Sept. 4, 1945. C. H. McKINNEY 2,384,184

APPARATUS FOR MAKING COKE

Filed Jan. 18, 1943 4 Sheets-Sheet 1

Fig. 1.

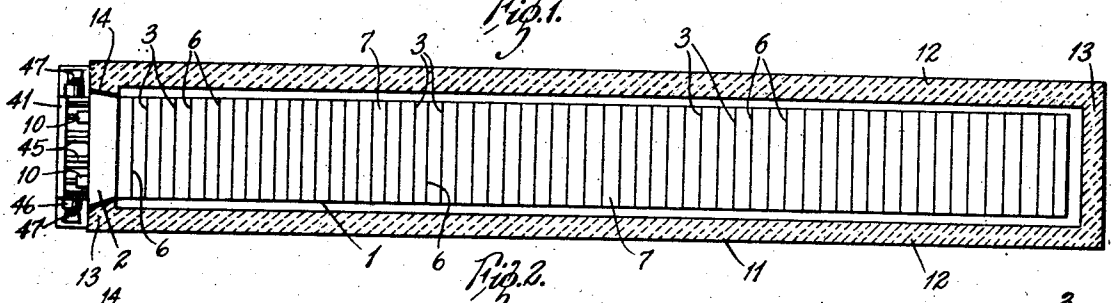


Fig. 2.

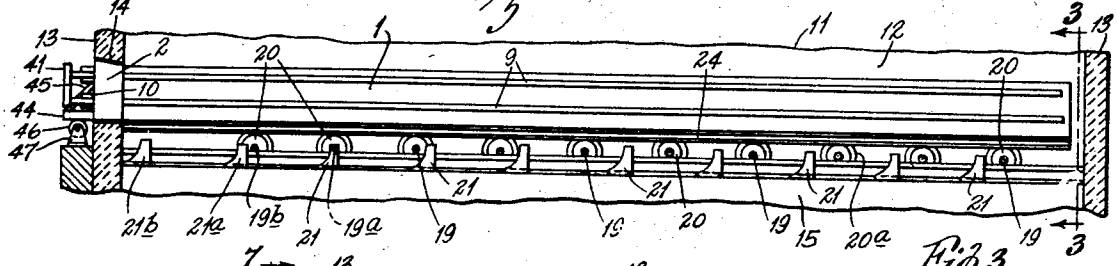


Fig. 3.

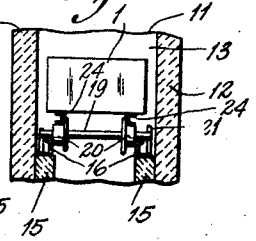


Fig. 4.

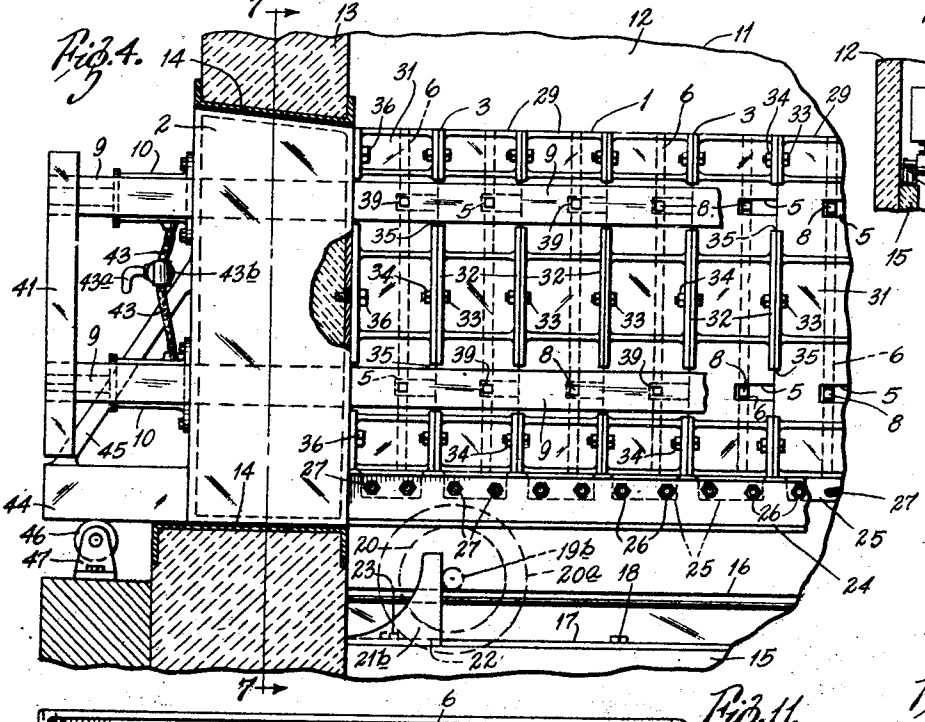


Fig. 11.

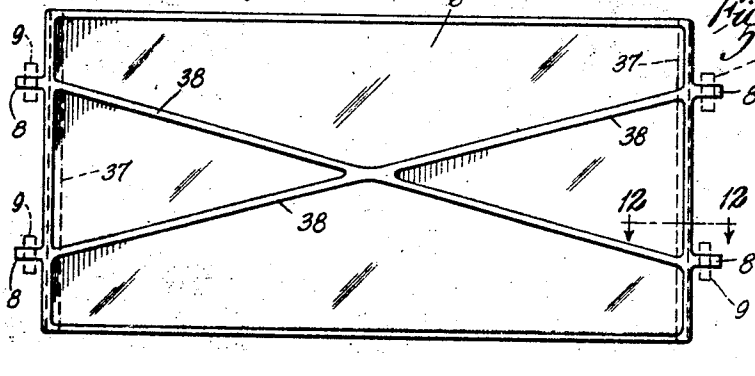
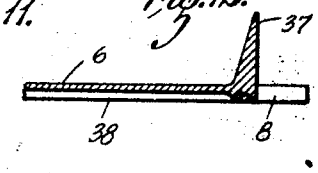


Fig. 12.



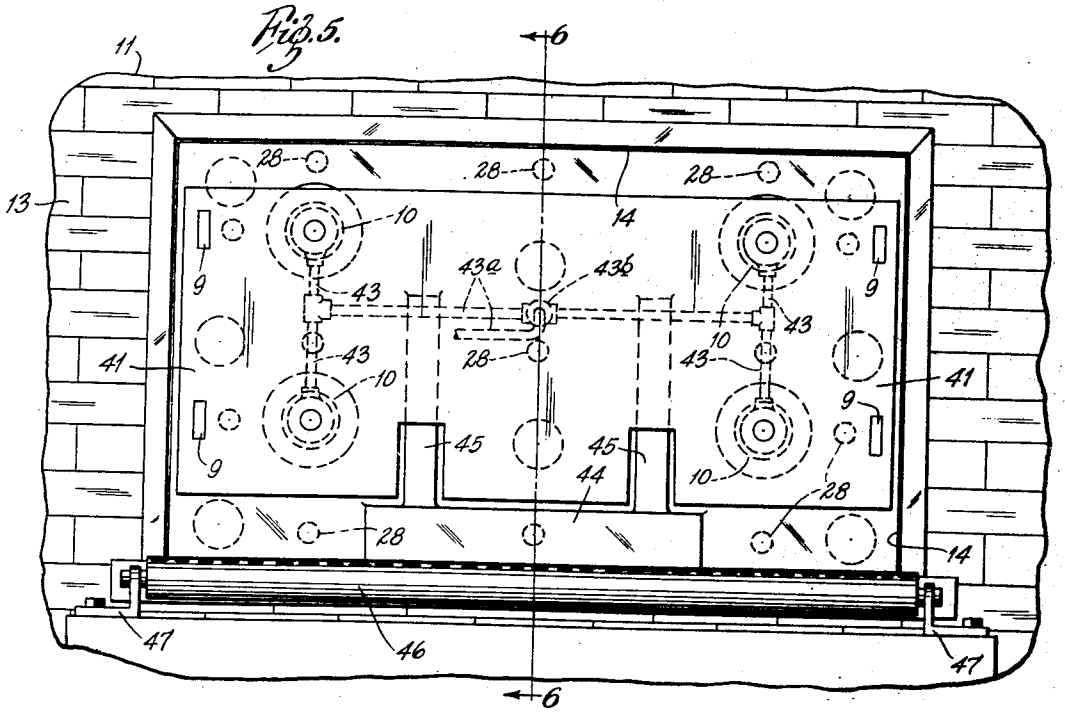
INVENTOR:
Chas. H. McKinney
by Pennie Davis Marvin & Edmonds
HIS ATTORNEYS.

Sept. 4, 1945. C. H. McKINNEY 2,384,184

APPARATUS FOR MAKING COKE

Filed Jan. 18, 1943 4 Sheets-Sheet 2

Fig. 5.



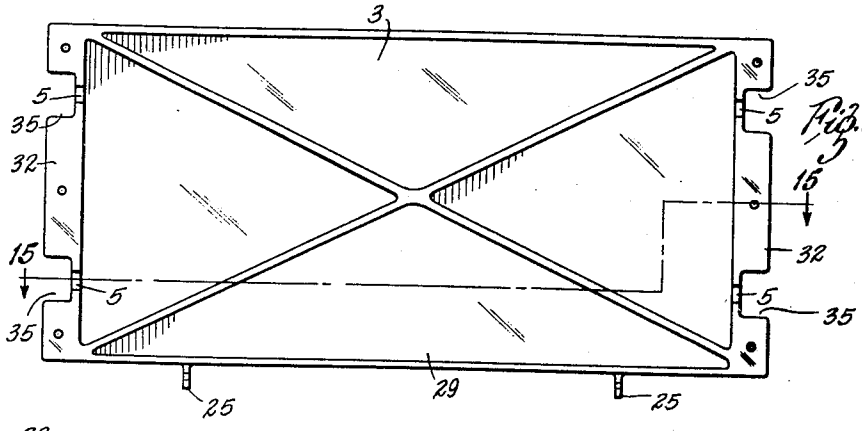


Fig. 13.

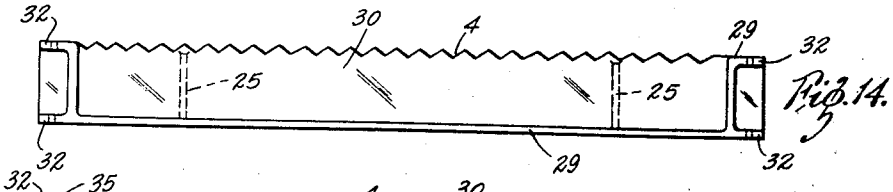


Fig. 14.

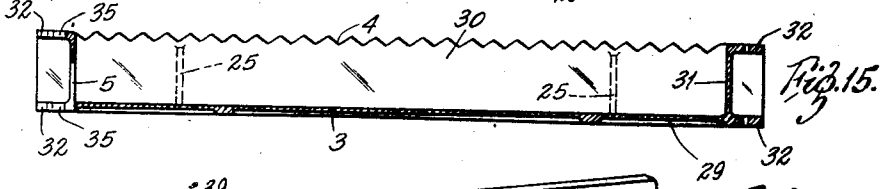


Fig. 15.

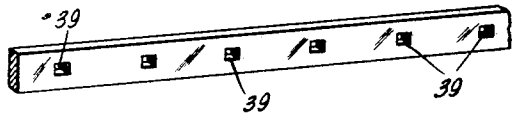


Fig. 16.

INVENTOR:
C. H. McKinney
by Cornet Cornet & Cornet

HIS ATTORNEYS.

Sept. 4, 1945. C. H. McKINNEY 2,384,184

APPARATUS FOR MAKING COKE

Filed Jan. 18, 1943 4 Sheets-Sheet 3

Fig. 6.

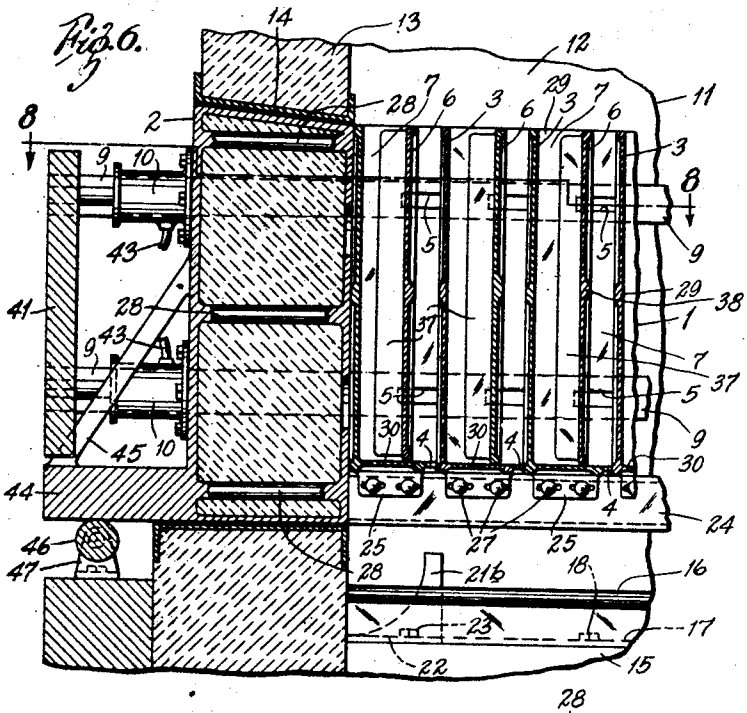


Fig. 9.

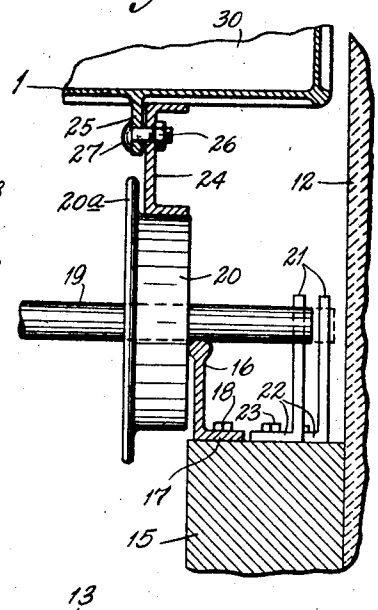


Fig. 7.

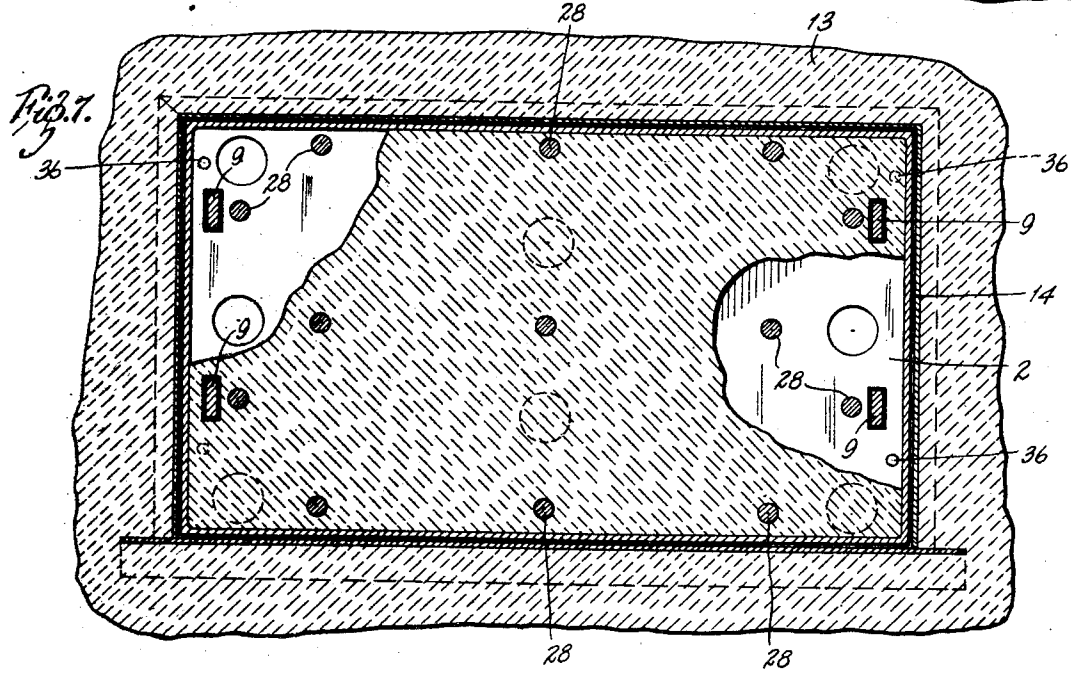
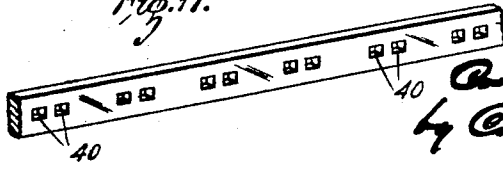


Fig. 17.



INVENTOR:
Charles H. McKinney
by Cornell Cornell Brandy
HIS ATTORNEYS.

Sept. 4, 1945. C. H. McKINNEY 2,384,184

APPARATUS FOR MAKING COKE

Filed Jan. 18, 1943 4 Sheets-Sheet 4

Fig. 8.

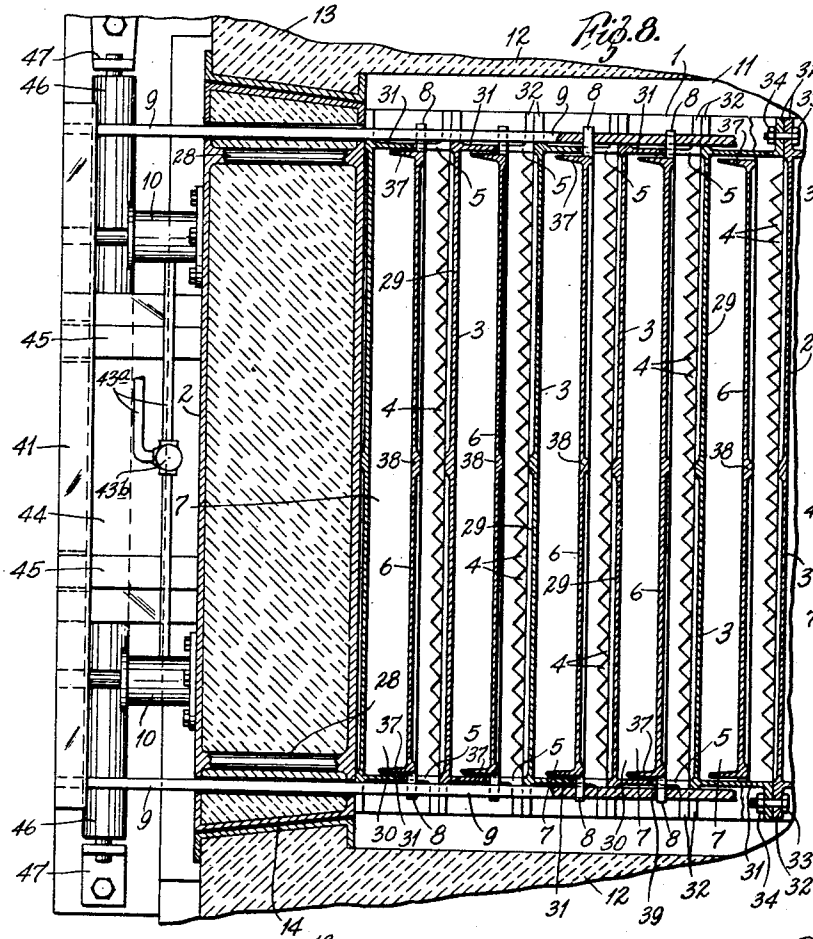


Fig. 19.

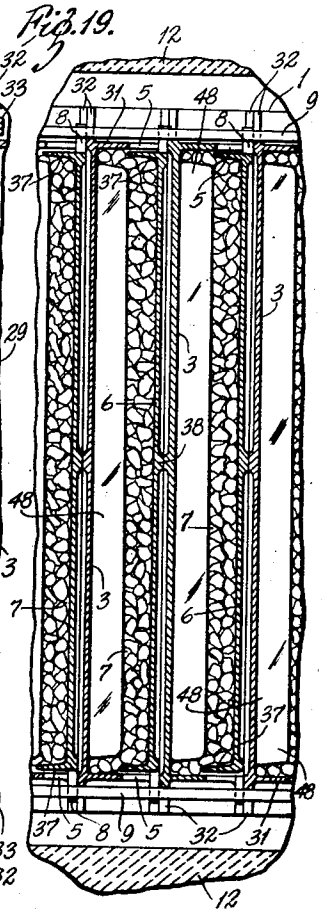


Fig. 10.

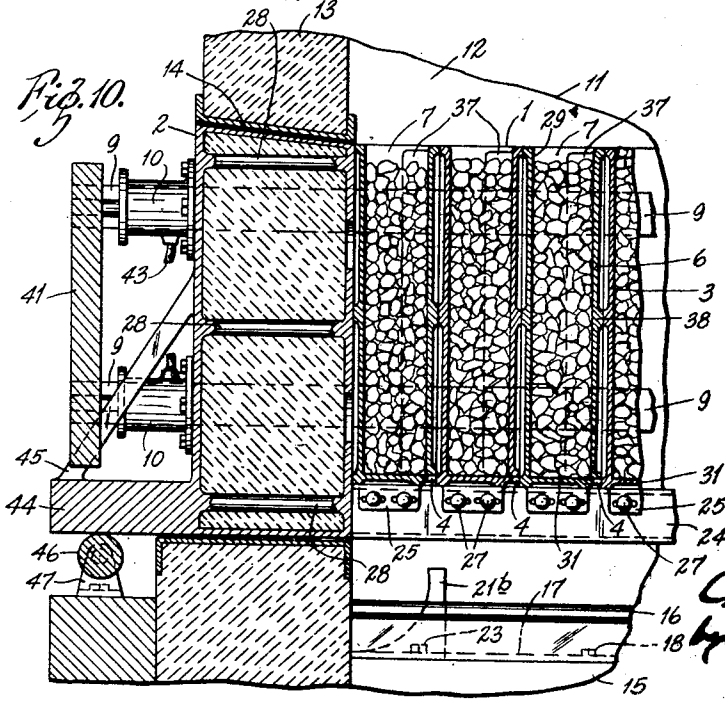
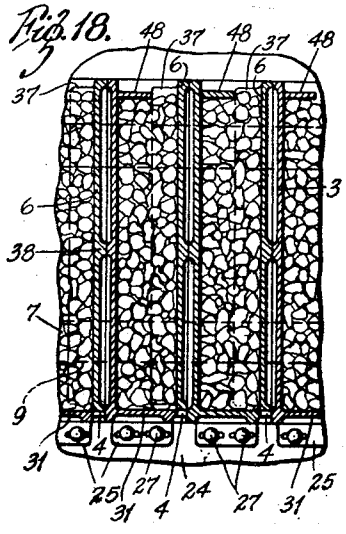


Fig. 18.



INVENTOR:
C. H. McKinney
by Burt, Ewart & Hruby

HIS ATTORNEYS.

Patented Sept. 4, 1945

2,384,184

UNITED STATES PATENT OFFICE

2,384,184

APPARATUS FOR MAKING COKE

Corius Hartsol McKinney, Carbondale, Ill., assignor to Walter E. Ackermann, Belleville, Ill.

Application January 18, 1943, Serial No. 472,680

9 Claims. (Cl. 202—97)

My invention relates to the coking of coal and, more particularly, to a device or apparatus for making coke.

It has for its principal objects to devise a device or apparatus for the manufacturing of coke which has means for applying pressure to the coal as it is being coked; which will produce an improved fuel in which the volatile matter, as well as, the density of the coke has been carefully controlled; which is of simple and durable construction; and which will permit the heat of the coking furnace to readily reach the coal, thus producing coke more economically and more rapidly than is possible with present day methods.

My invention consists principally in a device having a series of spaced immovable partitions, a movable partition between each of said immovable partitions and means for moving said movable partitions and applying pressure on the coal in the device while the coal is being coked. It also consists in the device and apparatus and parts and combinations and arrangements of parts hereinafter described and claimed.

In the accompanying drawings, which form part of the specification and wherein like reference numerals refer to like parts wherever they occur,

Figs. 1 and 2 are diagrammatic top and side elevational views, respectively, of a coking device embodying my invention within a coking furnace, the furnace being shown in section in each view,

Fig. 3 is a sectional view taken on the line 3—3 in Fig. 2,

Fig. 4 is an enlarged fragmentary side elevational view of said device,

Fig. 5 is an enlarged end view of the coking device in the coking furnace,

Fig. 6 is a sectional view taken on the line 6—6 in Fig. 5,

Fig. 7 is a sectional view taken on the line 7—7 in Fig. 4,

Fig. 8 is a sectional view taken on the line 8—8 in Fig. 6,

Fig. 9 is an enlarged front view of one of the wheeled axles, adjacent parts being shown in section,

Fig. 10 is a view similar to Fig. 8 showing the movable partitions back against the immovable partitions and the compartments filled with coal,

Fig. 11 is a rear elevational view of one of the movable partitions,

Fig. 12 is a sectional view taken on the line 12—12 in Fig. 11,

Fig. 13 is a rear elevational view of one of the sections forming the immovable partitions,

Fig. 14 is a top plan view of the section shown in Fig. 13,

Fig. 15 is a sectional view taken on the line 15—15 in Fig. 13,

Fig. 16 is a perspective view of one of the draw bars,

Fig. 17 is a perspective view of a modified form of draw bar; and

Fig. 18 is a view similar to Fig. 10 showing a modification in which a cover plate is used,

Fig. 19 is a horizontal sectional view of the modification shown in Fig. 18.

The coking device illustrated in the drawings comprises generally an open or covered top rectangular-shaped carriage or coal receiving unit 1 and a furnace door 2 which is preferably secured to one end of said unit. The carriage has a series of spaced parallel immovable partitions 3 extending transversely across the inside thereof, openings 4 of any desired size and shape through the bottom of the carriage adjacent to the corresponding side of each immovable partition, slots 5 through the sides of the carriage, movable partitions 6 between the immovable partitions to form coal receiving compartments 7, partitions 6 having ears 8 extending through the slots in the sides of the carriage, draw or pull bars 9 extending longitudinally of said carriage having said ears secured thereto, and hydraulic jacks 10 secured to the outside of said furnace door 2 for moving said pull bars whereby said movable partitions may be moved toward or away from said immovable partitions.

As shown diagrammatically in Figs. 1 and 2, the coking furnace or oven 11 may be of any suitable construction and comprises side walls 12 and end walls 13 enclosing a coking chamber, one of said end walls having a doorway or opening 14 therethrough for the removal and entry of the carriage 1.

The lower portion of the furnace has benches or steps 15 of any suitable material positioned on each side thereof and each step has a rail or track 16 having a foot 17 extending longitudinally thereof which is secured to the step with bolts 18. The rails 16 mounted on the steps are parallel and extend longitudinally of the length of the furnace. Extending transversely across the furnace and spaced apart are a series of parallel axles 19 having flanged wheels 20 fixed thereon, the end portions of said axles projecting outwardly beyond said wheels. The end portions of the axles extending beyond the wheels rest on the rails and are adapted to roll thereon. Pairs of longitudinally spaced upstanding stop

lugs 21 having feet 22 which are secured to the steps with bolts 23 are spaced longitudinally of said chamber and each pair of stop lugs is adapted to limit the roll of the axles on the rails when the carriage is removed from the furnace.

All of the axles except the first two adjacent to the furnace opening are of the same length and all of the stop lugs except the first two pairs are spaced the same transverse distance apart. However, the second axle 19a is of less length than the succeeding axles and the first 19b is of less length than the second. Likewise, the space between the second pair 21a of stop lugs is less than that between the succeeding pairs and the space between the first pair 21b is less than that of the second. Thus, in removing the carriage from the furnace, the second axle will roll past the third pair of stop lugs but will be stopped by the second pair while the first axle will roll past the second pair of stop lugs but will be stopped by the first pair.

Channel-shaped rails 24 positioned on their sides extend longitudinally of the carriage and are secured to flanges 25 depending from the bottom of the carriage by nuts 26 and bolts 27. These rails rest on the wheels 20 adjacent to the wheel flanges 20a and the carriage is adapted to be removed from the furnace by these rails moving on the wheels.

More specifically, the carriage comprises the furnace door 2 which is hollow and has tubular strengthening members 28 extending across the inside thereof. The inside of the door is preferably filled with any insulating material to prevent the loss of heat from the furnace during coking operations. The top and sides of the door slope inwardly and the top and sides of the furnace opening also slope inwardly so that the door will seal the opening when the carriage is placed in the furnace. The bottom of the furnace opening is on a level with the top of the wheel so that the carriage may be easily removed from the furnace.

For economy and ease of manufacture, the carriage preferably comprises a series of sections 29 bolted together but, if desirable, it may be cast in one piece. Each section 29 comprises an end wall 3 forming one of the immovable partitions, a bottom 30, side walls 31 having flanges 32 projecting outwardly from the ends thereof. These flanges have openings extending therethrough and the sections are secured together to form the carriage 1 by bolts 33 extending through the flange openings in adjacent sections. The bolts are secured by nuts 34 screwed thereon. As described above, the bottoms of each section has depending flanges 25 to which the channel-shaped rails 24 are secured. Also as mentioned before, the sides 31 of each section have slots 5 therethrough and openings 35 between the outwardly projecting flanges 32 form guides for the pull bars 9. The bottom 30 of the open end of each section is preferably serrated to form the openings 4 when the sections are bolted together. The endmost section is secured to the door with bolts 36.

Between the immovable partitions 3 are placed the movable partitions 6. These movable partitions have ears 8 projecting therefrom which extend through the slots 5 in the sides 31 of the carriage. Each partition has tapering plates 37 integral therewith at the ends thereof which move adjacent to the side walls of the carriage. The backs of the movable partitions have strengthening ribs 38 thereon.

Extending longitudinally of the carriage and mounted in the guide openings 35 are the draw bars 9 having slots 39 therethrough to receive the ends of said movable partition ears 8. In Fig. 17 a modified form of draw bar is shown which may be used if adjustment of the movable partitions is desirable. Groups of two adjacent slots 40 are provided, either of which may be used to retain an ear 8. These draw bars extend through the furnace door 2 and are secured at their ends to a plate 41 on the outside of said door. Mounted on the outside of said furnace door between said furnace door 2 and said plate 41 are the jacks or other pressure devices 10 adapted to move said plate inwardly or outwardly. Said jacks may have hose connections 43 leading to any suitable pressure tank (not shown), the pressure of which may be controlled in any suitable means.

A base plate 44 extending outwardly from the furnace door 2 is provided which is preferably integral with said door, said plate having supporting rods or bars 45 provided therefor.

Said base plate rests on a long roller 46 journaled in suitable supports 47 and extending transversely across the front of said carriage.

The operation of my device is simple. The movable partitions 6 are moved adjacent to the immovable partitions 3 so that they cover or partially cover the openings 4 through the bottom of the carriage. Coal or coking material is put into the receiving compartments 7 of the carriage and the device is pushed into the furnace. The coal or coking material may preferably be first pressed into blocks and preheated and then the blocks of coking material may be inserted in the receiving compartments of the carriage. The coking furnace is heated and after the carriage is in place in the furnace, the jacks 42 are set in operation so that the plate 41 pulling the draw bars 9 has a pressure thereon tending to push said plate from the door. Thus, there is a pressure exerted on the movable partitions 6 tending to move them away from the adjacent immovable partitions 3. As the volatile is driven off and the coal or coking material becomes plastic or semi-fluid the movable partitions continued to move away from the immovable partitions immediately in the rear of each movable partition. The openings 4 through the bottom of the carriage and the open space formed between the immovable and movable partitions permits the heat of the furnace to readily reach the partitions, keeping them hot. After the carriage has been in the furnace a predetermined time, the jacks are released and the carriage is removed from the furnace. The jacks are then reversed and the movable partitions are moved back to their original position adjacent to immovable partitions. The wedge-shaped plates 37 on the movable partitions keep the coke from sticking or adhering to the sides of the carriage so that when the carriage is turned over by a car dump or other suitable means, the coke readily falls from the carriage. After the carriage is emptied, it is again filled with coal or coking material and the operation is repeated.

In the modification shown in Figs. 18 and 19, the construction is similar to that described above except that lids or plates 48 are provided for the coal receiving compartments to keep the molten or plastic coal or coking material from bubbling over the sides of the carriage. These plates are preferably formed integral with the immovable partitions 3 and are tapered to conform to the

shape of the compartments after the coal has been coked and pressed.

The advantages of my device are many. The coke produced in it is of a dense and uniform texture. This density may be controlled by the pressure applied to the coking material, and by compressing the coking material and preheating same before it is placed in the carriage. Also, the volatile matter may also be carefully controlled by controlling the amount of pressure and heat applied to the coking material. Coking in my device is economical for the coking is done relatively rapidly as the heat readily reaches the coal to plastify it. Also, the pressure tends to speed up the time required for coking. Less heat is required to coke the fuel in my device as the coal is at all times in direct contact with the hot metal plates. The advantages of my device are also obtainable by placing the coal or coking compartments horizontal instead of perpendicular as heretofore described.

Obviously, numerous modifications may be made and I do not wish to be limited to the precise device shown. For instance, as shown in Figs. 4 and 5, the fluid pressure supply pipe 43a for the pipes 43 leading to the jacks 10 may be provided with a suitable pressure relief valve 43b adapted to open at a predetermined pressure and permit the fluid to escape from the jacks when the coke expands in the compartments 7 and tends to move the movable pressure plates 6 away from the immovable plates 3 cooperating therewith.

What I claim is:

1. A coal carriage adapted for insertion in and removal from a coking oven as a complete self-contained unit, said carriage comprising a series of spaced immovable partitions, a series of movable partitions between said immovable partitions forming compartments in said carriage for receiving coal to be coked, and means for positively moving the entire series of movable partitions so as to apply substantially uniform pressure to the coal in all of said compartments as it is coked therein.

2. A coal carriage adapted for insertion in and removal from a coking oven as a complete self-contained unit, said carriage comprising a series of spaced parallel immovable walls extending transversely thereacross, a series of parallel movable walls between said immovable walls, forming compartments in said carriage for receiving coal to be coked, and means for positively moving said movable walls so as to apply substantially uniform pressure to the coal in all of said compartments as it is coked therein, said means being yieldable under a predetermined pressure due to expansion of the coal in said compartments.

3. A coal carriage adapted for insertion in and removal from a coking oven as a complete self-contained unit, said carriage comprising a series of spaced parallel immovable partitions extending transversely thereacross, openings through said carriage adjacent to one side of said partitions, movable partitions positioned adjacent to said immovable partitions and forming therewith compartments in said carriage for the reception of coal and closures for preventing communication with said compartments through said openings, and means for moving said movable partitions away from said immovable partitions whereby pressure may be exerted on coal as it is being coked.

4. A coal carriage adapted for insertion in and removal from a coking oven as a complete self-contained unit, said carriage comprising a series of spaced parallel immovable partitions extending transversely thereacross, movable partitions between said immovable partitions and parallel therewith positioned adjacent to said immovable partitions to form compartments for the reception of coal, openings through the bottom of said carriage adjacent to said movable partitions, pull bars disposed lengthwise of said carriage on opposite sides thereof, means for securing said movable partitions to said pull bars, and means for moving said pull bars whereby said movable partitions may be moved to apply pressure to the coal as it is being coked.

5. A coking device comprising a carriage having a series of spaced parallel immovable partitions extending transversely thereacross, said carriage having slots through the side walls thereof, movable partitions between said immovable partitions positioned adjacent to said immovable partitions to form compartments for receiving coal, said movable partitions having ears projecting through said slots, pull bars having openings therethrough for receiving said ears, said ears positioned in said openings, openings through the bottom of said carriage covered by said movable partitions, and hydraulic jacks for moving said pull bars whereby said movable partitions may be moved to apply pressure to the coal as it is being coked.

6. A coal carriage adapted for insertion in and removal from a coking furnace through an opening therein as a complete preassembled unit, said carriage comprising a front wall adapted to constitute a closure for the carriage receiving opening in said furnace when said carriage is inserted therein, a series of immovable partitions, a series of movable partitions between said immovable partitions forming compartments for the reception of coal, and means for moving said movable partitions whereby pressure may be applied to the coal as it is coked.

7. A coal carriage adapted for insertion in and removal from a coking furnace through an opening therein as a complete preassembled unit, said carriage comprising a front wall adapted to constitute a closure for the carriage receiving opening in said furnace when said carriage is inserted therein, a series of spaced parallel immovable partitions extending transversely thereacross, openings through said carriage adjacent to one side of said partitions, movable partitions positioned adjacent to said immovable partitions and forming therewith compartments in said carriage for the reception of coal and closures for preventing communication with said compartments through said openings, and means for moving said movable partitions away from said immovable partitions whereby pressure may be exerted on the coal while it is being coked.

8. A coking device comprising a carriage having a coking furnace door at one end thereof and a series of spaced parallel immovable partitions extending transversely thereacross, movable partitions between said immovable partitions and positioned adjacent to said immovable partitions to form compartments for the reception of coal, openings through said carriage adjacent to said movable partitions, pull bars, said movable partitions secured to said pull bars, said pull bars extending through said furnace door and the ends of said pull bars secured to a plate, and hydraulic jacks mounted on the outside of said furnace door

for moving said plate whereby said movable partitions may be moved by said pull bars to apply pressure to said coal as it is being coked.

9. A coking device comprising a carriage having a coking furnace door at one end thereof and a series of spaced parallel immovable partitions extending transversely thereacross, said carriage having slots through the side walls thereof, movable partitions between said immovable partitions positioned adjacent to said immovable partitions to form compartments for the reception of coal, said movable partitions having ears projecting through said slots, pull bars having openings therethrough, said ears being positioned in said openings, said pull bars extending through said furnace door, openings through the bottom of said carriage and covered by said movable partitions when said movable partitions are adjacent to said immovable partitions, and hydraulic jacks mounted on the outside of said furnace door for moving said pull bars whereby said movable partitions may be moved to apply pressure to said coal as it is being coked.

CORLUS HARTSOL McKINNEY.