My invention relates to coke oven apparatus and has particular relation to the provision of lorry cars or charging trucks having means for selectively sealing the openings of a coking chamber during the charging operation.

One object of my invention is to provide effective means for preventing smoke from a coking chamber from passing through the hoppers of the charging truck during the charging operation.

A second object of my invention is to provide a charging truck having means for selectively sealing the charging opening whereby smoke is normally prevented from escaping into the atmosphere and the danger of damage from explosions is avoided.

A further object of my invention is to provide means for insuring that proper conditions obtain in the hoppers of a charging truck before coal can be discharged therefrom.

In the operation of charging coke ovens, gases are generated very quickly and in great volume when coal enters the heated chambers. This is particularly true when preheated coal is used. Inasmuch as considerable air is present, an explosive mixture may result that will be ignited at the relatively high temperature in the chamber.

Accordingly, it is desirable to avoid the damaging effects of such explosions. It is also desirable to prevent the escape of smoke and gases either through the hoppers of the truck or directly into the atmosphere below the hoppers.

Lorry cars, as at present constructed, are provided with heavy extensible sleeves for connecting the hoppers to the charging openings. Gates control the discharge of coal from the various hoppers. Smoke and gases may accordingly escape when either the sleeves are up or the gates are open. If the sleeves are down and the gates are closed, they constitute rigid closures and damage is likely in case of an explosion.

In accordance with the present invention, I provide a lorry car having means for connecting the hoppers to the openings of the coking chamber and that constitute also pressure-relief devices. The hoppers are sealed at their tops, whereby no smoke may pass through them when the gates are open.

In the accompanying drawings, Figure 1 is an end view in elevation of a lorry car constructed in accordance with my invention, parts being broken away; and Fig. 2 is a side view in elevation of the lorry car of Fig. 1, the top of a coking chamber being shown in section.

A battery of coke ovens comprises individual coking chambers 11 the tops of certain of which are illustrated. As shown in Fig. 2, each chamber has a series of openings 12 through which the chamber is charged.

Each chamber 11 is provided with a standpipe 13 through which smoke and gases are withdrawn. A steam jet 14 establishes sufficient forced draft upwardly in the standpipe 13 that gas and smoke normally do not escape when one of the hoppers is being discharged. The standpipe is provided with a pressure relief device 15.

A lorry car 16 has a frame 17 of structural material and is mounted on wheels 18 that operate on tracks 19 extending across the oven. The car 16 has four hoppers 20, 21, 22 and 23 the operating mechanism for which is controlled from a cab 24. Each hopper has a chute 26 that is adapted to register with corresponding openings in the oven top.

Each chute 26 has a movable sealing bell 27 that seals the corresponding opening from the atmosphere when in its lowermost or extended position.

Each sealing bell is controlled by a lever 28 that is connected thereto by a link 29, a rocker arm 30, a rock shaft 31, and a pair of rocker arms 32 that are respectively connected to opposite sides of the bell. The link 29 has a lost-motion connection to the arm 30. The chutes 26 are each controlled by a gate 34 that is connected to an operating lever 35 by means of a link 36, a lever 37 and a link 38.

Each hopper is provided with a slidable cover 40. The position of the covers are controlled by racks 41 and pinions 42, the latter being mounted on a common shaft 43 that may be rotated by a crank 44 in the cab 24 and having a sprocket-and-chain connection 45 to the shaft 43.
The covers 40 are each held in position by clamps 46 that are connected by means of springs 47, arms 48 and a common rock shaft 49 to a lever arm 50. The lever 50 is connected at its lower end to a piston rod 51 that is rigidly connected to the piston 52 of a cylinder 53. The lever 50 is interlocked with the covers 40 by means of a hook 54 that engages a lug on the top of the cylinder 53 and a link 55 and arms 56 and 57 that control the hook 54 in accordance with the positions of the several covers.

The lever 50 is interlocked also with the levers 35 for controlling the gates 34. An arm 59 having a detent bar 60 prevents the operation of each of the levers 35 except when the lever 50 occupies an operative position as will be later described.

It may be assumed that the hoppers of the lorry car 15 have been filled with coal from the storage bins or preheater. The covers 40 are closed by means of the crank 44 at any time after the hoppers are filled. One of the covers 40 engages the arm 57 and actuates the connected mechanism to the position indicated by dotted lines to disengage the hook 54.

When the car is over the next coking chamber 11 to be recharged, connection is made at 62 between a steam supply pipe 63 and a steam pipe 64 that is connected to the cylinder 53 and through the cylinder and breach pipes comprising apportioning discs 65 to the space between the surface of the coal and the cover of each of the hoppers.

When a valve 66 is opened, steam enters the cylinder 53 and actuates the piston 52, rod 51 and lever 50 to the left as shown in Fig. 1. The arms 48 thereupon move downwardly to tightly clamp the covers 40 and the arms 59 move upwardly to remove the detent bars 30 from the corresponding levers 35. Steam also enters the upper spaces of the hoppers and drives out any air therein.

Before the hoppers are discharged, the levers 28 are actuated forwardly to lower the sealing-bells 27 to seal the openings 12, the usual lids or covers having been previously removed. One of the gates, preferably the one for the hopper farthest from the stackpipe 13, is then opened and the coal is discharged. Under normal conditions, gasses and smoke are produced immediately and in considerable quantities but they are drawn off through the stackpipe 13, their escape through the openings 12 being prevented by the sealing bells 27 and by the covers 40 together with the steam that is trapped in the hoppers and exerts a certain counter pressure against that of the gases. This counter pressure is preferably higher than that of the gases in the coking chamber.

However, since the ovens have filled with air upon being previously emptied of its product of coke, an explosion may occur upon the contact of the coal dust with the highly heated walls of the coking chamber. No damage results, however, the sealing bells 27 and the connected rocker arms 32 readily lifting to permit the gases to escape temporarily and thus relieve the excessive pressure in the coking chamber. This action is permitted by reason of the lost-motion connection between the link 29 and the arm 30. The bells 27 drop back to again seal the openings when the pressure has subsided.

The remaining hoppers are discharged in any desired order, the sealing bells functioning as described above to retain the gases and smoke and to constitute pressure-relief devices in case of explosion.

When the hoppers are empty, the gates 34 are closed by their levers 35, the valve 66 is closed and an exhaust valve 67 is opened whereupon a spring 68 returns the lever 50, piston rod 51 and piston 52 to their normal positions. The arms 48 accordingly release the covers 40 and the arms 59 return the detent bars 60 to lock the levers 35 in the closed position of the gates. The steam pipe is then disconnected at 62, the sealing bells are lifted by their levers and the openings 12 covered by the usual heavy lids. The covers 40 may be opened at any time prior to the filling of the hoppers for the succeeding charge.

It will be noted that I have provided a lorry car having means for effectually sealing the charging openings of a coking chamber and which constitute pressure-relief devices for avoiding damage in case of an explosion. I have provided also means for sealing the hoppers mechanically and by fluid pressure to prevent the escape of gas and smoke through the hoppers.

The covers for the hoppers and the levers for the gates are interlocked whereby the hoppers cannot be discharged until the covers are in position and steam has entered the spaces above the coal.

Many modifications of my invention may occur to those skilled in the art to which it relates. It is desired, therefore, that no limitations be imposed upon my invention except such as are expressly recited in the claims.

I claim as my invention:

1. In a charging truck for coke ovens, said truck having a combination with a hopper and means for connecting said hopper to an opening of a coking chamber of means for applying fluid pressure to said hopper to prevent the escape of smoke or gases therefrom from said chamber while said hopper is being discharged.

2. In a charging truck for coke ovens, said truck having a plurality of hoppers for charging a coking chamber, of means for connecting said hoppers to said chamber, said connection means being readily yieldable to excessive pressure within said cham-
In a charging truck for coke ovens, the combination with a hopper, a cover therefor, a gate for controlling said hopper and means for preventing the operation of said gate, of a source of fluid pressure and means for controlling said gate, of a source of fluid pressure and means for preventing the operation of said gate to discharge the contents of said hopper except when said cover has been closed and fluid pressure has been applied to said hopper, said means comprising a member for locking said gate controlling means and a fluid-pressure device between said source and said hopper.

In a charging truck for coke ovens, the combination with a hopper, a cover therefor, a gate for controlling said hopper and means for preventing the operation of said gate to discharge the contents of said hopper except when said cover has been closed and fluid pressure has been applied to said hopper, said means comprising a fluid-pressure device between said source and said hopper and means coacting with said cover for controlling the operation of said fluid-pressure device.

In a charging truck for coke ovens, the combination with a hopper, a cover therefor, a gate for controlling said hopper and means for applying fluid pressure to said hopper, of a source of fluid pressure and means for preventing the operation of said gate, of a source of fluid pressure and means for controlling said gate, of a source of fluid pressure and means for preventing the operation of said gate to discharge the contents of said hopper except when said cover has been closed and fluid pressure has been applied to said hopper, said means comprising a member for locking the gate-controlling means in position, a fluid-pressure device for actuating said member and means coacting with said cover for controlling the operation of said fluid-pressure device.

In a charging truck for coke ovens, the combination with a hopper, a cover therefor, and a lever for controlling said gate, of a source of fluid pressure connected to said hopper, a fluid-pressure device between said source and said hopper, a locking member for said lever controlled by said fluid-pressure device, and a member coacting with said cover for controlling the operation of said fluid-pressure device.

In a charging truck for coke ovens, the combination with a hopper, a cover therefor, and a lever for controlling said gate, of a source of fluid pressure connected to said hopper, a fluid-pressure device between said source and said hopper, a locking member for said lever controlled by said fluid-pressure device, and said locking member whereby said cover must be closed and fluid pressure applied to said hopper before the gate may be opened.

The method of charging a coke oven which comprises applying fluid pressure to a container for fuel and then discharging the fuel into the oven while the container is under pressure.

The method of charging a coke oven which comprises maintaining the pressure outside the charging opening higher than that normally obtaining in said oven during the charging operation and then discharging coal into said oven while such difference in pressure is maintained.

The method of charging a coke oven which comprises connecting a container for fuel to said oven, applying fluid pressure to said container and then discharging the fuel into said oven while the pressure is maintained.

In average, the method of charging a coke oven which comprises connecting a container for fuel to said oven, applying fluid pressure to said container and then discharging the fuel from said container into said oven while the pressure is maintained in said container.

In testimony whereof, I have hereunto subscribed my name this 29th day of April, 1927.

FRANZ PUENING.