Aug. 23, 1932. J. SPERLING 1,873,353

COMBUSTION APPARATUS

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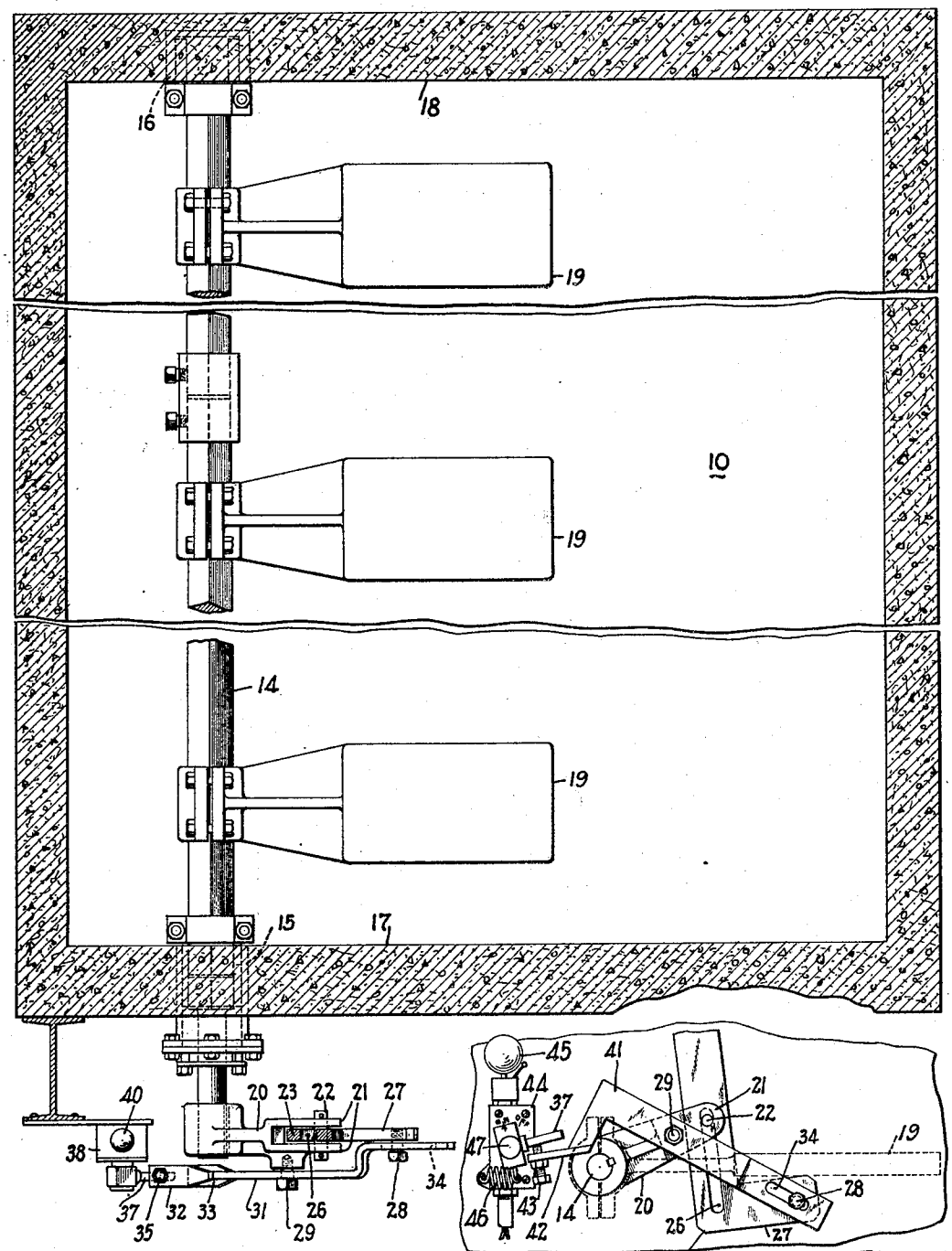



FIG. 1.




FIG. 5.

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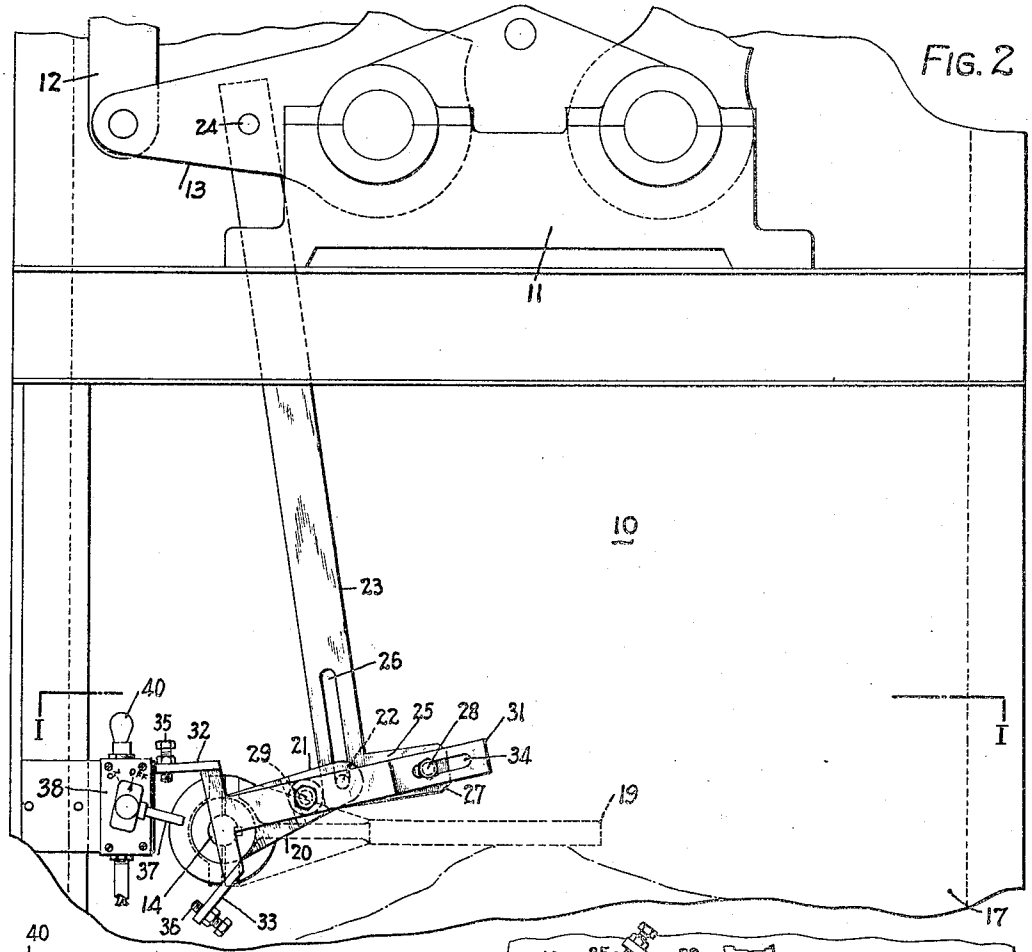
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FIG. 2



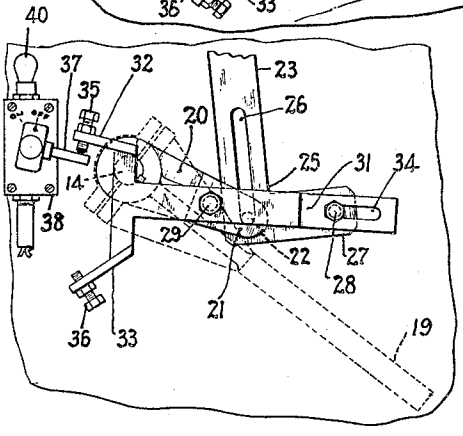




FIG. 3.

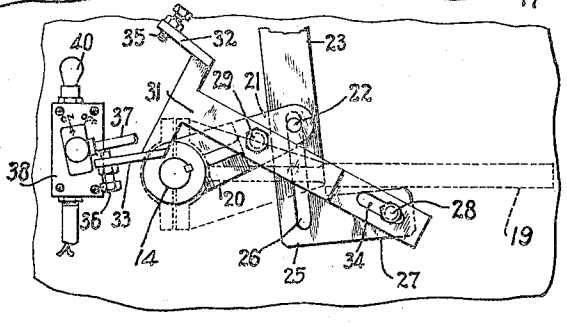



FIG. 4.

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# UNITED STATES PATENT OFFICE

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## COMBUSTION APPARATUS

Application filed August 20, 1931. Serial No. 558,414.

My invention relates to a control mechanism to be used in conjunction with a bin for storing granular material in either a wet or dry state, and it has for an object to provide an improved means that will operate indicating or controlling devices used in connection with the bin when the material has reached a predetermined level or levels in the bin.

In accordance with one specific embodiment of my invention, I provide a mechanism having a paddle disposed within the bin, which paddle is adapted to contact with the body of material as it fills the bin. The mechanism is reciprocated by a rod having a lost motion connection therewith which provides for decreased amplitudes of movement as the paddle contacts with the increasing body of material in the bin. A tripping lever is pivotally carried by the mechanism and is operatively connected to the reciprocating rod. The tripping lever may either carry a device for indicating a level of material within the bin, may actuate mechanism for indicating the level or may actuate a controlling switch or valve used to initiate the operation of apparatus for removing the material from the bin.

It is, therefore, a further and more specific object of my invention to provide a control mechanism, which operates an indicating or a controlling device when the material within the bin reaches a predetermined level, and which includes as a part thereof a reciprocating paddle member, the amplitudes of movement of which depend upon the particular level of the material within the bin.

These and other objects are effected by my invention, as will be apparent from the following description and claims, taken in connection with the accompanying drawings, forming a part of this application, in which:

Fig. 1 is a plan view in section of an ash pit employing my novel control mechanism and is taken along line I—I of Fig. 2;

Fig. 2 is a side elevation of the pit shown in Fig. 1;

Figs. 3 and 4 are fragmentary views of my mechanism showing two positions assumed thereby during its cycle of operation; and,

Fig. 5 is a fragmentary view similar to Figs. 3 and 4, except that a modified lever is employed.

While my novel control mechanism is applicable to any bin, pit, receptacle, or the like, in which granular material is stored, I have chosen to show it as applied to the conventional ash pit used in connection with furnaces for burning solid fuel.

Referring now to Figs. 1 to 4, inclusive, of the accompanying drawings, it will be observed that I have shown an ash pit 10, having a clinker grinder mechanism 11 mounted adjacent the upper portion thereof. Such ash pit is of the conventional design and is used to receive the refuse and ash as it is discharged from a furnace, not shown. The clinker grinder mechanism 11 crushes the material as it comes from the furnace and discharges such material into the pit. The mechanism 11 may be operated in any desired manner, for example, by a driving rod 12 connected to an arm 13 forming a part of the grinder mechanism. The driving rod 12 may be operated from any suitable source of power and when operated imparts oscillatory motion to the arm 13.

A shaft 14 is journalled in bearings 15 and 16, which bearings are mounted in side walls 17 and 18 of the pit 10. Within the pit and fixed to the shaft 14 are paddle members 19 so disposed as to contact with the body of ash as it fills the pit. Exteriorly of the pit and fixed to the shaft 14 is an arm 20 having bifurcations 21 at one end thereof which carry a pivot pin 22.

The paddle members 19 are reciprocated toward and away from the inner portion of the pit 10 by a connecting rod 23, which latter is pivotally connected at its upper end by a pin 24 to the arm 13. The lower end of rod 23 extends between the bifurcations 21 and is provided with a longitudinally-extending slot 26 receiving the pivot pin 22. The pin 22 and the slot 26 form a lost motion connection to provide relative movement between the connecting rod 23 and the arm 20, the function of which will appear more fully hereinafter.

The extreme lower end 25 of the connecting

rod 23 includes a lateral projection 27 which carries a shoulder bolt 28.

The arm 20 carries a pivot 29, at a point between the shaft 14 and the pin 22, and a tripping lever 31 is pivotally connected intermediate its ends to the pin 29. Spaced actuating fingers 32 and 33 are provided at one end of the lever 31 and a slot 34 surrounding the shoulder bolt 28 is provided at the opposite end. The spaced fingers 32 and 33 are provided with adjusting screws 35 and 36 respectively, which are adapted to engage and operate a trigger 37 for actuating the device to be operated, for example, an electric switch 38.

Having described the working elements of my novel control mechanism, the operation will be readily understood and is as follows:

In Fig. 2 the parts are shown in their relative position. When the rod 12 and arm 13 are at the extreme upper part of their movement, with the pit empty, the switch 38 is in its "off" position. As the driving rod 12, the arm 13, and the rod 23 move downwardly, the arm 20 and paddles 19 also move downwardly, the pin 22 remaining in the bottom of the slot 26 by virtue of the weight of the paddles 19. Fig. 3 shows the relative position of the parts at the end of the down stroke.

During a downward movement of the arm 23, the lever 31 carried by the pivot 29 and the shoulder bolt 28 carried by the projection 27 also move downwardly and it will be observed from Fig. 3 that the adjusting screw 35 engages the trigger 37 of the switch 38 at the end of a down stroke. With the switch 38 in the "off" position, no movement is imparted to the switch 38 by the screw 35 during a down stroke, but if the switch 38 be in the closed or "on" position during a down stroke, the adjusting screw 35 will engage the trigger 37 and will cause it to move downwardly and move the switch 38 to the "off" position.

The apparatus will operate in the manner just described until the ash within the pit 10 reaches a level that is within the arc described by the end of the paddles 19. When this latter occurs, the paddles 19 will, of course, engage the body of ash and further downward movement of the paddles will be prevented. The connecting rod 23, however, must continue on its downward travel so the bottom of the slot 29 now leaves the pin 22 which latter is held up by the arm 20, shaft 14, and paddles 19. The rod 23 continues downwardly until the end of the stroke is reached and then begins its upward stroke. During the up stroke, the lost motion provided by the pin 22 and the slot 26 is taken up and when the bottom of the slot 26 again engages the pin 22, the arm 20 and paddle 19 are moved upwardly by the rod 23 until the position shown in Fig. 2 is again attained.

It will thus be seen that the stroke or rather the amplitude of movement of the paddles 10 becomes shorter as the level of the ash within the pit 10 becomes higher and also that the arm 20 and pivot pin 29 are in higher positions during the downward strokes of the connecting rod 23. As stated, one end of the lever 31 is pivoted by the pin 28 and slot 34 to the rod 23 and such end moves for the full length of the travel of 23. Consequently, during a down stroke with the paddle 19 engaging the ash and preventing further movement of arm 20, the lever 31 is moved about the pin 29 and the distance between the adjusting screw 36 and the trigger 37 becomes shorter and shorter. When the ash within the pin 10 has accumulated to the predetermined level, the arm 20 and pin 29 will be held at a height, whereby downward movement of rod 23 causes the lever 31 to move about the pin 29 a sufficient distance to effect engagement of the screw 36 and trigger 37 and thereby move the switch 38 to the "on" position.

Fig. 4 shows the relative position of the parts when the pit is full of ash. The rod 23 is at the lowermost position and the switch 38 is shown as having been moved to the "on" position.

In closing the switch 38, a signal device such, for example, as a light 40 is connected to an electrical circuit, and informs the operator that the pit is full of ash and should be emptied. As has already been explained, when the level of the ash has fallen a sufficient distance to allow the paddles 19 to move to the position shown in Fig. 3, the adjusting screw 35 engages the trigger 37 of the switch 38, and moves the latter to its open or "off" position, thereby disconnecting the lamp 40 from the circuit.

Referring to Fig. 5, my novel mechanism is shown as having a lever 41 with only one finger 42 and adjusting screw 43, which operates a momentary contact switch 44, which latter is adapted to open and close a circuit to a suitable signal or indicating device, for example, a bell 45. The operation of the mechanism in this embodiment is identical with that described in connection with Figs. 1 to 4 with the exception that instead of having the finger 35 and the adjusting screw 36 to move the switch to "off" position a spring 46 is utilized to bias the rotating member 47 of the switch 44 to the open or "off" position. This embodiment would be desirable for use in applications where a short time contact is desired.

From the foregoing, it will be apparent that I have devised a novel mechanism to be used in connection with bins or pits for storing granular material, which mechanism is adapted to operate devices in accordance with predetermined levels of material within the pit. The device may be either for the purpose of indicating or signalling the

operator or may be used to initiate the operation of auxiliary apparatus used with the pit. Furthermore, while I have shown my mechanism as being driven by apparatus which is an auxiliary of the ash pit, it will be obvious that a separate drive may be employed.

While I have shown my invention in two forms, it will be obvious to those skilled in the art that it is not so limited but is susceptible of various other changes and modifications without departing from the spirit thereof, and I desire, therefore, that only such limitations shall be placed thereupon as are imposed by the prior art or as are specifically set forth in the appended claims.

What I claim is:

1. The combination with a bin for storing granular material and means for filling the bin with such material, of a member disposed within the bin and adapted to contact with the body of granular material as it fills the bin; means for reciprocating said member toward and away from the inner portions of the bin, and providing for decreased amplitudes of movement of such member as it comes into contact with the increasing body of material; and means dependent upon a predetermined level of the material and consequent position of the member for indicating exteriorly of the bin such level.

2. The combination with a bin for storing granular material, means for filling the bin with such material, and a device to be operated when the material within the bin has reached a predetermined level, of a mechanism for operating the device comprising a member disposed within the bin and adapted to contact with the body of granular material as it fills the bin, means for reciprocating said member toward and away from the inner portion of the bin, and providing for decreased amplitudes of movement of such member as it contacts with the increasing body of material, and means dependent upon a predetermined level of material and consequent position of the member, for actuating said device.

3. The combination with a bin for storing granular material, means for filling the bin with such material, and a device to be actuated when the material within the bin has reached a predetermined level; of a member disposed within the bin and adapted to contact with the body of granular material as it fills the bin; means, including a lost motion connection, for reciprocating the member toward and away from the inner portion of the bin and providing for decreased amplitudes of movement of such member as it contacts with the increasing body of material; and means, dependent upon a predetermined level of material and consequent position of the member, for actuating the device.

4. The combination with a bin for storing granular material, means for filling the bin with such material, and a device to be actuated when the material within the bin has reached a predetermined level, of a paddle disposed within the bin and adapted to contact with the body of granular material as it fills the bin, a shaft carrying said paddle, an arm fixed to said shaft, means including a lost motion connection to said arm for reciprocating said paddle toward and away from the inner portion of the pin and providing for decreased amplitudes of movement of the paddle as it contacts with the increasing body of material, and means dependent upon a predetermined level of material and consequent position of the paddle for actuating said device.

5. The combination with a bin for storing granular material, means for filling the bin with such material, and a device to be actuated when the material within the bin has reached a predetermined level, of a paddle disposed within the bin and adapted to contact with the body of granular material as it fills the bin, a shaft carrying said paddles, an arm fixed to said shaft, a reciprocating rod having a lost motion connection to said arm for reciprocating said paddle toward and away from the inner portion of the bin and providing for decreased amplitudes of movement of the paddle as it contacts with the increasing body of material, a lever having a pivotal connection with said arm and operatively connected at one side of the connection to said reciprocating rod; said lever having an actuating means at the other side of the pivotal connection; and a trigger for operating said device disposed adjacent said actuating means and adapted to be engaged thereby.

6. The combination with a means for crushing ash discharged from a furnace, a pit for receiving ash discharged by the crushing means, means for driving the crushing means and a device to be actuated when the ash within the pit has reached a predetermined level, of a mechanism for actuating said device comprising a paddle disposed within the pit and adapted to contact with the body of ash as it fills the pit, a shaft carrying said paddle, an arm fixed to said shaft, a rod for reciprocating said paddle toward and away from the inner portion of the pit, said rod being driven by the driving means that operates the ash crushing means and having a lost motion connection with the arm and providing for decreased amplitudes of movement of the paddle as it contacts with the increasing body of ash, and means, dependent upon a predetermined level of ash in the pit and consequent position of the paddle, for actuating said device.

7. The combination with a pit for receiving ash having a clinker grinding mechanism associated therewith, means for driving the

clinker grinding mechanism and an electric switch to be actuated when the ash within the pit has reached a predetermined level, of a mechanism for actuating the electric switch comprising a paddle disposed within the pit and adapted to contact with the body of ash as it fills the pit, a shaft carrying said paddle, an arm fixed to said shaft, a rod for reciprocating the paddle toward and away from the inner portion of the pit, said rod being driven by the clinker grinding mechanism and having a lost motion connection to said arm providing for decreased amplitudes of movement of the paddle as it contacts with the increasing body of ash, and a lever operated by the rod and pivotally carried by the arm for actuating the electric switch.

In testimony whereof, I have hereunto subscribed my name this 18th day of August, 1931.

JACOB SPERLING.