

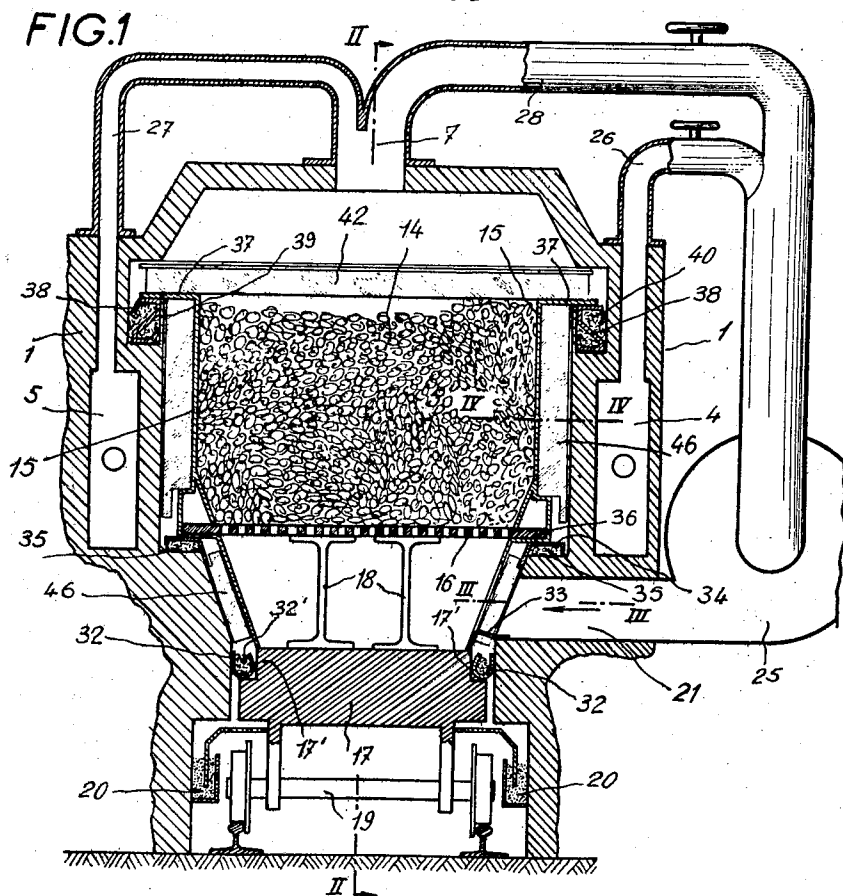
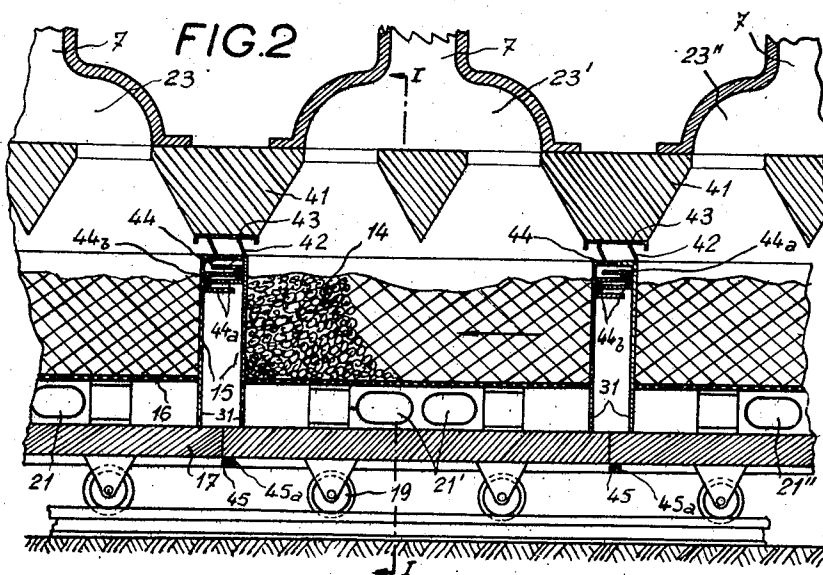
Aug. 11, 1959

E. MATIS ET AL.
APPARATUS FOR PROCESSING COMPRESSED FUEL
BRIQUETTES AND SIMILAR MATERIALS

2,899,189

Filed July 22, 1955

3 Sheets-Sheet 1



Aug. 11, 1959

E. MATIS ET AL.
APPARATUS FOR PROCESSING COMPRESSED FUEL
BRIQUETTES AND SIMILAR MATERIALS

2,899,189

Filed July 22, 1955

3 Sheets-Sheet 2

FIG3

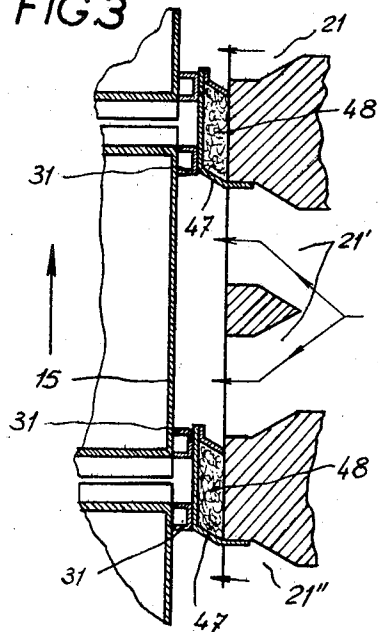
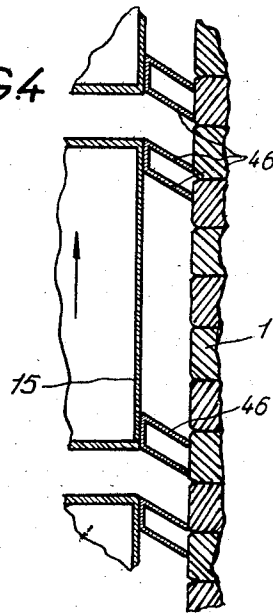


FIG4



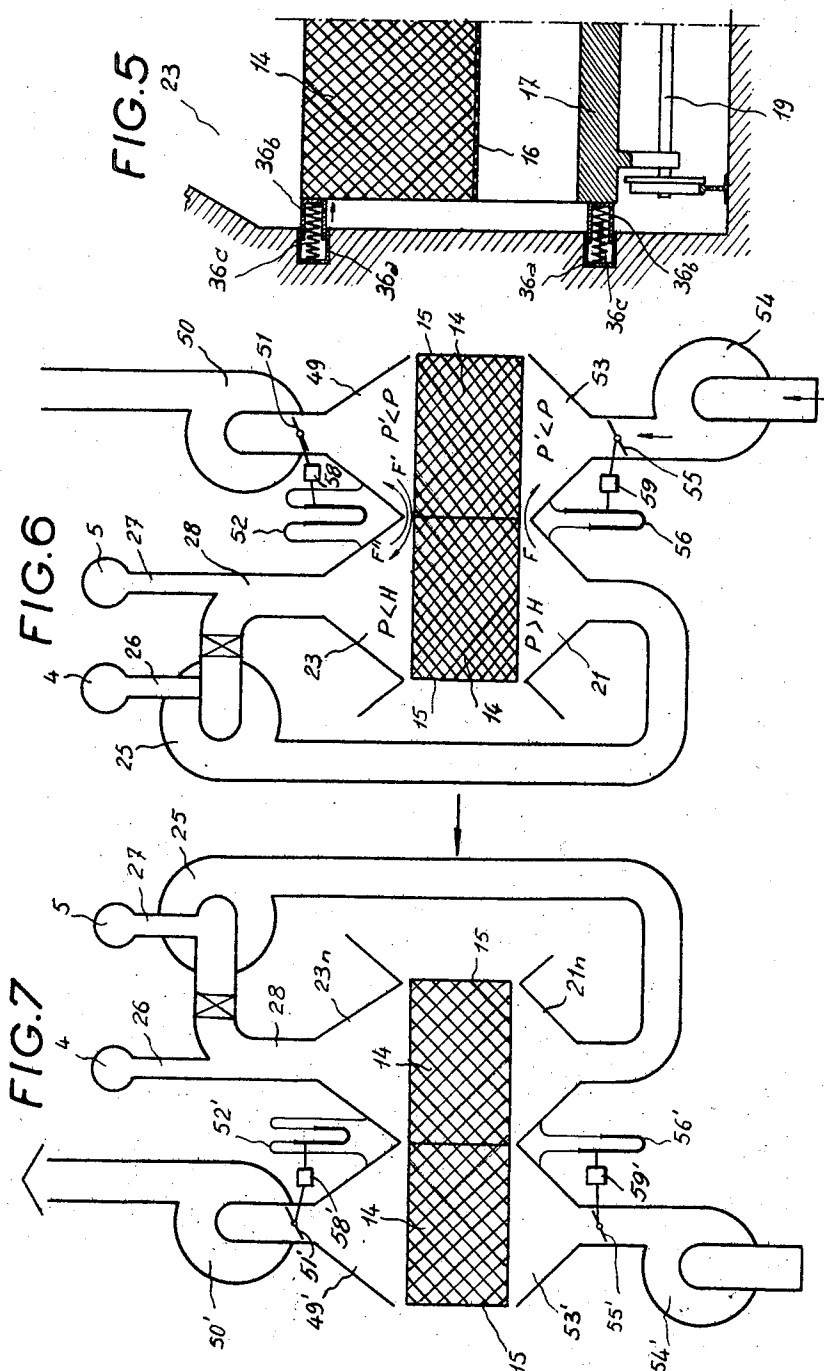
Aug. 11, 1959

E. MATIS ET AL
APPARATUS FOR PROCESSING COMPRESSED FUEL
BRIQUETTES AND SIMILAR MATERIALS

2,899,189

Filed July 22, 1955

3 Sheets-Sheet 3



1

2,899,189

APPARATUS FOR PROCESSING COMPRESSED FUEL BRIQUETTES AND SIMILAR MATERIALS

Ernest Matis and Pierre Demolon, Douai, Claude Nobécourt, Auberschicourt, and René Henri, Douai, France, assignors to Houillères du Bassin du Nord et du Pas-de-Calais, Douai, France, a French public establishment

Application July 22, 1955; Serial No. 523,898

Claims priority, application France July 24, 1954

7 Claims. (Cl. 263—28)

This invention relates to apparatus for subjecting materials to treatments involving exposure of the material in successive treating stages to gases of predetermined chemical compositions and at predetermined temperatures. More particularly though not exclusively, the invention relates to apparatus for processing compressed fuel briquettes as disclosed in the co-pending patent application Ser. No. 332,222 filed January 21, 1953, and which has issued as United States Letters Patent No. 2,805,848, dated September 10, 1957.

Broadly speaking the above-mentioned patent discloses apparatus of the specified type having a tunnel in which a plurality of treating zones are defined corresponding to the successive treating stages of the process. A train of trucks having perforate bottom walls and each bearing a charge of the material to be treated are adapted to be moved through the tunnel over a suitable track therein and to be arrested in successive positions so that the respective charges of material are allowed to dwell successively in the treating zones for simultaneous exposure to the atmosphere therein. Opening into each zone at an elevation below that of the perforate truck bottoms is a gas inlet, and opening from the top of each zone is a gas outlet. A stream of treating gas having a respectively predetermined temperature and chemical composition (particularly as regards oxygen content) is delivered into the inlet of each zone, forced to rise up through the perforate bottom of the truck stationed therein and through the charge of material thereon and discharged through the top outlet of the zone. The treating gas flow for each circuit thus defined is provided by a combustion unit outside the furnace which generates combustion gases, and these gases are mixed in a mixing chamber with spent gases discharged from at least one of the tunnel zone outlets prior to the direction of the resulting mixed gas composition into the inlet to at least one of said tunnel zones; and the remaining zone inlets and outlets are interconnected according to a selected pattern. Thus, as disclosed in the above identified patent the treating zones may be three in number and the flow-sheet may be such that the gases from the mixing chamber are directed into the inlet to the second zone; the effluent gases from the second zone outlet may be directed into the first zone inlet together with make-up air; the effluent from the first zone outlet may be cooled and then directed toward the third zone inlet; and the gas issuing from the third zone outlet may be directed into the mixing chamber for mixing with the combustion gases generated by the combustion unit. It will be understood however that other flowsheets than this may be used.

In order to ensure that in each zone the treating gas delivered through the bottom inlet will flow wholly through the perforate bottom-plate of the truck and the bed of material thereon without by-passing the latter, sealing means extending longitudinally of the tunnel have to be provided between the sides of the trucks and the

2

inner side walls of the tunnel, and since the trucks are mobile units this sealing problem is a difficult one to solve. In the prior system sand seals have been disclosed for this purpose but this expedient has not lived up to expectations in actual practice, since the sand was soon scattered under the combined effect of the turbulent gas flow and the displacement of the trucks.

It is therefore an object of this invention to provide an improved sealing structure in each treating zone for constraining the gas flow to pass wholly through the charge of material in the zone without substantially by-passing said material.

Another object is to improve the definition of the treating zones within the tunnel, and prevent intermingling of the respective gaseous atmospheres as between adjacent zones. In this connection the invention provides improved sealing means running transversely of the tunnel to seal off the adjacent zones from one another while permitting displacement of the trucks.

A particularly serious sealing problem arises in connection with the end treating zones of the tunnel, i.e. the initial and the final zones, since each of these zones at one side is in communication with the external atmosphere. Since the circulation of the gas stream through each zone requires that the bottom or inlet region of each zone be at super-atmospheric pressure while the upper or outlet region of the zone is at sub-atmospheric pressure, there is a tendency for treating gas to escape outwards from each of the end zones and for atmospheric air to penetrate into these zones. It is an object of this invention to prevent this condition.

In addition to the above specific objects, it is a general object of this invention to provide improved apparatus for subjecting material to treatments involving exposure of the material in successive treating stages to gases of predetermined chemical composition and at predetermined temperatures.

With the above objects in view, the invention provides apparatus for treating compressed fuel briquettes and materials of similar character in a plurality of treating steps, which apparatus comprises: a tunnel adapted to have a plurality of treating zones defined longitudinally therein corresponding to said steps; gas inlets and outlets extending into and out of the tunnel transversely thereof in the respective zones; means for conveying the material longitudinally through the tunnel for simultaneous treatment of successive longitudinal portions of the material in the respective zones; a flow system for circulating treating gases of predetermined temperatures and compositions over a plurality of separate flow circuits each extending into the inlet of a zone, through the portion of material therein and out of the outlet of the zone; and cooperating sealing means on outer wall surfaces of the tunnel respectively, for opposing flow of gases otherwise than over the respective circuits.

In the accompanying drawings:

Fig. 1 is a cross sectional view of an improved apparatus taken along the line I—I of Fig. 2;

Fig. 2 is a longitudinal sectional view of the apparatus taken along the line II—II of Fig. 1;

Figs. 3 and 4 are fragmentary horizontal sections taken along the lines III—III and IV—IV of Fig. 1 respectively;

Fig. 5 is a cross-sectional view similar to a portion of Fig. 1 though somewhat more diagrammatic in character, and relating to a modified form; and

Figs. 6 and 7 are diagrammatic illustrations showing the means provided for preventing the entry of atmospheric air into the initial and final zones or sections of the apparatus, respectively.

The furnace structure shown in Figs. 1 and 2 is generally similar to that disclosed in the co-pending application

Ser. No. 332,222 filed January 21, 1953, and which has now issued as United States Letters Patent No. 2,805,848, and comprises a furnace body or tunnel 1 through which the materials to be processed (e.g. briquettes) are adapted to be passed in the direction indicated by the arrow in Fig. 2. Extending through the opposite side walls of the tunnel longitudinally thereof are a pair of flues 4 and 5. While the flues 4 and 5 have been shown as forming an integral built-in part of the furnace body 1 it will be understood that they may be formed as separate structures closely adjacent the sides of the furnace. Means for circulating gas through the furnace sections or zones are illustrated as comprising a blower 25 and conduits 26, 27 and 28 suitably connected with the flues 4 and 5 and provided with flow control means therein.

Arranged for movement within and through the tunnel 1 are a set of trucks 15 each containing a charge 14 of the material to be treated. Each truck comprises a bed plate or base frame 17 having depending extensions in which an axle-and-wheel assembly 19 is journaled for supporting the truck upon a suitable track as clearly shown in Fig. 1. Supported on frame 17 by steel members 18 is a body including a perforate bottom wall or sole-plate 16 and imperforate side walls arranged to extend in close proximity to the respective inner side walls of the tunnel 1. The trucks further include vertical end members 31. It will be understood already at this point that the perforate character of the base 16 and the elevated position thereof upon the members 18 will provide for a free circulation of gases as discharged from the fan outlet conduit 21 through the bottom walls 16 and up through the charges of material contained in the trucks.

A gas tight seal is provided between bed-plate 17 and the lowermost area in which the wheel structures 19 of the trucks are located, by suitable sand seals 20. Additional sealing means are provided between the side walls of the tunnel 1 and the upper side portions of the base plate 17 of the trucks, in the form of a yielding sheet steel element 32 shaped as a trough, suitably secured to each tunnel side wall as by welding and filled in its concavity with a suitable compressible refractory mass 32' such as glass wool or the like. Each trough 32 rests against a side shoulder 17' formed on the bed plate 17, and serves to prevent any possibility of the combustion gases from the fan outlet conduits 21 flowing downwards, but instead forces the gas flow to rise up through the perforate plate 16 and the mass of agglomerate thereon. As an additional precaution, a baffle plate 33 is preferably secured to the bottom wall surface of each fan outlet conduit 21 so as to project inwards towards the side wall of the trucks and diminish the gas pressure acting upon the trough seal arrangement 32. According to a modified construction, the seal 32 may be arranged with its concave side directed downwards rather than upwards, as shown and, in such case, the additional baffle 33 should be superfluous.

It will be seen that, in Patent No. 2,805,848 mentioned above, a sand seal is provided above the gas inlet and located to prevent upward flow of the gases laterally along the sides of the truck. Experience has shown that this upper seal is subjected to considerable stress due to the turbulent condition of the gases as they issue out of the duct 21, as a result of which the sand particles tend to be scattered and the seal soon loses its effectiveness. To avoid this condition, therefore, it is a feature of the present invention to also provide a flexible type of seal in this last mentioned location.

The improved seal comprises a resilient sheet element 34 seated upon a cushion of glass wool or the like as shown at 35, and having a flat upper section as well as a downwardly projecting inner section overlapping the top of the downwardly tapered side wall of the tunnel, as clearly illustrated in Fig. 1. Cooperating with the sheet element 34 is a longitudinal member 36 secured to the side of the truck and including an outwardly projecting

horizontal bottom flange extending from the perforate bottom wall 16 and a vertical outer web from the upper end of which there extends an inturned top flange which is secured to a side wall of the truck. The bottom horizontal flange of the member 36 engages the flat horizontal upper section of element 34 and provides a tight seal owing to the yielding character of the mass 35 on which the element 34 is seated.

Further in accordance with the invention an additional prevent is provided at the top of the truck, to seal communication between the space defined between the side wall of the truck and the adjacent side of the tunnel, and the top gas discharge chamber or hood 23 present at the top of the furnace above the trucks. For this purpose, an outwardly projecting horizontal flange 37 is provided at the top of the truck and extends into engagement with the horizontal upper flange of an S-shaped sheet element 38 having its bottom flange seated on a shoulder of the furnace wall, with an integral web interconnecting both flanges. The spaces between the web and both flanges of this S-shaped member are filled with a mass of glass wool or equivalent material 40, the entire seal assembly being retained within a channel or casing element as indicated at 39 on the left side of Fig. 1.

Fig. 5 illustrates a modified construction of the seal assemblies described above for sealing the top and bottom ends of the spaces defined between the sides of the trucks and the adjacent sides of the tunnel. As shown in Fig. 5, both the top and bottom side seals may be similar and each comprises a channel member 36a embedded in a recess of the furnace wall with its open side directed inwards. A complementary channel member 36b has its web arranged for frictional engagement with the side of the truck and its flanges project into the recess of channel member 36a in sliding frictional engagement with the flanges of the latter member. Spring means such as 36c are inserted in the variable cavity defined by the two cooperating channel members to press both webs away from each other, and the cavity around the springs is filled with a mass (not shown) of the compressible medium previously mentioned herein, such as glass wool. Stop means, not illustrated, prevent the escape of the movable channel member 36b from the fixed member 36a in the absence of any trucks in the furnace.

According to a further feature of the invention, improved sealing means are provided for isolating the adjacent longitudinal zones or sections of the furnace in which, as disclosed hereinabove, the material is adapted to be subjected to respective stages of the process. From Fig. 2 of the accompanying drawings, it is seen that each zone or section comprises two adjacent gas inlet ducts or nozzles such as are indicated at 21, 21' or 21'', at the bottom of the section and a single top outlet such as are indicated at 7, 7', 7'', and which communicate with the related section through a domed hood such as are indicated at 23, 23', 23''. The upper parts of adjacent sections are separated by overhead wall portions 41. In accordance with this invention, a metal plate is secured to the bottom face of each overhead wall portion, and a pair of metal sheet elements 42 depend from pivots 43 carried by each plate and are adapted yieldingly to engage horizontal plates 44 transversely secured to the top of each end wall of each truck. Beneath the plate 44 there is furthermore provided an interlocking set of baffle plates 44a, alternately secured to the rear end wall of each truck and to the front end wall of the adjacent truck. Between the end of each baffle 44a projecting from one truck and the wall of the adjacent truck there is interposed a roll of asbestos or other suitable material 44b.

The arrangement last described serves to seal the tops of the spaces defined between adjacent trucks. These spaces have to be sealed because, as already mentioned, it is contemplated that each truck will dwell in a respective section or zone of the tunnel while its charge of

agglomerate material is being exposed to the particular conditions of gas temperature and composition obtaining in that zone or section. Hence an effective seal between the adjacent trucks is required. In accordance with a further feature of the present invention, an additional seal is preferably provided between the trucks at the bottom thereof, and this seal may take the form of a simple round bar 45 extending transversely across the underside of the bed plate 17 of each truck near an end thereof, and adapted to fit into a complementary cavity formed in the adjacent truck, with a web of asbestos fabric or other suitable material 45a to improve the seal.

Furthermore, as shown in Fig. 4, a pair of sheet elements 46, which may constitute the flanges of a suitably shaped channel member, are secured vertically to each side wall of each truck adjacent each end thereof, to extend into resilient flexible engagement with the adjacent walls of the furnace body or tunnel 1. As indicated, the elements 46 are arranged to slant away from the truck in a rearward direction with regard to the direction of travel of the trucks through the tunnel, which direction is indicated by an arrow in Fig. 4. The elements 46 correspond in vertical extent to the spacing between the perforate sole plates 16 and the tops of the trucks.

Further, to achieve the desired isolation between the trucks and furnace sections, a somewhat similar sealing arrangement to the one just described is provided on a level with the fan outlet conduits 21. As shown in Fig. 3, the seal structure used at this point may take the form of a box-like structure 47 of sheet elements including two vertically extending horizontally slanting flanges secured to the solid parts of the wall of the tunnel 1 at the front and rear of the adjacent gas outlets 21 respectively, and interconnected by web elements parallel to and spaced from the tunnel wall. The boxes thus provided are filled with bodies 48 of glass wool or equivalent material. The web elements just mentioned are arranged to bear resiliently against complementary faces of vertical elements 31 constituting the end members of the trucks.

It will be understood that the arrangements described above with reference to Figs. 2, 3 and 4, all cooperate in achieving a common purpose, which is the positive isolation between the adjacent processing stations which are created in the stationary condition of the trucks in their respective furnace sections, as in the condition illustrated in Fig. 2. In such condition there will be no possibility for the gases delivered through an inlet, such as is indicated at 21, into one section or zone, to mingle with the gases delivered into the adjacent zones or sections, nor will there be any mingling between the gas discharge spaces 23 of adjacent zones above the charges of agglomerated material. In other words, there are achieved a number of sealed longitudinal treating zones or sections positively sealed from one another and each containing one truck with a charge of material thereon, and an individual and separate flow of treating gases for each zone flowing around a circuit transverse to the direction of the tunnel.

The present invention further provides certain measures for preventing entry and discharge of air and gases into and from the end sections of the tunnel. These features are diagrammatically illustrated in Figs. 6 and 7. For the sake of clarity, the gas inlet means into the sections or treating zones, which, in the actual construction as described with reference to Figs. 1 and 2, comprise a pair of ducts 21 opening into a side of each tunnel section, illustrated in Figs. 6 and 7 in the form of a single bottom inlet 21 symmetrical with respect to the top discharge outlet 23. It should be understood that the gases delivered into each section through the inlet 21 for discharge through the charge of material in the section, have to be delivered at an inlet pressure substantially higher than the atmospheric pressure H , e.g. a relative pressure of several centimeters water. On the other

hand, the spent gases discharged out of the section through outlet 23 are at substantially subatmospheric pressure.

Fig. 6 relates to the initial or input treating section of the tunnel, shown as comprising the inlet 21, a truck 15 with its load of material 14, and an outlet or exhaust hood 23. A fan 25 drives the gas flow into inlet 21, up through the bed of material 14 and out of the section through hood 23 and pipe 28. The flues 4 and 5 although actually extending in closely spaced relationship to the furnace side walls have been shown for convenience as separate chambers connected with the fan inlet through branch conduits 26 and 27. Adjacent and to the right of the input section just described, Fig. 6 illustrates an additional or auxiliary section. In the absence of such auxiliary section, it is clear that, owing to the super-atmospheric pressure in the inlet 21 there would be a tendency for the gases delivered into the inlet to escape out of the furnace to the outer atmosphere as indicated by the arrow F , and similarly a tendency would exist for atmospheric air to enter the top of the zone as indicated by the arrow F' due to the sub-atmospheric pressure in the exhaust space 23. The auxiliary zone or section provided ahead of the initial treating zone or section of the furnace in accordance with this invention is generally similar to the other furnace sections, with an inlet 53 and an exhaust hood 49. A blower or fan 54 has its outlet connected to the inlet 53 through a conduit including a flow control valve or gate 55, and a suction blower or fan 50 having an inlet flow control gate 51 is connected with the exhaust space or hood 49 of the auxiliary section. The rate of blower 54 is adjusted to maintain in the bottom space 53 a pressure P somewhat higher than the pressure P_1 in the inlet space 21, and the effective suction of fan 50 is adjusted to maintain in the upper space 49 a pressure somewhat lower than the pressure in the upper space 23. Thus, considering for example the upper portion of the left hand section shown in Fig. 6, the tendency for atmospheric air to enter therein as indicated by arrow F' will now be replaced by a controlled tendency for the combustion gases to issue therefrom into the auxiliary section to the right thereof as indicated by the arrow F'' .

The rate of delivery and effective suction of the fans 49 and 54, respectively, are controlled by actuation of the gate valves 51 and 55, so as to maintain the small but definite pressure differentials required to positively prevent discharge of gases from the inlet space 21 and entry of air into the exhaust space 23 e.g. pressure differentials in the order 2-3 mm. water. Advantageously the regulation of the valves 51 and 55 associated with fans 49 and 54 may be performed automatically in response to the pressure differentials between spaces 21 and 53, and between spaces 23 and 49 as sensed by a differential gauge 56 and a differential gauge 52, respectively. Any suitable pressure-responsive means, which may be mechanical or electrical, may be provided for operating the valves 51 and 55 in response to the pressure drops sensed by the respective gauges 52 and 56, for example, as indicated diagrammatically at 58 and 59.

The auxiliary section provided as just described, may further be employed for de-dusting the briquette material. For this purpose it is simply necessary to connect the output of suction fan 50 with the input to a cyclone type dust-remover (not shown) or the like.

Referring to Fig. 7, it will be seen that an arrangement generally similar to that just described is there illustrated in connection with the endmost treating section of the tunnel. The components of this endmost treating section have been designated with the same reference numerals as the components of the initial treating section shown in Fig. 6, but with the letter n appended thereto indicating that the furnace comprises n treating sections in all (e.g. $n=3$). The auxiliary section provided according to this invention beyond this n th treating section, is illustrated on the left side of Fig. 7 and

includes broadly the same components as the auxiliary (right-hand) section in Fig. 6, which components are identified by the same numbers primed. Further description of Fig. 7 is superfluous in view of the above given description of Fig. 6, it being simply noted that the air-flow circulated through this endmost auxiliary section may also desirably serve to provide a final cooling stage for the treated material.

While an exemplary embodiment of the invention has been described and illustrated in detail, it will be understood that variations may be made therein without exceeding the scope of the claims.

What we claim is:

1. Apparatus for treating carbon agglomerates comprising a furnace structure including walls, a roof and a floor defining a tunnel-like interior and having means therein dividing said interior into at least three longitudinally successive sections, means for conveying the agglomerates to be treated through said longitudinally successive sections of the tunnel-like interior of said furnace structure, said furnace structure having a set of inlet and outlet orifices opening into and out of, respectively, each of said sections of the interior for circulating gases through agglomerates present in the related section in directions at right angles to the longitudinal direction of movement of said conveying means, said conveying means having transverse partitions spaced apart in said longitudinal direction, means defining gas-tight sliding joints between said transverse partitions and said walls, floor and roof of the tunnel structure effective to isolate the adjacent successive sections of said tunnel-like interior from each other when said partitions are located between the sets of inlet and outlet orifices associated with said adjacent successive sections so that the agglomerates in each of said sections are then subjected to the gases circulated by the related inlet and outlet orifices and protected from contamination by the gases circulated in the adjacent sections, a chamber disposed externally of said furnace for producing combustion gases, means for regulating the temperature and the oxygen content of the combustion gases issuing from said chamber, longitudinal conduits extending along said furnace structure, and means communicating said orifices and said mixing chamber with said longitudinal conduits to circulate treating gases having desired constituents through the sections by way of the related orifices.

2. Apparatus for treating carbon agglomerates comprising a furnace structure defining a tunnel-like interior, said furnace structure having sets of inlet and outlet orifices at locations spaced apart in the longitudinal direction of said tunnel-like interior for circulating treating gases through the latter in directions at right angles to said longitudinal direction, longitudinal conduits extending along said furnace structure and communicating with said orifices to carry treating gases to and from the latter, a train of coupled-together containers adapted to contain the agglomerates to be treated, each of said containers having side walls and end walls which are spaced apart by a distance substantially equal to the distance between successive sets of said inlet and outlet orifices, means defining gas-tight sealing means between the adjacent end walls of successive containers in said train to prevent flow of gas between said adjacent end walls, said train of containers being intermittently movable through said tunnel-like interior and being brought to rest with said end walls disposed intermediate the successive sets of inlet and outlet orifices, and means defining sliding, gas-tight joints between the interior surface of said tunnel structure and said containers at said end walls of the latter so that, whenever said train is brought to rest, said gas-tight joints separate said tunnel-like interior into successive sections each of which has a set of inlet and outlet orifices communicating therewith and is isolated from the other sections to avoid intermixing within said

tunnel-like interior of the treating gases circulated by the orifices of the several sections.

3. Apparatus for treating carbon agglomerates comprising an elongated furnace structure having side walls, a roof and a floor defining a tunnel-like interior and means within the latter defining a series of successive treating sections therein, conveying means for carrying the agglomerates to be treated longitudinally through said successive treating sections of the tunnel-like interior and having perforated bottoms adapted to support the agglomerates and transverse partitions spaced apart in the direction of movement of said conveying means, said furnace structure having a set of inlet and outlet orifices in each of said sections opening into and out of the related section of the interior below said perforated bottoms of the conveying means and above the latter, respectively, conduit means extending longitudinally along said furnace structure and communicating with said inlet and outlet orifices of said sections, pressure flow means for circulating treating gases through said conduit means to enter said sections at said inlet orifices, pass upwardly through the agglomerates in said sections and leave the latter at said outlet orifices, means for controlling the temperature and composition of the treating gases admitted to said sections at the related inlet orifices of the latter, and means defining gas-tight sliding joints between said transverse partitions of the conveying means and said walls, roof and floor of the furnace structure effective to isolate the adjacent successive sections from each other when said partitions of the conveying means are located between the sets of inlet and outlet orifices associated with said adjacent successive sections, thereby to prevent intermixing, within said tunnel-like interior, of the treating gases circulated through said sections.

4. Apparatus as in claim 3; further comprising means in said furnace structure defining an auxiliary section at least at one end of said series of successive treating sections, said auxiliary section also having a set of inlet and outlet orifices communicating with the interior thereof below said perforated bottoms of the conveying means and above the latter, respectively, pressure flow means operative to induce a circulation of air into said auxiliary section, at said inlet orifice, upwardly through the agglomerates on said conveying means within the auxiliary section and out of said outlet orifice of the latter for establishing relatively high and low pressures within said auxiliary section below and above, respectively, said perforated bottoms of the conveying means, and means for controlling the last mentioned pressure flow means to maintain a positive pressure differential between said inlet orifices of the auxiliary section and the next adjacent end treating section, respectively, and to maintain a negative pressure differential between said outlet orifices of the auxiliary section and the next adjacent end treating section, respectively, thereby to prevent treating gas outflow and air inflow from and into said end treating section next adjacent to said auxiliary section.

5. Apparatus as in claim 4; wherein said means for controlling the pressure flow means includes differential pressure sensing means sensing the pressure differentials between the inlet and outlet orifices of said auxiliary section and the next adjacent end treating section, and means responsive to said sensing means for regulating said last mentioned pressure flow means.

6. Apparatus as in claim 4; wherein said last mentioned pressure flow means includes blower means having its discharge connected to said inlet orifice of said auxiliary section and suction means connected with said outlet orifice of said auxiliary section.

7. Apparatus as in claim 4; wherein said furnace structure has means defining said auxiliary section at each of the opposite ends of said series of treating sections, thereby to prevent treating gas outflow and air inflow

from and into the treating sections at the opposite ends of said series.

References Cited in the file of this patent

UNITED STATES PATENTS

241,840	Bowen et al. -----	May 24, 1881
1,122,879	Drayton -----	Dec. 29, 1914

5

1,541,099
2,386,835
2,672,412

Barnebey et al. -----	June 9, 1925
Beatty -----	Oct. 16, 1945
Burrow et al. -----	Mar. 16, 1954

FOREIGN PATENTS

France -----	Dec. 7, 1911
Switzerland -----	July 1, 1943