July 4, 1933. F. PUENING 1,916,331

COKING APPARATUS

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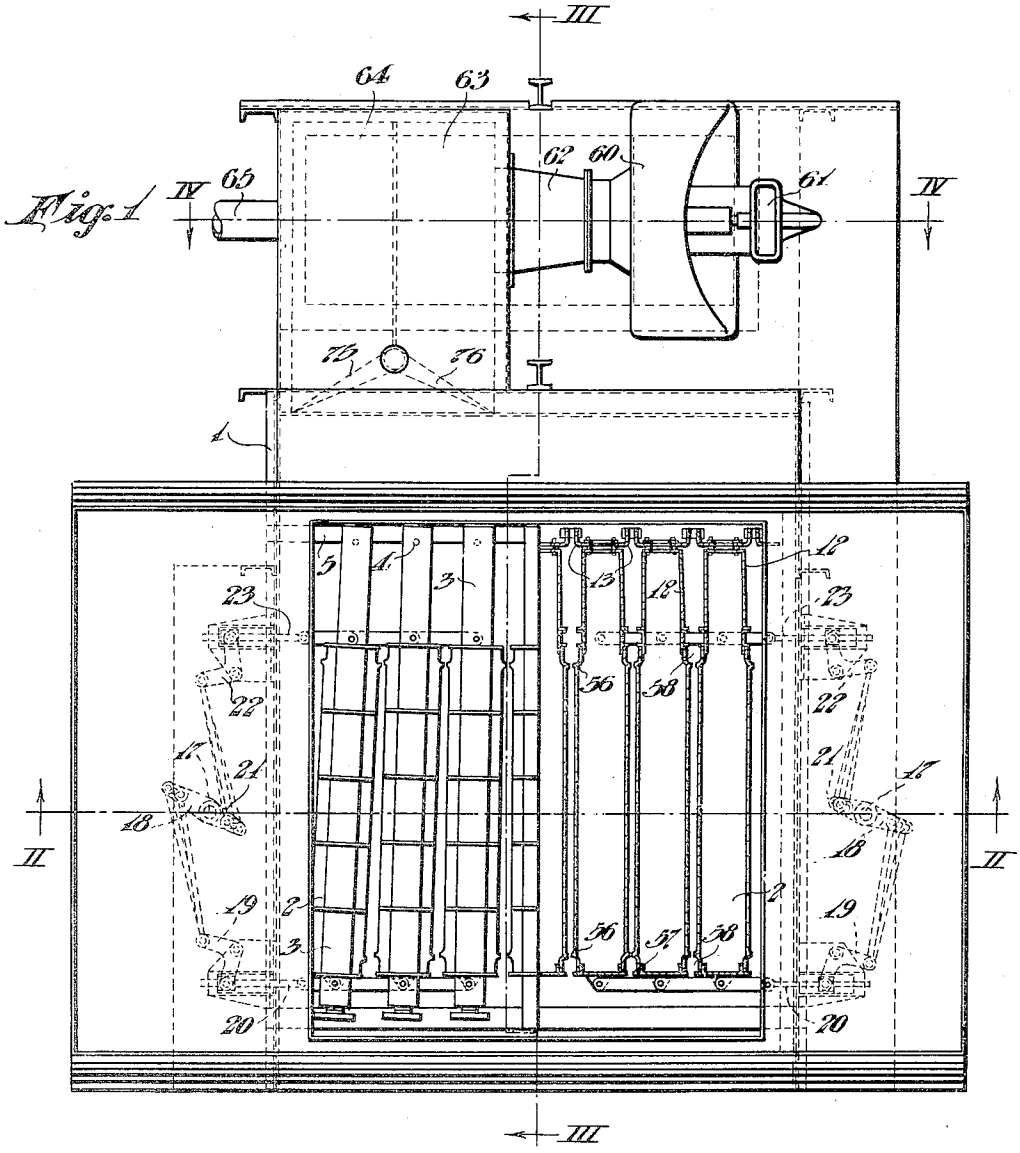

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COKING APPARATUS

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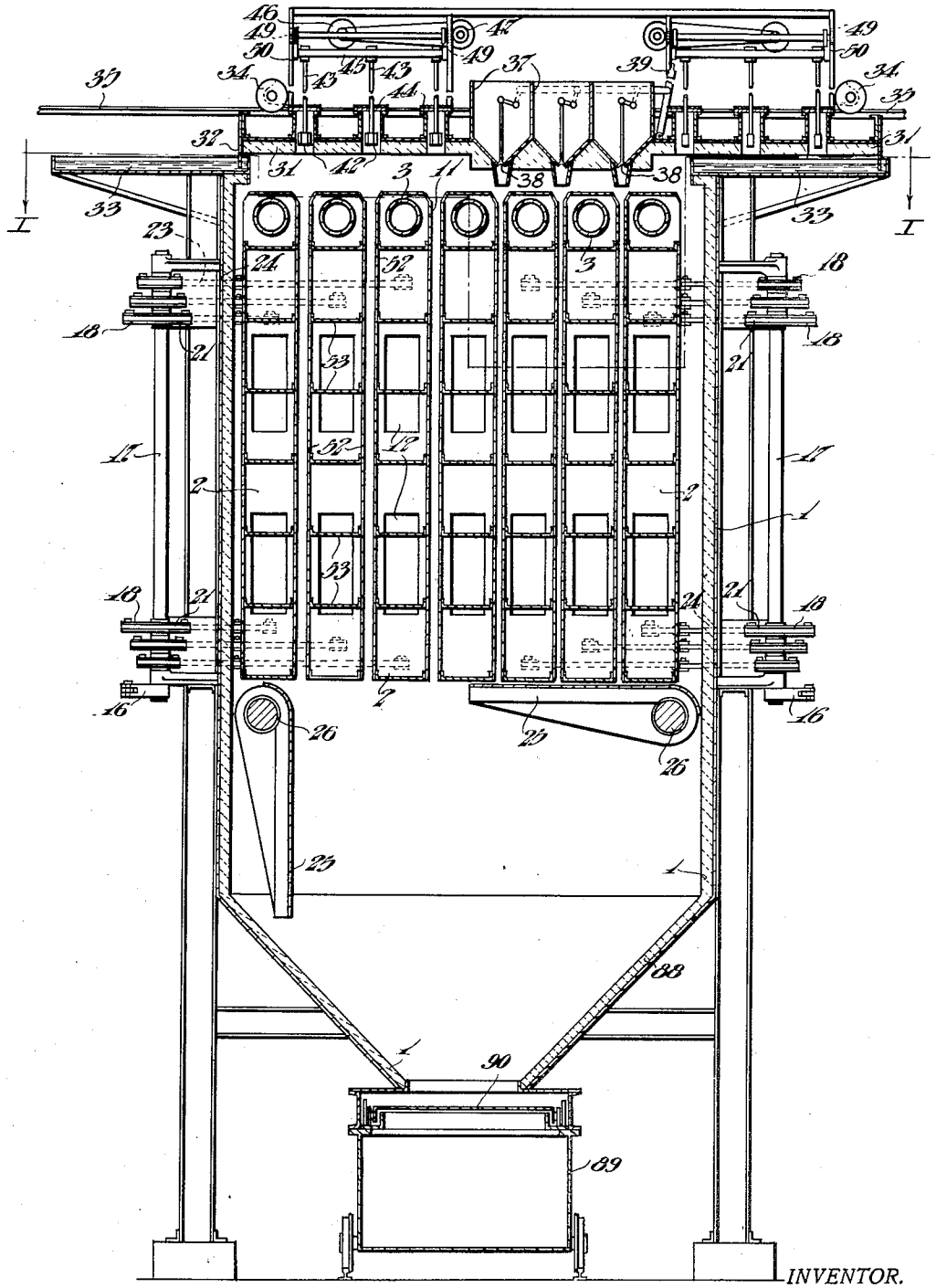

Fig. 2

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COKING APPARATUS

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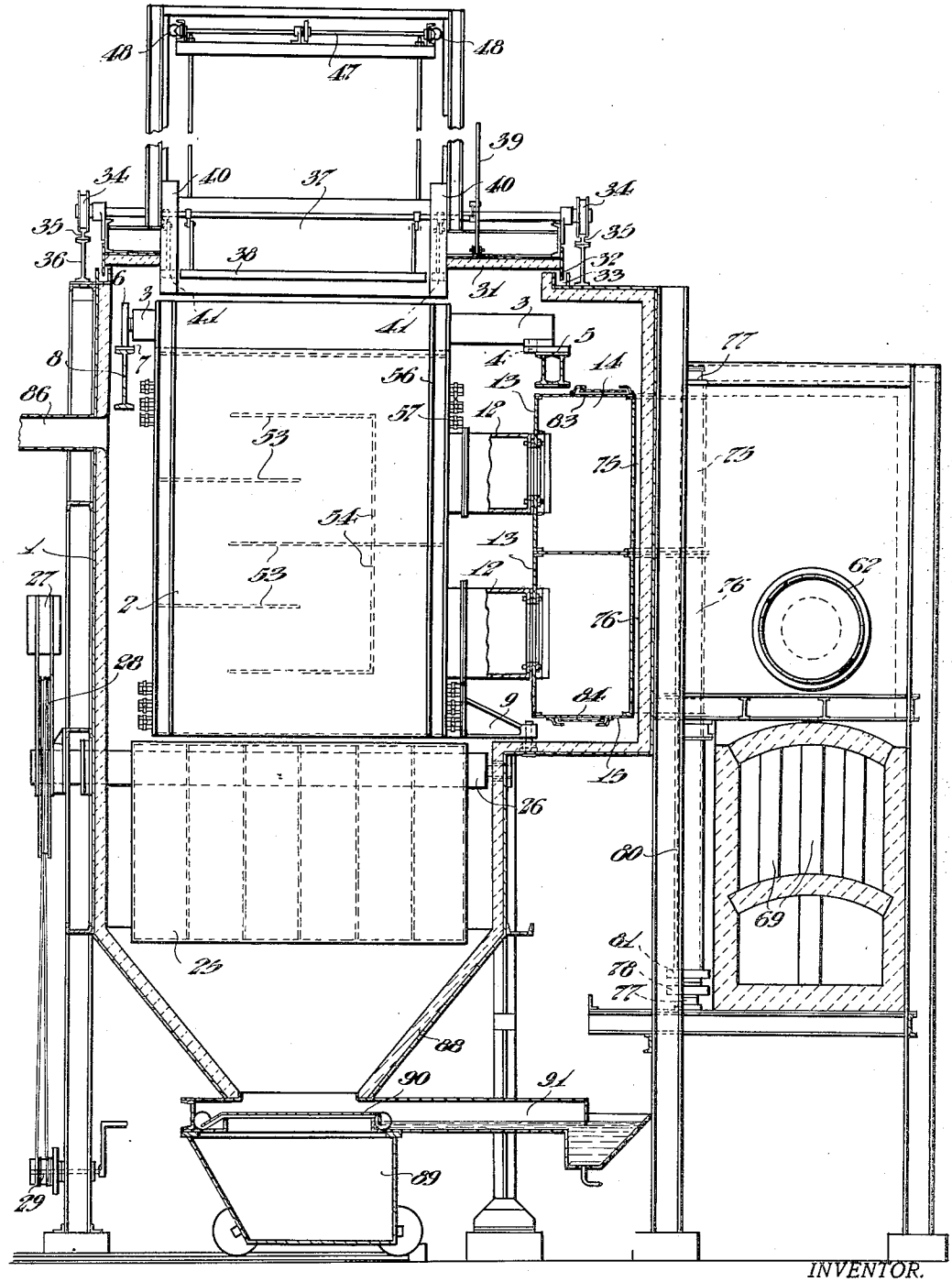

Fig. 3

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COKING APPARATUS

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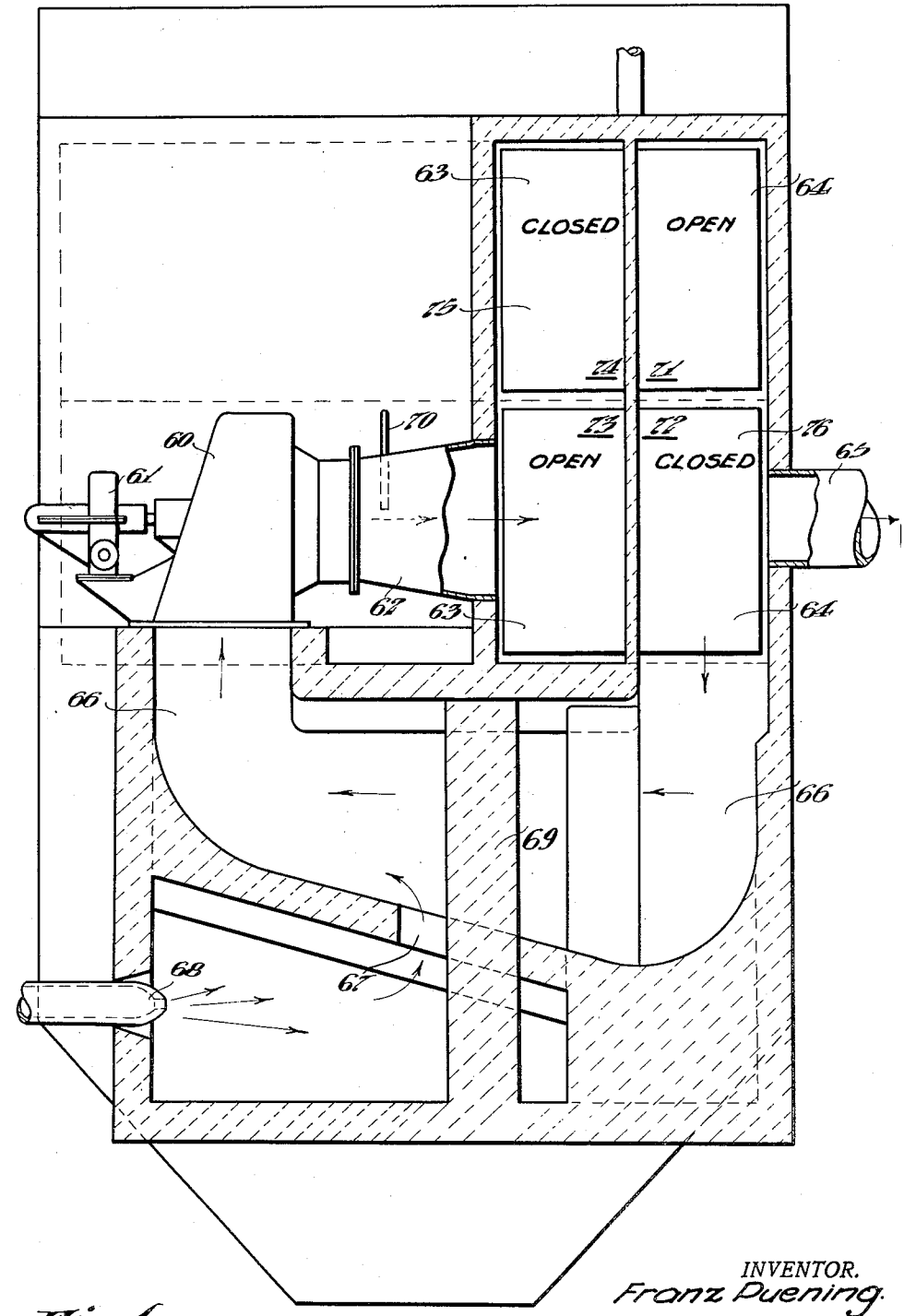

Fig. 4

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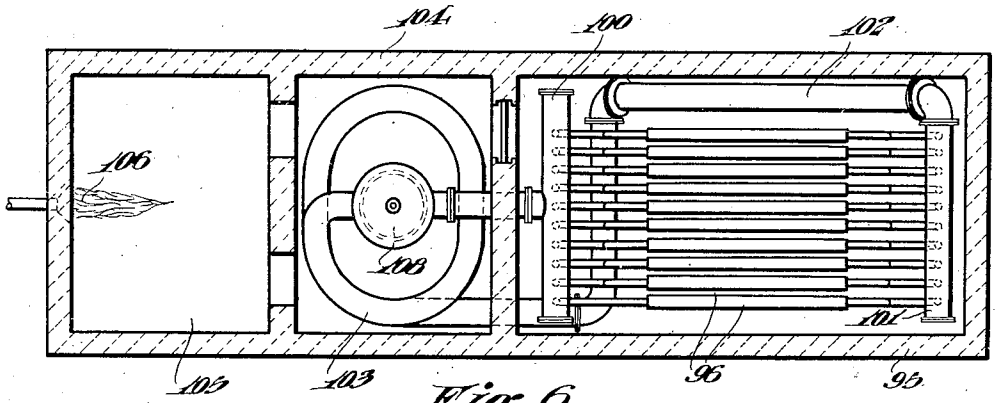

Fig. 6

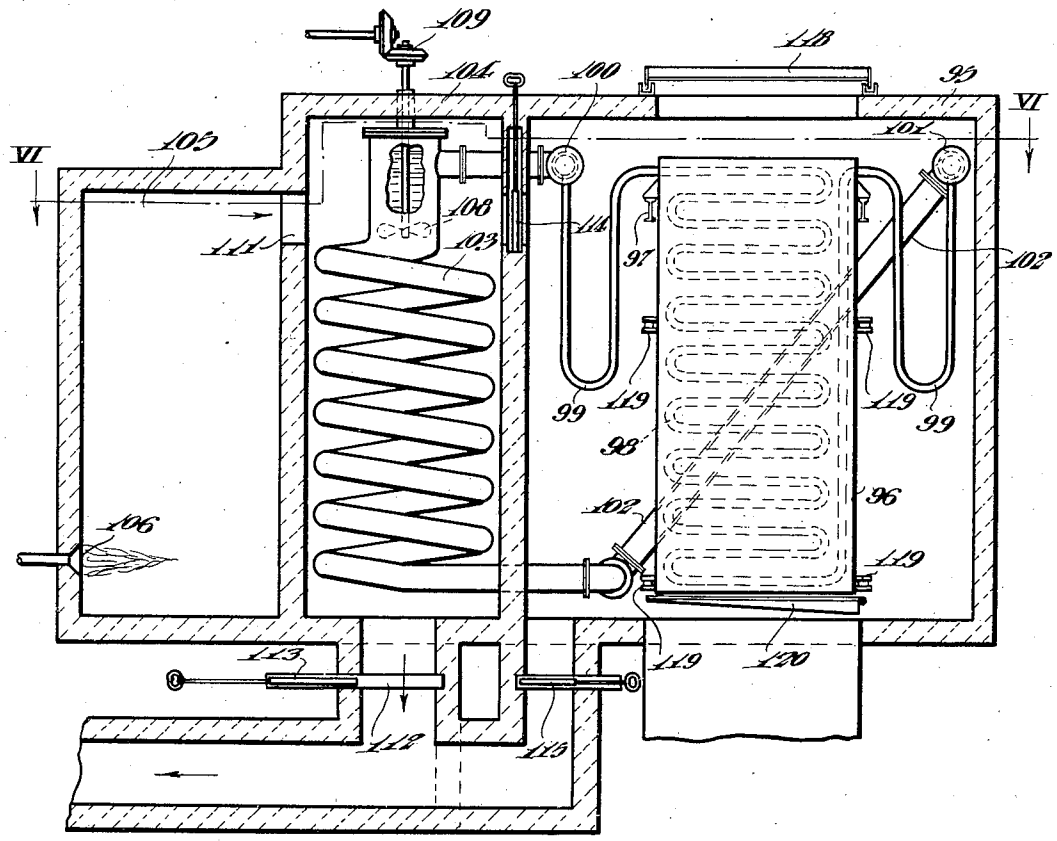

Fig. 5

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COKING APPARATUS

Application filed October 1, 1929. Serial No. 396,468.

My invention relates to coking apparatus and particularly to such apparatus as is adapted to produce low-temperature coke.

My invention has for one of its objects to provide apparatus for producing low-temperature coke of relatively high specific gravity and that is suitable for domestic use.

A further object of my invention is to provide apparatus for producing coke of the character described above that is adapted to maintain the coal being carbonized under certain pressure and which is capable of operation to freely remove the coke from the carbonizing chambers.

A still further object of my invention is to provide coking apparatus that is adapted to produce low-temperature coke that is of relatively large size and of high specific gravity and in which the walls are adapted for relative movement whereby the coke may be easily discharged from the coking spaces therebetween.

Coke of this character can be produced economically only by continuous uniform supply of heat at low or medium temperatures over a period ranging from one to six hours. The process of manufacturing coke of this character differs materially from that in which coke is rapidly manufactured in a few minutes in thin layers of ¼ or ½ inch in thickness and which coke is intended for combustion in power plants.

The principal difficulty in the production of hard, dense low-temperature coke has been in the discharge of the coke from the retorts in which it has been produced. In accordance with approved practice, the temperature of the metal retorts for producing such low-temperature coke should not exceed approximately 1100° to 1300° F. At such temperatures, coke shrinks very little and when the coke adheres to and interlocks with the irregularities of the surfaces of the retorts, it will be readily understood that it offers relatively great resistance to its being forced from the retort.

The walls, which are hollow, are adapted to be supplied continuously with a hot fluid heating medium at proper temperature whereby the coking operation proceeds uniformly and at maximum speed. The walls are so connected to the source of hot heating fluid that the latter is entirely separated from the products of distillation and in such manner, also, that the continuity of flow is not interfered with by the swinging movement of the walls.

The present invention relates to improvements on the apparatus I claimed and described in my U. S. application Serial No. 339,521 for patent filed February 13, 1929, and also relates to alternative structures for embodying the broad features of my invention as claimed in the above application.

One of the improvements is the provision of continuous or uninterrupted flexible conduits capable of withstanding internal pressures for conducting the heating fluid from a stationary source of the heating fluid to the movable walls and return.

Another improvement resides in the combination of a recirculating system for supplying heating fluid to the hollow walls with means for reversing the flow of fluid through the hollow walls every few minutes. Also, an improved mechanism for moving the walls toward and away from each other that permits the location of substantially all of the linkage mechanism away from the heat of the distillation space, and operates also to impart less motion to the edges of the walls nearest the points about which the walls swing than to the edges farthest removed from the pivot points.

Another improvement is the provision of small auxiliary spaces or enclosures along the vertical edges of the coking chambers in which a coarse grained material such as pieces of coke can be placed, thereby forming a small vertical column which seals the coking chamber and prevents escape of the finely divided and easily flowing material being carbonized.

The invention includes an improved pushing and charging machine for charging part of the coking spaces at the same time that coke is pushed from another part of the coking spaces.

A still further improvement consists in means for circulating the gases of combus-

tion through the distillation space for warming up the apparatus to place it in service.

The improvements include large coal retaining doors, which are common to a plurality of carbonizing chambers and swing inside of the distillation chamber and a horizontally movable cover provided with water seals that project beyond the main walls of the apparatus.

The details of my invention will be described in connection with the accompanying drawings, in which

Figure 1 is a view partially in plan and partially in section on line I—I of Fig. 2 of apparatus constructed in accordance with my invention;

Fig. 2 is a vertical sectional view, taken on the line II—II of Fig. 1;

Fig. 3 is a vertical sectional view taken on the line III—III of Fig. 1;

Fig. 4 is a vertical sectional view taken on line IV—IV of Fig. 1;

Fig. 5 is a vertical cross-section of a modification of the apparatus; and

Fig. 6 is a horizontal cross-section taken on line VI—VI of Fig. 5.

Referring to Figs. 1 to 4 inclusive of the drawings, coking apparatus constructed in accordance with my invention comprises a housing 1 of suitable refractory material that is of substantially rectangular shape and within which are supported for swinging horizontal movement a series of hollow walls 2. As best shown in Figs. 1 and 3, each wall 2 is supported by a horizontal beam 3 that is pivotally connected at one end by a pin 4 to a beam 5 extending transversely to the beam 3 and that is supported by suitable framework of the housing 1.

The other end of the beam 3 or the left-hand end, as viewed in Fig. 3, is provided with a relatively wide wheel 6 that is adapted to be supported by a rail 7. The rail 7 is supported by a beam 8 that is connected at its ends to the framework of the housing 1. While the weight of each wall 2 is supported at its top by the beam 3 for movement about the pin 4, the lower part of each wall is anchored by means of a bracket 9 that is pivotally connected to the housing 1. The pivotal connection of each end of the several walls insures that they swing about a vertical axis and that the sides of adjacent walls maintain the same spacing from top to bottom.

Each of the hollow walls 2 is provided at its top with a shield 11 and at one edge with extensions or ducts 12 which are joined to flexible sheets of metal 13 forming one side of chambers 14 and 15 that are in turn in communication with a source of heating gases. The flexibility of the metal plates 13 permits the swinging of the walls about pivot points which lie approximately in the plane of the metal plates 13. The metal plates 13 may be provided with corrugations to increase their flexibility.

The walls are moved by means of arms 16 connected to a source of power (not shown) which rock two vertical shafts 17 on the respective sides of the housing 1. Each of the two vertical shafts 17 is provided with three pairs of relatively long arms 18 of unequal length which are respectively connected to bell cranks 19 by means of appropriate links. The bell cranks 19 are connected to the outer ends of the walls 2 by pairs of rods 20 of unequal lengths.

Each of the two shafts 17 also is provided with three pairs of relatively short arms 21 of unequal length that are respectively connected to bell cranks 22, as is shown in Fig. 1. The bell cranks 22 are connected to the inner ends of the walls 2 by means of pairs of rods 23 of unequal lengths. The arms 18 and bell cranks 19 actuate the ends of the movable walls that are farthest removed from the flexible plate 13 and therefore are arranged to move the walls through a longer path of travel than is effected at the inner ends of the walls by means of the arms 21 and bell cranks 22. Therefore, the arms 18 are longer than the corresponding arms 21.

It is unnecessary to move the center one of the hollow walls 2 and the hollow walls farthest from the central wall must be moved through a greater distance than those adjacent the central wall. Therefore, the pairs of arms 18 are of unequal lengths, as are the pairs of arms 21, the ones for actuating the outermost walls being longer than those for operating the walls adjacent the central stationary wall. The rods 20 and 23 for connecting the various bell cranks with the hollow walls are provided with stuffing glands 24 where they pass through the outer casing 1.

The bottoms of the coking chambers formed between the hollow walls are closed by two large doors 25, each of which serves to close three chambers. They are mounted on shafts 26 and the doors are counterbalanced by weights 27. The doors are opened and closed by means of a sheave or wheel 28 and a hand-operated windlass 29.

The top of the housing 1 is closed by a roof or platform 31 which is provided with downwardly extending flanges 32 that project into liquid seals 33 that overhang the housing 1. The platform 31 is supported by flanged wheels 34 that run on rails 35 mounted on I-beams 36.

In the illustrative example shown in Figs. 1 to 4, inclusive, the apparatus comprises seven hollow walls 2 forming six coking chambers therebetween. This number is taken by way of example only as any suitable number may be used.

The movable platform 31 carries a group of three coal hoppers 37 and two groups of three

coke pushers each as will be described below.

As shown in the right-hand half of Fig. 2, three coal hoppers 37 extend through the platform 31 and each has a gate 38. All of the gates 38 for the several hoppers 37 are controlled by a single lever 39 that is connected to the gates or bells 38 by means of appropriate linkage. The hoppers 37 are each arranged to contain sufficient coal to charge a coking chamber. The tops of the shields 11 above the walls have inclined edges as shown in Fig. 2, in order to facilitate the flow of coal into the coking spaces.

At both ends of each of the main coal charging hoppers 37 are located small auxiliary bins 40 provided with gates 41. The gates 41 are opened simultaneously by a hand lever and linkage (not shown) similar to that used for operating the gates 38. The auxiliary bins are for the purpose of charging coke breeze at the vertical edges of the heating walls for sealing purposes as will be explained later.

One group of coke pushers 42 is shown immediately above the spaces between the walls 2 in the left-hand half of Figs. 1 and 2, in which views the walls of the left half of the apparatus are shown in their extended positions. The coke pushers 42 remove the coke from between the walls when the latter have been separated in the manner previously described. The coke pushers 42 are carried by vertical rods 43 which extend through stuffing boxes 44 in the roof 31. The vertical rods 43 are secured to a steel frame 45, the vertical position of which is controlled by a mechanism comprising an electric motor 46 mounted thereon and having a chain-and-sprocket connection to a shaft 47. The latter has a bevel gear connection at each end thereof to a transverse shaft 48 having gears 49 that coact with stationary vertical racks 50 whereby the frame 45 and the rods 43 with the corresponding pushers may be raised or lowered, as desired.

The pushers 42 are shown in elevation in Fig. 2, but if viewed in plan would appear wedge-shaped or tapered to fit the spaces between the hollow walls when farthest removed from each other, as shown in the left-hand half of Fig. 1. This wedge-shape insures that the pushers 42 will conform to the position of the adjacent walls so as to pass in closest proximity to the walls and remove any coke that might adhere thereto.

On the opposite side of the three coal hoppers 37 is located the second group of three pushers 42, as shown in the right-hand half of Fig. 2. This second group is not in operative position, but upon movement of the platform 31 to the left they can be brought opposite the three coking chambers in the right-hand half of the apparatus, as viewed in Fig. 2.

Each of the heating walls 2 shown in Figs. 1, 2 and 3 comprises two side plates 52 having plane surfaces that are spaced apart by flanged baffle members 53 of different lengths, as best shown in Fig. 3, in order to properly regulate the flow of heating gases therethrough. The members 53 also reinforce the side plates 52 in order to resist the pressure of the coal when the latter swells during the coking operation.

In addition to the members 53 a vertical member 54 shown in Fig. 3 extends between the two side plates of each hollow wall 2 and causes the heating gases entering one of the ducts 12 to follow a tortuous path which traverses the entire surface of the coking space formed by the side plates 52 before the gases can leave by the other duct 12.

Each of the plates 52 terminates below the beam 3 and special shields 11 are provided above each wall for enclosing the supporting beam 3 upon which the walls are mounted for swinging movement. The supporting beams 3 are much cooler than the wall plates 52 and the difference in temperature would buckle or warp the plates 52 if they were not terminated short of the relatively cool beams 3.

As clearly shown in Fig. 1, the vertical edges of the coking spaces are closed by flanges 56 carried by the adjacent walls 2. When the walls are in closed position the flanges 56 do not touch each other, and as a result the walls are free to warp slightly. Immediately beyond the flanges 56 are located a second set of flanges 57 forming in conjunction with the first flanges narrow chambers 58 at the vertical edges of each coking space, which are adapted to receive small coke or small pieces of material after the walls are swung toward each other to their closest positions and before the coal or material to be carbonized, usually in fine pulverized condition, is deposited in the coking spaces extending from one set of flanges 56 to the other.

The heating gases are supplied to the hollow walls by means of a circulating fan 60 driven by a steam turbine 61 or other suitable motive device. The fan directs the heating gases through a conduit 62 into a vertical chamber 63 shown in Fig. 4. The vertical chamber 63 forms part of a reversing valve arrangement which includes an exactly similar chamber 64 that is in communication with a stack through a duct 65, and which is also in communication with a duct 66 communicating with the intake of the fan 60.

Only a small portion of the gases from the narrow vertical chamber 64 pass out through the duct 65 and most of the gases leaving the chamber 64 pass through duct 66 to the intake of the fan. Such volume of gases as leaves the closed circuit through duct 65 is replaced by gases of combustion through an opening 67 that in turn is supplied by the burner 68. Vertical baffles 69 serve to agitate

and mix the gases. A thermometer 70 indicates the temperature of the gases as they leave the fan.

The circuit is a closed one as all of the gases enter the vertical chamber 63, pass through the valve, and the hollow walls 2 and are then returned through the valve to the chamber 64. Adjacent the two vertical chambers 63 and 64 are the two horizontal arranged chambers 14 and 15 shown in Fig. 3. The two pairs of chambers communicate through four openings 71, 72, 73 and 74.

Two diagonally located openings are always open while the other two are closed by means of reversing valves 75 and 76 shown in Fig. 3, and also shown in Fig. 1. Valve 75 is mounted on a vertical shaft 77 provided with a spur gear 78 at its lower end. Valve 76 is mounted on a tube 80 at the lower end of which is a spur gear 81. Gears 78 and 81 are simultaneously rotated in opposite directions by mechanism (not shown), reversing the valves 75 and 76 to open one pair and to close the opposite pair of the openings 71 to 74 inclusive.

Chambers 14 and 15 are provided with dampers 83 and 84 respectively which are kept closed at all times except when the apparatus is being placed in operation from a cold condition. The opening of the dampers 83 and 84 permits the gases of combustion to circulate outside of the hollow walls 2 until such time as distillation starts.

After the apparatus is heated up and the distillation commences, dampers 83 and 84 are closed, and the distillate circulates throughout the entire space within the housing 1, exterior to the hollow walls 2, and passes out through the pipe 86.

Coke discharged from between the hollow walls drops from the door 25 into the hopper 88 that forms the lower part of the housing 1, and passes into a car 89 through a door 90 that is provided with a liquid seal 91.

The operation of the apparatus of my invention will now be described:

It may be assumed that the walls 2 are in their normal or closed positions, as shown in the right-hand half of the apparatus as viewed in Figs. 1 and 2, and that hot gases from the fan 60 and recirculation system are being supplied through the ducts or extensions 12 for circulation through the heating walls 2. It may be assumed further that the hoppers 37 are filled with finely divided coal and the auxiliary hoppers 40 with coke breeze.

In order to fill the spaces 58 between the several heating walls 2, the gates 41 are opened by a lever (not shown) and after the spaces 58 are filled, gates 41 are closed and gates 38 are opened, filling the main coking spaces between the heating walls 2 with the finely divided coal that is to be coked.

The hoppers 37 are refilled from any suitable source and the platform 31 is moved to the left to register with the other coking spaces and the latter are filled in a similar manner.

The heating of the walls 2 continues for a period that varies with the thickness of the coke that is being produced, which may, for example, require a period of approximately two hours to produce coke that is about three inches in thickness. The temperature of the gases employed may be, for example, about 1250° F. upon entering the heating walls and about 1150° F. upon leaving the walls. The comparatively small drop in temperature insures greater uniformity of temperature throughout the coking mass.

If the circulation of gases continued in the same direction through the hollow walls there would be a variation in temperature from the top to the bottom of the wall corresponding to the drop in temperature of the gases leaving the walls as compared with the temperature of the gases entering the walls.

This is overcome by reversing the valves from time to time, which period is about five minutes for the apparatus illustrated. The reversal is brought about simply by the reversal of the position of the valves 75 and 76. My application No. 315,271, filed Oct. 26, 1928, discloses mechanism for reversing similar valves.

Gases of distillation escape through a pipe 86 in a side wall of the housing and may be conducted to any suitable by-product apparatus. Any tar flowing to the bottom of the housing 1, for example, when the operation of the apparatus is first begun, is caught in the liquid seal 91 from which it can be drained.

When the coking is completed, the hollow walls can be spread apart as shown in the left-hand side of Figs. 1 and 2, and doors 25 dropped and the pushing mechanism located on the left-hand side of the platform 31 put in operation to remove any adhering pieces of coke from the walls 52 by means of the pushers 42.

After this group of pushers 42 are retracted the movable platform 31 can be moved to its extreme left-hand position, whereupon the coking chambers on the right-hand side of the apparatus can be pushed by the other pushers 42. The doors 25 are then closed in readiness for the subsequent filling operation.

The foregoing sequence may be varied as desired, for example, by charging and discharging the groups of coking chambers alternately at desired intervals.

The modification shown in Figs. 5 and 6 is provided with a rectangular housing 95 and hollow movable heating walls 96 suspended from I-beams or supports 97 and having a

conduit 98 in the interior of each wall for the conveyance of heating fluid.

The conduit 98 is connected by means of flexible metallic tubes 99 to the headers 100 and 101. The header 101 is connected by a pipe 102 to a coil 103, and header 100 is joined directly to the other end of the coil 103. Coil 103 is surrounded by a housing 104 and is heated by gases from a combustion space 105 supplied by a burner 106.

A screw propeller type of pump 108 circulates the heating fluid either through header 100, conduit 98, header 101 and pipe 102 through the coil 103, or upon reversal of the bevel gears 109, can circulate the fluid in the opposite direction. The gases of combustion normally pass through an opening 111 leading to the coil 103 and out through opening 112, damper 113 being open. However, when the apparatus is to be warmed up from ordinary temperatures, dampers 114 and 115 are opened and damper 113 closed in order to circulate the gases of combustion throughout the entire housing 95, because the heating fluid used in this modification is either a molten metal or a fused salt and such materials, solid at ordinary temperatures, must be liquefied previous to their circulation.

The top of the housing 95 is provided with a platform 118 upon which a suitable charging and pushing mechanism is mounted. The several heating walls are moved to and from each other by linkage connected to the four lugs 119 of each wall. The bottom of the coking spaces between the walls 96 are closed by a door 120.

The modification shown in Figs. 5 and 6 differs from the embodiment of the invention shown in Figs. 1 to 4 inclusive, in the substitution of a heating liquid such as a metal having a low melting point or a fused salt in place of heating gases. The flexible connections, owing to the more compact nature of the heating fluid, can be made so much longer that the movement of the heating walls is not limited to a swinging motion and they can be moved uniformly to positions that are parallel to their original or operating positions.

The linkage for moving the walls may be arranged to move the bottom pairs of lugs 119 through a greater distance than the corresponding upper pairs of lugs 119 at the time of discharge of the coke. This produces a progressively increasing spacing apart of the walls in a downward direction and facilitates the downward removal of the coke.

The heating fluid circulated in the hollow walls circulates in a system entirely separate from the circuit of the gases of combustion. Heat is transferred from one to the other by means of a heat exchanger, which is the coil 103. There is no discharge of a small part of the products of combustion while the remainder of the products are recirculated. All of the products of combustion leave the system after passing in contact with the coil 103.

The operation of the modification shown in Figs. 5 and 6 is essentially the same as the operation of the one shown in Figs. 1 and 4. The propeller pump 108 is reversed periodically just as are the valves in the other apparatus. The same types of charging, pushing and wall moving mechanisms are used that were described in connection with Figures 1 to 4 inclusive.

The advantage of the uninterrupted or continuous flexible ducts leading from the stationary part of the apparatus to the movable walls is that direct and straight connections of large size are possible when gases of combustion are used as the heating fluid. The ducts 12, as shown in Figs. 1, 2 and 3 are at right angles to the axis about which the hollow walls pivot.

Owing to the fact that the continuous flexible connections are capable of withstanding internal pressure it is possible to use a more powerful pump for the circulation of the heating fluid and to reduce the size of the connections, which in turn results in greater freedom of movement of the walls.

The circulation of the heating gases as controlled by the reversing valves results in uniformity of heating of the hollow walls, a great advantage as there is small latitude between a temperature high enough to carbonize the coal and one low enough to avoid oxidation of the metal.

The provision of the coke seals is advantageous since such large walls, kept at such a high temperature cannot have a close fit and the material to be coked is pulverized before being deposited between the walls and would escape without the seals.

While I have show and described preferred embodiments of my invention, it is understood that it is not to be limited thereto except as expressed in the claims.

I claim as my invention:

1. In carbonizing apparatus, a housing for confining distillate, relatively movable hollow walls having vertical pivotal supports within the housing and having carbonizing spaces therebetween, means for separating said walls for the removal of carbonized material from said spaces, said walls serving as conduits for heating fluid, a combustion chamber located outside of the housing for heating fluid for circulation through said conduits, flexibly connected conduits for conducting the heating fluid from the combustion chamber to the relatively movable walls respectively, and means for reversing the direction of the flow of heating fluid.

2. Carbonizing apparatus comprising a stationary housing, movable walls within the housing, passageways within the walls for a heating fluid, said walls forming carbonizing chambers therebetween, means for

separating said walls for the removal of carbonized material, flexible plates mounted in the sides of the stationary housing and conduits extending through said plates to said passageways within the walls, and said carbonizing chambers being in communication with said housing.

3. Carbonizing apparatus comprising a stationary housing, movable walls within the housing, said walls forming carbonizing spaces therebetween, means for separating said walls for the removal of carbonized material from said spaces, and said walls being hollow to permit the circulation of a heating fluid therethrough, flexible connections in the sides of the housing and conduits extending therethrough for conveying the heating fluid to and from said connections to the heating walls whereby distillates can pass from the edges of the carbonizing spaces into said housing.

4. Carbonizing apparatus comprising a stationary source of heating fluid, movable heating walls, said walls being horizontally movable about vertical pivotal supports being hollow to permit circulation of the heating fluid therethrough, each adjacent pair of said walls being adapted to form a carbonizing chamber therebetween, means for separating said walls for the removal of carbonized material from said chambers, conduits for conveying the heating fluid from the stationary source of heating fluid to said heating walls and means for flexibly connecting the conduits to the stationary source.

5. Carbonizing apparatus comprising a stationary source of heating fluid, movable heating walls having vertical pivotal supports and passageways therein for said heating fluid, a conduit for the heating fluid extending from said source to each wall, a stationary exit for the heating fluid, a second conduit extending from each wall to said stationary exit and flexible connections between the conduits and said source and said exit.

6. Carbonizing apparatus comprising a stationary housing, movable walls inside the housing having passageways therein for a heating fluid, devices for moving the walls adjacent to each other to form carbonizing chambers therebetween and for separating them for the removal of carbonized material, ducts for conveying the heating fluid through the sides of the housing into the passageways within said movable walls, and means for establishing communication between said ducts and the interior of the housing before distillation temperature is attained.

7. Carbonizing apparatus comprising hollow walls arranged for relative horizontal movement about vertical axes and spaced to provide a chamber therebetween, means for separately supplying said hollow walls with heating gases, and a plurality of ribs located along the vertical edges of the walls adapted to hold columns of coarse pieces of material for sealing the chamber.

8. Carbonizing apparatus comprising a series of elongated vertical walls of substantially rectangular cross-section having passageways therein for the circulation of heating fluids, said walls being relatively movable and forming carbonizing spaces therebetween, extensions from the corresponding vertical edges of the walls for conducting the heating fluid to and from the walls, said walls being pivoted for movement about a vertical axis at the outer ends of the extensions, a furnace, and a flexible plate having openings therethrough for connecting the furnace and the outer ends of said extensions.

9. A coking chamber having a row of relatively movable vertical side walls pivoted for horizontal movement and having adjacent ribs at the vertical edges of said walls to provide a space that is adapted to be filled with coarse material for sealing the material to be carbonized in the coking chamber.

10. Carbonization apparatus comprising a plurality of relatively movable walls arranged for the circulation of heating fluid therein and spaced to form carbonizing chambers therebetween, a stationary furnace for supplying the heating fluid and having a structure comprising a flexible plate, conduits extending through said plate and connected to the interiors of the movable walls, said flexible plate being spaced from the coking chambers and said walls pivoting about points adjacent the plane of the plate.

11. Distillation apparatus comprising a group of relatively movable walls arranged in a row side-by-side, said walls being arranged for circulation of heating fluid therein and forming coking chambers therebetween, a housing for the walls, rods movable through the sides of the housing and connected to the walls, respectively, for moving them sidewise and a rotatable shaft having arms connected to said rods, the arms that actuate the walls being of progressively greater length, proceeding outwardly from the center of the group.

12. Distillation apparatus comprising a group of relatively movable walls arranged side-by-side in a row, said walls being arranged for the circulation of heating fluid therein and forming coking chambers therebetween, a housing for the walls, rods connected to the walls, respectively, and extending to the exterior of the housing and means exterior of the housing for actuating the rods through progressively greater distances according as they are connected to walls in order proceeding outwardly from the center of the group to move said walls laterally with respect to each other.

13. Carbonization apparatus comprising a stationary heating wall arranged for the cir-

culation of heating fluid therein, a plurality of similar movable walls located at one side of the stationary wall and arranged side-by-side in a row therewith, all arranged to form coking chambers therebetween, a housing for the walls for receiving the distillate, rods projecting through the sides of the housing for actuating the movable walls respectively, sidewise along said row, and mechanism located exterior of the housing and arranged to give greater movement to the rods connected to the walls farthest removed from the stationary wall than to the rods connected to the walls nearest the stationary wall.

14. A coking chamber and heating wall-enclosing chamber, a series of alternate substantially vertical coking chambers and pendant flued static heating walls therefor, arranged laterally of each other in a row in said enclosing chamber, each of said heating walls being adapted for being maintained stationary relative to each other and the coking chambers when the latter are filled with coal for coking and being mounted for movement to increase the coking chamber space between the heating walls relative to each other in said chamber for discharge of finished coke from said coking chambers, hot gas flues for circulating hot gaseous combustion products through the flues of said heating walls, inlet and outlet conduits communicably connecting the flues of said heating walls with said hot gas flues, and means for moving the heating walls relative to each other for discharge of finished coke from the coking chambers, each of said coking chambers communicating with said enclosing chamber, and the flues of each of said heating walls, the hot gas flues and the inlet and outlet conduits therefor being closed to said enclosing chamber, and a distillate gas offtake conduit communicating with said enclosing chamber for off-flow of distillate therefrom separately from the hot combustion gas, each of said inlet and outlet conduits comprising a flexible gas-tight connection between the hot gas flues and the flued heating walls.

15. A coking chamber and heating wall-enclosing chamber, a series of alternate substantially vertical coking chambers and pendant flued static heating walls therefor, arranged laterally of each other in a row in said enclosing chamber, each of said heating walls being adapted for being maintained stationary relative to each other and the coking chambers when the latter are filled with coal for coking and being mounted for movement to increase the coking chamber space between the heating walls relative to each other in said chamber for discharge of finished coke from said coking chambers, a fuel combustion chamber exterior to said enclosing chamber, hot gas flues for circulating hot gaseous combustion products in cycle through the flues of said heating walls and the combustion chamber, inlet and outlet conduits communicably connecting the flues of said heating walls with said hot gas flues, and means for moving the heating walls relative to each other for discharge of finished coke from the coking chambers, each of said coking chambers communicating with said enclosing chamber, and the flues of each of said heating walls, the hot gas flues and the inlet and outlet conduits therefor being closed to said enclosing chamber, and a distillate gas offtake conduit communicating with said enclosing chamber for off-flow of distillate therefrom separately from the hot combustion gas, each of said inlet and outlet conduits comprising a flexible gas-tight connection between the hot gas flues and the flued heating walls.

In testimony whereof, I have hereunto subscribed my name this 26th day of September 1929.

FRANZ PUENING.