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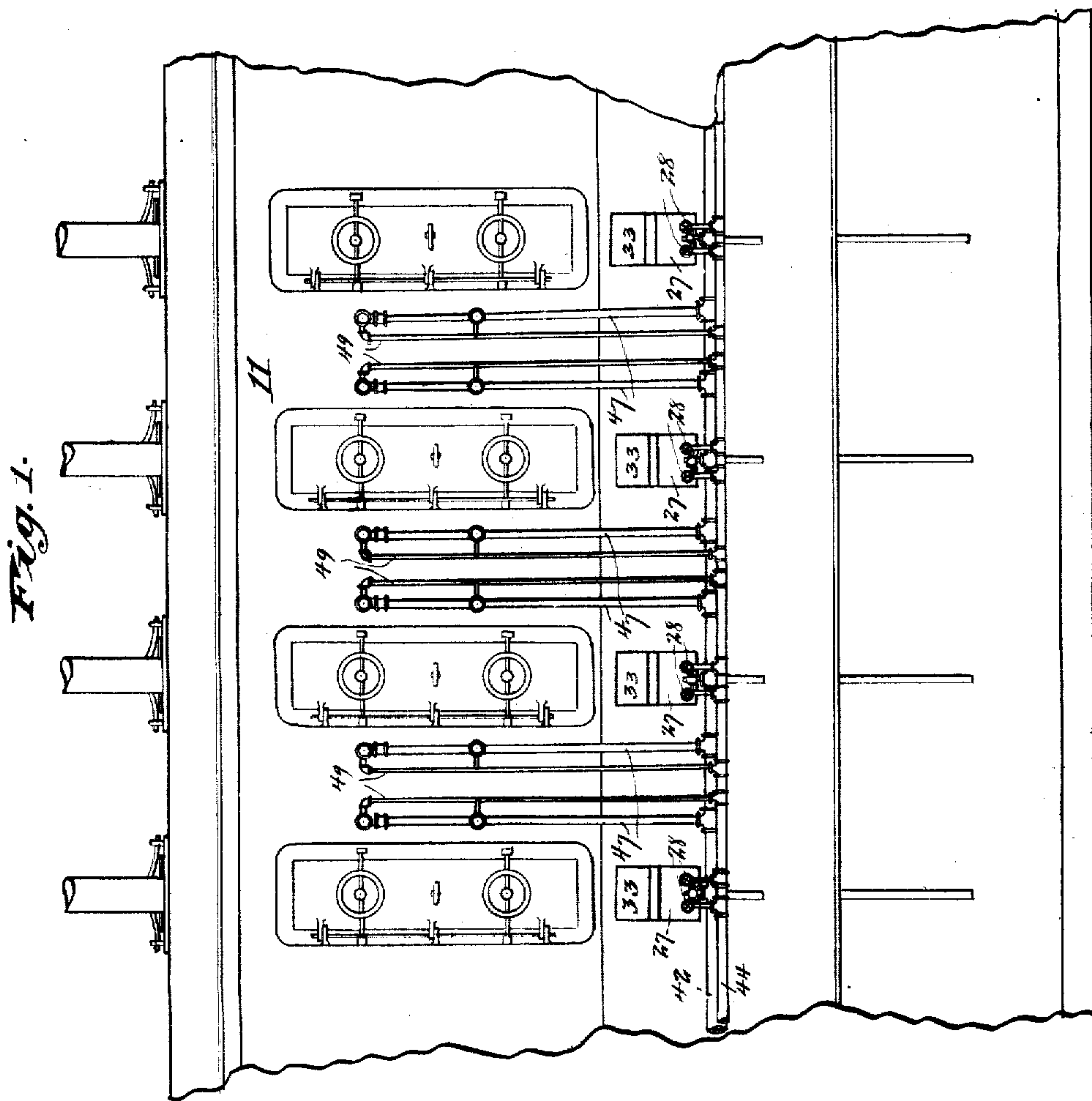
COKE OVEN.

APPLICATION FILED SEPT. 8, 1903.

Patented May 18, 1909.

6 SHEETS—SHEET 1.

922,201.



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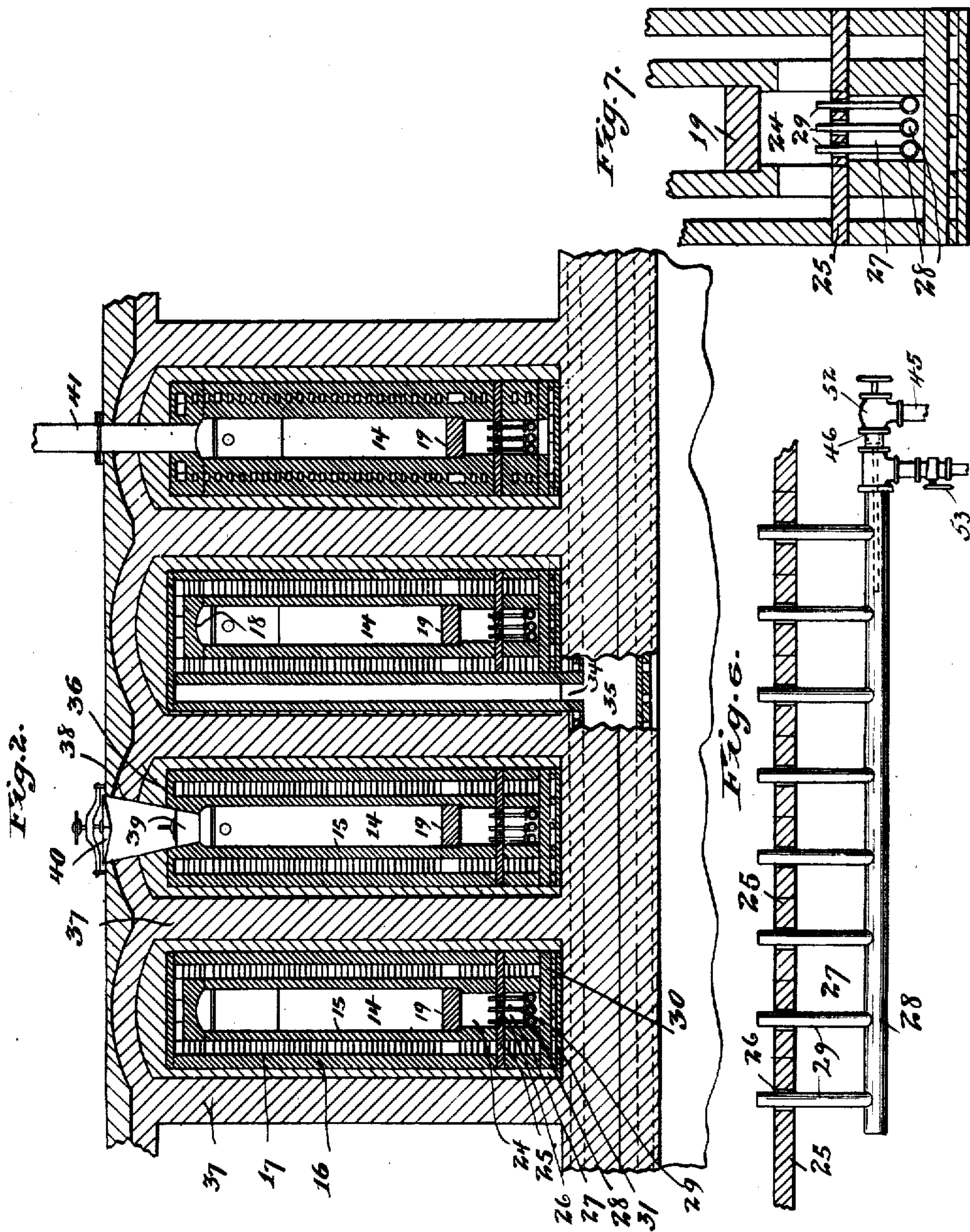
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5 SHEETS—SHEET 2.



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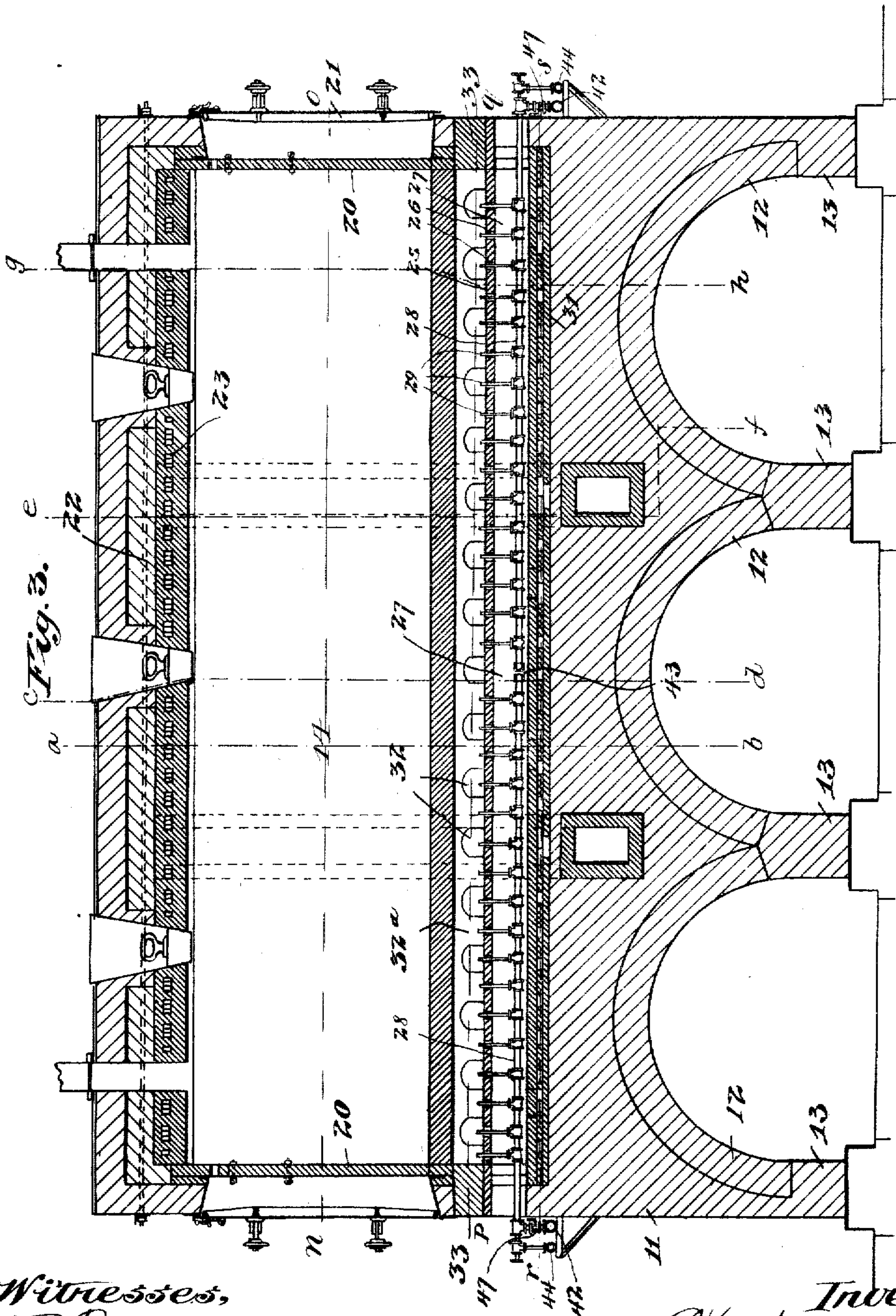
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5 SHEETS—SHEET 3.



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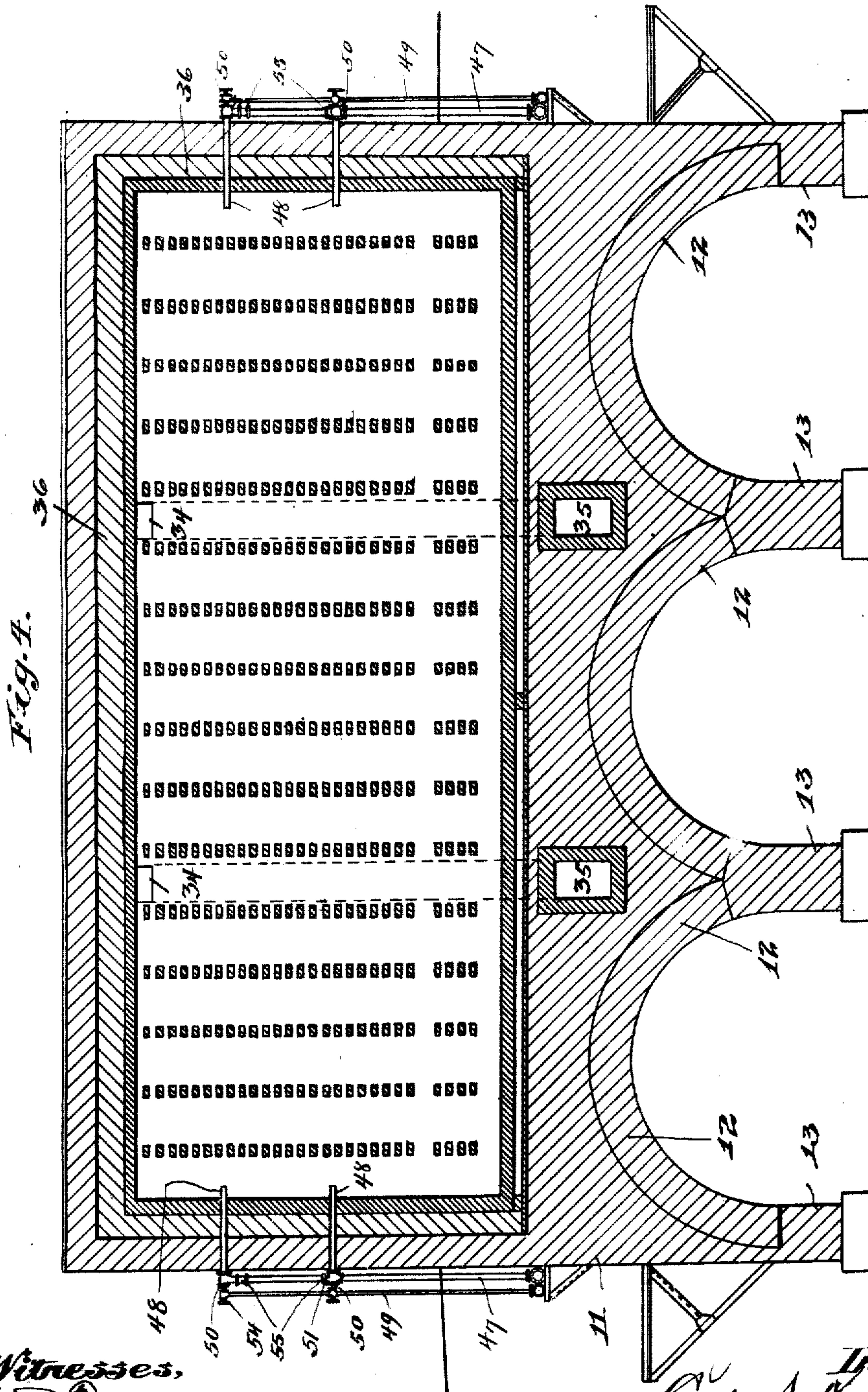
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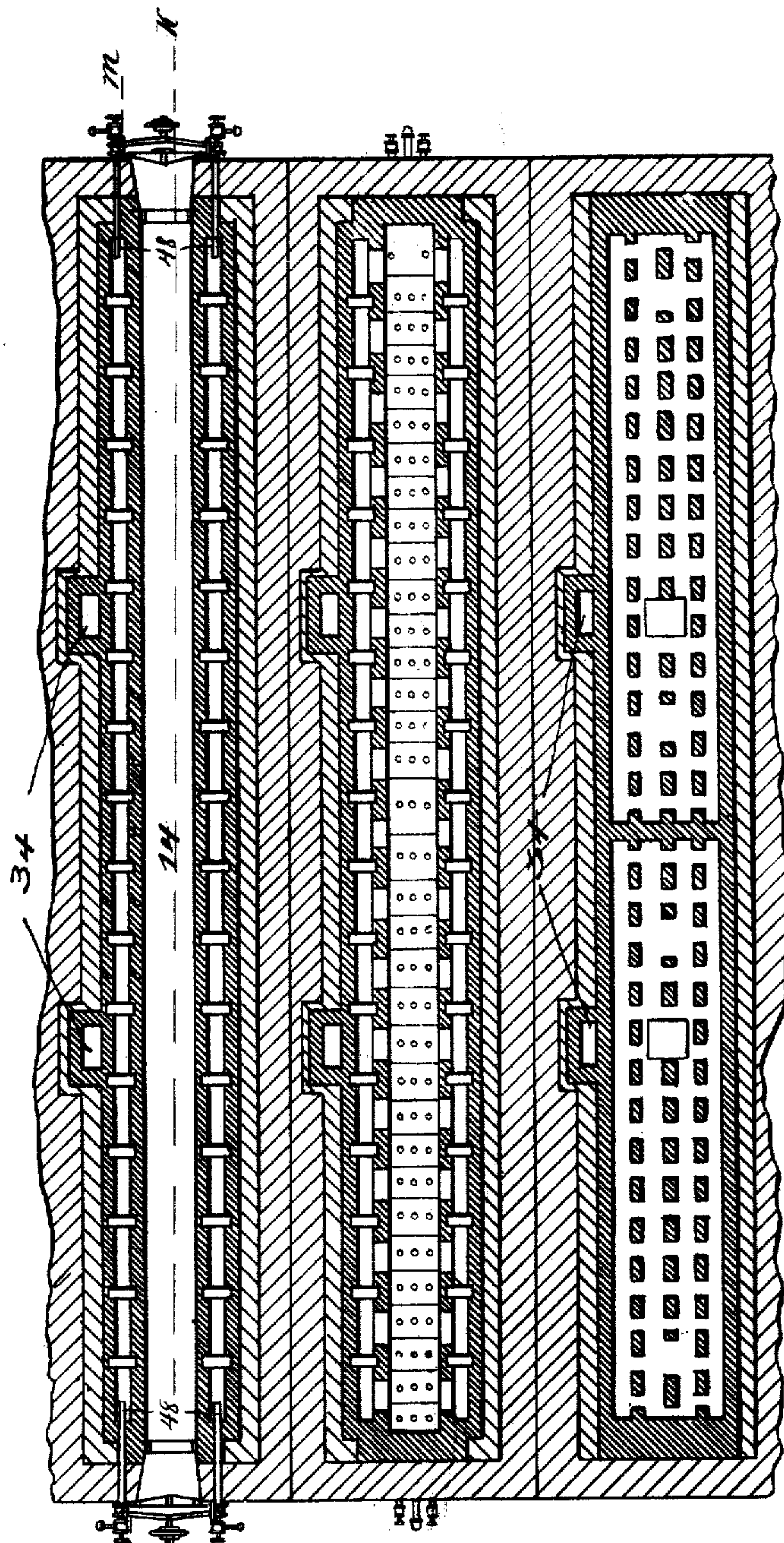
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5 SHEETS—SHEET 5.

Fig. 5.



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UNITED STATES PATENT OFFICE.

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COKE-OVEN.

No. 922,201.

Specification of Letters Patent.

Patented May 18, 1909.

Application filed September 8, 1903. Serial No. 172,298.

To all whom it may concern:

Be it known that I, CARL SCHROETER, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Coke-Ovens, of which the following is a specification.

My invention relates to improvements in coke ovens of that general type wherein the oven comprises within a single external housing or casing a bank or series of similarly arranged and equipped retorts adapted to treat independent quantities of coal supplied thereto, the several retorts being adapted to effect the coking action solely through the application of external heat.

The invention relates more particularly to improvements upon the apparatus set forth in my prior application Serial No. 153,596, filed April 20, 1903.

Among the salient objects of the present invention are to simplify and improve the arrangement of the burners and combustion-chambers within which the latter discharge; to dispense with the regenerators employed in my former apparatus for utilizing the heat from the outgoing gases of combustion and in lieu thereof to arrange the transverse outlet flues which lead to the chimney within the main body of the masonry foundation; to provide auxiliary fuel-supply pipes leading to and discharging within the checker-work spaces at each end of each retort; to provide an improved arrangement or disposition of the down-take flues which lead from the combustion spaces surrounding the retorts whereby I am enabled to secure a more uniform circulation or distribution of the gases of combustion; to dispense with the open spaces or air chambers intervening between the several retorts and the fuel pipes and burners extending within said spaces and discharging into the sides of the checker work and substitute in lieu thereof the fuel pipes and burners discharging into the checker work at the ends of the retorts; to provide below the main combustion chambers air chambers from which supplies of air are admitted to the combustion chamber, and to provide in conjunction with said air chamber means for insuring a more perfect mixing of the air and fuel gases; to so arrange the air supply openings with relation to the nozzle ends of the burner pipes as to protect the latter against burning off; and

in general, to provide improvements in the details of construction and arrangement of the apparatus as will hereinafter more fully appear.

The invention consists in the matters hereinafter described and more particularly pointed out in the appended claims.

In the accompanying drawings I have illustrated a coke oven embodying my present improvements, wherein—

Figure 1 is a front elevational view broken away at the sides of the oven, illustrating a group of four retorts arranged side by side, it being understood that the rear end of the bank of retorts is a duplicate of the front end, the retorts extending entirely through the oven and being provided with similar closures at both ends; Fig. 2 is a vertical sectional view taken transversely of the retorts, the several retorts from left to right being shown on the lines *a—b*, *c—d*, *e—f* and *g—h*, respectively, of Fig. 3; Fig. 3 is a longitudinal vertical section through one of the retorts and its underlying supports taken on the line *i—k* of Fig. 5; Fig. 4 is a longitudinal vertical section through one of the checker-work side walls of a retort, taken on the line *l—m* of Fig. 5; Fig. 5 is a horizontal sectional view through three adjacent retorts, the upper retort being shown as cut on the line *n—o*, the intermediate retort as cut on the line *p—q* and the lowermost retort as cut on the line *r—s*, all of Fig. 3. Figs. 6 and 7 are detailed views showing the arrangement of the fuel supply pipes.

Referring to the drawings, 11 designates an external brick work or other fireproof housing or casing resting upon a series of arches 12 and vertical supports 13 and enclosing a series of relatively long, narrow retort chambers 14. The several retorts of the oven are duplicates of each other in construction, and a description of one will suffice for all.

The side walls of the retorts, instead of being formed as usual of solid masonry, are made with interior open work formation, each wall consisting of an inner lining 15, an outer shell 16 and an intermediate open or checker-work 17; this construction being best shown in Figs. 2 and 4. The top lining of the wall of the retort is formed by a series of transversely extending fire-clay arch pieces 18, while the bottom wall or sole is formed by one or more removable fire-clay

slabs 19. Refractory plates 20 (see Fig. 3) which may be made in sections are set in the retorts near the ends thereof to serve as inner end walls and to prevent excessive heating of the outer iron doors 21. The top of the retort comprises an outer plate or cover 22 between which and the refractory lining 18 is intersticed or checker-work 23. Beneath the floor walls 19 of the retorts the checker-work sides 17 are continued downwardly constituting the side walls of combustion chambers 24, the bottom walls of which chambers are formed by horizontal plates 25 having burned apertures 26 formed therein at frequent intervals. Below the plates 25 forming the bottom of the combustion chamber is formed an air chamber 27 within which are arranged the fuel supply pipes 28, each provided with a series of branch burner pipes or nozzles 29 (see detail Fig. 6). The bottom of the air chamber 27 is formed by a refractory wall 30, and below this extends a checker-work space 31 which communicates with the checker-work spaces 17 at the sides of the retort. The lower wall 31 rests directly upon the masonry of the arches.

In the inner linings of the side walls of the combustion chamber are formed lateral openings 32, conveniently formed by means of longitudinally extending endwise abutting arch pieces 32^a. The ends of the combustion chambers are closed by means of loosely placed brick 33 or other suitable closures, while the ends of the air chambers 27 are open except as occupied by the fuel pipes 28.

The checker work spaces at the sides of the retorts are in communication with each other at their upper ends through the checker-work spaces 23, and at one side said spaces communicate with down-take flues 34 (see Figs. 4 and 5) which lead to, and discharge within transverse flues 35 formed to extend through the solid masonry foundation between the arches and the bottoms of the retorts and leading to any suitable chimney.

A non-conducting jacket 36 of ash or other material completely surrounds the top and sides of the walls or heating jackets of the retorts; this layer of non-conducting material being confined between the outer side walls 37 of the several retort-containing receptacles of the superstructure of the oven. The chambers extending between the several retorts of my prior invention are in the present instance dispensed with, and the structure accordingly made more compact.

Through the roof of each retort and its surrounding shell or casing are formed conical charging openings 38, which can be made air-tight by fire-clay plugs 39 seated in the lower ends of said openings and cast iron covers 40 applied to the entrance ends of the openings. Chimneys or flues 41 also tap the roof of each retort and serve as outlets for the

volatile products driven off by the coking operation, which products may if desired be led to, and passed through suitable converters to extract therefrom the by-products while the combustible gas therefrom is returned to the oven to supply when mixed with air and burned the necessary heat which is applied to and through the combustion chamber and checker-work jackets of the retorts as now to be described.

42 designates gas pipes leading from a suitable source of gas supply and extending along the front and rear sides of the oven respectively, desirably on a level with the air chambers 27. With these pipes are connected the several gas pipes 28 which extend throughout the length of the combustion chamber, there being in the present instance in each chamber three parallel pipes 28, as best seen in Fig. 2, extending inwardly from each pipe 42 to points about the middle of the combustion chamber and the ends of the pipes capped, as shown at 43, so that the supplies of gas to the respective halves of the combustion chamber are independent. Alongside of the gas pipes 42 are disposed air pipes 44, which are in communication with a blower, air pump or other suitable source of compressed air. Opposite the ends of each of the several pipes 28, the air pipes 44 are provided with lateral branches 45 which extend through suitable couplings 46 and project concentrically within the respective gas pipes 28 a short distance, as indicated clearly in detail Fig. 6.

The gas pipes 42 are provided with branch risers 47 which rise adjacent to the end walls of the furnace opposite the side checker spaces of the several retorts; said riser pipes 47 being each provided with a plurality of inturned extensions or burner tubes 48 (see Fig. 4) which project through the end walls of the furnace and discharge into the checker spaces 17. The air pipes 44 are likewise provided with riser pipes 49 which extend alongside the riser pipes 47 and similarly provided with inturned branch extensions 50 which enter through suitable couplings 51 and extend concentrically within the burner tubes 48, as best seen in Fig. 4.

The several gas pipes, air pipes and risers are provided with suitable valves for regulating the relative quantities of air and gas, as indicated at 52, 53, 54 and 55.

With the oven constructed as described, the coking operation is carried on substantially as follows: The retorts having been charged with coal through the several charging openings 38, and the latter closed, gas and compressed air are turned on through the pipes 28 and 44; it being understood that the air supply is under pressure while the supply of gas will be drawn in to the furnace chiefly by the entraining action or suction of the air jets. The air and gas entering the

longitudinally disposed pipes 28 in the air chambers, passes upwardly through the burner tubes and discharges within the combustion chambers, in which latter the combustion initiates. The burning gases flow from the combustion chambers laterally outward through the arch openings 32 to the checker spaces 17 rising through the latter to the top of the furnace and passing over the tops of the retorts, and thence to the down-take flues 34. From the down-take flues the gases pass to the transverse flues 35 and thence to the chimney. Inasmuch as the several soles of the retorts form the tops of the combustion chambers, it will be seen that the retorts are completely enveloped by the burning gases, and by reason of the distribution of the burners and the eduction flues the gases are thoroughly dispersed and the circulation maintained quite uniform around each of the several retorts. Accordingly the coking operation is both thorough and uniform. By reason of the fact that the burner tubes 29 extend through openings in the protecting plates 25 of larger diameter than the exterior diameter of the burner tubes, and discharge in the combustion chamber a slight distance above said protecting plates, the relatively cool air contained in the air chamber 27 is entrained or drawn upwardly through said apertures 26 around the several burner tubes, thereby thoroughly protecting the latter and preventing them from being burned off by the intense heat of the combustion chamber. This is a feature of much importance, and furthermore, the air thus entrained forms an auxiliary supply of oxygen in addition to that introduced by the internal air blast. The horizontal partition formed by the plates 25 obviously protects the piping contained in the air chamber, and it will be further noted that the construction and arrangement of the plates are such that the latter may be readily lifted out, thus permitting the gas tubes to be withdrawn from the several air chambers with great facility. The fact that the gas pipes within the air chambers are made in two sets extending inwardly from each end further contributes to the ready removal of the pipes, for the purposes of inspection and repair.

It will be understood that the details of construction may be somewhat modified without departing from the spirit of the invention, and accordingly I do not limit myself to the exact details shown and described except to the extent that they are made the subject of specific claims.

I claim as my invention:

1. In a coking oven, a coking retort provided in its lower portion with a supporting wall or sole, a second wall mounted between said sole and the bottom of said retort and forming a combustion chamber thereabove and an air chamber therebelow, said second

wall being provided with a series of apertures, a series of burner tubes mounted within said air chamber and projecting through said apertures into said combustion chamber, said tubes being smaller than said apertures and mounted concentrically therein, whereby air from said air chamber is entrained into said combustion chamber around the ends of said tubes by the action of the fuel flowing therefrom, and means for supplying fuel to said burner tubes, substantially as and for the purpose described.

2. A coking oven, comprising a coking retort composed of double walls providing a checker-work combustion space therebetween, a combustion chamber beneath the coking retort and communicating with said combustion space, the floor wall of said combustion chamber being apertured, a series of burner tubes supported beneath said floor wall and projecting into said combustion chamber through said apertures, said apertures being larger than said tubes whereby air is entrained through said apertures around the ends of said tubes within said combustion chamber, and means for supplying fuel to said burner tubes, substantially as and for the purpose described.

3. In a coking oven of the character described, the combination of a bank of coking retorts arranged parallel and contiguous with each other, a combustion chamber extending longitudinally beneath each retort throughout the length thereof, an air chamber extending longitudinally beneath each combustion chamber throughout the length of the latter, a partition wall separating said combustion and air chambers from each other and provided with burner tube apertures, a header fuel pipe extending across each end of the oven opposite the ends of the several retorts, a group of branch pipes extending from each header pipe longitudinally within the respective air chambers to points intermediate the lengths thereof, burner tubes connected with the several pipes of the several groups, extending upwardly through said partition wall and discharging within the combustion chambers, header air pipes extending along each end of the oven adjacent to the fuel pipes, branch injector pipes connected with said header air pipes and extending and discharging within the several combustion chamber pipes, riser pipes connected with the header fuel pipes at each end of the oven and rising adjacent to the end walls thereof, branch burner pipes connected with said risers and extending through the end walls of the oven and discharging into the spaces at each side of each retort, riser air pipes connected with said header air pipes at each end of the oven and provided with branch extensions extending and discharging within the burner tubes of the riser fuel pipes, and means for supplying gas and air to the

respective header pipes, substantially as described.

4. In a coking oven of the general character described, the combination with a bank
5 of coking retorts arranged side by side and a masonry foundation support comprising a series of transversely extending arches, of intercommunicating combustion spaces below, at each side of, and above each retort,
10 down-take flues communicating with the upper combustion spaces of each retort and ex-

tending downwardly alongside of the respective retorts, and one or more transversely disposed main flues formed within the masonry foundation between the chambers of
15 adjacent arches, with which transversely disposed flues said down-take flues communicate, substantially as described.

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Witnesses:

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