

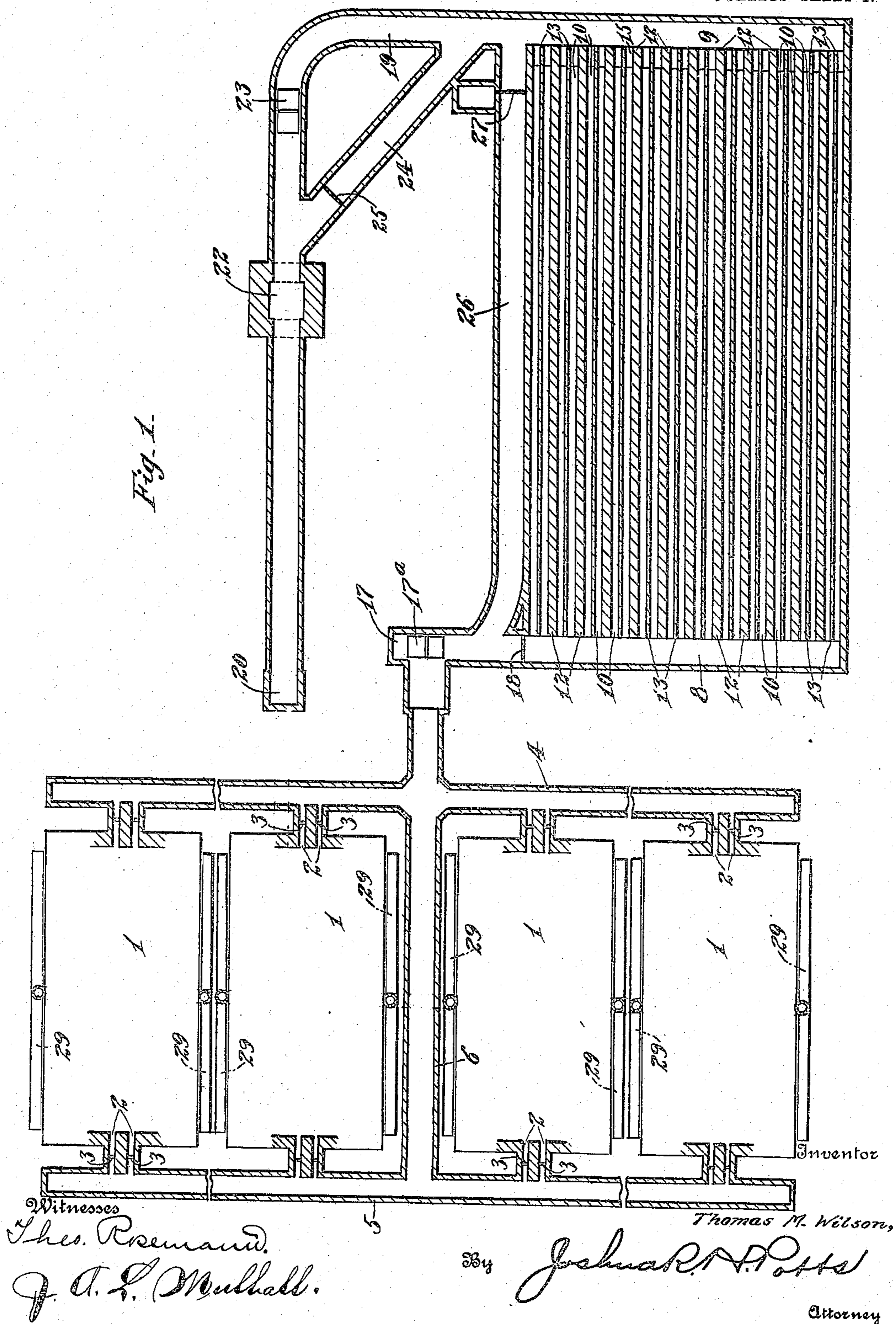
T. M. WILSON.  
DRIER.

APPLICATION FILED FEB. 20, 1909.

Patented Aug. 10, 1909.

6 SHEETS—SHEET 1.

930,587.



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DRIER.

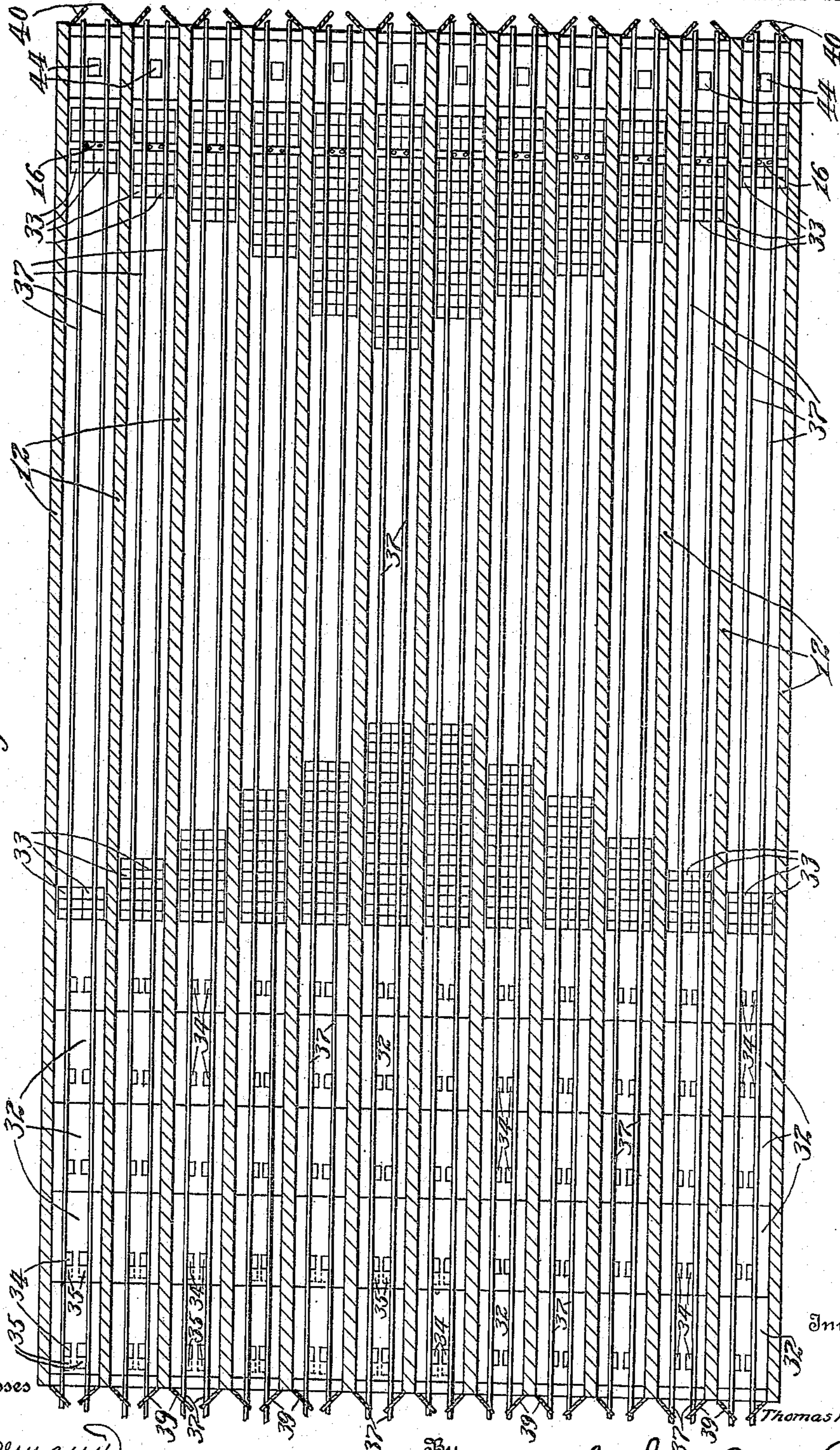
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6 SHEETS—SHEET 2.

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Fig. 2.



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6 SHEETS—SHEET 3.

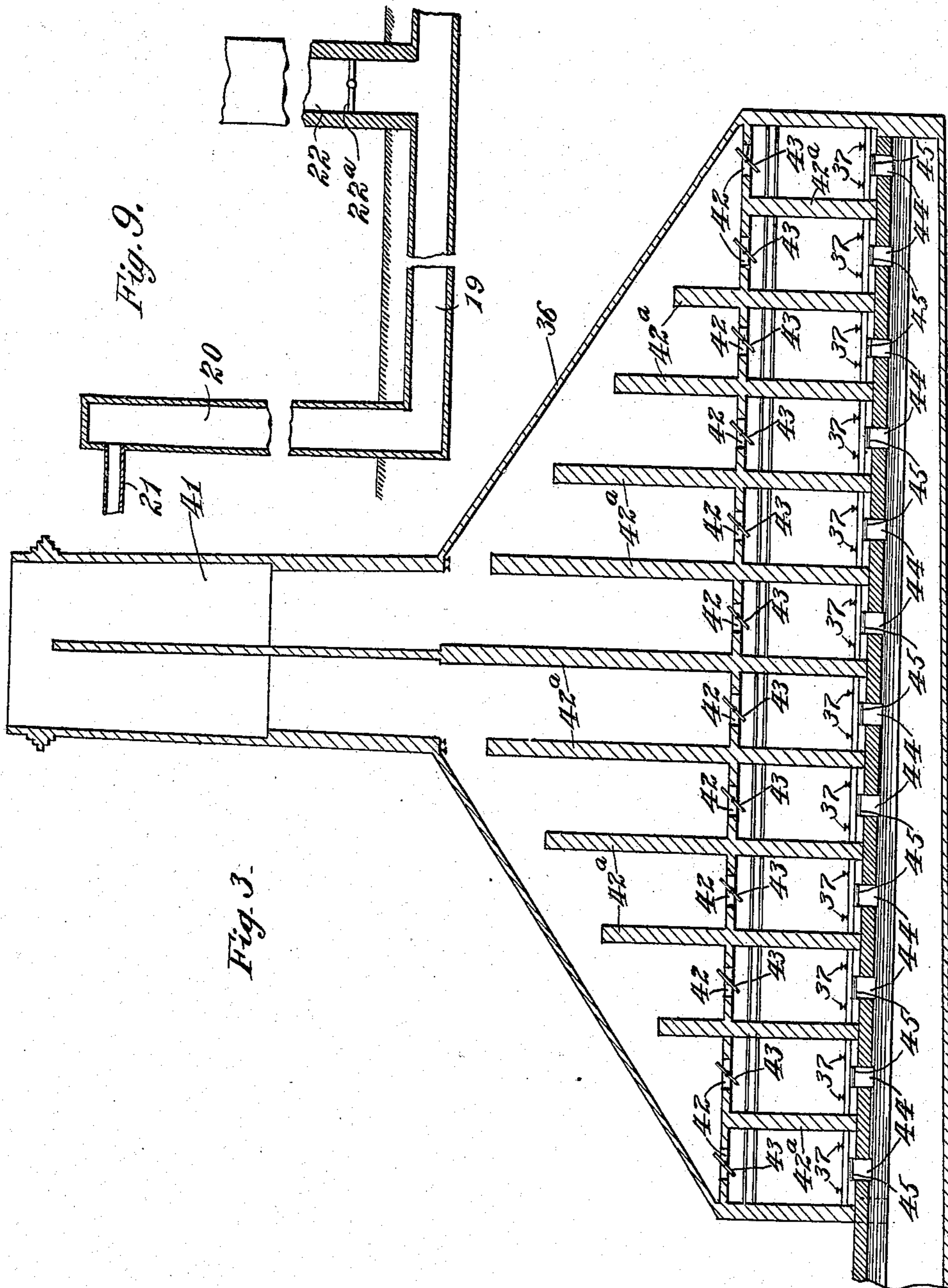


Fig. 3.

Fig. 9.

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6 SHEETS—SHEET 4.

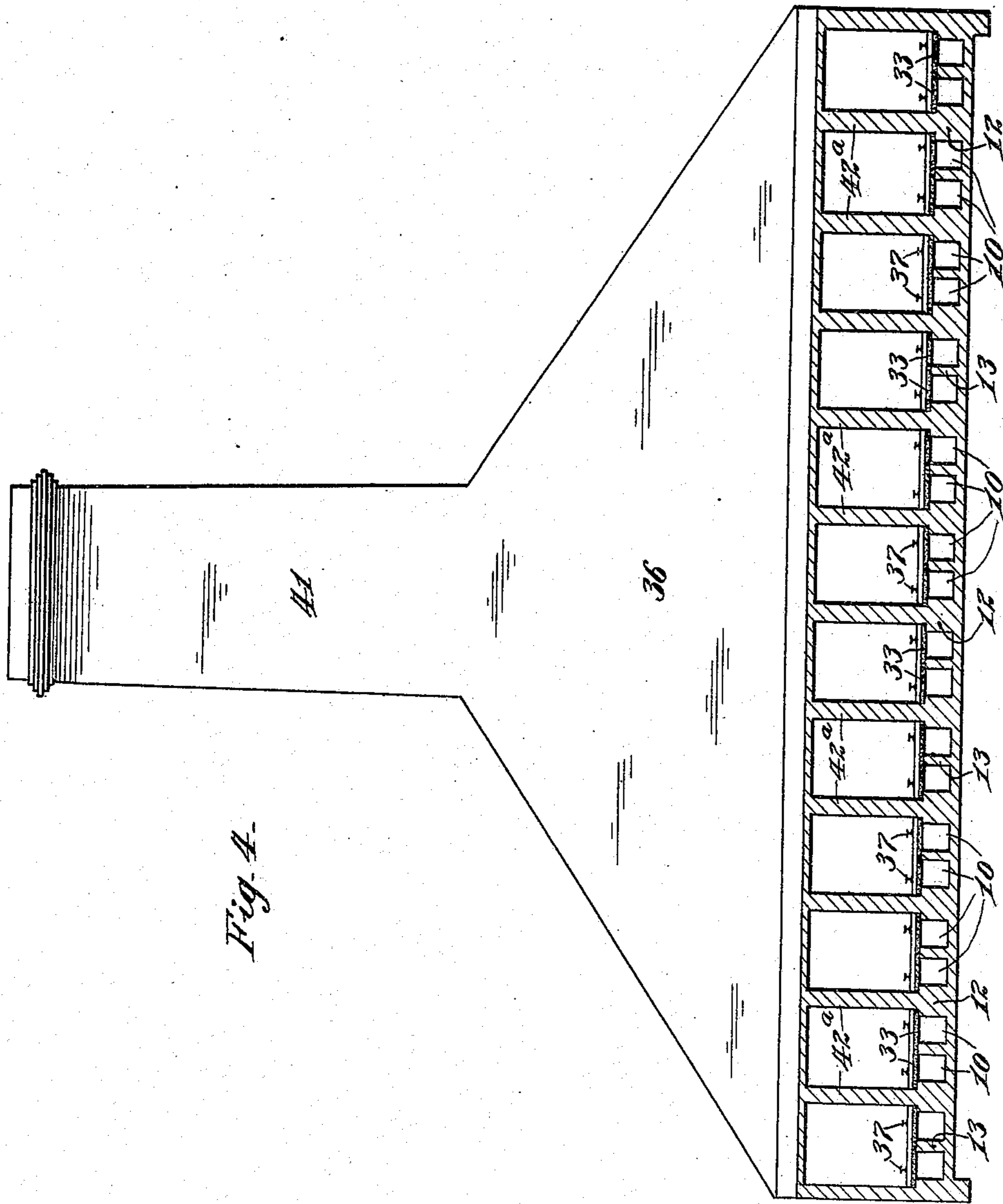


Fig. 4.

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6 SHEETS—SHEET 5.

Fig. 6.

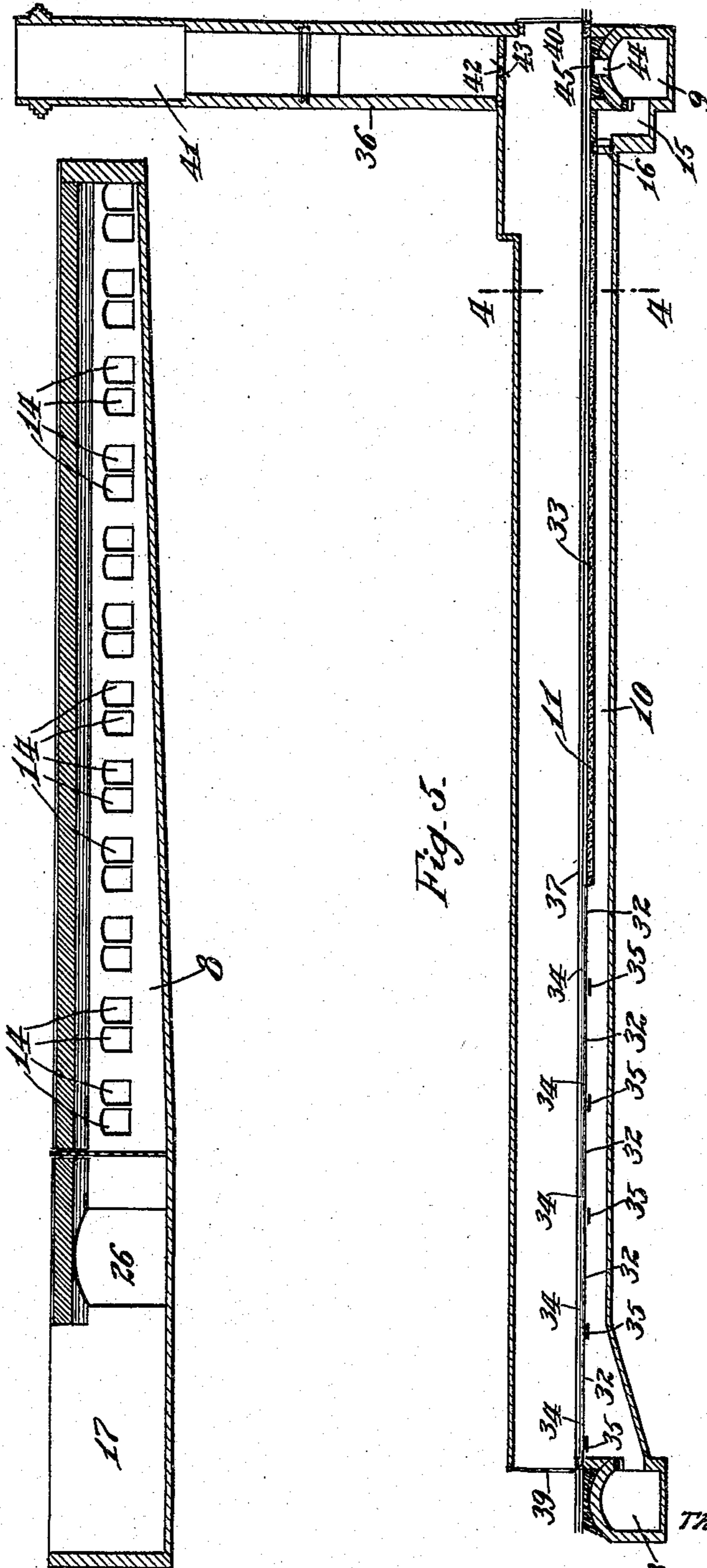
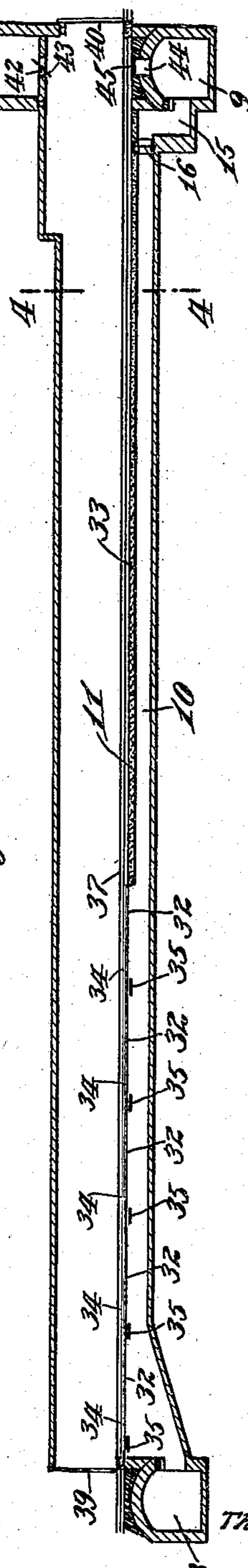


Fig. 5.



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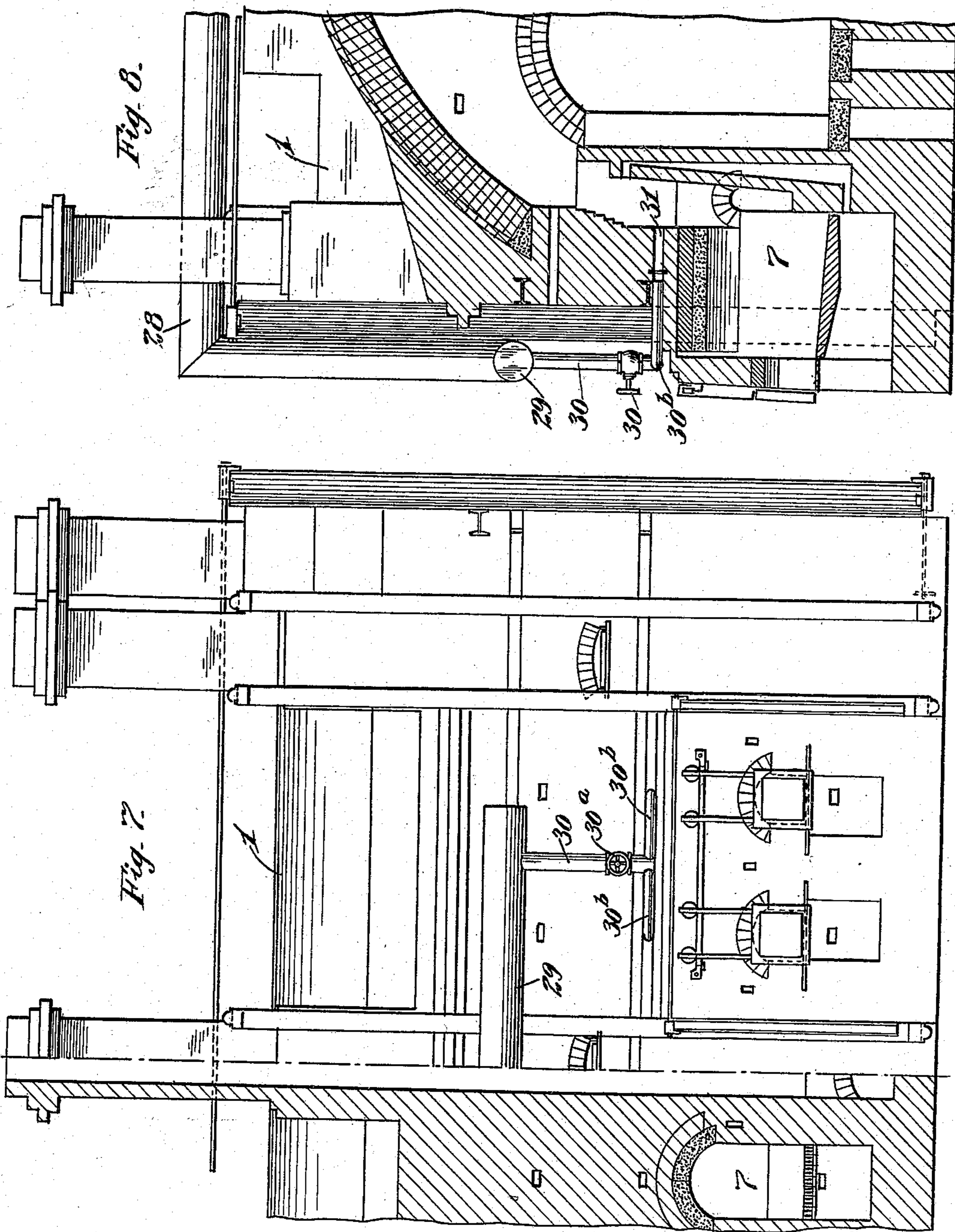
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6 SHEETS—SHEET 6.

930,587.



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# UNITED STATES PATENT OFFICE.

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## DRIER.

No. 930,587.

Specification of Letters Patent.

Patented Aug. 10, 1909.

Application filed February 20, 1909. Serial No. 479,246.

*To all whom it may concern:*

Be it known that I, THOMAS M. WILSON, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Driers, of which the following is a specification.

My invention relates to improvements in driers, and more particularly to a drier, in combination with a battery of kilns, whereby the smoke and gases from any, or all of the kilns, may be utilized to heat the drier and be returned to the kilns.

A further object is to provide improvements of this character in which the heat in the driers will be by radiation from the floor and walls of the drier, or may be received directly into the drying chamber accordingly, as an approved arrangement of dampers may be operated.

A further object is to provide an improved construction of drier, whereby the heat agent is directed through the flues below the floors of the drying chambers, and provide an improved stack for all of said drying chambers to carry off the moisture-laden air charged by the wet brick.

A further object is to provide an improved arrangement of flues or passages, so connecting a kiln or battery of kilns with a drier, and so construct the kilns and the drier, that the smoke and gases may be received directly from the kilns to heat the drier, may be returned to the kilns for reburning, or may be discharged through a stack into the air.

A further object is to provide improvements of this character in which either the smoke and gases from the kilns may be utilized to heat the drier chambers by radiation from the floor and walls of the chambers, or which may take the hot air from the kilns, while the latter are cooling, and conduct the same directly in the drier chambers.

A further object is to provide an improved arrangement of flues with fans or blowers for compelling a continuous circuit of smoke and gases from the kilns, through the drier, back to the kilns, and provide a stack to which the smoke and gases may be directly conducted without passing through the drier.

A further object is to provide improvements of this character which will enable a wide range of utility, giving to the operators a great variety of uses, enabling the smoke and gases from the kilns to be utilized in

heating the driers, and be returned to the kilns, or else exhausted into the air, which will enable the smoke and gases to be conveyed directly to the stack without communicating with the drier, which will enable the hot air from the kilns in cooling, to be conveyed directly into the drier chambers, which will convey the moisture-laden air from all of the drier chambers, preventing over accumulation of moisture in the drier chambers, and all of which comprises a plant of comparatively small area, the greater portion of flues and passages being below the ground, so as not to take up much space, and which will result in a great cheapening of the output, with but comparatively slight increase in the cost of establishing the plant.

With these and other objects in view, the invention consists in certain novel features of construction, and combinations, and arrangements of parts as will be more fully hereinafter described and pointed out in the claims.

In the accompanying drawings, Figure 1, is a sectional plan view illustrating my improvements. Fig. 2, is a sectional plan view taken through the drier at a point above the floors of the drying chambers. Fig. 3, is a view in vertical section taken through an end cross flue of the drier illustrating the construction of stack on the drier. Fig. 4, is a similar view taken at a point through the drier on the line 4—4 of Fig. 5. Fig. 5, is a view in longitudinal section through the drier. Fig. 6, is a view in longitudinal section through the cross flue at one end of the drier, and Figs. 7 and 8, are detail views illustrating the smoke and gas returning passages. Fig. 9, is a fragmentary view in longitudinal vertical section through the column 20 and the flues connected thereto.

1 represents the kilns, which are preferably arranged side by side, spaced apart, and provided at their ends with ducts 2, having dampers 3 therein. The ducts 2 at one end of all the kilns are connected by a flue 4, the ducts 2 at the other end of the kilns being connected by a flue 5, and said flues 4 and 5 being connected by a flue 6. All of said flues and ducts being below the ground level, and preferably constructed of brick with arched tops for strength.

It is of course to be understood, that the kilns 1 are provided with the usual perforated, or open work floor, and with furnaces 7 in their walls, so that the smoke and gases

from the furnaces will be passed down through the perforated floors into suitable flues below the floor, and thence into either or both of its pairs of ducts 2, and into the flues 4, 5 and 6, for a purpose which will hereinafter appear.

My improved drier is provided at its ends with parallel cross flues 8 and 9 respectively, the former constituting an entrance flue, and the latter an exit or outlet flue, both of said flues made with inclined bottoms as clearly shown in Fig. 6. The bottom of the entrance flue tapers upward from its open to its closed end, while the outlet flue 9 is inclined exactly at a reverse ratio to that of the inlet flue 8, the purpose being to more equally distribute the smoke and gases received by flue 8 to the several longitudinal flues 10 below the drier chamber floors 11, and to compel as equal a draft through the several flues 10 as possible. The flues 10 are formed by a series of longitudinal chords 12 and 13 respectively, the chords 12 being thicker than the chords 13, and the latter serving as partition walls between the chords 12. The chords 12 and 13 are constructed to support the floors 11 thereon, and two of these flues 10 are provided below each floor 11. The flues 10 as clearly shown in Fig. 5, communicate with the flues 8 by means of openings 14, and the bottom of said flues 10 adjacent to the openings 14, are inclined upwardly to properly direct the smoke and gases into the flues 10. The outlet ends of the flues 10 communicate with the outlet flue 9 through the medium of a vertical passage 15, and communication between the flues 10 and the passages 15 may be closed by means of dampers 16 in the ends of flues 10.

The flue 6 above referred to, communicates with a fan chamber 17, having a fan 17<sup>a</sup> therein, and the chamber communicates with the flue 8, so as to blow the smoke and gases into flue 8, a damper 18 being provided to open and close the flue 8 as may be desired. The flue 9 communicates with a flue 19, which bends or curves as shown, and communicates with a vertical column or flue 20, extending up out of the ground at any desired height, and with which a pipe 21 communicates, and is adapted to convey the smoke and gases back to the kilns, as will more fully hereinafter appear. With this flue 19, a stack 22 communicates, and a fan 23 is provided in the flue 19 to assist in blowing the smoke and gases back to the furnace, or up the stack 22, a suitable damper, of course being provided in the stack, to open and close the same, according to the use which is made of the smoke and gases.

A direct flue 24 connects the flue 9 with the flue 19, so as to cut out the fan 23, and enable the hot smoke and gases to be conveyed either to the stack 22, or back to the kilns without contact with the fan, thus

preventing burning the fan, and lengthen its life. For a great portion of the time this fan will not be needed to blow the smoke and gases back to the kiln, or up the stack, and this passage 24 is simply provided as a more direct returning passage for the smoke and gases.

A suitable damper 25 is provided in the passage 24, to close the same when the fan 23 is in use. A flue 26 connects the fan chamber 17 with the discharge end of flue 9, so as to convey the smoke and gases to the stack 22, or back to the kilns without utilizing the same in the drier, and a damper 27 in said flue 26 is adapted to close the same when the smoke and gases, or waste heat is being used in the drier.

The smoke and gases which enter pipe 21, returning from the drier, enter a pipe 28 extending throughout the battery of kilns, and having branch pipes 29 at the respective kilns. These branch pipes 29 extend along the side walls of the kilns, and are provided with a series of small pipes 30, having valves 30<sup>a</sup> and branch pipes 30<sup>b</sup>, directing the smoke and gases into lateral openings 31 in the kiln walls, said openings 31 being preferably located at points above the fire-boxes of the several furnaces, and discharging directly into the passage of the smoke and gases from said fire-boxes, so that the returning smoke and gases may be consumed and aid in the consumption of the smoke and gases from the fire-boxes.

The drying chamber as illustrated in Fig. 5, is located above and extends throughout the length of the flues 10, the floor of said chamber constituting the top of the flues 10. This floor comprises a sheet metal plate or plates 32, extending from the end of the chamber nearest the flue 8, to a point about one-third the length of the chamber, or any desired distance along the chamber, the rest of the chamber floor being preferably composed of tile 33. The sheet metal floor will become highly heated and radiate the maximum of heat units in the drying chamber, the tile of course becoming heated, will also radiate the heat. This metal floor 32 is provided at regular intervals, with openings 34, having suitable dampers 35, said dampers being closed during the heating of the drying chambers, by means of the smoke and gases, but are open when the waste heat or the hot air from the kilns, (while the latter are cooling) is being utilized for the drier, when such air will be admitted directly into the drying chambers, through the openings 34 and allowed to pass through the length of the drying chambers into my improved stack 36 at the end thereof.

The drier chambers are provided with tracks 37 to accommodate the ordinary cars used for carrying brick, and the openings 34 are provided in the drier chambers, a dis-

tance apart equal to the length of the ordinary cars, so as to admit the heated air directly beneath the brick cars. The ends of the drier chambers are provided with doorways, so that a car may be admitted at one end and after moving through the drying chamber, discharged at the other end in convenient position for transit to the kilns, the arrangement of trackage not being shown, but is readily comprehended. The ends of the drier chambers are closed by batterdoors 39 and 40 respectively, said doors being battered, so as to insure their remaining closed or open as occasion may require.

The ends of all of the drying chambers communicate with the stack 36, the latter converging into a central chimney 41, for conveying the moisture-laden air from the several drier chambers into the atmosphere, and preventing the accumulation of moisture within the drying chambers. The roofs of the drying chambers are provided with openings 42 which communicate with vertical passages above the drying chambers, formed by upwardly extending the side walls 42<sup>a</sup>, of the drying chambers, which terminate short of the upper inclined walls of the stack 36, so as not to interfere with the passage of the air from other drying chambers. All of these openings 42 are provided with dampers 43 to regulate the passage through them.

The arched top of flue 9 which rests directly below the bottom of the drier chambers at their extreme ends is provided with openings or passages 44 connecting the flues 9 directly with the drier chambers, and in communication directly with the stack 36, so as to permit the smoke and gases, or the hot air, from the flue 9 to pass directly up and through the stack 36, should it be desired to do so, and dampers 45 normally close the said passages 44.

The operation of the kilns and driers may be varied in a great many ways, by the manipulation of the dampers described, but the way which will economize fuel to the greatest extent will be to take the smoke and gases from the kilns through the flues 4, 5, 6 and 8, aided by the fan or blower 17, to drive the same through the flues 10 beneath the drying chambers, to heat the brick in the latter, and then convey said smoke and gases through the flues 9 and 19, aided by fan 23, or else directly through the flue 24, cutting out the fan, and thence convey the smoke and gases by column or flue 20, to pipes 21, and thence through pipes 28, 29 and 30, back into the kilns for reburning.

By this arrangement, a maximum of heat is utilized from every particle of fuel, there is practically no waste, the drier is heated without employment of separate furnaces for the purposes, and the result is, an economical production, which cannot be equaled by any of the known plants now in use.

As above explained, when it is desired, the drier may be cut out altogether, the smoke and gases simply passing through the kiln, and being returned to the same, and when the kilns are being cooled, the waste heat from the kilns may be directed into the drying chambers through the openings 34 into direct contact with the brick, it being understood of course, that when the smoke and gases are utilized, the openings 34 are closed, so as not to bring the smoke and gases into contact with the brick, as it might be injurious to them in their wet or moist condition.

A great many slight changes might be made in the general form and arrangement of parts described without departing from my invention, and hence I do not restrict myself to the precise details set forth, but consider myself at liberty to make such changes and alterations as fairly fall within the spirit and scope of my invention.

Having thus described my invention what I claim as new and desire to secure by Letters Patent is:

1. In combination with a kiln, a drier comprising a plurality of elongated chambers, flues below the chambers, cross flues at the ends of the drier communicating with said flues below the drying chambers, means for directing the smoke and gases from the kiln to one of said cross flues, and from the other of said cross flues back to the kiln.

2. In combination with a battery of kilns, a drier comprising a series of elongated chambers, of longitudinal flues below the drier chambers, cross flues at the ends of the drier, connecting all of said flues, means for directing the smoke and gases from the kilns to one of said cross flues, and from the other of said cross flues back to the kiln.

3. In combination with a battery of kilns, a drier comprising a series of elongated chambers, of longitudinal flues below the drier chambers, cross flues at the ends of the drier, connecting all of said flues, means for directing the smoke and gases from the kilns to one of said cross flues, and from the other of said cross flues back to the kiln, and a fan or blower adapted to force the smoke and gases through said flues.

4. In combination with a battery of kilns, a drier comprising a series of elongated chambers, of longitudinal flues below the drier chambers, cross flues at the ends of the drier, connecting all of said flues, means for directing the smoke and gases from the kilns to one of said cross flues, and from the other of said cross flues back to the kiln, a fan or blower adapted to force the smoke and gases through said flues, and a stack communicating with said directing means.

5. In combination with a battery of kilns, a drier comprising a series of longitudinal chambers, longitudinal flues below the chambers, cross flues at the ends of the chambers

and communicating with all of said longitudinal flues, said cross flues having upwardly inclined bottoms; means for directing the smoke and gases from the kilns to one of said cross flues, and from the other of said cross flues back to the kiln.

6. In combination with a battery of kilns, a drier comprising a series of longitudinal chambers, flues below the chambers, cross flues with which all of said longitudinal flues communicate, a flue connecting one of said cross flues with the kilns for conveying smoke and gases from the kilns to the driers, another flue connecting the other cross flue with the kilns to return the smoke and gases thereto, and a flue connecting said cross flue, whereby the smoke and gases may pass without entering into the drier, and dampers in all of said flues.

7. In combination with a battery of kilns, a drier, means for conveying smoke and gases to said drier, a returning flue for the smoke and gases connected with said drier, a fan in said flue, a stack communicating with said flue, means connecting said flue with the kilns to return the smoke and gases thereto, and a direct passage or flue connecting portions of said first mentioned flue, so as to cut out the fan, and a damper in said last mentioned flue.

8. In combination with a battery of kilns, a drier, means for directing smoke and gases from all of the kilns to the drier, a flue for conveying smoke and gases from the drier, a column or flue communicating with said flue, a pipe connected to said column, and a series of branch pipes connected with said last mentioned pipe, and directing the smoke and gases into all of the kilns, substantially as set forth.

9. In combination with a battery of kilns, a drier comprising a series of longitudinal chambers, longitudinal flues below said chambers, cross flues connecting the longitudinal flues, means for conveying smoke and gases from said kilns to one of said cross flues, and from the other of said cross flues back to the kiln, and a stack common to all of said drying chambers, and located above said last mentioned cross flue.

10. In combination with a battery of kilns, a drier comprising a series of longitudinal chambers, means for conveying smoke and gases from said kilns below the floors of said drying chambers, and thence back to the kilns, a stack common to all of said drying chambers, and dampers normally closing openings connecting said stack with the smoke and gas passages below.

11. In combination with a battery of kilns, a drier comprising a series of longitudinal

chambers, a series of smoke flues below the floors of the drier chambers and parallel therewith, a cross flue comprising an outlet for said smoke flues and located below the floors of said drier chambers, openings in the floors between the said cross flue and the drier chambers, dampers closing said openings, a stack common to all of said drier chambers, openings in the tops or roofs of the drier chambers connecting the drier chambers and dampers for said openings.

12. In combination with a battery of kilns, a drier comprising a series of longitudinal chambers, a series of smoke flues below the floors of the drier chambers and parallel therewith, a cross flue comprising an outlet for said smoke flues and located below the floors of said drier chambers, openings in the floors between the said cross flue and the drier chambers, dampers closing said openings, a stack common to all of said drier chambers, openings in the tops or roofs of the drier chambers connecting the drier chambers and dampers for said openings, and said openings in the roof of the drier chambers and in the floor thereof in approximate alignment.

13. In combination with a battery of kilns, a drier comprising a series of longitudinal chambers, a series of smoke flues below the floors of the drier chambers and parallel therewith, a cross flue comprising an outlet for said smoke flues and located below the floors of said drier chambers, openings in the floors between the said cross flue and the drier chambers, dampers closing said openings, a stack common to all of said drier chambers, openings in the tops or roofs of the drier chambers connecting the drier chambers and dampers for said openings, and the vertical partition walls between said drier chambers projecting up into the stack, substantially as and for the purpose set forth.

14. In combination with a battery of kilns and a drier, longitudinal flues below the drier, cross flues at the ends of the drier communicating with the longitudinal flues, a flue conveying smoke and gases from the kilns to one of said cross flues, a flue conveying smoke and gases from the other of said cross flues back to the kiln, and a flue connecting said cross flues and a damper in said last mentioned flue.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

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Witnesses:

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