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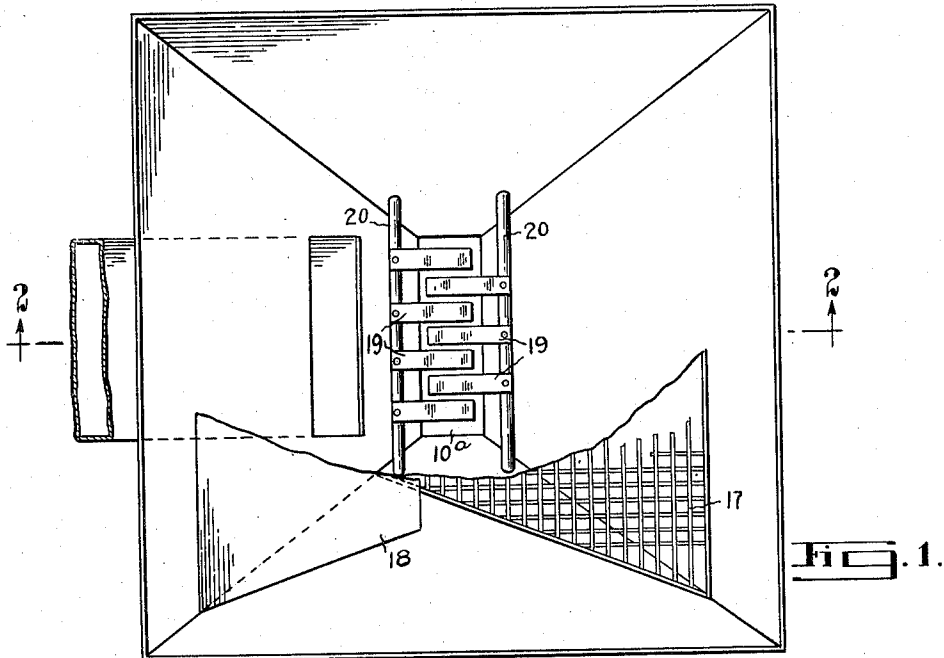
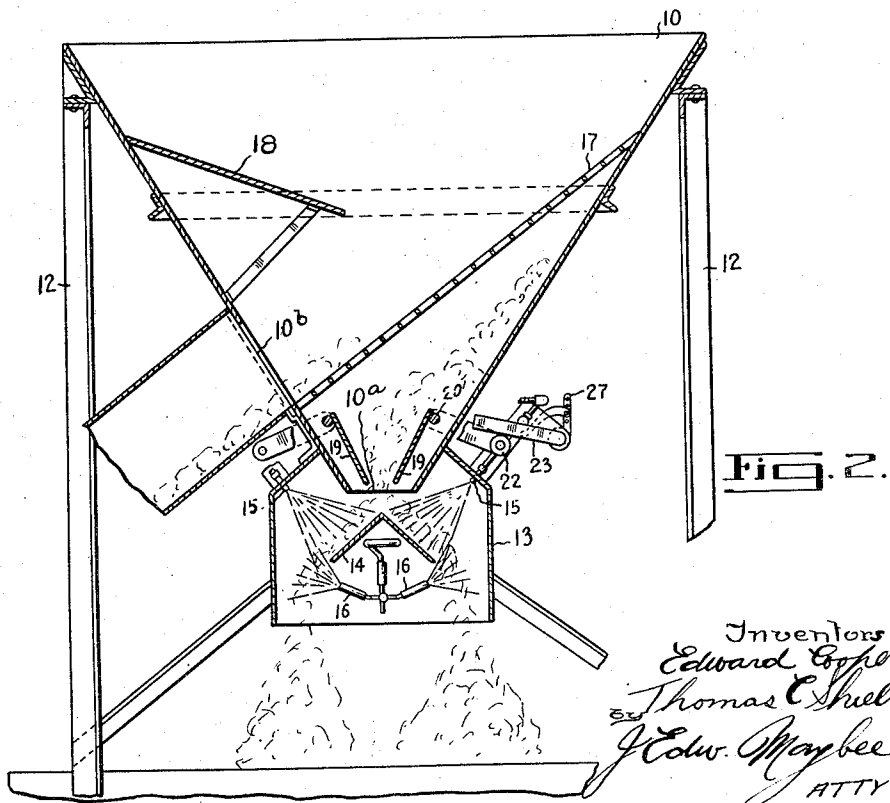
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2,097,914

APPARATUS FOR TREATING SOLID FUEL PARTICLES

Filed May 1, 1937

2 Sheets-Sheet 1



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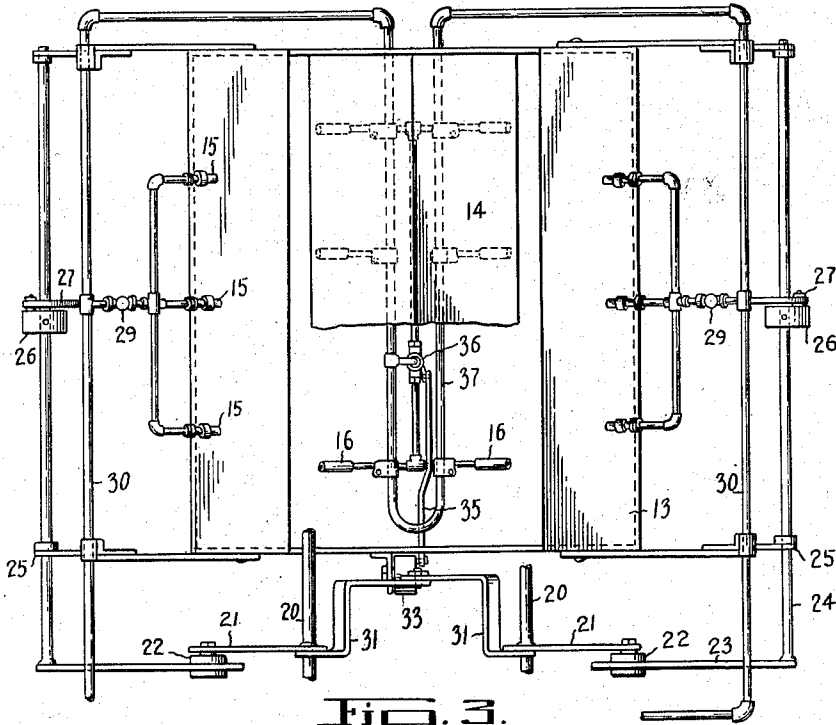


Fig. 3.

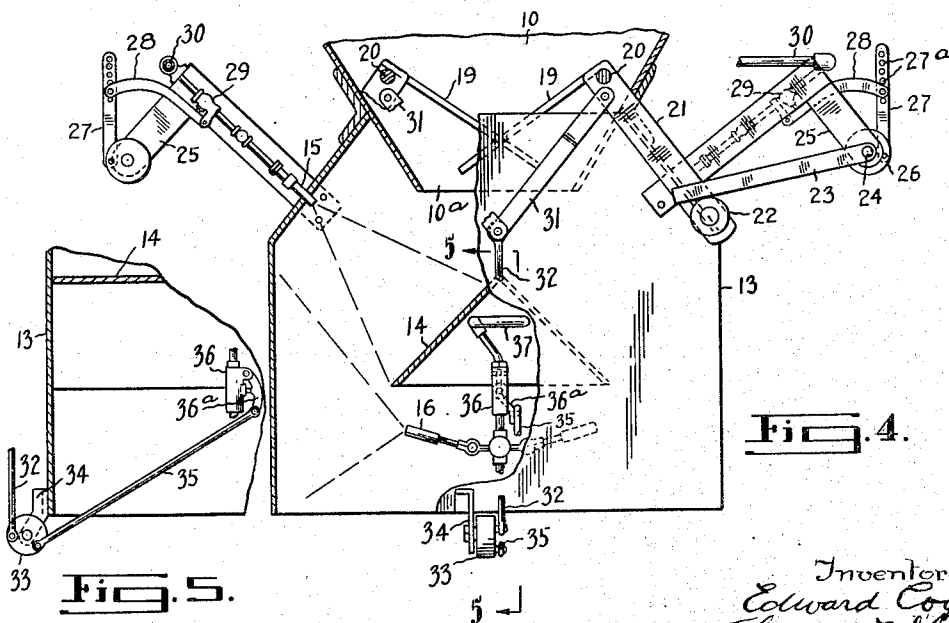


Fig. 5.

Fig. 4.

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UNITED STATES PATENT OFFICE

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APPARATUS FOR TREATING SOLID FUEL PARTICLES

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6 Claims. (Cl. 91-44)

This invention relates to an apparatus for treating solid fuel particles particularly for spraying coal or coke with a dust-laying liquid such as oil.

5 The object of our invention is to provide a means for very efficiently spraying the particles of coal with a liquid in such a way that substantially all the particles are sprayed with a minimum of waste of the liquid.

10 Numerous difficulties are met with in spraying coal or coke with oil. One of the difficulties is that when the spraying is done intermittently the oil becomes cold and stiff when the spray is cut off and will not properly atomize when spraying is re-commenced. This difficulty is overcome 15 by the construction described and claimed in co-pending application filed March 19, 1937, Serial No. 131,873, whereby a constant flow of warm fuel heats the fuel in the spray nozzles.

20 A further difficulty is that the fuel remote from the spraying apparatus is not properly sprayed even though a very thin stream of fuel is treated. Moreover the coal is apt to freeze into larger lumps the outside only of which is 25 treated. Subsequently when the lumps break into smaller particles, the particles are untreated and dusty. Furthermore when the coal passes through the treating apparatus intermittently, unless the flow of oil is promptly cut off when 30 the flow of fuel stops, there is considerable waste of oil.

We overcome the latter difficulties and attain the objects of our invention by means of an apparatus whereby the falling fuel particles are 35 sprayed from two sides thereof, a baffle being provided to break up the fuel into comparatively thin streams, and means being provided for removing large lumps of fuel and for automatically shutting off the oil spray when the flow 40 of fuel is interrupted.

The invention is particularly valuable when treating coal or coke with oil because a high grade expensive oil must be used for proper atomization, and any waste or inefficiency in the 45 method or apparatus used increases the cost of the operation very considerably, in some cases making the cost prohibitive.

Our invention is more particularly described and is illustrated in the attached drawings in 50 which

Fig. 1 is a plan view of the apparatus;

Fig. 2 a vertical section on the line 2-2 in

Fig. 1;

Fig. 3 a plan view of the spraying apparatus 55 partly broken away;

Fig. 4 a part section and part side elevation showing the spray control mechanism; and

Fig. 5 a side elevation, partly in section, of part of the mechanism for controlling the lower spray nozzles, taken on the line 5-5 in Fig. 4. 5

In the drawings like numerals of reference indicate corresponding parts in the different figures.

The frusto-pyramidal hopper 10 is mounted over a bin 11 by suitable supports 12. Solid fuel 10 in particles of the desired size is shovelled or otherwise discharged into the hopper, and passes out through the discharge opening 10^a in the base of the hopper in a comparatively wide, thin stream. Beneath the discharge opening of the 15 hopper is a fogging box 13 which is open in its bottom. An inverted V-shaped baffle 14 extends from end to end of the fogging box and is arranged beneath the discharge opening in the hopper 10 so that the stream of fuel is divided 20 into two substantially equal parts as it flows from the hopper.

Arranged on each side and above the baffle 14 are a plurality of inwardly directed spray nozzles 15, three being shown at each side arranged 25 so as to direct a fine spray of oil or other liquid over the particles of fuel as they pass over the baffle.

Below the baffle and outwardly directed are a plurality of spray nozzles 16, three being shown 30 as directed towards one side of the baffle and three towards the other whereby the inner sides of the streams of particles of fuel as they descend from the baffle 14 are subjected to a fine spray of oil or other liquid. The nozzles are 35 fed by branches from the supply pipe 30 which branch pipes are branched to the nozzles.

It will be seen that the comparatively long narrow discharge opening in the hopper produces a comparatively thin stream of fuel particles which is divided into two streams of approximately half the thickness of the original stream. These streams are subjected to the spray of liquid on both sides as they are falling 40 so that practically all the particles are coated with a uniformly fine coating of liquid. 45

The solid fuel which is treated in this manner has usually been screened and graded before treating with the liquid. However, when fuel is stored in cold weather it frequently freezes into 50 large lumps. If these lumps are treated only their surfaces will receive a coating of liquid. The result is that when they break through impact or melting, the individual particles which form the lump have not been properly treated. 55

To eliminate these lumps, means is provided for screening them out and automatically removing them from the hopper. For this purpose a screen 17 is mounted on the hopper 10, the plane of the screen lying substantially at an angle of 45° to the plane of the discharge opening 10^a of the hopper, the lower edge of the screen being adjacent to but above the said opening. At the lower edge of the screen 17 is an opening 10^b in the side of the hopper through which lumps screened out by the screen 17 may pass to a chute. Above this opening is a plate 18 inclined in the opposite direction to the screen 17 adapted to direct particles of fuel away from the opening 10^b and towards the screen 17 to prevent the particles from passing out through the opening 10^b without first passing over the screen 17.

In order that the liquid sprays may be turned on, or cut off as soon as the flow of fuel ceases, means is provided for controlling the supply of liquid, which is fed to the nozzles under pressure by means of a pump or pumps not shown. For this purpose a plurality of overlapping wings or fingers 19 are mounted on rods 20, 20 which extend on either side of the hopper 10 above and parallel to the long sides of the discharge opening 10^a (see Figs. 1 and 2). The rods 20, 20 pass through and are rotatably mounted on the sides of the hopper 10.

The mechanism for automatically controlling the supply of liquid will be described with regard to the nozzles at one side of the baffle 14, it being understood that the same mechanism is used on both sides.

Referring to the right hand side of Figs. 3 and 4, outside the hopper and at one end thereof a lever 21 is fixedly secured to and extends at right angles to the rod 20. At the free end of the lever 21 is a roller 22, on which rests the free end of a lever 23, the other end of which is fixed to a shaft 24. The shaft 24 is pivotally mounted on brackets 25, 25 which are secured to each end of the fogging box 13. Mounted on the shaft 24 centrally thereof is a crank disk 26 at one side of which is pivoted an arm 27 having a series of holes 27^a therein. The handle 28 of a whistle valve 29 is pivotally connected to the arm 27 in one of the holes 27^a, which are provided for purposes of adjustment. The whistle valve 29 is located in a branch from the main liquid supply pipe 30 which is branched to the nozzles 15.

When the fingers 19 are depressed by the weight of coal, the lever 21 is raised, which in turn raises the lever 23 which rotates the shaft 24 causing the arm 27 to move downward, pulling down the handle 28 of the valve 29 thus opening the valve and permitting the liquid from the supply pipe 30 to pass to the nozzles 15. When there is no coal in the hopper the fingers 19 are raised by the weight of the valve opening mechanism described above and the operation of the said mechanism is reversed closing the whistle valve 29.

To open and close the branches of the feed line to the lower nozzles 16, bent links 31 are pivotally connected to the lever 21 and loosely connected to one end of a rod 32. The other end of the rod 32 is pivotally and eccentrically connected to a crank disk 33 which is mounted on a bracket 34 secured to the fogging box 13. A rod 35 is pivotally and eccentrically connected to the crank disk 33 and the lever handle 36^a of the whistle valve 36 in the feed pipe 37 leading from the supply pipe 30. The rotation of

the rod 20, by the depression of the fingers 19 raises the lever 21, and pulls up the link 31 and the rod 32, which rotates the cam 33, causing the rod 35 to drop and opening the whistle valve 36.

It will be seen from the above description that the apparatus described overcomes the objectionable features of previously known apparatus used for the similar purposes, and achieves the objects of this invention.

What we claim as our invention is:

1. Apparatus for treating solid fuel comprising a hopper adapted to hold fuel particles having a discharge opening in its lower end; spray nozzles below the discharge opening of the hopper; a feed pipe for feeding liquid under pressure to the nozzles; a valve in the feed pipe; pivoted fingers adjacent the lower end of the hopper, said fingers tending to rise but adapted to be depressed by the weight of fuel in the hopper; and connecting members between the fingers and the valve whereby when the fingers are depressed the valve is opened.

2. Apparatus for treating solid fuel comprising a hopper adapted to hold fuel particles having a discharge opening in its lower end; spray nozzles below the discharge opening of the hopper; a feed pipe for feeding liquid under pressure to the nozzles; a valve in the feed pipe; pivoted fingers adjacent the lower end of the hopper, said fingers tending to rise but adapted to be depressed by the weight of fuel in the hopper; a rotatable horizontal rod on which said fingers are mounted; a lever fixedly connected to the horizontal rod; a second rotatable horizontal rod; a lever fixedly connected to the said second horizontal rod and adapted to be slidably engaged by the first mentioned lever to rotate the second horizontal rod; a crank disk on the second horizontal rod adapted to rotate therewith; and connecting means between said disk and said lever, whereby the valve is opened and closed by the rotation of the cam.

3. Apparatus for treating solid fuel comprising a hopper adapted to hold fuel particles having a discharge opening in its lower end; spray nozzles below the discharge opening of the hopper; a feed pipe for feeding liquid under pressure to the nozzles; a valve in the feed pipe; pivoted fingers adjacent the lower end of the hopper, said fingers tending to rise but adapted to be depressed by the weight of fuel in the hopper; rotatable horizontal rods on which said fingers are mounted; levers fixedly connected to the horizontal rods; a substantially vertical rod; links connecting said levers and said vertical rod whereby the vertical rod is raised or lowered when the horizontal rods are rotated by raising and lowering of the fingers; a crank disk rotatable by the vertical rod; a rod adapted to be actuated by the disk to open and close the valve in the feed pipe.

4. Apparatus for treating solid fuel comprising a hopper adapted to hold fuel particles having a discharge opening in its lower end; spray nozzles below the discharge opening of the hopper; a feed pipe for feeding liquid under pressure to the nozzles; a valve in the feed pipe; a valve actuating member positioned in the lower part of the hopper movable by the weight of coal in the hopper to a valve opening position; and connecting members between the valve actuating member and the valve whereby the valve actuating member actuates the valve, the valve actuating member normally tending to move to its valve closing position.

5. Apparatus for treating solid fuel comprising a hopper adapted to hold fuel particles having a discharge opening in its lower end; spray nozzles below the discharge opening of the hopper; a feed pipe for feeding liquid under pressure to the nozzles; a valve in the feed pipe; a finger pivoted at its upper end adjacent the lower end of the hopper, said finger tending to swing inwardly and upwardly but adapted to be depressed by the weight of fuel in the hopper; and connecting members between the finger and the valve whereby when the finger is depressed the valve is opened.

6. Apparatus for treating solid fuel comprising a hopper having a discharge opening at its bot-

tom; means for splitting the discharged fuel into two parallel streams; spray nozzles located at each side of each stream adapted to discharge towards said streams of fuel; means controlling the discharge from the nozzles; a valve actuating member positioned in the lower part of the hopper movable by the weight of coal in the hopper to a valve opening position; and connecting members between the valve actuating member and the valve whereby the valve actuating member actuates the valve, the valve actuating member normally tending to move to its valve closing position.

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