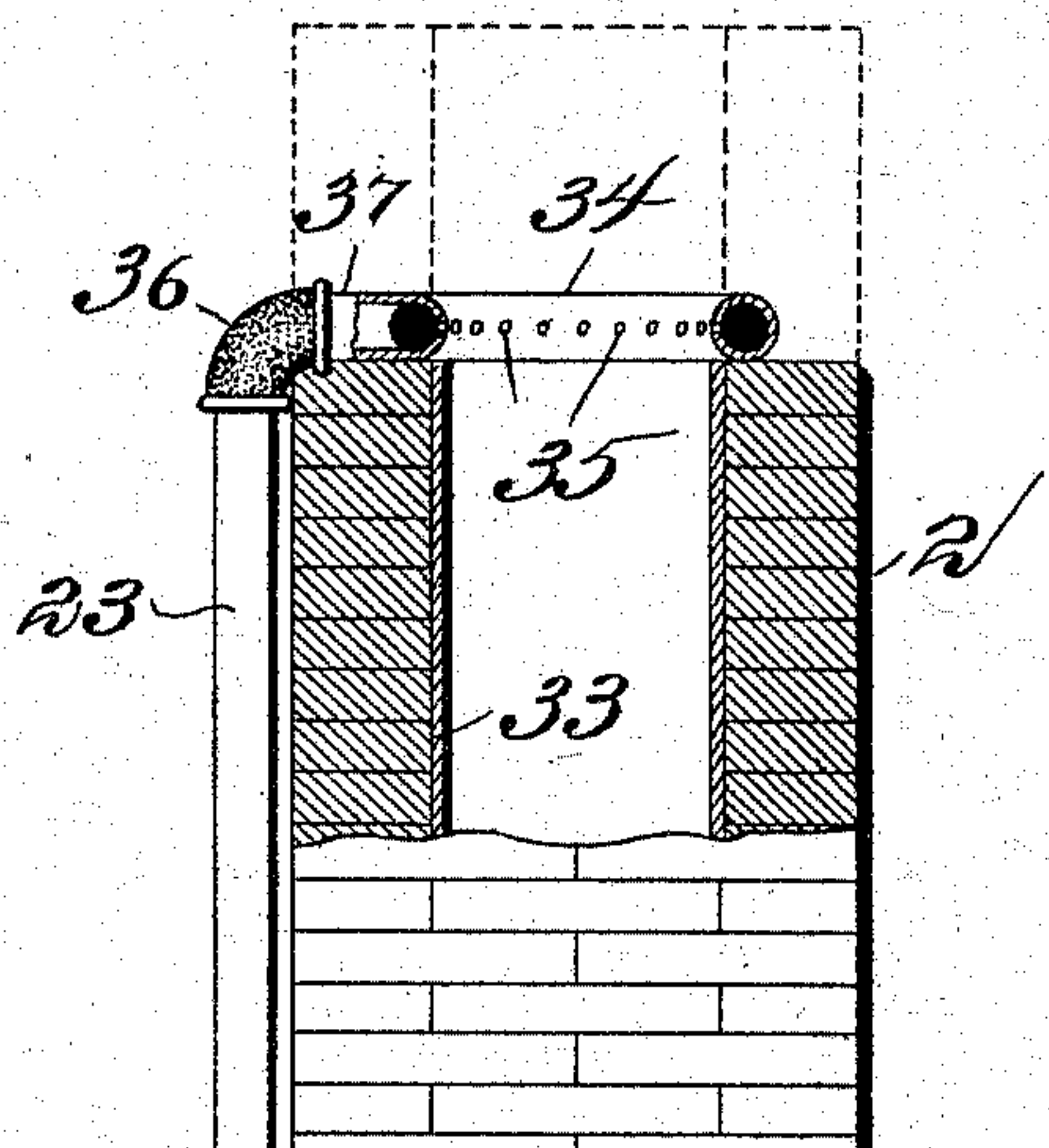
2 Sheets—Sheet 2.

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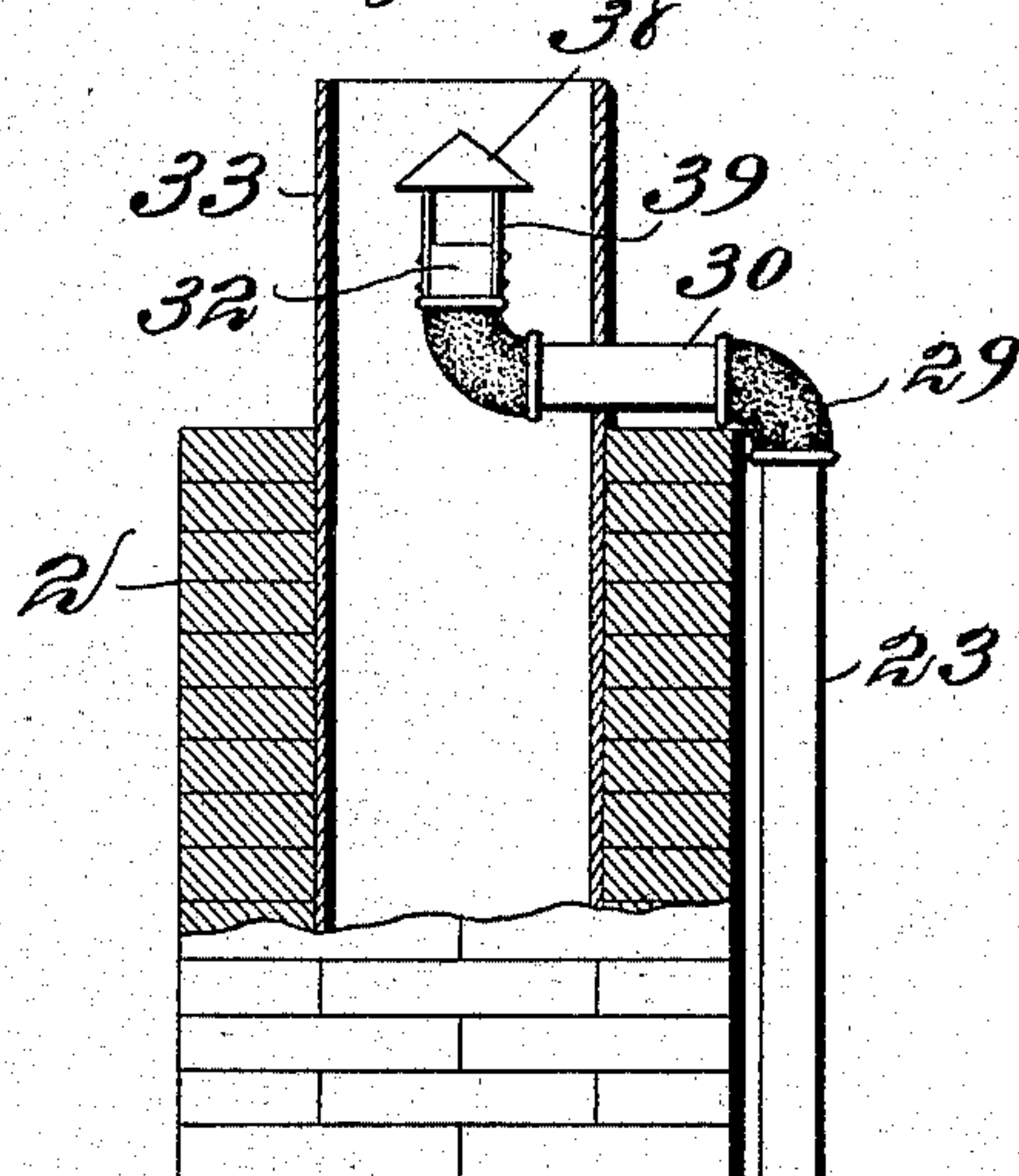
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*fig. 3.*

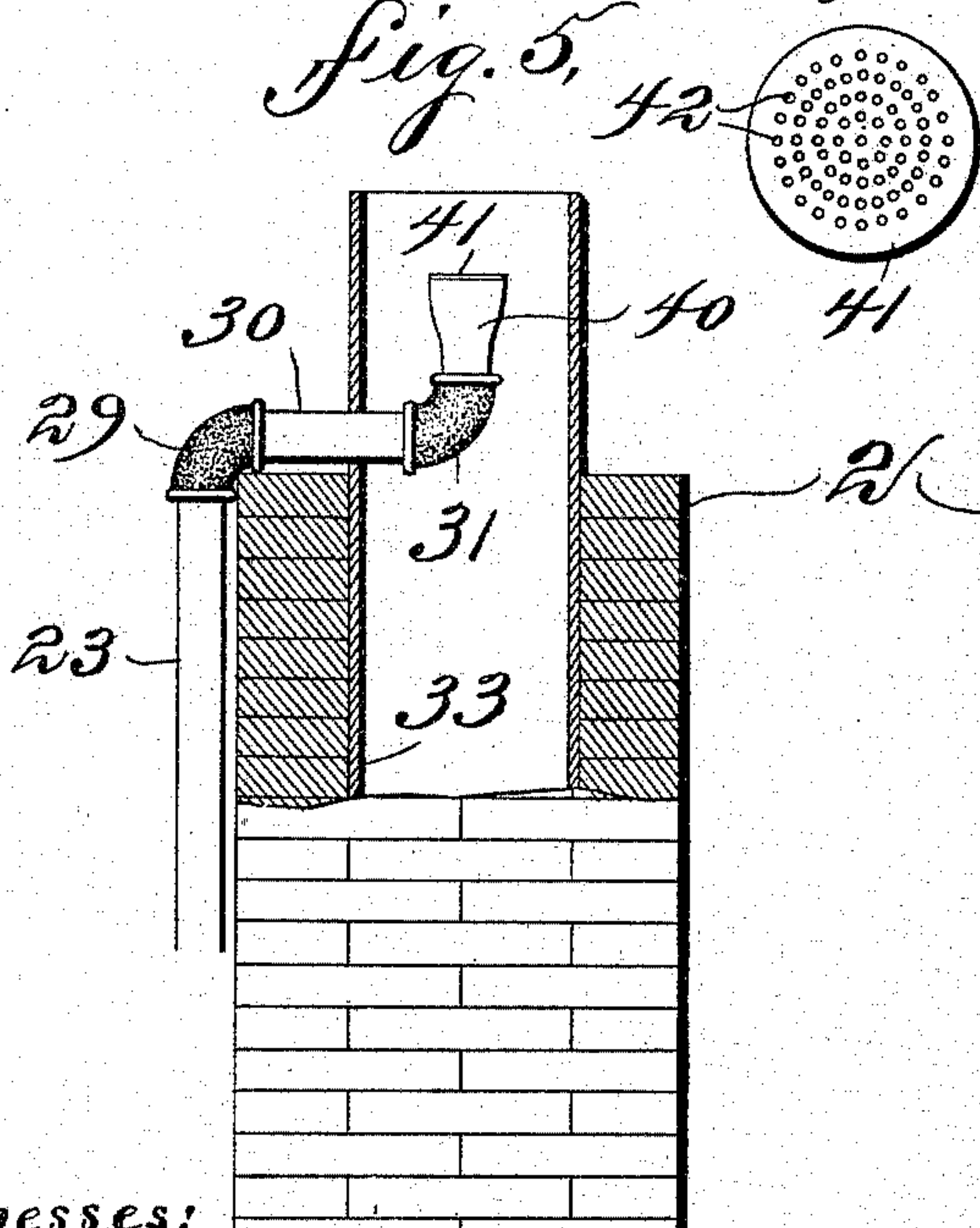


*fig. 4.*

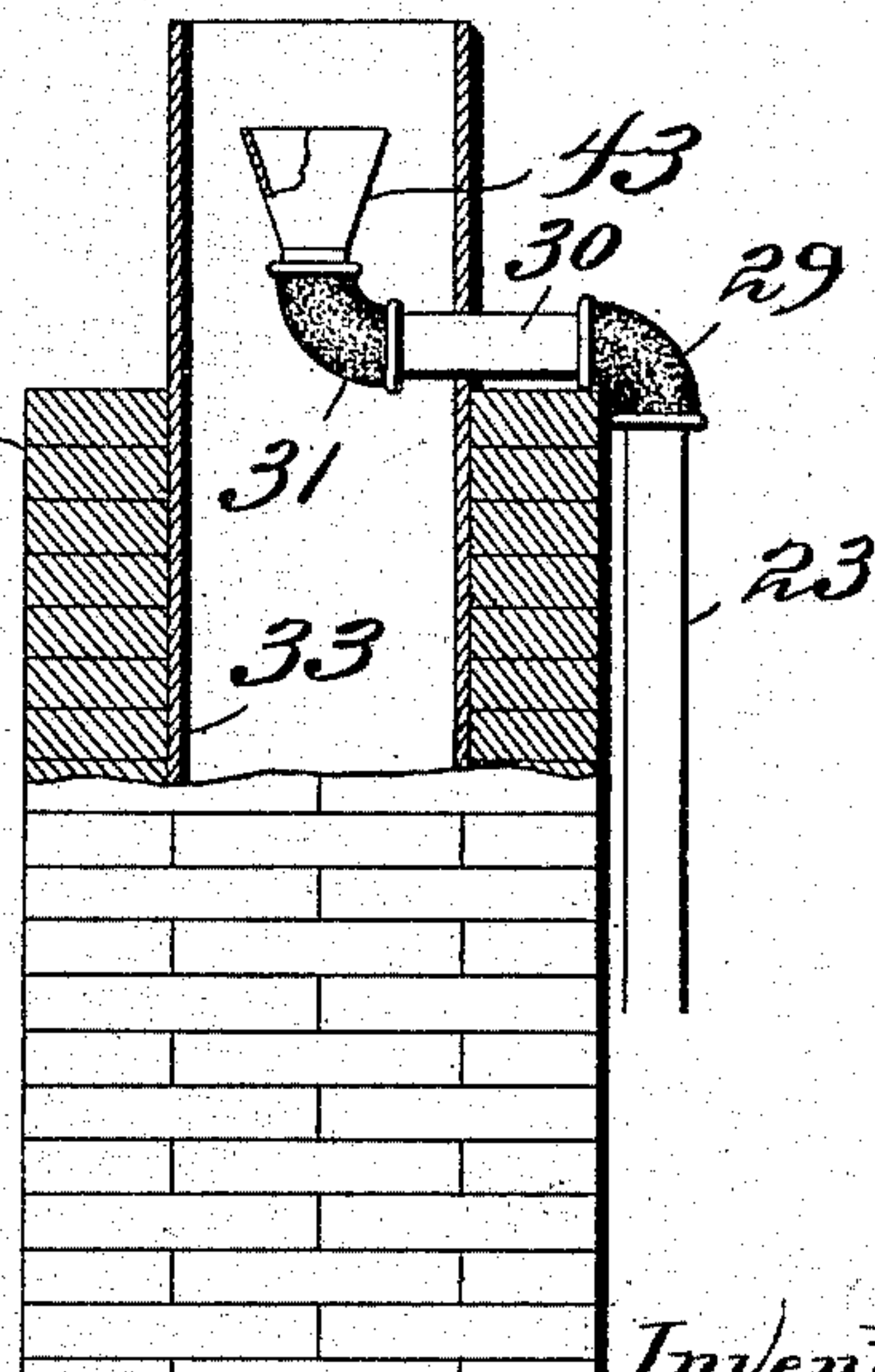


*fig. 6.*

*fig. 5.*



*fig. 7.*



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# UNITED STATES PATENT OFFICE.

JAMES T. SANDS, OF ST. LOUIS, MISSOURI.

## APPARATUS FOR BLEACHING SMOKE.

SPECIFICATION forming part of Letters Patent No. 526,542, dated September 25, 1894.

Application filed March 5, 1894. Serial No. 502,321. (No model.)

*To all whom it may concern:*

Be it known that I, JAMES T. SANDS, of the city of St. Louis, State of Missouri, have invented certain new and useful Improvements in Apparatus for Bleaching Smoke, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part hereof.

My invention relates to an improved apparatus for bleaching smoke, and consists in the novel construction, combination and arrangement of parts hereinafter described, designated in the claim, and illustrated in the accompanying drawings, in which—

Figure 1 is a diagrammatic view, showing the manner in which my improved smoke bleacher is connected with the steam supply. Fig. 2 is a side elevation of a portion of a chimney having a portion of its upper end in section, and showing the manner in which the pipe discharges therein. Figs. 3, 4, 5 and 7 are similar views to that of Fig. 2, but showing modified forms of the manner in which the smoke is discharged into the upper end of the chimney. Fig. 6 is a plan view of the upper end of the truncated pipe illustrated in Fig. 5.

The object of my invention is to locate a pipe in such a manner that it will discharge steam that is forced through it immediately into the smoke at the upper end of the chimney, where the smoke is the coolest.

Referring to the drawings: The numeral 1 designates a portion of a building; 2, the chimney; 3, the engine room; 4, the floor above said engine room; 5, the boiler; 6, the steam engine, and 7 the radiator, which is located on the upper surface of the floor 4. Connected to the steam-dome 8 of the boiler 5 is a pipe 9, which leads to the steam-chest 10 of the engine 6, and an exhaust pipe 11 leads from said steam-chest to and discharges into the water heater 12.

13 indicates a pipe which leads from the pump to the heater 12 and connects with a coiled pipe 14, which is located within said heater, and the upper end of said coil is en-

gaged by a pipe 15 which leads to the boiler 5. By the construction of this heater 12 the exhaust steam is discharged from the engine into said heater and heats the coil 14 which causes the water as it passes through the pipe 13 and said coil to be heated before it reaches the boiler 5.

Connected to the upper end of the heater 12 is a pipe 16, which is connected to a pipe 17 by a T-coupling 18, and said pipe 17 is constructed with a valve 19 and leads to the steam radiator 7.

20 indicates a pipe which leads to and discharges into the lower end of the vapor tank 21.

22 indicates a pipe, one end of which is connected to the T-coupling 18 and the other end is engaged by a vertical steam-supply pipe 23, which leads to the upper end of the chimney 2.

24 indicates a pipe which leads from the vapor tank 21, and is connected to the pipe 22 intermediate its ends by a T-coupling 25. Located on the pipe 22 between the T-couplings 25 and 18 is a valve 26.

27 designates a pipe which leads from the boiler to the pipe 22, and said pipe 27 is a suitable amount smaller than the pipe 22 so that it can project into said last mentioned pipe toward the lower end of the pipe 23. This pipe 27 is constructed with a valve 28, so that the flow of steam through said pipe can be regulated.

The pipe 23 is of sufficient length that the upper end will be approximately in horizontal alignment with the upper end of the chimney, and the upper end of said pipe is constructed with an elbow-coupling 29, so that the pipe 30, which is engaged thereby, will project over the chimney and adjacent thereto. Said pipe 30 is of such a length that the elbow-coupling 31, which is engaged thereby, will be approximately in the center of the chimney, and said coupling 31 is engaged by a short vertical pipe 32, so that the steam discharged therefrom will project upward from the chimney.

The chimney illustrated in the drawings is



constructed with an inner lining 33 which projects a distance above the upper end of the pipe 32. By this construction the steam will be discharged from the pipe 32 into the lining 33.

I desire to state that the location of the discharge pipe is not an essential feature of my invention, for it can be located in such a manner that the steam will be discharged above the lining, or a greater distance below the upper end than is shown in the drawings.

Referring now to Figs. 3, 4, 5, 6, and 7, the numeral 2 designates the chimney and 33 the inner lining thereof.

In Fig. 3 I have shown an annular pipe 34 which is located upon the upper end of the chimney and approximately the same size in diameter as the inner lining 33. Said pipe 34 is constructed with a series of apertures 35 which are so formed that a jet of steam therefrom will project across the upper end of the chimney. The steam-supply pipe 23 is connected to the annular pipe 34 by an elbow-coupling 36, a suitable projection 37 being formed on said annular pipe to allow the coupling to be connected thereto.

In Fig. 4 the construction of the pipes are substantially the same as those illustrated in Fig. 2, with the exception that the pipe 32 is provided with a conical cover 38 supported a distance above the upper end thereof by braces 39.

The construction illustrated in Fig. 5 is substantially the same as that illustrated in Fig. 2, with the exception that a truncated pipe 40 is connected to the elbow-coupling 31. The upper end of said pipe 40 is the largest and provided with a cover 41 having a series of perforations 42 therein. The object of having the upper end of this pipe made larger and provided with a perforated cover is to allow the steam to spread and be discharged from the pipe in jets so the smoke will easily commingle therewith.

In Fig. 7 the elbow-coupling 31 is engaged by a conical-shaped pipe 43, the upper end being the largest so the smoke can spread somewhat before it leaves said pipe, thus causing it to more readily commingle with the smoke.

The operation is as follows: The valve 26 being closed and the valve 19 open, exhaust steam discharged from the engine will pass through the pipe 11 into the heater 12, which will heat the water as it passes through the coil 14 from the pump to the boiler 5, thus partially heating the water before it reaches said boiler. After the steam leaves the heater 12, it passes through the pipes 16 and 17 into the radiator 7, and after it leaves said radiator it passes through the pipe 20 into the vapor tank 21, and from said vapor tank through the pipe 24 into the pipe 22, and from said pipe 22 is conveyed to the upper end of the chimney by the pipe 23, and the upper end of said pipe 23 is so constructed that steam dis-

charged therefrom will commingle with the smoke as it is discharged from the chimney.

By the arrangement of pipes just mentioned, the exhaust steam from the engine can be utilized for heating purposes, and then conveyed to the upper end of the chimney and discharged in such a manner that it will commingle with the smoke.

I have found by practical experience that steam discharged into the chimney adjacent the upper end will commingle with the smoke as it is discharged from said chimney and to the eye of the observer causes it to appear of a lighter color, and apparently bleach the same, which will overcome the black smoke ordinances of cities. The discharge of hot vapor or wet steam closely adjacent the upper end (and interior) of the chimney causes a down-draft or reverse-current of cold air, which enters the top of the chimney and mingles with the hot vapor or wet steam at such point and condenses the steam in a great measure, both before and after it has united with the floating or flying particles of carbon of the smoke, and the water thus formed and the particles of carbon thus taken up by said water, are formed into drops of liquid of such size and weight that they are immediately gravitated to the bottom of the chimney, and resemble drops of black ink which are so large that they cannot be vaporized by the heat of the chimney until after they fall. I have also found in some instances that where the exhaust steam is used for heating purposes that the discharge from the pipe 32 is not sufficient to overcome the black smoke at all times, especially when there has been a great amount of fresh fuel applied to the fire, which, it is well known, will cause a great amount of black smoke. To supply the required amount of steam at this time, I have constructed a pipe 27 which leads directly to the pipe 22 and projects thereinto, and is bent at right angles so that a jet of steam discharged therefrom will project toward the pipe 23. This pipe 27 is provided with a valve 28 so that the flow of steam from the boiler into said pipe 22 can be regulated.

As illustrated in the drawings, the elbow-coupling 31 projects upward so that the steam discharged from the pipe 32 will project upward. I desire to state that this coupling can be turned down, so that the steam discharged therefrom will project down and meet and commingle with the smoke as it passes out through the chimney. I have also found by practical experience that on some chimneys the device works to better advantage with the exhaust end adjacent the top, while in other chimneys a better result is obtained by having the exhaust end of the pipe a distance below the upper end of the chimney. This operation depends greatly on the size, height and draft of the chimney, as there are very few chimneys with the same



draft. Therefore, the device can be adjusted relative to the top of the chimney to correspond with the draft thereof.

What I claim is—

5 The combination in a device for bleaching smoke, of a steam pipe leading from a suitable steam-supply to a chimney a distance below the upper end thereof, another steam pipe connected to the upper end of said first  
10 mentioned pipe for conveying the steam into

the chimney, and a jet-discharging steam pipe connected to said last mentioned pipe for forcing and guiding the steam upward, substantially as set forth.

In testimony whereof I affix my signature in 15 presence of two witnesses.

JAMES T. SANDS.

Witnesses:

W. J. SANKEY,  
JNO. C. HIGDON.