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COKE QUENCHING

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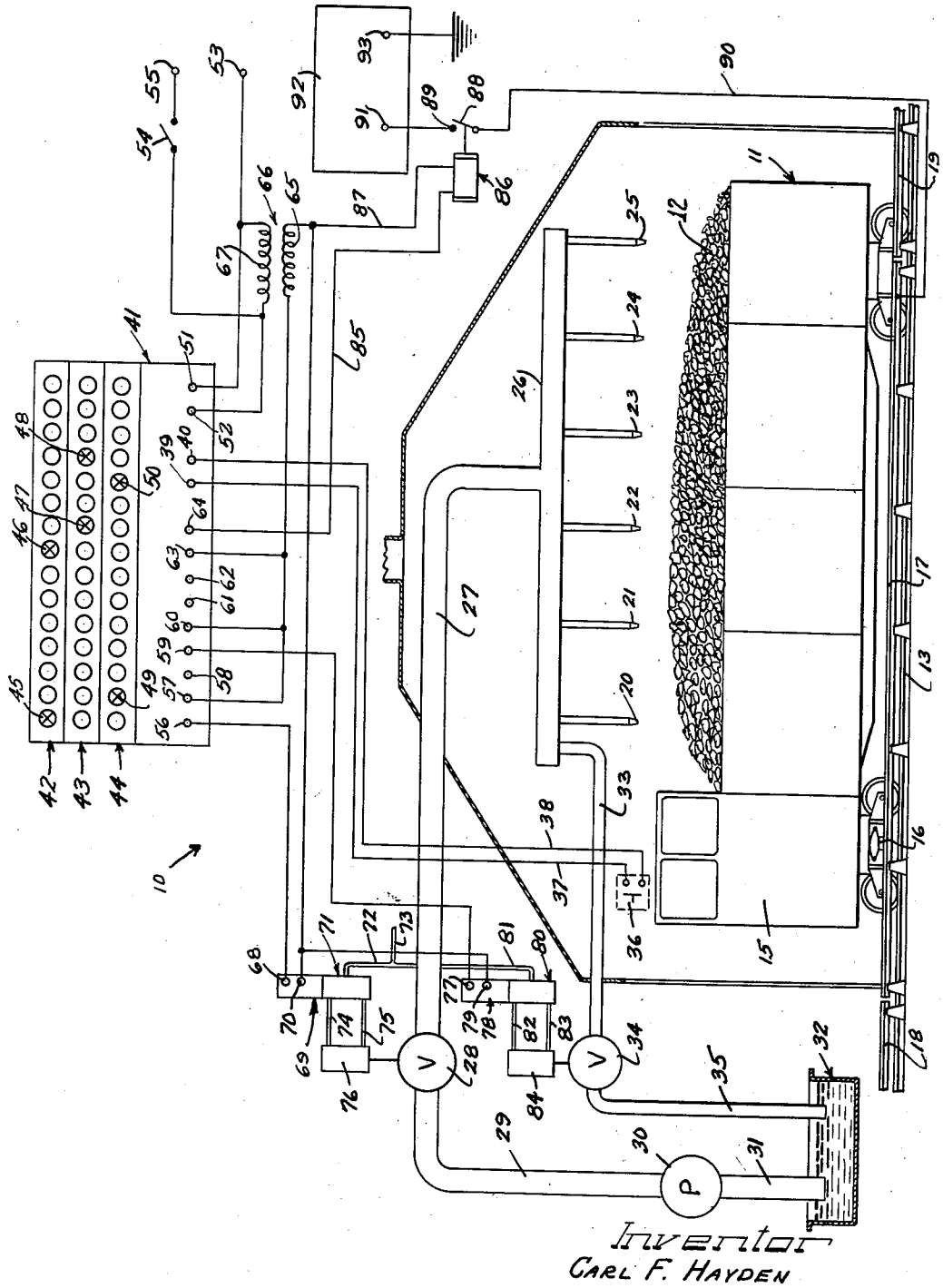

Inventor
CARL F. HAYDEN

by Kills, Sherman, Merriam, Gross & Leighton Attys.

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COKE QUENCHING

Carl F. Hayden, Chicago, Ill., assignor to Hayden and Company, Chicago, Ill., a corporation of Illinois

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This invention relates to a coke quenching system and more particularly to a system which is readily and safely operated and in which the application of quenching water is accurately controlled and timed to produce coke of uniform high quality.

In the system of this invention, hot coke is carried by a railroad car from a coke oven to a quencher tower which includes spray nozzles for spraying water on the coke. Means are provided for automatically opening and closing valve means which control flow of water to the nozzles, the valve means being open for only a certain time interval to achieve optimum quenching of the coke and to produce coke of uniform high quality.

The railroad car is preferably electrically powered with conductor means such as a third rail being provided for transmitting the electrical power to the car. According to an important feature of the invention, such conductor means are deenergized after the railroad car is in the quenching tower so as to prevent movement of the car out of the quenching tower until after the coke is cooled and so as to prevent injury to operating personnel.

In accordance with a specific feature of the invention, switch means such as a push-button switch are arranged to be manually operated after the railroad car is in the quencher tower, such switch means being preferably located in the quencher tower close to the operating cab of the railroad car when positioned in the tower. The operation of a timer is initiated by actuation of such switch means and the quenching operation is automatically controlled by the timer.

The timer is preferably adjustable to obtain the optimum quenching time and most preferably is of a type commercially available in which the beginning and end of the time interval of one function such as the operation of the valve are adjustable independently of the beginning and end of the time interval of another function such as the deenergization of the conductor means which transmits power to the railroad car.

In accordance with another specific feature of the invention, the conductor means which transmit power to the railroad car are not deenergized immediately when the valve means to the spray nozzles are opened, but the deenergization of the conductor means is delayed for a short time interval to permit accurate positioning of the railroad car relative to the nozzles.

A plurality of spray nozzles are preferably used, all being connected to a common header with the valve controlling supply of water to the header. The header preferably has substantial capacity and when the valve is closed, it may take a substantial length of time for the water in the header to drain out through the spray nozzles. In accordance with still another feature of the invention, a drain valve is automatically opened to drain the header at a relatively rapid rate when the supply valve is closed, so as to achieve greater accuracy of operation and to minimize the time required for each quenching operation.

An object of this invention, accordingly, is to provide

an improved coke quenching system which is readily and safely operated.

Another object of this invention is to provide an improved coke quenching system in which the application of quenching water is accurately controlled and timed.

This invention contemplates other and more specific objects, features and advantages which will become more fully apparent from the following detailed description taken in conjunction with the accompanying drawing in which the single figure illustrates diagrammatically a coke quenching system constructed according to the principles of this invention.

Referring to the drawing, reference numeral 10 generally designates a coke quenching system of this invention in which a railroad car 11 loaded with hot coke 12 is moved on rails 13 from a coke oven (not shown) to a quencher tower 14. The railroad car 11 is preferably self-powered and has an operator's cab 15. Electrical power is preferably used with a suitable brush 16 being provided on the car 11 for engaging a third rail. The third rail may be sectioned with one section 17 being used to transmit power to the railroad car 11 as it moves through the quencher tower 14, separate sections 18 and 19 being used to transmit power to the car 11 before it reaches the tower 14 and after it passes through the tower 14.

Disposed in the quencher tower 14 above the coke 12 when the car 11 is positioned in the tower are a plurality of spray nozzles 20, 21, 22, 23, 24 and 25 which are connected to a common header 26. The header 26 is connected through a pipe 27 to the outlet of a valve 28 having an inlet connected through a pipe 29 to the outlet of a pump 30 having an inlet connected through a pipe 31 to a water reservoir 32 as diagrammatically illustrated. The reservoir 32 preferably is arranged to receive water draining from the car 11 in the quenching operation and means not shown may be provided for maintaining a supply of water in the reservoir 32.

The header 26 is also connected through a pipe 33 to the inlet of a drain valve 34 having an outlet connected through a pipe 35 to the reservoir 32.

According to this invention, means are provided for automatically controlling energization of the third rail section 17 and controlling the supply valve 28 and drain valve 34. As schematically illustrated, a switch in the form of a push-button 36, is provided in the tower 14 at a location adjacent the operator's cab 15 when the car 11 is driven into the tower. The push-button switch 36 is connected through conductors 37 and 38 to terminals 39 and 40 of a timer generally designated by reference numeral 41.

The timer 41 is arranged to open the supply valve 28, open the drain valve 34 and deenergize the third rail section 17 for certain time intervals and is preferably adjustable with the beginning and end of the time interval of each operation being adjustable independently of the beginning and end of the time intervals of the other operations. For this purpose, the timer 41 has a control panel including a section 42 for controlling the operation of the supply valve 28, a section 43 for controlling the operation of the drain valve 34 and a section 44 for controlling deenergization of the third rail section 17. Each of the sections 42, 43 and 44 comprises a plurality of jacks into which plugs may be inserted to obtain the desired operation. In the arrangement as schematically illustrated, each of the sections 42, 43 and 44 comprises fifteen jacks, which represent fifteen time intervals of ten seconds, for example.

As illustrated, a plug 45 is inserted in the first jack of the section 42 which results in opening of the supply valve 28 immediately when the terminals 39 and 40

are connected together by actuation of the push-button switch 36. A second plug 46 is inserted in the eighth jack of the section 42 which will result in closing of the supply valve 28 seventy seconds after the valve was opened, assuming a time interval of ten seconds between jacks of the section 42. A plug 47 is inserted in the ninth jack of the section 43 which results in opening of the drain valve 34 eighty seconds after the terminals 39 and 40 are connected together by the push-button switch 36, and a plug 48 is inserted in the twelfth jack of the section 43 which results in closing of the drain valve thirty seconds after it was opened. A plug 49 is inserted in the second jack of the section 44 which results in deenergization of the third rail section 17 ten seconds after actuation of the push-button switch 36, this ten second interval being provided to allow for positioning of the car 11 during the initial part of the quenching operation. A plug 50 is inserted in the eleventh jack of the section 44 which results in reenergization of the third rail section 17 one hundred seconds after the push-button switch 36 is actuated. It will be appreciated that the positions of the plugs 45—50 may be adjusted to obtain the optimum time intervals.

It should be noted that the timer 41 is of a type known in the art and commercially available and the construction thereof is therefore not illustrated in detail. The timer 41 has a pair of power input terminals 51 and 52, the terminal 51 being connected to a terminal 53 and the terminal 52 being connected through a switch 54 to a terminal 55, the terminals 53 and 55 being arranged to be connected to a suitable power source, such as a source of 60 cycle, 110 volt alternating current.

A first group of three terminals 56, 57 and 58 are controlled by the panel section 42, the terminal 57 being electrically connected within the timer to the terminal 56 and disconnected from the terminal 58 at a time corresponding to the first plug in the section 42, with the terminal 57 being disconnected from the terminals 56 and reconnected to the terminal 58 at a time corresponding to the position of the second plug in the section 42. A second group of three terminals 59, 60 and 61 are controlled in like fashion from the panel section 43, and a third group of three terminals 62, 63 and 64 are controlled in like fashion from the panel section 44.

The terminals 57, 60 and 63 are connected to one side of a secondary winding 65 of an isolation and step-down transformer 66 having a primary 67 connected to the terminal 53 and through the switch 54 to the terminal 55, the transformer 66 being thus energized when the switch 54 is closed. The terminal 56 of the timer is connected to one terminal 68 of an electro-magnetic actuator 69 having a second terminal 70 connected to the secondary winding 65.

The actuator 69 is arranged to actuate an air valve 71 having an inlet connected through a conduit 72 to a conduit 73 arranged to be connected to a source of compressed air (not shown), and the valve 71 has a pair of outlets connected through conduits 74 and 75 to an actuator 76 for the supply valve 28. In operation, the control valve 71 is normally in a position such that the conduit 72 communicates with the conduit 75 to supply compressed air to the actuator 76 in a direction to hold the supply valve 28 in a closed position. When electrical power is applied across the terminals 68—70, the control valve 71 will be actuated by the electro-magnetic actuator 69 to establish communication between the conduit 72 and the conduit 74 to apply compressed air to the actuator 76 in a direction to open the water supply valve 28. When the electrical power is disconnected from the terminals 68, 70, the control valve 71 will move to its normal position to establish communication between the conduit 72 and the conduit 75 to apply compressed air to the actuator 76 in a direction to close the water supply valve 28.

The terminal 59 of the timer 41 is connected to a terminal 77 of an electro-magnetic actuator 78 having a second terminal 79 connected to the transformer secondary 65. The actuator 78 is arranged to actuate a control valve 80 similar to the control valve 71 having an inlet connected through a conduit 81 to the conduit 73 and a pair of outlets connected through conduits 82 and 83 to an actuator 84 similar to the actuator 76, the actuator 84 being arranged to open or close the drain valve 34. This arrangement operates the drain valve 34 in the same manner that the actuator 69, control valve 71 and actuator 76 actuate the supply valve 28. When electrical power is applied to the terminals 77—79, the drain valve 34 will be opened and when the electrical energization is removed, the drain valve 34 will be closed.

The terminal 64 of the timer 41 is connected through a conductor 85 to one terminal of an electro-magnetic device 86 having a second terminal connected through a conductor 77 to the transformer secondary 65. The device 86 when energized engages a movable contact 88 with a fixed contact 89, the movable contact 88 being connected through a conductor 90 to the third rail section 17 and the fixed contact 89 being connected to a terminal 91 of a suitable source of electrical power for the railroad car 11, such as the source of direct current, the source being schematically illustrated by the block 92. The source has a second terminal 93 connected to ground, i. e. to the supporting rails for the railroad car 11.

In operation, the switch 54 may be closed to energize the timer 41 and the transformer 66. At this time, the terminals 63—64 will be electrically connected within the timer to energize the device 86 so as to close the contacts 88—89 and energize the third rail section 17 from the source 92.

The railroad car 11 is driven with a load of hot coke 12 from the coke oven to a position as illustrated in the quencher tower 14. When the car 11 is so positioned, the pushbutton 36 is depressed to electrically connect the terminals 39—40 of the timer 41 and initiate operation of the timer 41. With the plug 45 in the first jack of the timer panel section 42, the terminals 56, 57 will be immediately electrically connected within the timer to effect energization of the electro-magnetic actuator 69 and cause the water-supply valve 28 to open to supply water to the header 26 and to the nozzles 20—25. Thus, quenching of the coke 12 will be initiated.

The third rail section 17 may be immediately deenergized, but preferably there is a certain time delay to allow for exact positioning of the railroad car 11 after flow of water from the nozzles 20—25. For this purpose, the plug 49 may be positioned as shown in the second jack of the timer panel section 44 and if there is a ten second interval between jacks of the timer 41, the third rail section 17 will be deenergized ten seconds after the water starts to flow from the nozzles 20—25.

Water will continue to flow from the spray nozzles 20—25 for a certain time interval dependent upon the position of the plug 46. The plug 46 may as illustrated be disposed in the eighth jack of the timer panel section 42 and with a ten second interval between jacks, the terminals 56, 57 will be disconnected within the timer 41 seventy seconds after the quenching operation was initiated to deenergize the actuator 69 and cause the supply valve 28 to be closed.

Ten seconds later, depending upon the position of the plug 47 and the time interval between jacks, the terminals 59—60 will be electrically connected within the timer 41 to energize the actuator 78 and cause the drain valve 34 to open so as to drain water from the header 26.

Twenty seconds later, depending upon the relative positions of plugs 47 and 50, the terminals 63—64 will be reconnected within the timer 41 to energize the device

86 and close the contacts 88, 89 to apply power from the source 92 to the third rail section 17.

Ten seconds later, depending upon the relative positioning of plugs 50 and 48 and the time interval between jacks of the timer 41, the terminals 59—60 will be disconnected within the timer 41 to deenergize the actuator 78 and cause closing of the drain valve 34. The timer will then be ready for a new cycle of operation which is initiated by connecting the terminals 39 and 40 together, and the car 11 may be driven out of the quencher tower 14, and another car driven in the tower 14 for a like quenching operation.

It will thus be appreciated that this invention provides a coke quenching system which is readily and safely operated and in which the application of quenching water is accurately controlled and timed to produce coke of uniform high quality.

It will be understood that modifications and variations may be effected without departing from the spirit and scope of the novel concepts of this invention.

I claim as my invention:

1. In a coke quenching system in which coke is carried by an electrically powered railroad car from a coke oven to a quencher tower which includes spray nozzles for spraying water on the coke in the car, valve means arranged for controlling flow of water to said nozzles, conductor means arranged for transmitting electrical power to the railroad car, and timer means arranged for automatically opening said valve means and deenergizing said conductor means for certain time intervals after the railroad car is in the quencher tower.

2. In a coke quenching system in which coke is carried by an electrically powered railroad car from a coke oven to a quencher tower which includes spray nozzles for spraying water on the coke in the car, valve means

arranged for controlling flow of water to said nozzles, conductor means arranged for transmitting electrical power to the railroad car, and timer means arranged for automatically opening said valve means and deenergizing said conductor means for certain time intervals after the railroad car is in the quencher tower, the deenergization of said conductor means being delayed for a certain time interval after opening of said valve means.

3. In a coke quenching system in which coke is carried by an electrically powered railroad car from a coke oven to a quencher tower which includes spray nozzles for spraying water on the coke in the car, valve means arranged for controlling flow of water to said nozzles, conductor means arranged for transmitting electrical power to the railroad car, and timer means arranged for automatically opening said valve means and deenergizing said conductor means for certain time intervals after the railroad car is in the quencher tower, said timer means being adjustable to change the time interval of opening of said valve and the time interval of deenergization of said conductor means independently of each other.

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