

W. L. AFFELDER & M. GORTON.
 APPARATUS FOR WATERING COKE IN COKE OVENS.
 APPLICATION FILED JULY 15, 1909.

949,290.

Patented Feb. 15, 1910.

4 SHEETS—SHEET 1.

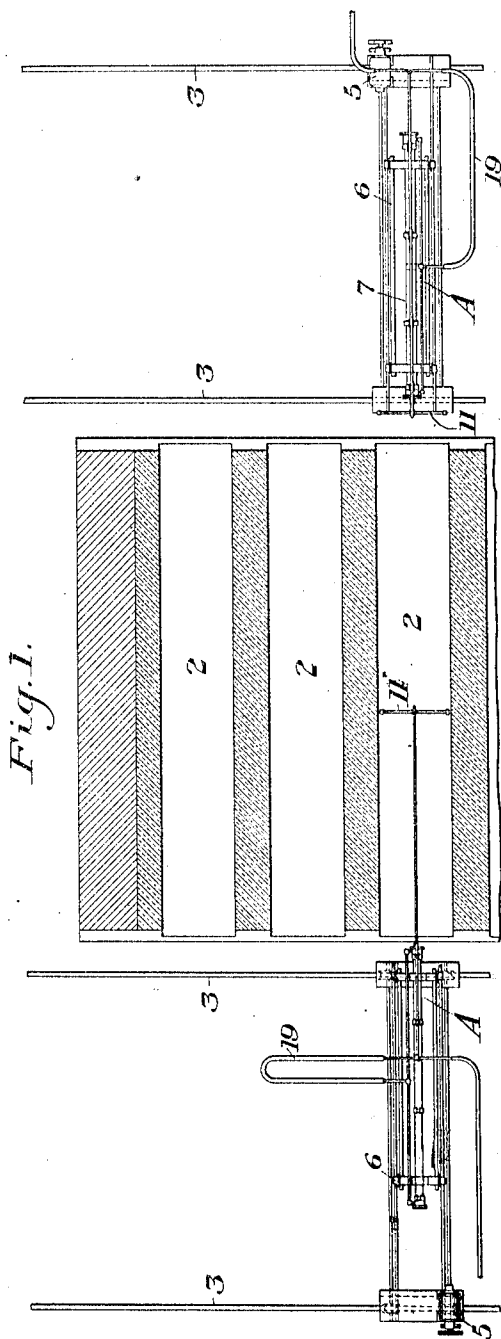


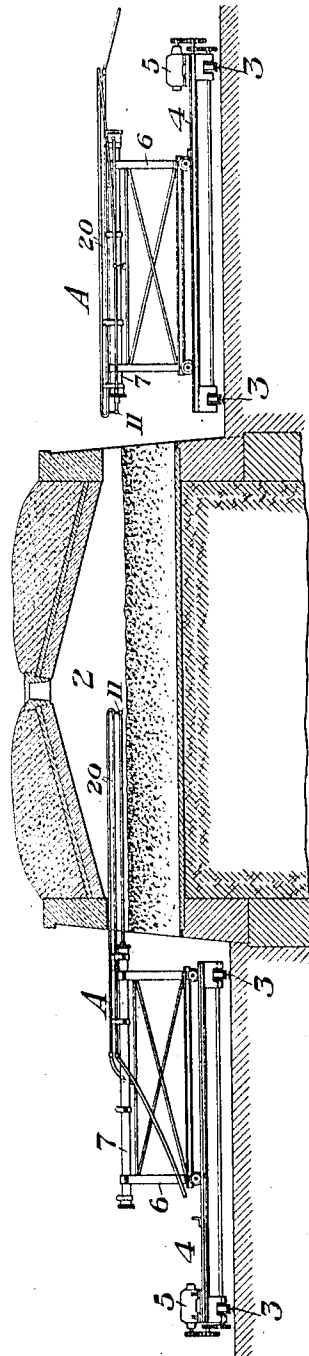
Fig. 1.

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Fig. 2



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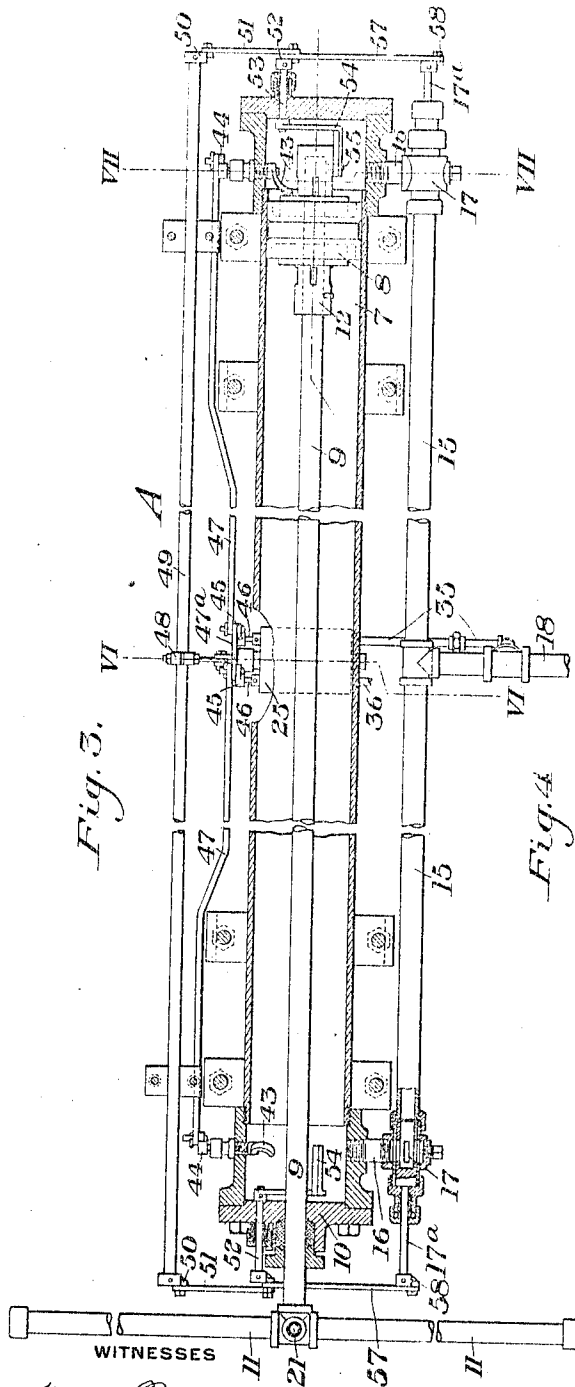


Fig. 3.

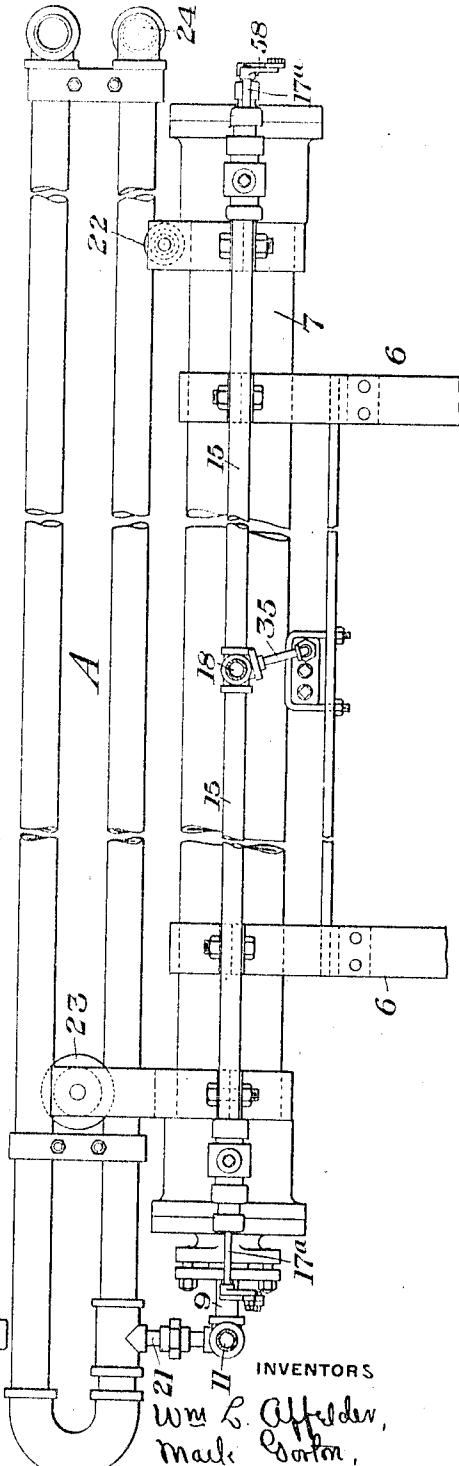


Fig. 4.

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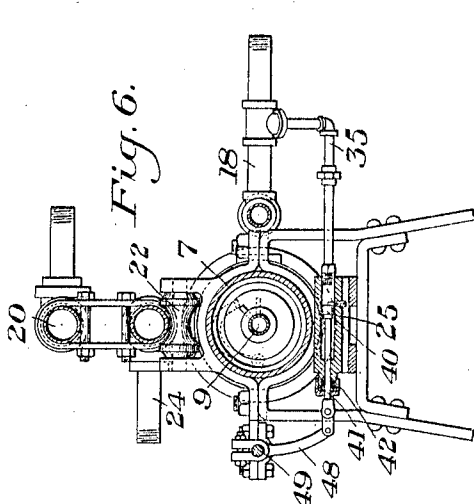


Fig. 6.

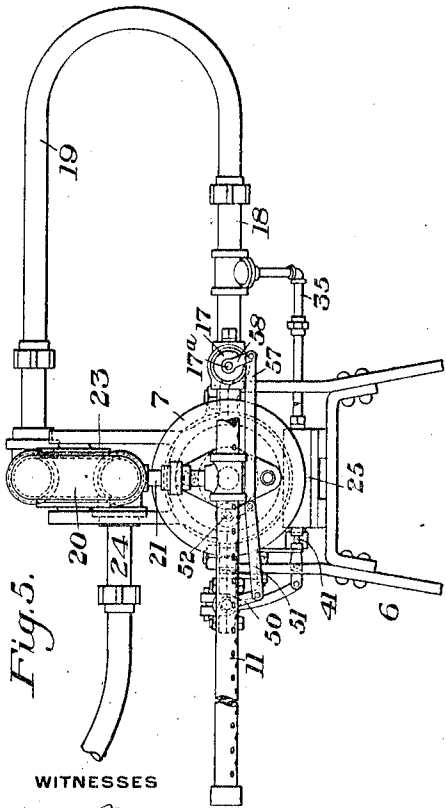


Fig. 5.

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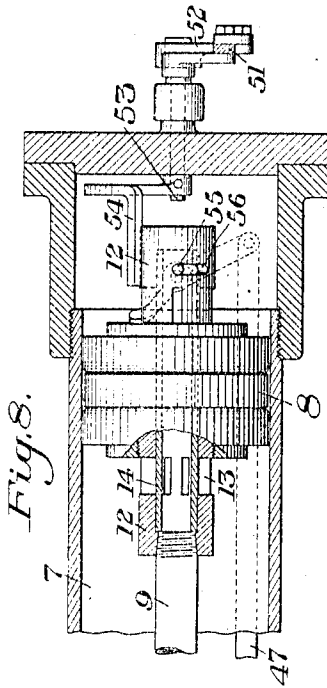


Fig. 8.

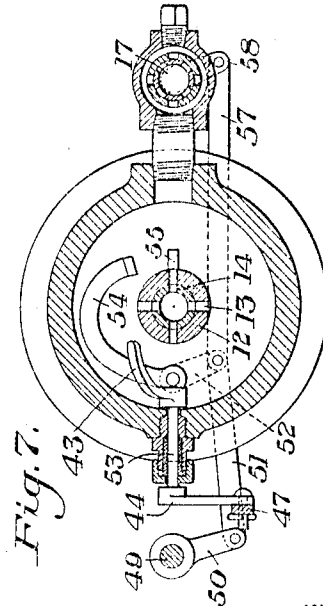


Fig. 7.

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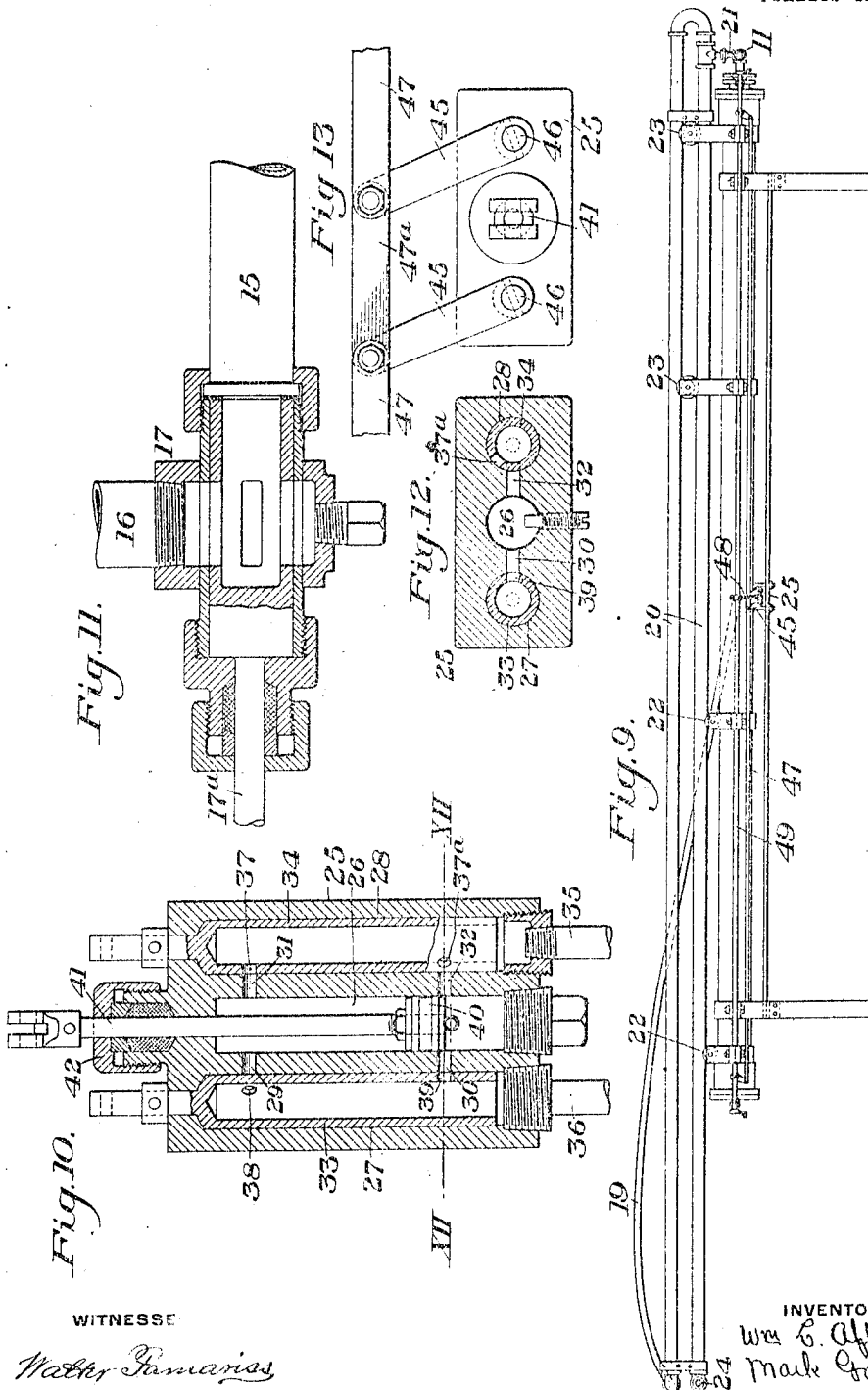
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4 SHEETS—SHEET 4.



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UNITED STATES PATENT OFFICE.

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APPARATUS FOR WATERING COKE IN COKE-OVENS.

949,290.

Specification of Letters Patent.

Patented Feb. 15, 1910.

Application filed July 15, 1909. Serial No. 507,755.

To all whom it may concern:

Be it known that we, WILLIAM L. AFFELDER and MARK GORTON, both of Brownfield, in the county of Fayette and State of Pennsylvania, have invented a new and useful Apparatus for Watering Coke in Coke-Ovens, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a view partly in plan and partly in horizontal section, showing watering apparatus embodying our invention, in connection with a series of coke ovens. Fig. 2 is a sectional elevation of the same. Fig. 3 is a longitudinal horizontal section showing the cylinder and adjacent parts. Fig. 4 is a side elevation of the same. Fig. 5 is an end view. Figs. 6 and 7 are sections on the lines VI—VI and VII—VII respectively of Fig. 8. Fig. 8 is a sectional view of a portion of the cylinder showing the piston therein. Fig. 9 is a side view looking at the opposite side from Fig. 4. Fig. 10 is a longitudinal horizontal section of the valve shifting motor. Fig. 11 is a detail view of one of the inlet valves. Fig. 12 is a cross section on the line XII—XII of Fig. 10, and Fig. 13 is an end view of the valve shifting motor.

Our invention has relation to apparatus for water quenching coke in coke ovens, and is designed to provide apparatus of this character which is simple and effective in its operation.

Further and more specific objects of the invention are to provide apparatus of this character, which is compact in form; which can be readily moved from one oven to another; which shall be automatic in its operation; and in which the water is first used as a motive power for the device and is then used for the actual watering of the coke.

The nature of our invention will be best understood by reference to the accompanying drawings, which will now be described, in which we have shown the preferred embodiment of the invention, it being premised, however, that various changes may be made in the details of construction and arrangement of the various parts without departing from the spirit and scope of our invention as defined in the appended claims.

In these drawings, the numeral 2 designates a coke oven, a series of these ovens being shown in Fig. 1. Extending along each side of the series of ovens are parallel tracks

3 upon which is mounted a suitable carriage 4, which may be propelled along the said tracks by means of any suitable motive power, such as electric motor 5. Mounted upon each carriage 4 and preferably, although not necessarily, arranged to travel on said carriage in a direction at right angles to the travel of the carriage (that is to say, toward and away from the ends of the ovens) is a car or support 6. Mounted upon each car or support is watering apparatus A constructed in accordance with our invention.

By means of the carriages 4, the watering apparatus A can be readily moved from one oven to another along the series of ovens.

The watering apparatus shown upon the two cars or supports 6 are similar to each other, and but one of them will be described in detail. This apparatus consists of a cylinder 7 having therein a piston 8, which is arranged to reciprocate within the cylinder and which is carried by a hollow piston rod 9, which extends outwardly through a stuffing-box 10 at one end of the cylinder. Connected to the projecting end of the hollow rod 9 is a sprinkling head 11. The piston 8 is provided with a projecting hub 12 at each side, each of these hubs having therein a series of radial ports 13, the rod 9 being threaded, or otherwise secured in one of these hubs, as shown in Fig. 8. Within the piston head and extending into both hubs is a rotary valve sleeve 14 also having ports therein, and arranged to control the ports 13, said sleeve being so arranged that when the ports 13 of one hub are opened, the ports of the other hub are closed and vice versa. The manner of actuating this valve sleeve will be described hereinafter.

15 designates the supply pipe for the cylinder 7, said pipe extending longitudinally of the cylinder at one side thereof. This pipe 15 is connected with the end portions of the cylinders by the short inlet pipes 16, the admission to which is controlled by the rotary valves 17. Connected to the pipe 15 is a water feed pipe 18 having the flexible portion 19. This flexible portion 19 is connected at its opposite end to the looped pipe 20, having two parallel branches which extend above the cylinder and parallel therewith, and which form a support for the springler head 11 when the latter is extended into the furnace. For this purpose, the end portion of the hollow rod 9 to which the sprinkler head is attached is

connected with these looped pipes by the short rigid connection 21, as best shown in Fig. 9. In order to properly guide and support the looped pipe 20, as it is reciprocated into and out of the coke oven, with the sprinkler head, the cylinder is provided with a series of supporting and guiding rollers 22 and 23, the lower branch of the looped pipe resting upon the rollers 22, and the rollers 23 extending between the two branches of the looped pipe. Water is supplied to the lower branch of the looped pipe 20 by a connection at 24.

25 designates a valve shifting motor or engine which, in the particular arrangement shown in the drawings, is arranged transversely underneath the central portion of the cylinder 7. This motor or engine 25 (see Fig. 10) has a central piston chamber 26 with a valve chamber 27 at one side thereof and a similar valve chamber 28 at the opposite side. The valve chamber 27 is arranged to communicate with the piston chamber 26 by means of the two ports 29 and 30, which lead into opposite end portions of the piston chamber; and the valve chamber 28 communicates with the piston chamber 26 by the two similar ports 31 and 32. The ports 29 and 30 are controlled by the hollow rotary valve 33 mounted in the chamber 27, and the ports 31 and 32 are controlled by a similar valve 34 mounted in the chamber 28.

34 is the inlet valve for the chamber 26 and 33 is the outlet valve for said chamber. As above described, the two valves 33 and 34 are hollow, and each is open at one end for connection respectively with the inlet connection 35 and the outlet connection 36. The inlet connection 35 may conveniently form a branch of the inlet pipe 18, and the outlet connection 36 may discharge at any convenient point. The valve 34 has the two ports 37 and 37^a so arranged that when the port 37 is in register with the port 31, the port 37^a will be out of register with the port 32. The only outlet valve 33 has the two similarly but reversely arranged ports, 38 and 39.

40 is a piston arranged to work in the piston chamber 26 and carried by a piston rod 41 which extends outwardly through a stuffing-box 42.

Journalled in the side wall of each of the heads of the cylinder 7 and projecting inwardly into the interior of these heads is a tappet arm or finger 43. These tappet arms or fingers 43 are arranged to be engaged by the piston 8, near the limits of its respective strokes, to thereby impart a partial rotary movement to the shafts of said arms or fingers which extend outwardly through the walls of the cylinder heads. Connecting crank arms 44 of these shafts with the crank arms 45 on the projecting ends of the stems 46 of the valves 33 and

34 before described, are links or connecting rods 47. The two cranks 45 are connected by a link 47^a.

The projecting end of the piston rod 41 which carries the piston 40 is connected to a crank arm 48 of a longitudinally extending rock shaft 49. The ends of this rock shaft 49 are provided with cranks 50, connected each by a link 51 with a crank 52 on the outer end of a shaft 53. One of these shafts 53 is journaled in the end wall of each head of the cylinder 7 and carries at its inner end within the head a hook shaped crank arm 54, best shown in Figs. 3, 7 and 8. This hook shaped crank arm, when actuated in the manner hereinafter described, is arranged to engage a pin or stud 55, secured to the valve sleeve 14 before described, and projecting outwardly through an elongated slot 56 in one of the hubs 12. It will be understood that each end portion of the valve sleeve carries one of these pins or studs 55, one for contact with the crank 54 at one end of the cylinder 7 when the piston 8 is at the limit of its stroke in one direction, and the other for contact with the crank arm 54 at the opposite end of the cylinder 7 when the piston 8 is at the end of its reverse stroke. The two pins or studs, together with the actuating arms 54 are so arranged, however, as to cause the rotation of the valve sleeves 14 in opposite directions. The crank 52 of each shaft 53 is also connected by a link 57 with a crank 58 on the projecting end of the valve stem of the adjacent admission valve 17 whereby said valve will be controlled simultaneously with the movements of the crank arms 54.

The operation is as follows: As the piston 8 nears the limit of its stroke in one direction, as shown in Fig. 3, it contacts with the tappet arm or finger 43, thereby actuating one of the links 47 to shift the position of the inlet valve 34 of the valve shifting engine or motor 25. This cuts off the supply of water at one side of the piston 40, and admits water at the opposite side of said piston. By means of the link connection 47^a between the stems of the two valves 33 and 34, the outlet valve 33 is also shifted. The relative action of these valves to admit water at one side of the piston 40 and exhaust it at the opposite side, will be readily understood from Fig. 10 without a detailed description. The shifting of these valves 33 and 34 causes a reverse movement of the piston 40, thereby actuating the rock shaft 49. This movement of the rock shaft, through the links 51 and 54, opens the admission valve 17 at the end of the cylinder where the piston 8 now is, and closes the admission valve 17 at the opposite end of the cylinder. This movement of the rock shaft 49 also actuates the crank arm 54 to engage the pin

or stud 55 and thereby rotate the valve sleeve 14 so as to close the ports 13 at the right hand side of the piston, looking at Fig. 8, and open the ports 13 at the left hand side of the piston. The piston 8 now starts its reverse stroke and the water at the left hand side of the piston is exhausted through the ports 13 into the hollow piston rod 9 and thence to the sprinkler head 11 where it is discharged. When the piston 8 nears the other end of the cylinder 7, the tappet arm 43 at that end is actuated, thereby again shifting the valves 33 and 34, and actuating the rock shaft 39 in the reverse direction to reverse the inlet valves 17 and also reverse the position of the valve sleeve 14. During the next reverse stroke of the piston, the water at the right hand side thereof is forced into the hollow piston rod 9 and is discharged at the sprinkler head 11. It will be seen, therefore, that when the apparatus is properly positioned with reference to the coke oven, and the operation is started, the piston 8 and the cylinder 7 automatically continue to operate as a double acting motor to force the water to the sprinkler head upon both strokes. The cold water supply first passes through the looped supporting pipe 20, thereby preventing said pipe from burning out while it is within the oven, and then passes to the inlet pipe 15. The water which forms the motive power for the motor is afterward utilized in quenching the coke; and the only water lost is the comparatively small amount which is exhausted from the valve 33 of the valve shifting motor. This water may be utilized if deemed advisable by piping it into the oven or in other ways.

It will be understood that at each reciprocation of the piston 8, the sprinkler head 11 will be reciprocated within the oven over the bed of coke to be quenched, being guided and supported in its movements by the looped supporting pipe 20. It will be understood by reference to Fig. 2 that the purpose of providing a separate sprinkling apparatus at each side of the oven, or series of ovens, is to reduce the length of extension of the sprinkler head into the oven, by making the sprinkler head of each apparatus traverse approximately one-half the length of the oven. This avoids excessive over-hang of the sprinkler head in its extended position. It will be obvious, however, that if desired, and particularly with some ovens, but one apparatus need be employed and the sprinkler head be provided with a sufficient extension to travel substantially the length of the oven. As above stated, however, this is not preferred, for the reason that it not only increases the over-hang of the head, but it also increases the necessary length of stroke of the piston 8.

It will be obvious that various changes can be made in the details of construction

and arrangement of the parts. Thus, the several valves employed may be of any suitable character; the precise means for shifting and actuating the valves can be changed, changes may be made in the manner of supporting and guiding the sprinkler head in its movements, and various other changes made.

We claim:

1. In apparatus of the character described, a motor and a transversely elongated sprinkling device adapted to sprinkle substantially the entire width of a coke oven and arranged to be reciprocated by the motor and to utilize the exhaust water from the motor; substantially as described.

2. In apparatus of the character described, a double acting motor, a transversely extending sprinkler head reciprocated by said motor, and means for causing the exhaust water of the motor to be discharged at the sprinkler head; substantially as described.

3. In apparatus of the character described, a double acting motor, a sprinkling or quenching device connected to the piston of the motor to be reciprocated thereby, valve mechanism controlling the action of the motor, means whereby the movements of the piston automatically effect the shifting of the valves, and means for delivering the exhaust water of the motor to the sprinkling or quenching device; substantially as described.

4. In apparatus of the character described, a double acting motor, a piston arranged to reciprocate in said motor and having a hollow piston rod, a sprinkling or quenching device connected to said piston rod, and valve means for admitting the exhaust water of the motor into said piston rod; substantially as described.

5. In apparatus of the character described, a double acting motor having a piston provided with a hollow piston rod, a sprinkling or quenching device carried by said piston rod, valve means for controlling the action of the motor, valve means for controlling the admission of the exhaust water from the motor into the piston rod, and shifting devices for the valve means operated by the movements of the piston; substantially as described.

6. In apparatus of the character described, a double acting motor cylinder, a piston therein having a hollow rod, valve means for controlling the admission of fluid to said rod at both sides of the piston, and a sprinkling or quenching device connected to the piston rod; substantially as described.

7. Apparatus of the character described, having a double acting cylinder, a piston therein, a hollow piston rod, a sprinkling or quenching device connected with the piston rod, said rod having inlet ports at both sides of the piston, a valve member for con-

trolling said ports and means controlled by the movement of the piston for shifting said valve member to close the ports at one side of the piston and open the ports at the
5 opposite side of the piston; substantially as described.

8. In apparatus of the character described, a cylinder, a piston therein, a transversely extending sprinkling device connected to
10 and reciprocated by the piston, and means for supplying the sprinkling device with water from the cylinder; substantially as described.

9. In apparatus of the character described, a double acting cylinder, a piston in said
15 cylinder, a sprinkling device operated by the piston and arranged to receive its supply of water from the cylinder, a supply pipe for the cylinder having valve connections at opposite ends of the cylinder, a
20 valve shifting motor, valves controlling the action of said motor, devices operated by the movement of the piston for shifting said valves, and actuating connections between
25 the valve shifting motor and the valves of the admission pipe; substantially as described.

10. In apparatus of the character described, a double acting cylinder, a piston
30 therein, a sprinkling device connected to and operated by the piston and arranged to receive its supply from the cylinder, valve means controlling said supply, a valve shifting motor, connections operated by the
35 movement of the piston for shifting the valves and said motor, and connections actuated by said motor for controlling the valves of the admission pipe and also for operating the valve member which controls
40 the supply from the cylinder to the sprinkler; substantially as described.

11. In apparatus of the character described, a cylinder, a piston therein, a sprinkling device connected to and operated by
45 the piston, and arranged to receive its supply from the exhaust of the cylinder, and supporting and guiding means for the sprinkling device; substantially as described.

12. In apparatus of the character described, a cylinder, a piston therein, a sprinkling device connected to and reciprocated
50 by the piston and receiving its supply from the exhaust of the cylinder, and a water cooled support and guide for said device; substantially as described.

13. In apparatus of the character described, a cylinder, a piston therein, a sprin-

5 kling device connected to and reciprocated by the piston and receiving its supply from the exhaust of the cylinder, and a water
60 cooled support and guide for said device, said water cooled guide and support being formed by the supply pipe for the cylinder; substantially as described.

14. In apparatus of the character de-
65 scribed, the combination with a motor cylinder, a piston therein, and a watering device connected to and actuated by the piston, of admission valves for said cylinder, a shifting
70 motor for said valves, said motor comprising a piston and cylinder, valves controlling the action of said piston, and cylinder connections controlled by the first named piston for actuating said valves, and connections
75 actuated by the shifting motor for actuating said admission valves; substantially as described.

15. In apparatus of the character described, the combination with a motor cylinder, a piston therein, and a watering device
80 connected to and actuated by the piston, of admission valves for said cylinder, a shifting motor for said valves, said motor comprising a piston and cylinder, valves controlling the action together with valve
85 means controlling the admission of the exhaust from the main cylinder to the watering device, and connections whereby said valve means are also actuated by the shifting
90 motor; substantially as described.

16. In apparatus of the character described, a motor, a sprinkling device connected to the piston of the motor to be reciprocated thereby, a conduit leading from the motor cylinder to the sprinkling device,
95 and means operated by the movement of the motor piston for alternately opening said conduit to the cylinder at opposite sides of the piston, substantially as described.

17. In apparatus of the character described,
100 a double-acting motor, a sprinkling device connected to the piston of the motor, a conduit leading from the interior of the motor cylinder to the sprinkling device, and valve means controlling said conduit and operated
105 by the movements of the motor piston, substantially as described.

In testimony whereof, we have hereunto set our hands.

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Witnesses:

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JESSE B. WYATT.