Feb. 13, 1968 M. G. J. MEUNIER ETAL 3,368,948

APPARATUS FOR CHARGING COKE OVENS

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Fig. 1.

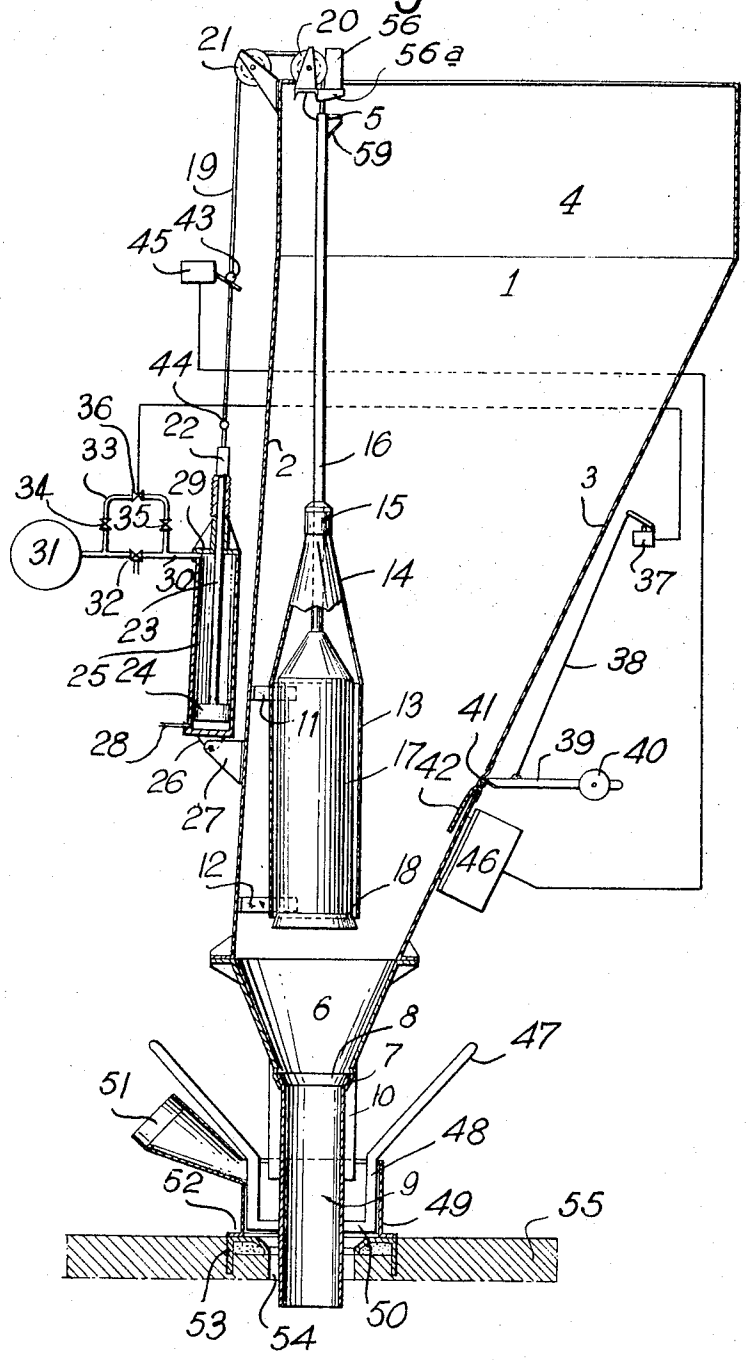

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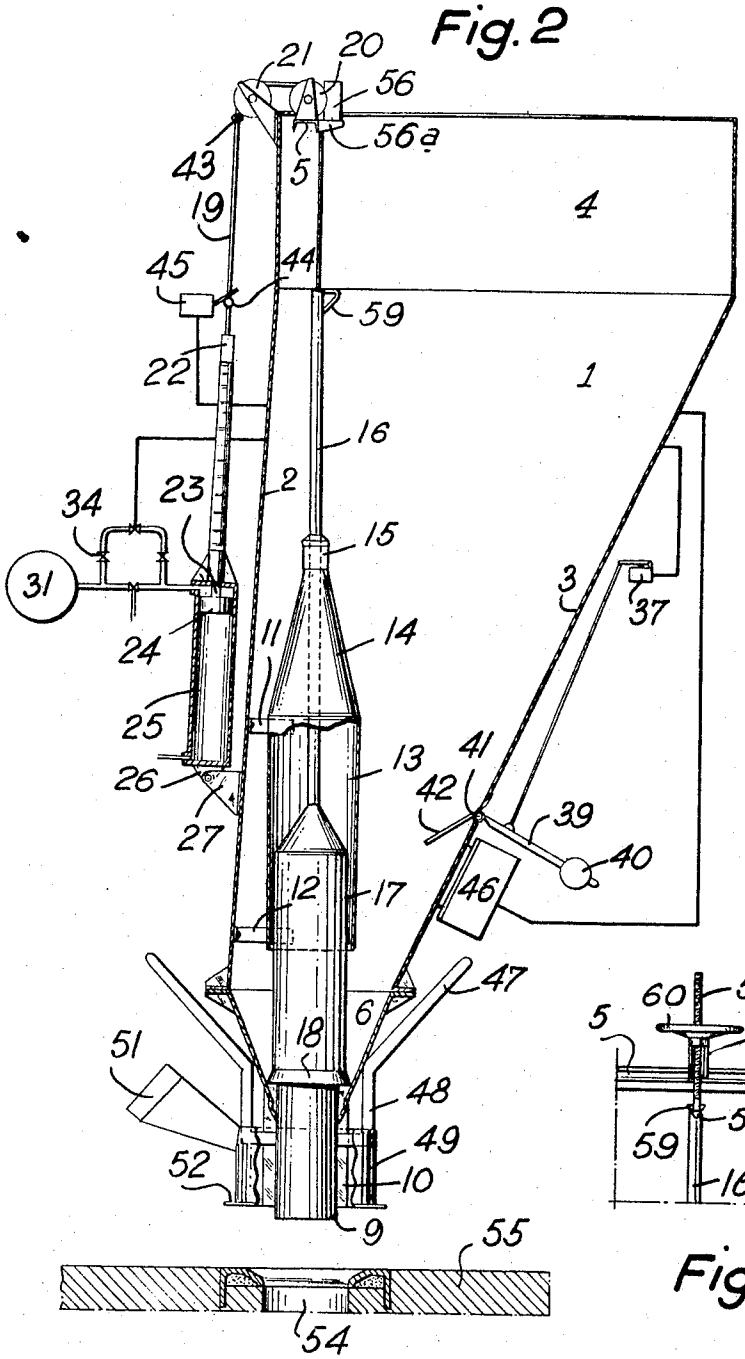
Fig. 2



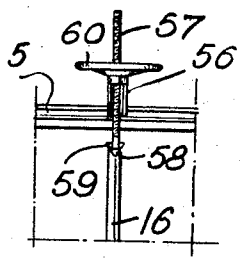


Fig. 3.

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APPARATUS FOR CHARGING COKE OVENS

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13 Claims. (Cl. 202—262)

ABSTRACT OF THE DISCLOSURE

The present invention relates to a coke oven chamber charging apparatus, having at least one hopper having distributing means of its coal charge said hopper being movably mounted over juxtaposed chambers on the upper paving of said cake oven, whereby successively charging said chambers when at least a charging hole is aligned with said distributing means, wherein are present in combination, a hopper, an internally disposed tubular protector inside said hopper, a tubular obturator slidably mounted within said protector, obturator having a lip, a guide at the base of said hopper, said guide being inside the contact line of said lip on said base when said obturator is in obturating position, a slidable telescopic tubular distributor in said guide, adapted for penetrating a charging hole when lowered and for being retracted inside said obturator when raised, means for moving said obturator, and means for moving said telescopic distributor.

This invention relates to apparatus for charging coke ovens by means of a charging car, in which the charge passes directly from at least one hopper to the charging hole without the need for any handling equipment between the hopper itself and the obturatable members feeding the charge and guiding it into said hole.

The apparatus according to the invention is also intended to provide a remedy for atmospheric pollution caused by smoke emission when charging.

The invention accordingly provides for apparatus comprising a hopper within which is mounted, beneath a protector, a slidable obturator adapted to seal off the lower part of said hopper by covering the inlet orifice of a raisable telescopic distributor which is in turn adapted to penetrate into a charging hole or to be retracted beneath said obturator.

The telescopic distributor cooperates with a likewise raisable smoke box which, in its lowermost position, is adapted to be applied against the periphery of the charging hole into which said telescopic distributor penetrates with suitable clearance.

The various moving parts thus operate without causing any obstructions or sealing flaws which could impair the flow.

For considerations of constructional simplicity and contouring, the protector, the obturator and the telescopic distributor are made of tubular elements. The obturator thus slides within the protector while the distributor tube slides in similar manner within the obturator.

The protector itself is provided with a contoured head and with suitably distributed attachments for preventing arching in the hopper charge.

Such an arrangement can be associated to power controls, and, more specifically as regards operation of the obturator, such control means may comprise a rod extending through the top of the protecting tube via a sealing gland and connected by a cable or the like to the

piston of a compressed air actuator which may be of the single-acting type.

Ancillary equipment such as vibrator and an indicator device of the end of charging may be associated to such an arrangement whereby to facilitate the flow of the charge and the return of the obturator to its lowermost position.

Preferably, the hopper is contoured symmetrically, but the apparatus of the present invention may also be utilized with an asymmetrically contoured hopper. The protector attachments are accordingly positioned on a counterslope while the said vibrator and indicator are positioned on a sloping face.

It will be of advantage for said indicator to be positioned on the corresponding wall at a height such that a residual charge remain in the hopper permanently and thereby perform the sealing function on completion of the charge dumping operation.

Controls are also provided for raising the telescopic distributor and the smoke box through a distance such that an ample gap be provided for convenient access to the charging hole obturating plug when the hopper overhangs the hole, said plug being operable by mechanical withdrawing and replacing means rigid with the hopper wagon.

The description which follows with reference to the accompanying non-limitative exemplary drawings will give a clear understanding of how the invention can be carried into practice.

In the drawings:

FIGURE 1 shows in diagrammatic section a coke oven charging apparatus in the charge dumping position;

FIGURE 2 shows in corresponding manner the apparatus in the position for interrupting the dumping process; and

FIGURE 3 is a detail view of the emergency control means.

The constructional form shown for illustrative purposes relates to the more complex general arrangement of an asymmetrically contoured hopper, but it will be obvious that the apparatus according to the invention could consist of similar components in the case of a symmetrical hopper.

The apparatus shown in the drawings comprises a hopper **1** of which one wall **2** has a slight reverse slope and the opposite wall **3** a steep slope. Above these walls, the hopper **1** comprises a cylindrical rim **4** at the top of which is provided a cross-member **5** adjacent the extension of wall **2**. The base of the hopper is joined to a frusto-conical termination **6** the smaller base of which has formed thereon a seat **7** against the inside of which the terminal flared portion **8** of a tubular telescopic distributor **9** is adapted to bear leak tightly. Said distributor is retractable into the termination **6** and the hopper **1**, and its movement is guided by uniformly distributed fixed external guides **10** rigid with the outer surface of the termination and against which slides the cylindrical outer surface of the distributor **9**.

Secured to said hopper through the medium of brackets **11** and **12** rigidly united with the inner surface of the wall **2** is a cylindrical protector **13** whose top is rigid with a conical cap **14** and whose base is left open. At the top of the cap **14** is a sealing gland **15** through which is slidable a rod or tube **16**. Within the protector and its cap, the rod **16** is rigidly connected to a tubular obturator **17** whose bottom is provided with a flared bearing lip **18** adapted to sealingly cooperate with the internal conical surface of the termination **6** when the obturator **17** is lowered, said lip not projecting to a substantial degree from the base of the protector **13** when the obturator **17** is raised into the protector.

The upper end of rod **16** is attached to a cable **19** which

runs over an intermediate pulley 20 whose supporting shell is mounted on the cross-member 5, and thence over a further intermediate pulley 21 whose shell is fixed to the outside of the rim wall 4. This cable is attached through an abutment-piece 22 to the end of the rod 23 of the piston 24 of an actuator whose cylinder 25 is pivotally connected, through a lug 26 on its end closure, to a yoke 27 secured to the outside of wall 2 at the appropriate height, the pivotal connection being provided by a pin extending through said yoke and said lug. Adjacent its lower end closure, said cylinder is provided with a vent 28, while the upper end closure 29 is connected to a feed pipe 30 and also forms a fluid-tight guideway through which the rod 23 extends.

The pipe 30 is connected to a compressed air source 31 through a three-way manually operated cock 32 which permits feeding the cylinder 25 or decompression thereof. The cock 32 can be by-passed through a pipe branch 33 into which are inserted two shut-off valves 34 and 35 positioned on either side of an electrovalve 36 whose electric circuit is connected to a switch 37.

The switch 37 is actuated through a rod 38 connected to an arm 39 carrying a counterweight 40, and this arm is pivotable about a hinge 41 inset into the thickness of the wall 3, the entire arrangement being so devised that said hinge be leaktight and that the arm 39 be rigid with a downwardly directed flap 42 adapted to be flattened by the charge in the hopper 1 against the wall 3 when the counterweight 40 is raised and to be restrained in that position by the charge, and furthermore that the flap 42 be lifted once more by the downward movement of the counterweight 40 after the charge has passed below the level of said flap.

On the cable 19 are provided two spaced catches 43 and 44 which cooperate with the actuating lever of a time-delay switch 45. This switch is connected into the feed circuit of a vibrator 46 applied against the outside of the wall 3, slightly below the hinge point of the flap 42.

To the telescopic distributor 9 are coupled handling arms 47 which are tightly slidable, through the medium of vertical portions 48, within a smoke box 49 which is itself sealingly guided over the guides 10, and the upper end closure of the smoke box is accordingly provided with corresponding slideways. Beneath the vertical portions 48, the arms 47 are attached to the tube 9 through horizontal portions 50.

The function of these horizontal portions 50 is to raise the smoke box 49 by abutment against the upper end closure thereof. The smoke box itself constitutes a kind of bell equipped with at least one lateral stub-pipe 51 intended for connection to a smoke extraction device (not shown). Near its bottom the bell skirt comprises a flange 52 which, in the lowered position, is adapted to bear against the rim 53 of a charging hole 54 formed in the paving 55 constituting the roof of a coke oven, the size of the hole 54 being such as to enable the tube 9 to be insertable thereinto with suitable clearance.

As FIGURE 3 clearly shows, to the cross-member 5 is rigidly connected a bracket 56*a* on top of which is fixed a sleeve 56. This sleeve receives therein a threaded rod 57 provided with a hook 58 adapted to cooperate with a gusset 59 carried on the top of the rod 16. Onto said threaded rod screws a handwheel 60 whose hub bears against the end face of the sleeve 56. This handwheel and threaded rod constitute emergency manual actuation means of the obturator 17.

The apparatus hereinbefore described functions in the following manner:

Reference to FIGURE 1 shows that the obturator 17 can be lifted without difficulty into the protector 13 without encountering opposition from the charge contained in the hopper 1, the only restraint exercised being due to friction against the vertical wall of the obturator and to the resistance offered by the flared end 18. The lifting operation is effected by the actuator 25. The distributor

9 is inserted into the charging hole 54 to the required depth, thus ensuring that the flow is correctly directed into the chamber without any of the mixture being lost or scattered over the paving 55, by reason of the seal obtained by cooperation of the flared part 8 with the seat 7. The smoke box 49 is then lowered and the smoke rising from the hole 54 around the tube 9 is thus collected and discharged through the extraction pipe 51. As the obturator 17 rises, the catch 43 operates the switch 45, which in turn renders the vibrator 46 operative for a preset time, thus preventing the charge from being restrained by the wall 3 and also making the flow rate more rapid and uniform.

As soon as the charge level falls below the flap 42, the downward swing of counterweight 40 actuates the switch 37 which in turn activates the electrovalve 36 which moves to the venting position on the side of the cock 35 and shuts off the air intake on the side of the cock 34. The obturator 17 then moves down under gravity, being assisted in this movement by the continuing flow of the charge. The obturator 17 drops until the flared portion 18 contacts the inner surface of the termination 6. The flow is then interrupted and tightness maintained throughout the operation by the charge itself and by the residual quantity thereof above the portion 18.

The entirety of the charge below the portion 18 is then discharged, thereby freeing the space through which the distributor 9 can then be raised to penetrate into the obturator 17. The rising motion of the distributor 9 in response to the arms 47 (which may be controlled by any convenient means) ultimately causes the box 49 to be raised also. The charging hole 54 is then cleared and an obturating plug can be replaced thereon without difficulty.

Reference to the situation of the various components in FIGURE 2 shows that the hopper 1 is ready for refilling.

Once it has been refilled at a filling station, the hopper can then be moved into position above another charging hole, from which the plug can be removed for insertion of the distributor 9. During this operation, the smoke box covers the hole and charging can take place as soon as the obturator has been raised to enable the operations hereinbefore described to be effected anew.

It will be appreciated that such an arrangement can be readily adapted to automation of the various operations. Air suction or smoke blow-back by the hopper are impossible.

The presence of the protector makes only a very small force necessary to move the obturator. Moreover, the shape of the protector and its attachments prevents snagging and humping.

In addition, the rising motion of the obturator rapidly decompresses the charge and facilitates and speeds up the flow.

Since the fact that the charge flows in the form of a fluid stream causes the latter to contract, the height of the distributor 9 and its deep penetration into the chamber in no way impair the flow, the rate of which remains very high.

No part whatsoever of the charge, however small, is scattered over the top of the battery of coke ovens during the charging operation. The general cleanliness of operation is further enhanced by the total absence of charging smoke, which can be either absorbed or recovered.

It goes without saying that many modifications can be made to the specific forms of embodiment hereinbefore described, without departing from the spirit and scope of the invention.

What we claim is:

1. In a coke oven chamber charging apparatus, having at least one hopper having distributing means of its coal charge, said hopper being movably mounted over juxtaposed chambers on the upper paving of said coke oven, whereby successively charging said chambers when at least a charging hole is aligned with said distributing

means, wherein are present in combination, a hopper, an internally disposed tubular protector inside said hopper, a tubular obturator slidably mounted within said protector, obturator having a lip, a guide at the base of said hopper, said guide being inside the contact line of said lip on said base when said obturator is in obturating position, a slidable telescopic tubular distributor in said guide, adapted for penetrating a charging hole when lowered and for being retracted inside said obturator when raised, means for moving said obturator, and means for moving said telescopic distributor.

2. In a coke oven chamber charging apparatus as claimed in claim **1**, a raisable smoke box which, in its lowermost position is adapted to be applied against the periphery of a charging hole into which said telescopic distributor penetrates with play, said smoke box being slidably mounted on said telescopic distributor and having moving means for its raising and lowering.

3. In a coke oven chamber charging apparatus as claimed in claim **1**, a protector having an upper streamline head.

4. In a coke oven chamber charging apparatus as claimed in claim **3**, a streamlined head for said protector having a leaktight gland through which extends an obturator lifting rod.

5. In a coke oven chamber charging apparatus as claimed in claim **1**, a protector having lateral attachments distributed over the wall of the hopper.

6. In a coke oven chamber charging apparatus as claimed in claim **5**, a wall of said hopper having a counterslope on the side of said attachments.

7. In a coke oven chamber charging apparatus as claimed in claim **1**, an obturator having an outwardly flared frusto-conical lip.

8. In a coke oven chamber charging apparatus as claimed in claim **1**, a distributor having at its head, a frusto-conical lip adapted to cooperate with a seat of matching shape on the guide situated at the base of the hopper.

9. In a coke oven chamber charging apparatus as claimed in claim **2**, common guiding means externally disposed with respect to said distributor and internally disposed with respect to said smoke box, and common moving means for said distributor and said smoke box.

10. In a coke oven chamber charging apparatus as claimed in claim **4**, connecting means attached to said lifting rod and to the piston rod of an actuator positioned externally of the hopper.

11. In a coke oven chamber charging apparatus as claimed in claim **1**, supplementary emergency lifting means for lifting said obturator.

12. In a coke oven chamber charging apparatus as claimed in claim **10**, a charge flow indicator flap disposed internally on a wall of said hopper controlling a fluid feed to said actuator through a switch, whereby to lower said obturator before all the charge of said hopper has flowed out.

13. In a coke oven chamber charging apparatus as claimed in claim **1**, a time-delay switch in the circuit of an electrical vibrator applied to a wall of said hopper, said switch having control means associated with said moving means for said obturator.

References Cited

UNITED STATES PATENTS

1,376,313	4/1921	Becker	202—263
1,785,750	12/1930	Van Ackeren	202—263

FOREIGN PATENTS

7,534	3/1907	Great Britain.

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