E. JOHNSON AND A. NORDQUIST.

COKE OVEN AND CHARGING MECHANISM.

APPLICATION FILED JULY 18, 1919.

1,382,916.

Patented June 28, 1921.

5 SHEETS—SHEET 1.

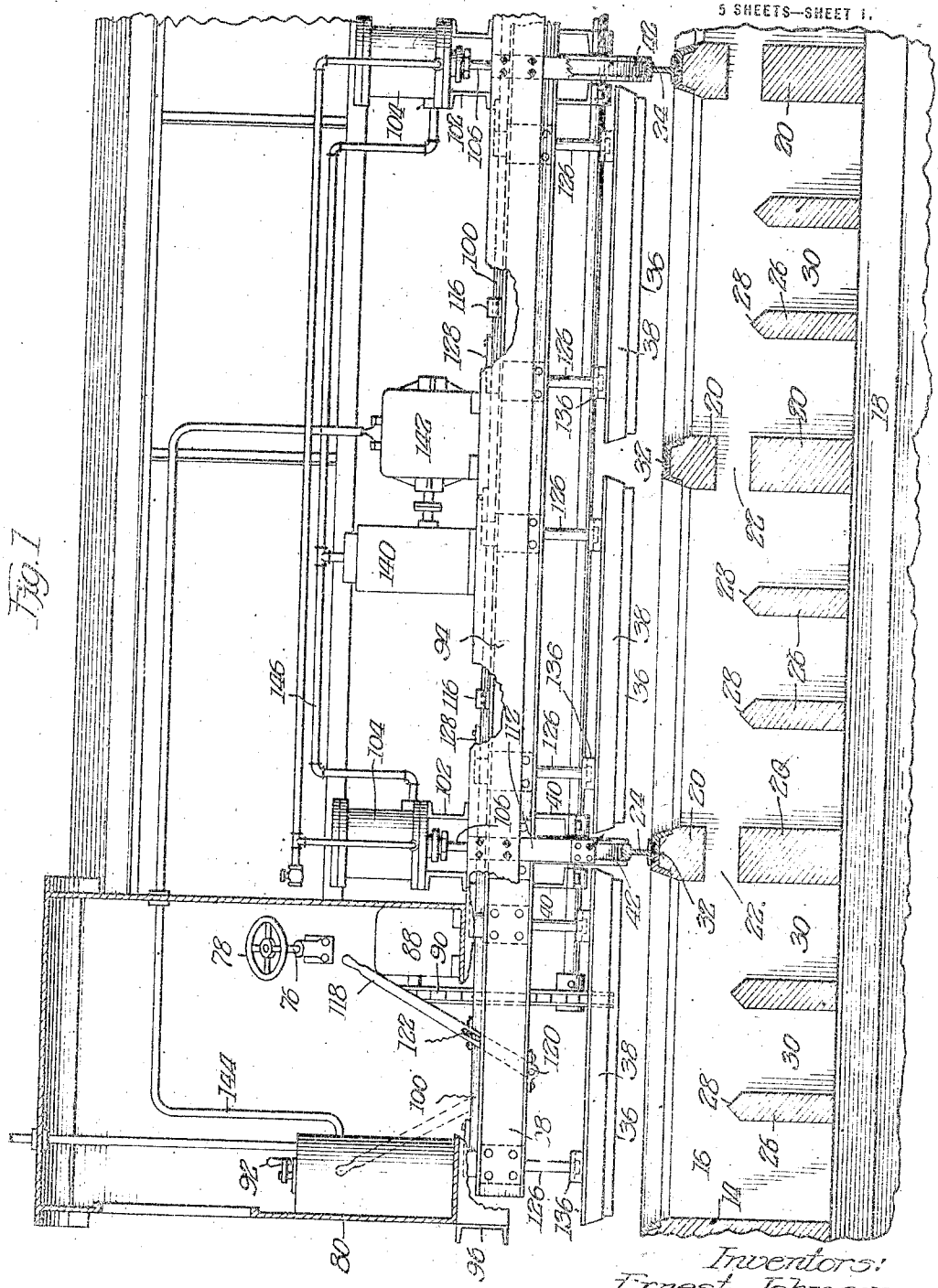


Fig. 1

Inventors:
Ernest Johnson,
Arthur Nordquist,
By Cheever & Cox
Attys.

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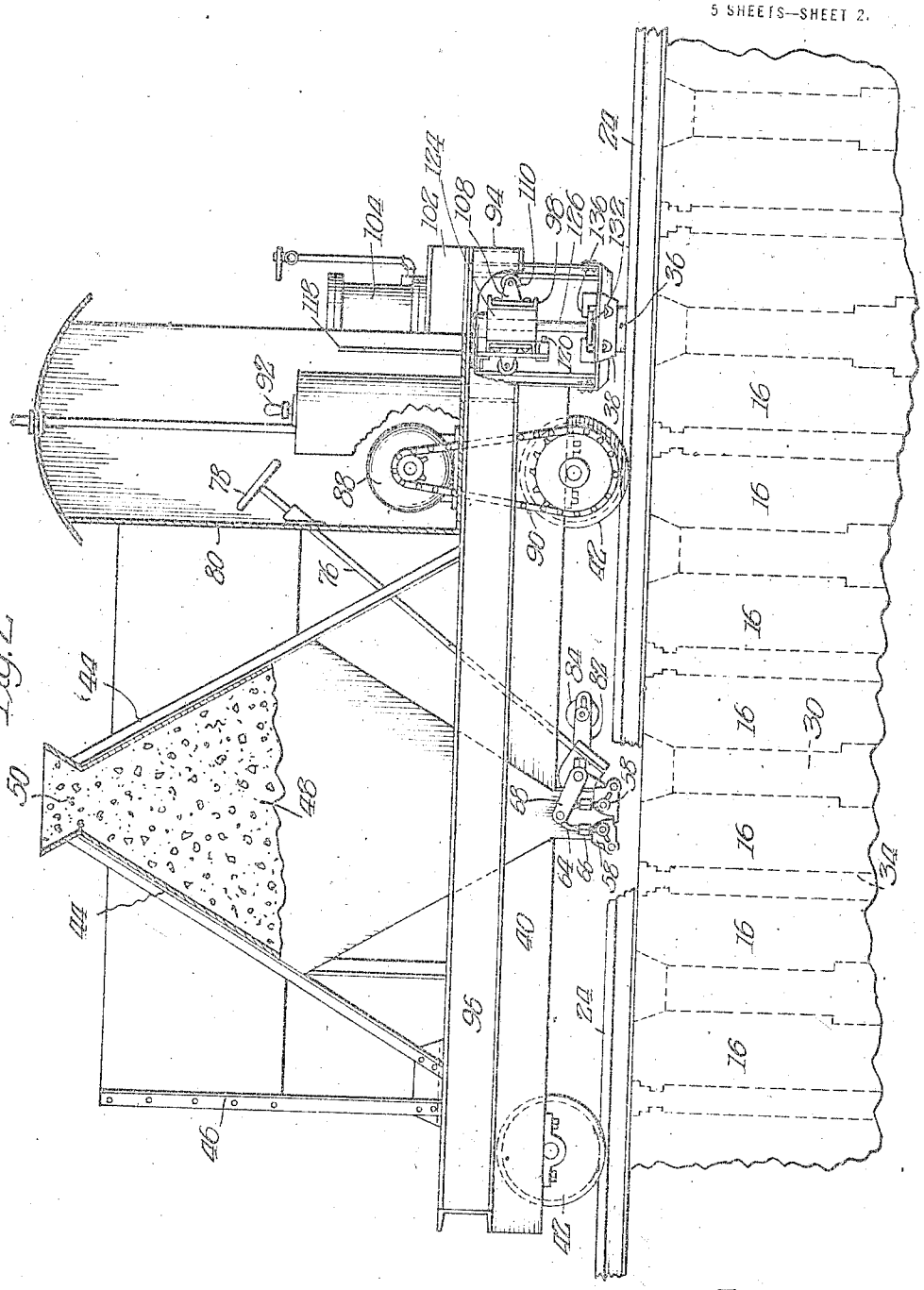


Fig. 2

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Arthur Nordquist,
By Cheever & Cox
Attys

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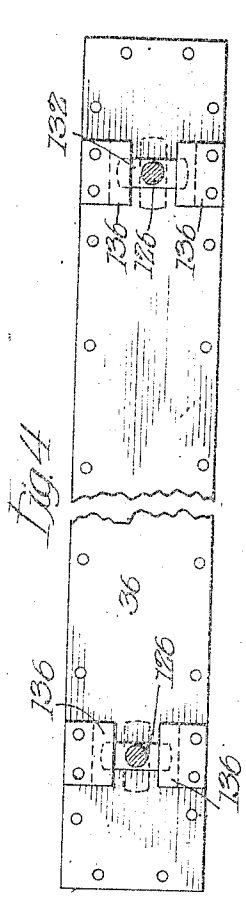


Fig. 4

Fig. 3

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Arthur Nordquist,
By Cheever & Cox
attys.

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5 SHEETS—SHEET 4.

Fig. 5

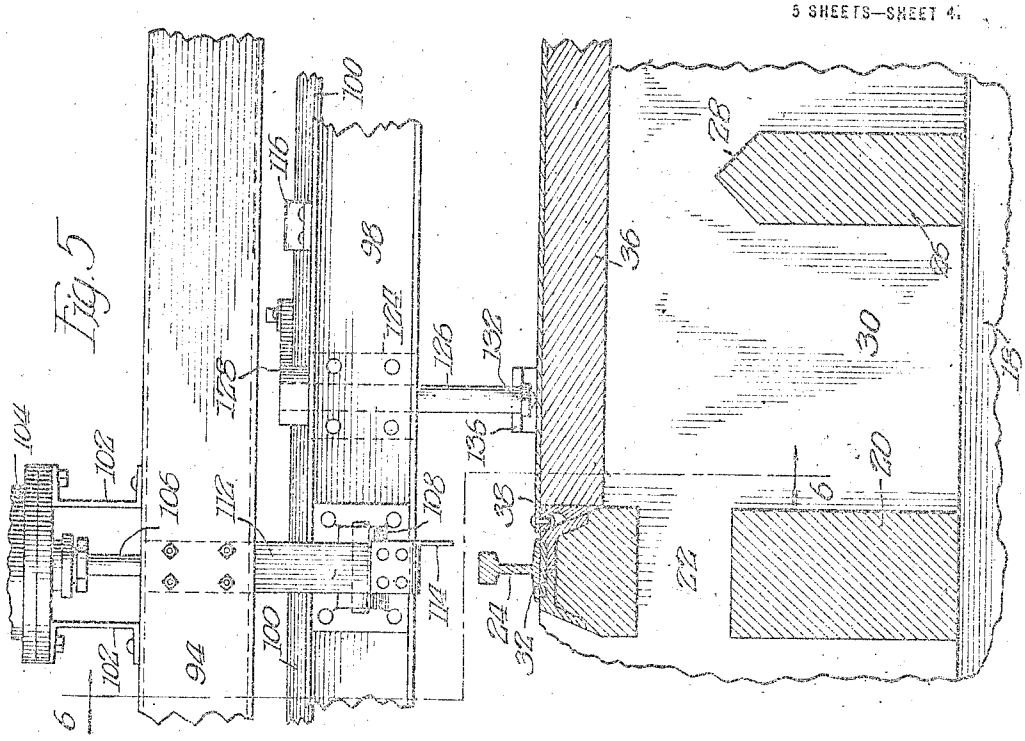
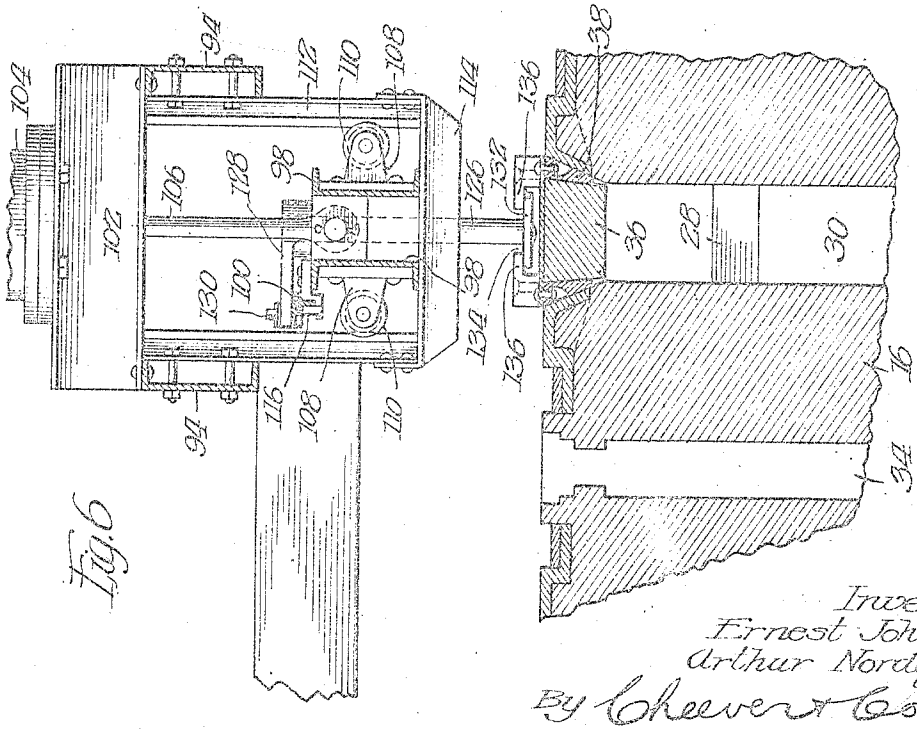


Fig. 6



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Arthur Nordquist,
By Cheever & Cox
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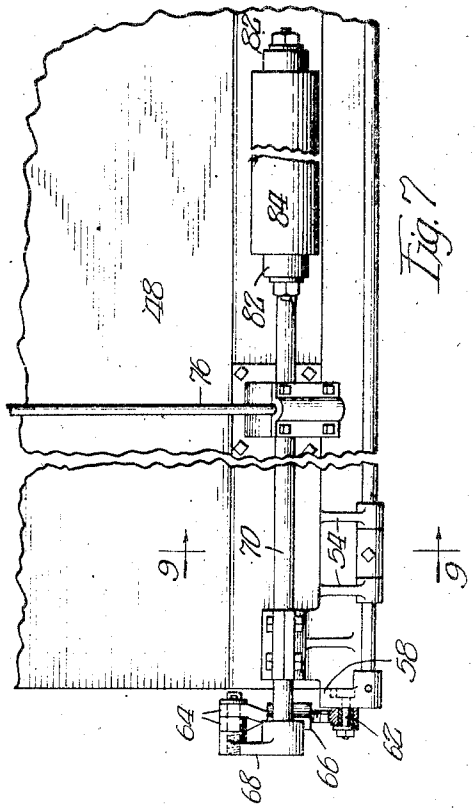


Fig. 7

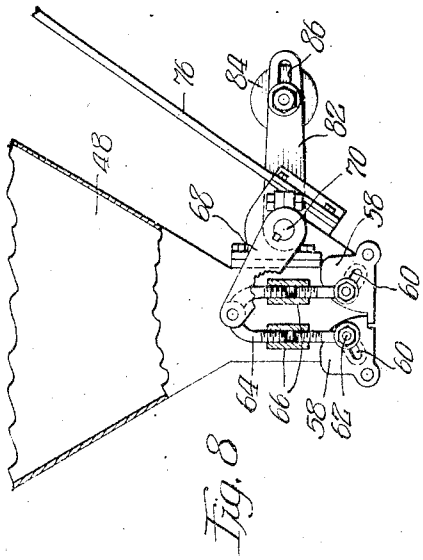


Fig. 8

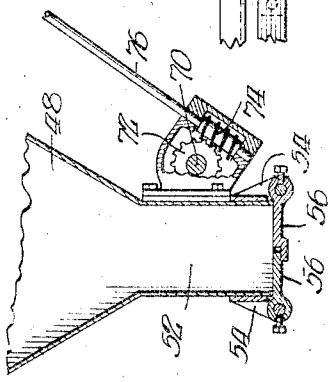


Fig. 9

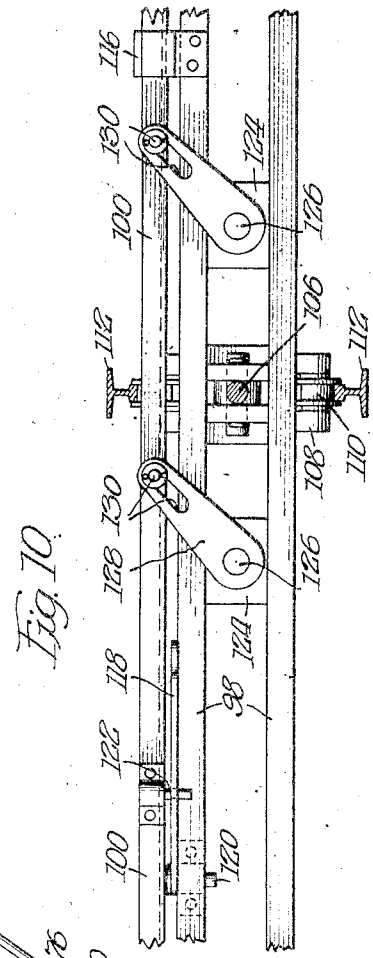


Fig. 10

Inventors:
Ernest Johnson,
Arthur Nordquist,
By Cheever & Cox
Attys.

UNITED STATES PATENT OFFICE.

ERNEST JOHNSON AND ARTHUR NORDQUIST, OF GARY, INDIANA.

COKE-OVEN AND CHARGING MECHANISM.

1,382,916. Specification of Letters Patent. Patented June 28, 1921.

Application filed July 18, 1919. Serial No. 311,824.

To all whom it may concern:

Be it known that we, ERNEST JOHNSON, residing at Gary, in the county of Lake and State of Indiana, and ARTHUR NORDQUIST, residing at Gary, in the county of Lake and State of Indiana, both citizens of the United States of America, have invented a certain new and useful Improvement in Coke-Oven and Charging Mechanism, of which the following is a specification.

This invention relates to coke ovens and to machinery for charging them. The object of the invention is to provide a coke oven and a charging machine therefor so constructed that the material delivered into the oven is much more evenly distributed in the oven than has heretobefore been possible, thus doing away with the large amount of labor heretofore required in spreading the material after it has been delivered into the oven, and in cleaning up the coal on top of the oven after the charging operation. A further object is to so construct the device that a much larger volume of material may be charged at one time, thus greatly saving the time the oven is out of commission, and therefore increasing efficiency. A further object of the invention is to provide an especially arranged and equipped charging machine adapted to be passed over the oven, and to, by special mechanism, substantially automatically charge the oven without the aid of roof or top workers adjacent to the charging opening. A further object of the invention is to entirely do away with the leveling machine which in prior constructions have had to work through openings in the end of the coal receptacles of the oven to level off the material delivered into it.

The invention consists in mechanism for carrying out the foregoing objects which can be easily and comparatively cheaply made, which is very efficient and satisfactory in operation, and is not liable to get out of order. More particularly the invention consists in many features and details of construction hereafter fully set forth in the specification and claims.

Referring to the drawings, in which similar numerals represent the same parts throughout the several views,

Figure 1 is a side elevation partially in section of the improved coke oven of this invention and the charging mechanism therefor, the charging machine being shown in the position which it assumes when it has lifted the doors in the top of the oven and is ready to charge the oven.

Fig. 2 is an end view of the mechanism of Fig. 1 certain parts being shown in section.

Fig. 3 is an enlarged detailed view showing the bottom of the car frame and the top of the furnace or oven with the oven door elevated, removed from Fig. 1.

Fig. 4 is a plan view on the line 4—4 Fig. 3, showing the top of the oven door.

Fig. 5 is a side detailed view in changed position to that of Fig. 3 showing the door lifting mechanism attached to the door of the oven, the door being in lowered or closed position with reference to the oven.

Fig. 6 is an end view on the irregular line 6—6 of Fig. 5.

Fig. 7 is a side and Fig. 8 an end view partially in section of the mechanism for releasing the fuel supply from the hopper which delivers into the oven.

Fig. 9 is a detailed sectional view corresponding to Fig. 8 on the line 9—9 Fig. 7.

Fig. 10 is a side detailed view of the mechanism for manipulating the detachable gripping devices on the car which take hold of the oven door.

As is well understood in the art, a coke oven as a whole consists of a plurality of coal chambers made relatively thin in one direction, say 16 inches, and long in the other, say 30 or 40 feet, in which coal is placed and heated by mechanism placed between said chambers forming no part of this invention. In prior constructions it has been customary to roof each of these compartments with solid brick perforated at intervals, with holes through which coal is delivered, said coal falling in conical piles at intervals along coal chambers from which condition it had to be leveled off by mechanism ordinarily operating through the end of the coal chamber at considerable trouble and expense. Furthermore, an operator had to walk along the top of each coal chamber, sweep into the surplus material left on the top in the process of delivering coal into it, and then put in by hand circular covers to close the coal chamber preparatory to the operation of coke making. In construction shown in this application, the upper or roof section of the coal chamber is replaced by a compartment having at its extreme ends a diagrammatically indicated wall 14, Fig. 1 connected by long parallel side walls 16 rising from the top portion 18 of the coal chamber proper

and open continuously into said such coal chamber. This top or supplemental roof passage is of approximately the dimensions of the coal chamber to be filled and as the lengths of the side walls 16 are therefore substantial it is necessary to tie them together. This is done by two classes of intermediate walls; 20, having through them gas passages 22 and carrying at their tops track rails 24 over which the charging machine passes; and 26 preferably sharpened at their tops in points 28 to assist in breaking up and distributing the coal passing down through the roof box 14—16 into the coal chamber proper.

It will, of course, be understood that the oven proper consists of a multiplicity of such coal chambers placed side by side and consequently there are a plurality of these roof passages, one for each coal chamber, placed side by side as clearly appears in Fig. 2. Adjacent chamber walls are tied together by metallic tie rods 32 which, in the case of the walls 20 carrying the rails 24, lie immediately below the rails, as shown in Fig. 1. In Fig. 2 the numeral 34 indicates the flue from the heating chambers (not shown) which are in the complete furnace or oven, forming no part of this invention, placed between the adjacent coal chambers.

The rectangular top openings left between the walls 16 and the walls 20 are selectively closable by rectangular doors 36 which are in the construction heretofore used about 9 inches wide and 8 feet long, and are equipped with downwardly beveled edges 38 adapted to insure a tight fit when lowered to place as shown in Figs. 5 and 6.

Considering the oven construction thus far described, it will be seen that by passing a proper machine over the oven top and dumping coal uniformly along the rectangular openings closed by these doors 36, a stream of coal substantially the length of the coal chamber can be delivered into it and that said coal in passing downward said openings to and through the passages 30, will engage the points 28 of the walls 26 and be broken up and thus fall in as near as possible an even shower into the coal pit below, with the result that the resulting pile in the coal chamber will be nearly, if not quite evenly, distributed and require practically no leveling. Even if some manual leveling be required, the openings closed by the doors 36 are so much larger than the circular holes heretofore provided that such manual leveling is greatly facilitated with consequent saving of time and energy.

In order to obtain the advantages of the oven roof construction just described, a charging mechanism is provided carried by a car traveling along the rails 24, heretofore referred to, said car being of such dimensions that all of the charging openings of a single coal chamber may be simultaneously charged with coal. The particular embodiment of the car shown in the drawings comprises a rectangular frame 40 of any suitable construction mounted on the wheel 42 traveling from coal compartment to coal compartment of the battery or oven over the rails 24.

Supported on this truck frame 40 by any suitable means such, for instance, as the construction 44, 46 is a coal compartment or chamber 48 extending the length of the car and the length of the coal chamber to be charged having at its top intake openings 50 for the reception of coal and at its bottom a plurality of longitudinally arranged discharge ports 52, one for each of the openings in the oven top closable by the doors 36. This coal chamber 48 is made of known predetermined coal capacity thereby dispensing with the necessity of weighing the coal about to be inserted in the coal chamber. In ordinary practice chamber 48 is made of exactly the right size to take the proper amount of coal for charging a given coal chamber of the coke oven. It is therefore necessary only to bring one load to each coal chamber in order to charge the entire coke oven. In charging an oven a train of cars equipped with coal chambers 48 may be passed over the oven one car being discharged into each coal chamber or the same car may be sent back and reloaded and successively used in charging successive coal chambers without departing from this invention.

Pivoted on suitable brackets 54 on opposite sides of discharge chute or passage 52 are doors 56 for closing the bottom of the chute and controlling the discharge of coal from coal chamber 48. The ends of these doors 56 are equipped with end members 58, Fig. 8, provided with slots 60 in which crank pin bolts 62 on the ends of connecting rods 64 are adapted to slide. These connecting rods are adjustable in length through the threaded links 66 clearly shown in Fig. 8. The opposite ends of these connecting rods are mounted on the end of a crank arm 68, on a shaft 70, driven by a worm gear 72, driven by a worm 74, on a rod 76, operated by a hand wheel 78, located within the operator's cage or house 80. The operator can by properly turning this wheel 78 open and close doors 56 for obvious purpose of controlling the discharge of coal from chamber 48. Shaft 70, just referred to, also carries the lever arm 82 on whose outer end is a counter weight 84 detachably adjustable along slot 86. This counterweight serves the function of normally holding the doors 56 closed without the strain thereof being carried by the gear mechanism 72, 74.

The operator's house or cage 80 also contains car driving mechanism which in the

particular case here illustrated is merely an electric motor 88 driving one of the wheels 24 through the sprocket chain mechanism 90. The controller for the motor 88 is indicated at 92.

Intermediate between the car frame 40 and various parts heretofore described, are stationary beams 94 and 96 at right angles to each other. Supported on beams 94 are cross beams 102, one pair of such beams for each of the two lifting cylinders 104. Each one of these cylinders 104 operates a vertical piston rod 106 on whose lower end is a cross head mechanism, made up of parallel beams 98, projecting arm 108, and rollers 110 traveling on guides 112 depending from beams 94 and connected together at their lower end by cross member 114. Extending parallel with the beams 98 and inside the guides 112 is an angular rod 100, reciprocatively mounted on brackets 116, which are in turn mounted on beam 98. Rod 100 is driven back and forward at the will of the operator by manipulating hand lever 118 pivoted on the bottom of beam 98 at 120, there being pin and slot connections 122^s between the lever and the rod. Between the beams 98 and at points remote from the suspension mechanism 106 are blocks 124 in which are rotatably mounted vertical shafts 126. These shafts are rotatable through approximately 90° by being equipped with lever arms 128 connected to rod 100 through pin and slot connections 130 clearly appearing in Fig. 10. These shafts 126 are located along the car one to each end of each door 36. On the bottom of each shaft 126 is an elongated button 132 adapted to be turned by the reciprocation of the rod 100 between two positions,—in one of which it freely passes through the space or buttonhole 134 between angular flange members 136 attached to the door, and in the other of which it is in the position shown in Fig. 6, behind said flanges and consequently secures the door to the adjacent shaft 126 so that vertical movement of the shaft will lift the door.

This reciprocation of the shafts and lifting the door obviously takes place when the operator manipulates the air or other source of power in cylinders 104 to lift piston rods 106 and consequently beams 98. In the particular construction shown in the drawings cylinders 104 are supplied with air through an air compressor 140 operated by a motor 142 controlled by the operator in his cage through wires contained in pipe 144. Piping 146 is that by which the compressor 140 supplies and operates cylinders 104.

General operation.

The operator having his car loaded with coal, in compartment 48 and the doors 56 closed as shown in Fig. 2 and with beams 98 drawn up as shown in Fig. 1 but without the doors attached thereto, turns on power to drive the car over the particular coal chamber of the oven which is to be charged with coal. He then operates cylinders 104 to lower shafts 126 until the buttons 132 enter buttonholes 134. He then takes hold of lever 118 and swings it, to turn the buttons 132 to the position of Fig. 6, whereupon he manipulates the air in the cylinders 104 to lift all the doors 36 to the position shown in Fig. 1. He now moves his car along the track until chute 54 is over the door openings, extending lengthwise of the coal receptacle. He now takes hold of wheel 78, opens the doors 56, whereupon the contents of chamber 48 slides into the oven opening through the passages 30 heretofore described, and evenly distributes itself along the length of the coal receptacle. The operator now manipulates handle 78 to close door 56, then moves his car until the doors 36 are over their respective entrances to the coal receptacles, whereupon he reverses his operation of cylinder 104, lowers the doors to closed position, and then reverses lever 118 thus releasing the buttons 132. He then manipulates cylinders 104 to raise the shafts 126 to original position whereupon he is ready to move his car off to get another load of coal.

As shown in Fig. 1 doors 38 are all in line with each other and are referred to as alined. Similarly doors 56 extend end to end across the hopper and are alined.

Having thus described our invention, what we claim as new and desire to secure by Letters Patent, is:—

1. In mechanism for charging the normally door covered chambers of coke ovens, a traveling car, longitudinally reciprocatable and rotatable members on the car, means for reciprocating and rotating said members, said members being engageable with said door to lift the same by reciprocation and detachably connectible with said door by rotation.

2. In mechanism of the class described, the combination with a traveling car, a member vertically reciprocatable with reference thereto, whereby an object may be engaged and lifted by said member, means operated from a distant point on the car for rotating said vertically reciprocatable member about a vertical axis, and means on said member rendered operative by the rotation of said member adapted to engage an object to be lifted and carried by the car.

3. In mechanism for charging the normally door covered chambers of coke ovens, in combination with a traveling car, a plurality of alined members vertically reciprocatable in unison with reference to the car, means operative from a single point for causing the reciprocation of said members, whereby said door may be engaged and lifted thereby, and mechanism operated from

the same point on the car for detachably simultaneously securing said members to said door.

4. Mechanism for charging the normally door covered chambers of coke ovens including a traveling car, a plurality of vertical shafts rotatably mounted on the car and movable to engage and lift said door, means on each shaft adapted for detachable connection with said door by rotation of the shafts, means for simultaneously rotating said shafts, and means for simultaneously moving said shafts to lift said door.

5. In mechanism of the class described, in combination with a car, a frame mechanism bodily reciprocatable with reference to the car, means for reciprocating said frame mechanism, a plurality of shafts journaled in said frame mechanism, means on said shafts adapted by rotary movement to engage doors to be lifted below the shafts, and means operative to simultaneously rotate said shafts for that purpose.

6. In mechanism of the class described, in combination with a coal receptacle having alined doors extending along it, and a track extending crosswise of it, a car traversing said track, a plurality of shafts carried by said car having button devices adapted to engage said doors, means in the car for causing said shafts to button onto said doors and means to elevate said shafts to elevate said doors, a coal receptacle, also carried by said car having discharge ports adapted to deliver coal into said receptacle through the openings for said doors, when the doors are open, means controlling the discharge from said coal receptacle, means for propelling said car along the track, and a housing for the operator on the car so arranged that he can therefrom control all of said actions by the car, for the purposes set forth.

In witness whereof we have hereunto subscribed our names.

ERNEST JOHNSON.
ARTHUR NORDQUIST.