

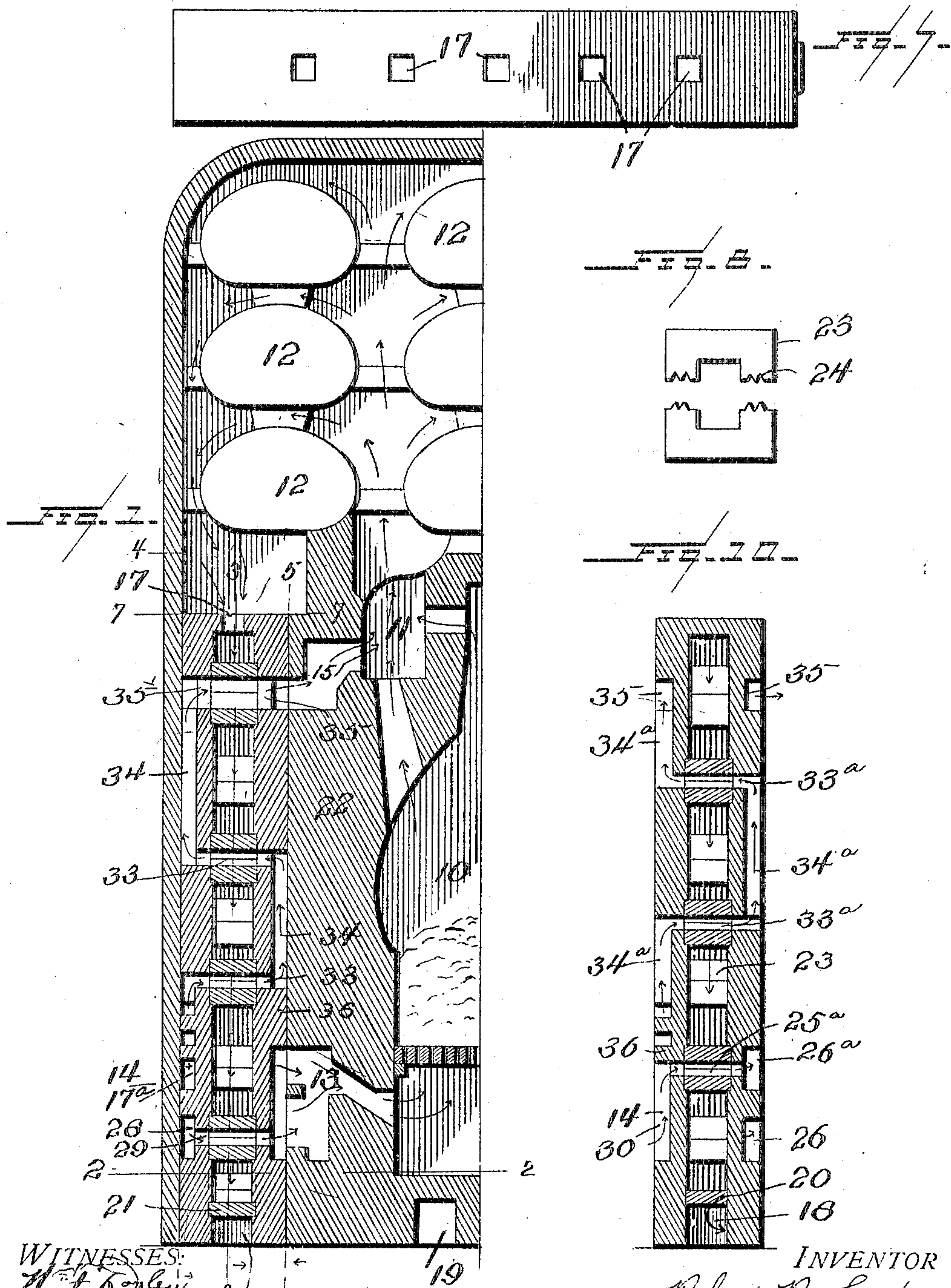
No. 817,326.

PATENTED APR. 10, 1906.

R. R. LADE.
RECUPERATOR.

APPLICATION FILED APR. 14, 1905.

3 SHEETS—SHEET 1.



WITNESSES:

W. H. R. 4

Geo. E. Tew

INVENTOR

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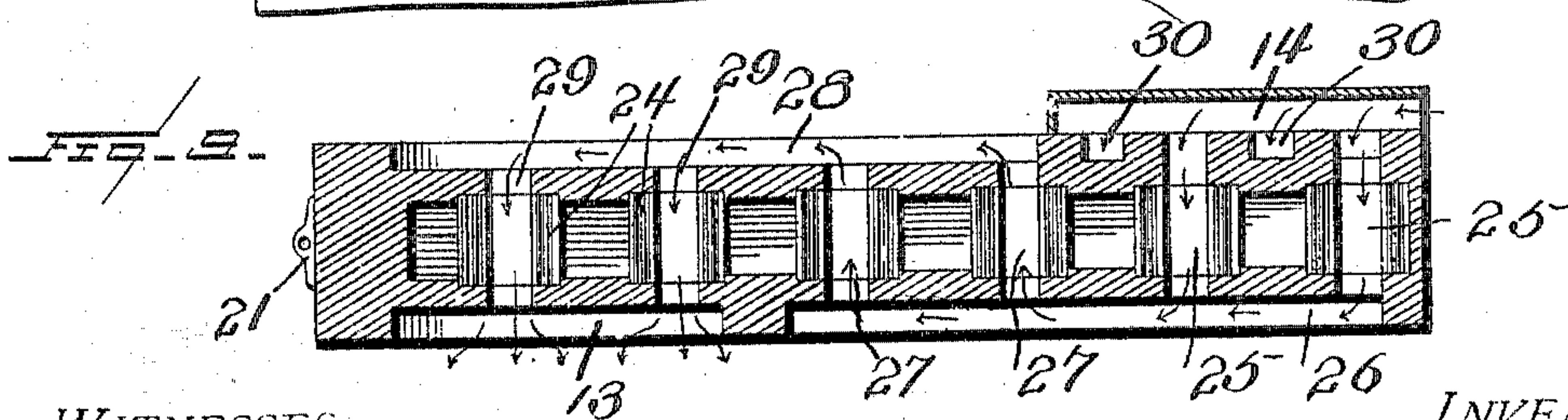
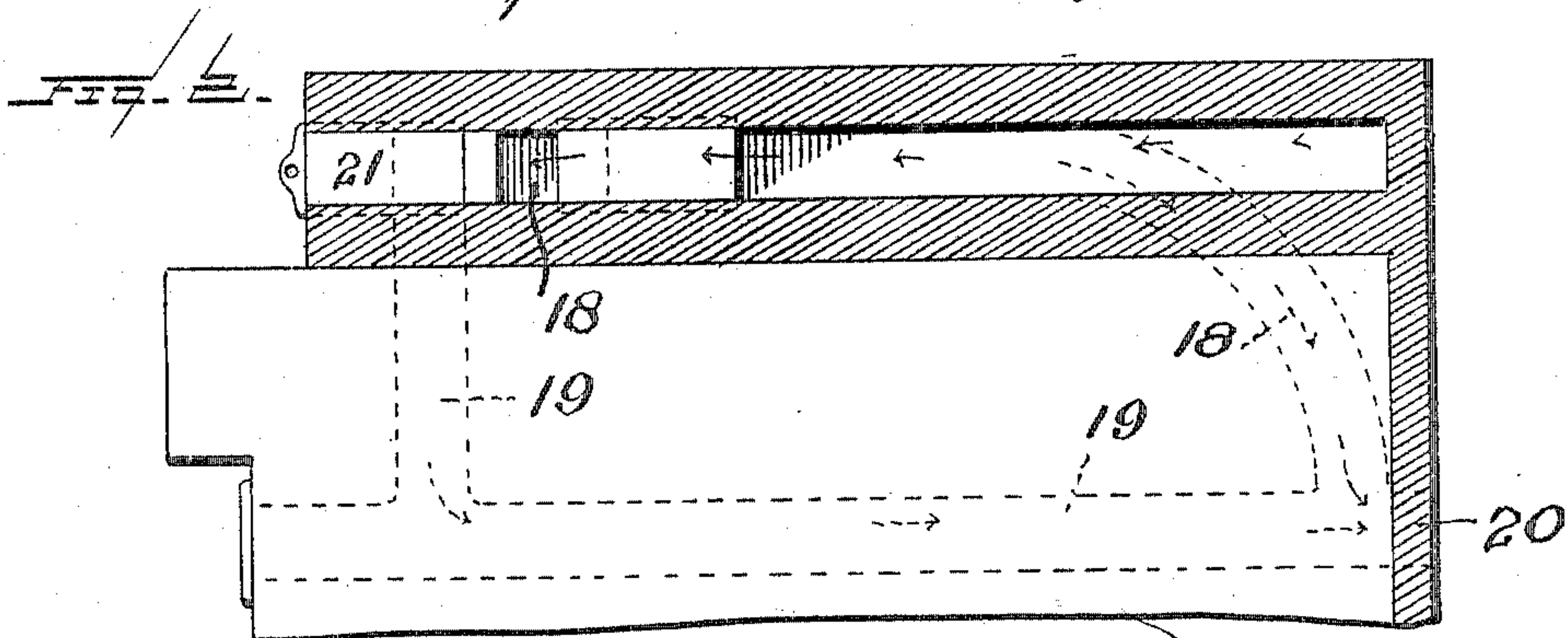
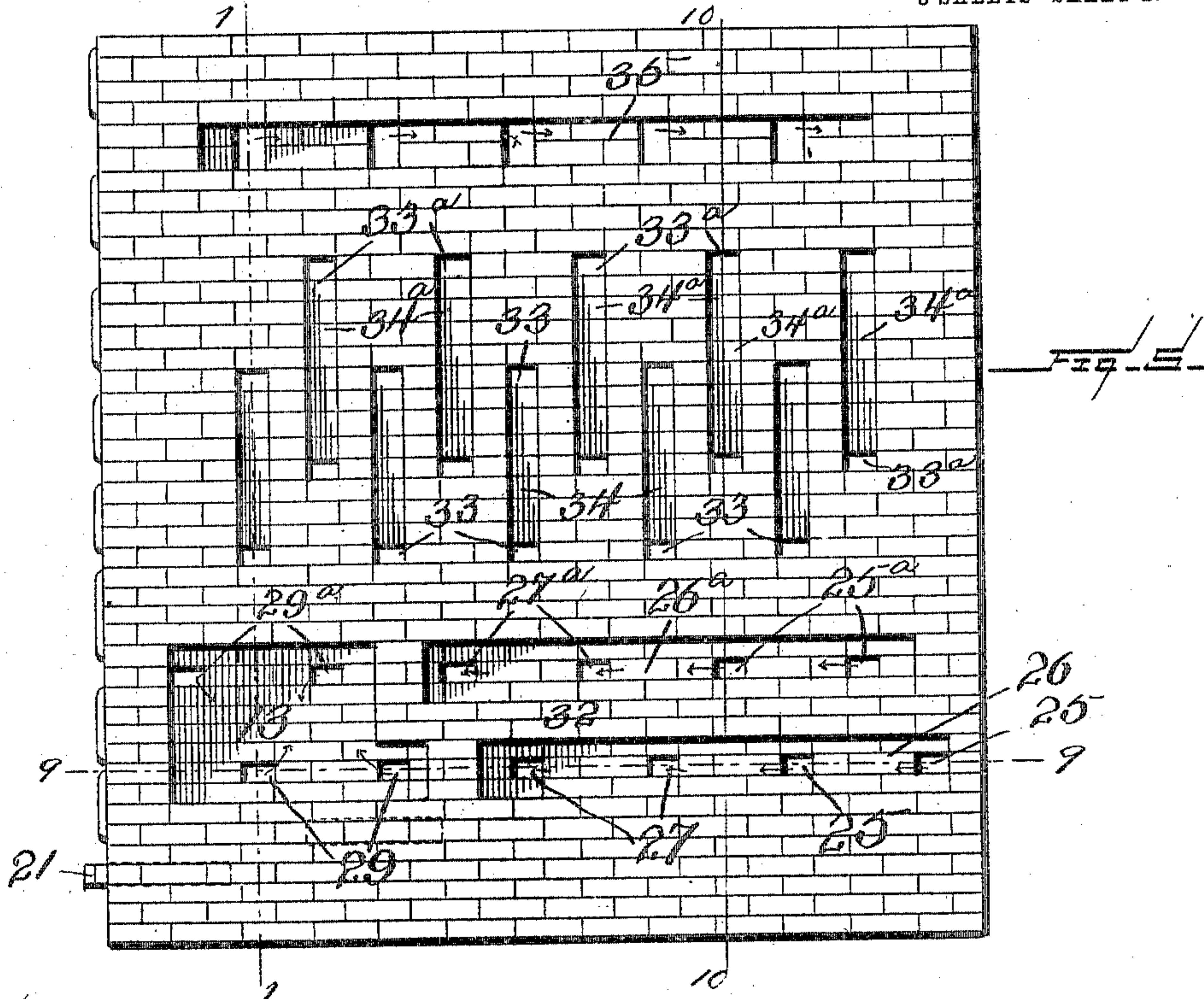
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3 SHEETS—SHEET 2.



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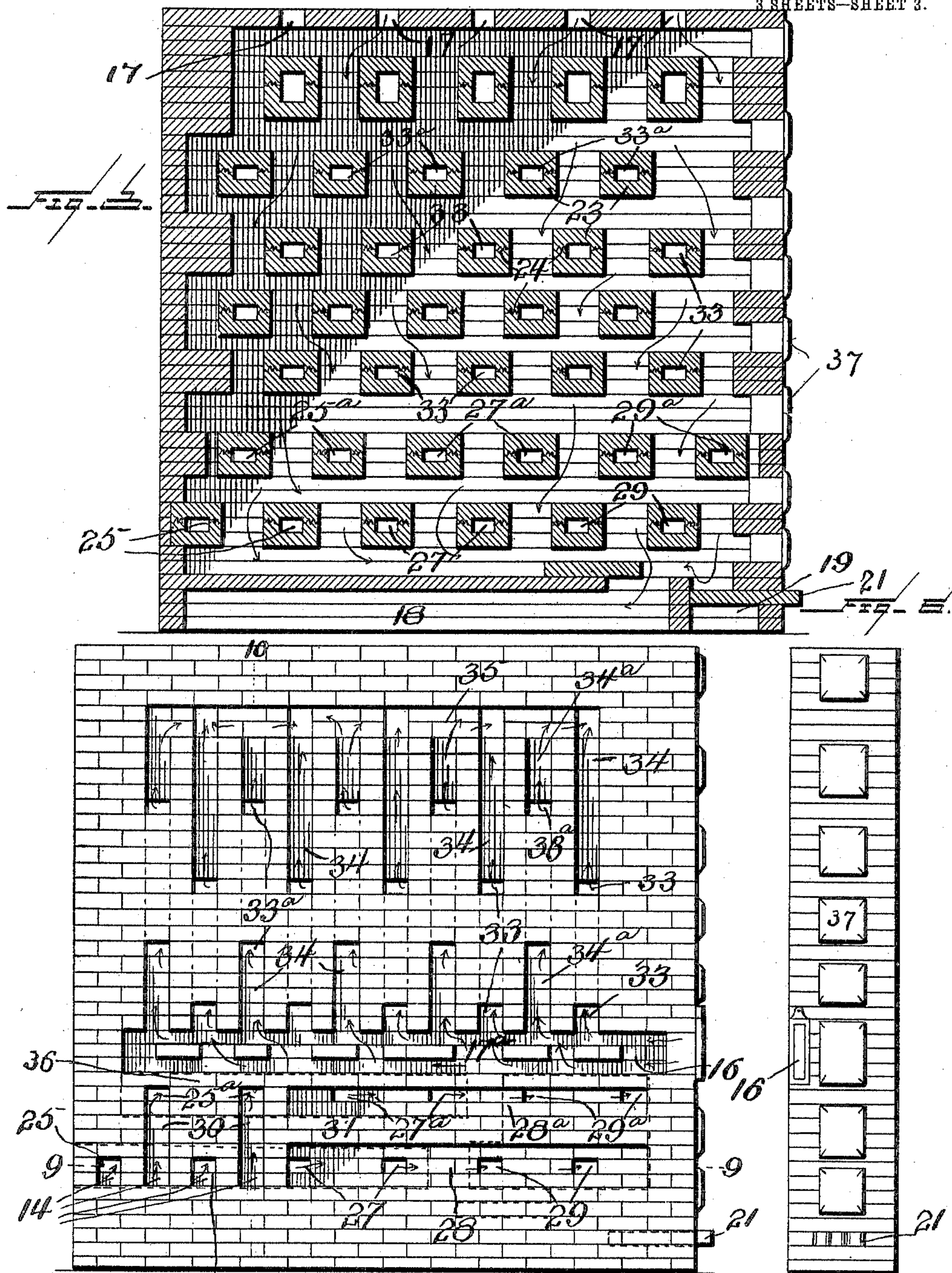
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3 SHEETS--SHEET 3.



WITNESSES: *H. F. Kaye* 25-10

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UNITED STATES PATENT OFFICE.

ROBERT R. LADE, OF CLEVELAND, OHIO.

RECUPERATOR.

No. 817,326.

Specification of Letters Patent.

Patented April 10, 1906.

Application filed April 14, 1905. Serial No. 255,505.

To all whom it may concern:

Be it known that I, ROBERT R. LADE, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented new and useful Improvements in Recuperators, of which the following is a specification.

This invention relates to recuperative or regenerative furnaces in which the primary supply of air is delivered to the fire-box and a secondary supply of air is delivered to the combustion-chamber, the products of combustion serving to heat retorts in the manufacture of coal-gas or for any other purposes desired.

The invention is characterized particularly by improvements with respect to the manner of arrangement of the primaries and secondaries and the construction of the recuperator, as more fully hereinafter pointed out.

In the accompanying drawings, Figure 1 is a vertical section of part of a furnace for heating retorts, showing the recuperator set in the wall of a furnace. Fig. 2 is a horizontal section on the line 2 2 of Fig. 1. Fig. 3 is a vertical section on the line 3 3 of Fig. 1. Fig. 4 is a side elevation of the recuperator proper removed from the wall of the furnace as it would appear on the line 4 4 of Fig. 1. Fig. 5 is a similar view of the opposite side as it would appear on the line 5 5 of Fig. 1. Fig. 6 is a front elevation of the recuperator. Fig. 7 is a top view of the recuperator as on the line 7 7 of Fig. 1. Fig. 8 is a detail in end elevation, showing the joints of the cross-flues. Fig. 9 is a horizontal section on the line 9 9 of Fig. 4. Fig. 10 is a vertical section on the line 10 10 of Fig. 4.

Referring specifically to the drawings, 10 indicates the fire-box of the furnace, 11 the upper combustion-chamber, and 12 the retorts. Air is fed to the fire-box through a flue 13 from one of the primaries of the recuperator, said air entering through the side wall of the furnace at 14. Air is supplied to the combustion-chamber 11 through a flue 15 from the secondaries, said air entering through the front of the recuperator at an opening at 16. The waste gases for heating the recuperator enter at the top at 17 from the chamber containing the retorts and pass down through the recuperator, around the

cross-flues thereof, to flues 18 and 19, leading to the stack 20. The latter flue is controlled by a damper 21 in the bottom of the recuperator, so as to vary the draft as desired.

The recuperator is set in the wall 22 of the furnace and is built of fire-brick with suitable cross-flues, (indicated at 23,) each of which is formed of two blocks joined with a zigzag joint at 24. As clearly shown in Fig. 3, the recuperator is hollow, and the waste gases entering through the openings 17 pass down around the cross-flues 23 and into the smoke-flues 18 and 19. These cross-flues are thus heated, and the primary and secondary air passing therethrough is also heated accordingly. The primaries occupy the lower part of the recuperator and have their intakes in the side wall of the furnace near the rear end thereof. The flow of air therethrough may be traced as follows, referring to Figs. 4 and 5: With respect to the first or lower primary the intake enters at 25 and passes through the cross-flues to the horizontal lengthwise flue 26, thence through the cross-flues 27 to the horizontal lengthwise flue 28, and thence through the cross-flues 29 to the outlet 13. The second primary intake is through the short vertical flues 30, cross-flues 25^a, longitudinal flue 26^a, cross-flues 27^a, longitudinal flue 28^a, and cross-flues 29^a to outlet 13. There are divisions 31 and 32 between the first primary flues and the second primary flues on both sides of the recuperator. The secondaries receive their supply of air through the inlet 16, and the air passes thence through the longitudinal flue 17^a, whence it passes to the first and second secondaries. The cross-flues of the first secondary are indicated at 33 and the vertical flues thereof at 34, and the cross-flues of the second secondary are indicated at 33^a and the vertical flues thereof at 34^a. The vertical flues 34 and 34^a, which are both secondaries, join longitudinal flues 35, which communicate with the outlet 15 to the combustion-chamber. Divisions 36 separate the secondary from the primary flues. The bricks 23, which form the cross-flues, are set in straight rows horizontally and staggered rows vertically, forming crooked passages through which the waste gases flow.

In the front of the recuperator on a line with the spaces between the horizontal rows of flues are openings closed by blocks 37, the

removal of which permits a scraper or tool to be inserted to readily clean out the passages. Dirt and soot can be dislodged from the tops of the cross-flues and will be carried down
5 and out through the stack.

The construction above indicated provides a large and highly-heated air-feed to the combustion - chamber, thereby insuring a greater heat.

10 The recuperator may be readily constructed of fire-brick and tile, and the use of large fire-brick blocks, which tends to leakage at the joints, is avoided. It is also possible to easily and readily clean out the flues, as
15 above indicated.

What I claim as new, and desire to secure by Letters Patent, is—

20 1. The combination with a furnace, of a recuperator located in one side wall of the furnace and having primary and secondary flues feeding air respectively to the fire-box and the combustion-chamber of the furnace, the said primary and secondary flues being

each divided by horizontal division - walls into separate and independent sets. 25

2. The combination with a furnace, of a recuperator set in one side wall thereof and having upper secondary and lower primary cross-flues separated by a division, said primary cross-flues being connected by horizontal
30 tal side flues, separated by a division, to form two sets of independent tortuous passages having intakes at one end and an outlet at the other end to the fire-box, and said secondary cross-flues being connected in alter- 35 nation by vertical side flues forming two independent sets of tortuous passages having an intake at the lower end and an outlet to the combustion-chamber at the upper end.

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

ROBERT R. LADE.

Witnesses:

JOHN A. BOMMARDT,
LOTTIE NEWBURN.