

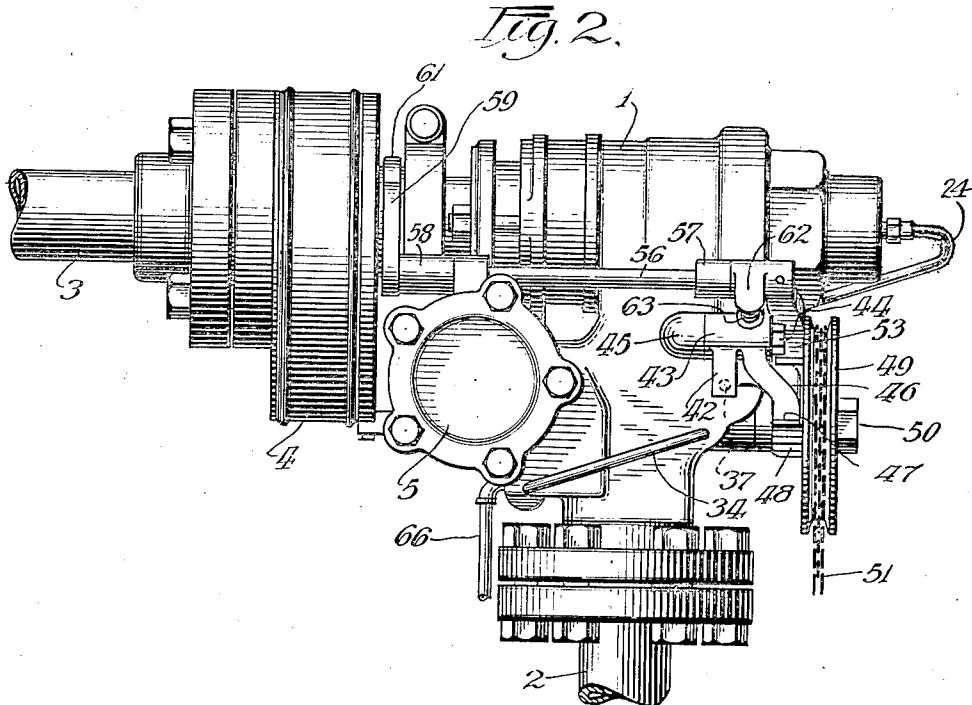
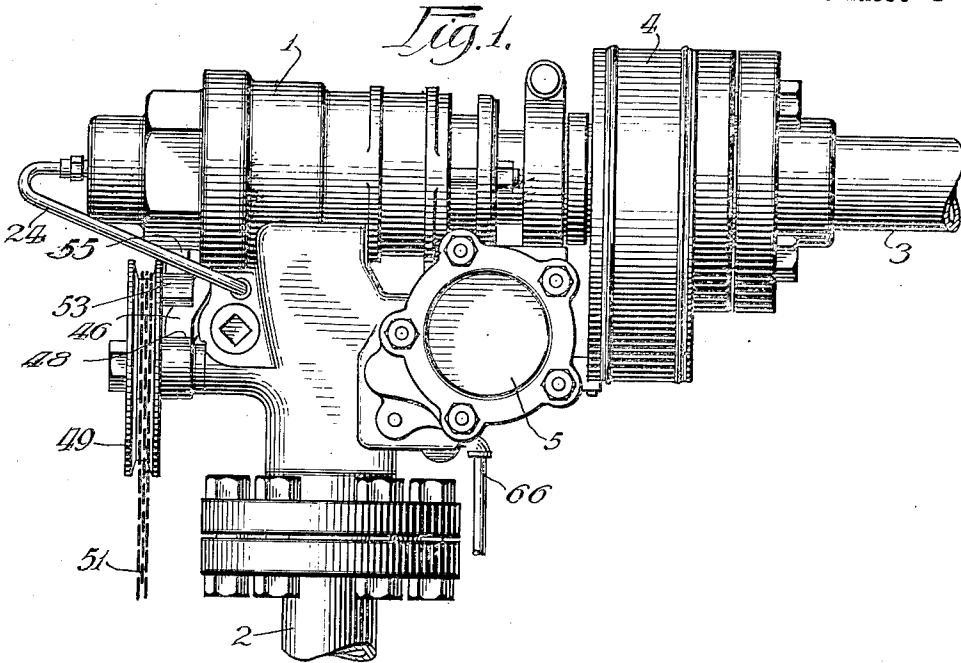
Oct. 30, 1934.

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1,979,136

AUTOMATIC POWER HEAD FOR SOOT BLOWERS

Filed April 11, 1932 . 4 Sheets-Sheet 1



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4 Sheets-Sheet 2

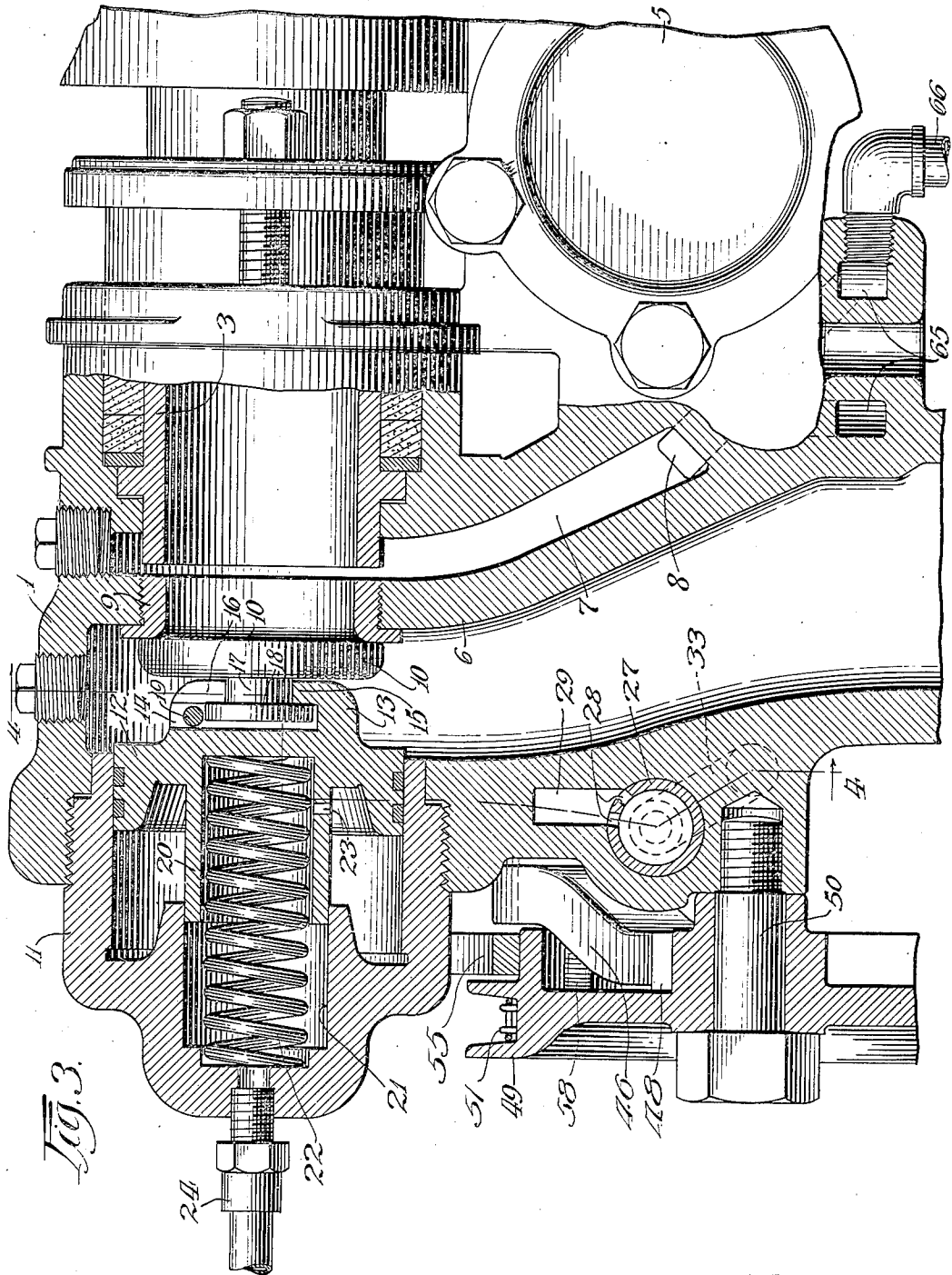


Fig. 3.

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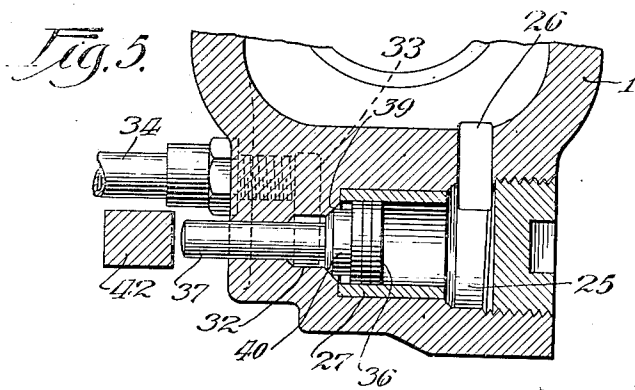
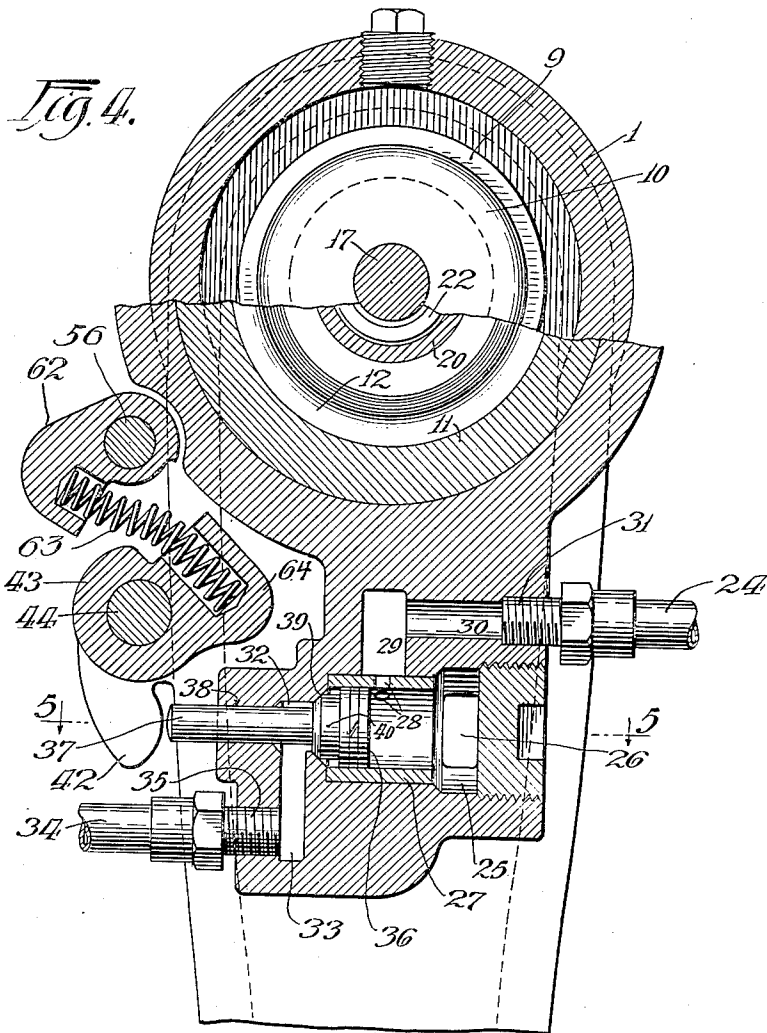
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AUTOMATIC POWER HEAD FOR SOOT BLOWERS

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4 Sheets-Sheet 3



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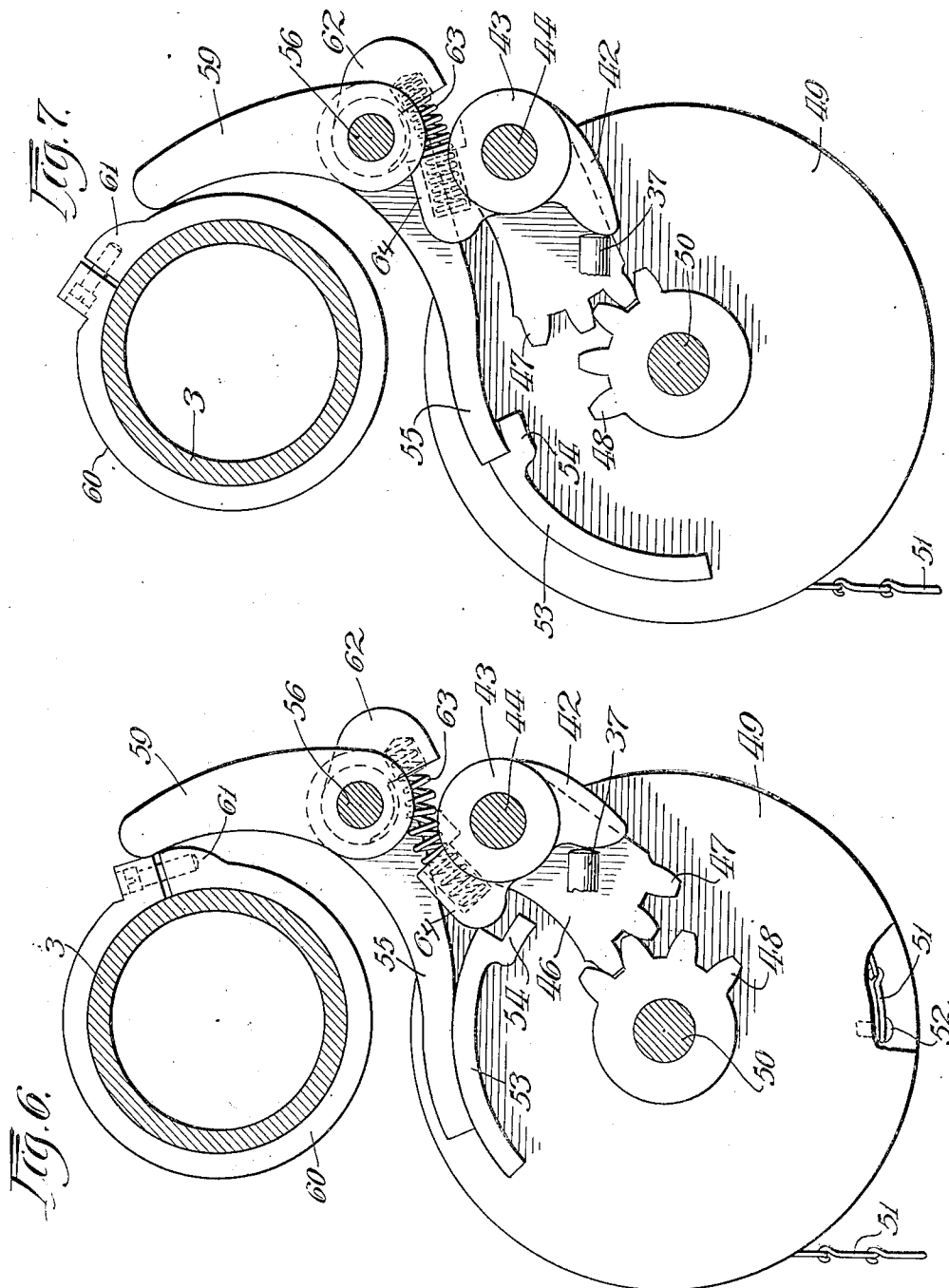
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AUTOMATIC POWER HEAD FOR SOOT BLOWERS

Filed April 11, 1932

4 Sheets-Sheet 4



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UNITED STATES PATENT OFFICE

1,979,136

AUTOMATIC POWER HEAD FOR SOOT BLOWERS

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Application April 11, 1932, Serial No. 604,382

6 Claims. (Cl. 122—392)

The present invention relates to power-operated soot cleaner devices and has for its object to produce simple and novel means whereby, upon the operation of a simple controlling device, steam will be admitted to the tubular cleaner element and the turning of the same will commence; the delivery of steam to and the turning of said element stopping automatically at the proper time.

Since soot cleaners or blowers are associated with steam boilers, it is advantageous to employ steam to turn the blower elements and also to furnish the power necessary to perform other work in connection with the starting and stopping of a blowing or cleaning operation. Therefore, viewed in one of its aspects, my invention may be said to have for its object to provide a power-operated cleaner device with a main valve to admit steam to the cleaner element and to an engine for turning the latter, together with means controlled by a small pilot valve for opening and closing the main valve, the pilot valve being automatically shifted at the proper time to cause the main valve to close after having been operated.

The various features of novelty whereby my invention is characterized will hereinafter be pointed out with particularity in the claims; but, for a full understanding of my invention and of its objects and advantages, reference may be had to the following detailed description taken in connection with the accompanying drawings, wherein:

Figures 1 and 2 are elevations showing opposite sides of a power head arranged in accordance with the present invention; Fig. 3 is a view, partly in side elevation, as in Fig. 1, and partly in central vertical section, on a larger scale than in Figs. 1 and 2, showing only a fragment of the head; Fig. 4 is a section taken approximately on the staggered line 4—4 of Fig. 3; Fig. 5 is a section on line 5—5 of Fig. 4; and Figs. 6 and 7 are more or less schematic views showing the controlling mechanism for the pilot valve in two different positions, looking at said mechanism as it would appear looking from the left hand of Fig. 2, with the power head proper omitted.

Referring to the drawings, 1 represents a hollow head into which steam is admitted through a supply pipe 2. Projecting laterally from the head is a tubular cleaner or blower element 3 adapted to turn about its long axis in the head. The tubular element 3 is adapted to be turned step by step by suitable mechanism housed in the casing 4 and operated by a reciprocating steam engine 5. None of these parts, except some of

the details of the head member 1 which will hereinafter be described, is new at this time, either separately or in combination, and therefore need not be described in detail. The steam engine and the mechanism by which it turns the tubular cleaning element step by step may conveniently be of the type illustrated in my Patent No. 1,886,515, granted November 8, 1932.

Heretofore it has been the custom to turn on the steam by hand when it was desired to perform a cleaning or blowing operation, and then to shut off the steam, in the same way, at the end of this operation. In accordance with the present invention, a small pilot valve is operated manually or in any pre-determined manner, causing forces to be set to work to open a main valve and thus permit the cleaning or blowing operation to begin; the pilot valve being automatically shifted at the proper time to cause the main valve again to close and thus bring the blowing or cleaning operation to an end.

As best shown in Fig. 3, the head is provided with an internal partition wall 6 that separates the main chamber in the head from a narrow chamber 7 into which the inner end of the rotatable cleaner element 3 opens and to which is connected a passage 8 for delivering steam to the engine. The partition 6 has therein a large opening, conveniently opposite the end of the member 3; this opening having therein a suitable bushing 9 whose outer end face constitutes a valve seat. Cooperating with the end face or seat of the bushing is a thick, disk-like valve 10. When the valve rests against the end of the bushing, no steam can reach the tubular cleaning element or the engine; but, when the valve is open, steam flows both to the cleaning element and to the engine so that the steam will be discharged through the nozzles (not shown) on the cleaner element, in the usual way, and the engine will operate to turn the cleaner element step by step. The outer or rear end wall of the head has therein a large opening concentric with the opening in the partition wall, and screwed into or otherwise fixed in the opening in this outer wall is a cup-shaped member 11 whose open end faces inwardly. Slidably fitted into this cup-shaped member is a piston 12. The piston has on the inner side a hub-shaped projection 13 provided with a deep pocket 14 opening down through the top thereof; the pocket, as viewed from above, being long or wide transversely of the axis of the piston, and being short or narrow in the direction of the length of this axis. The wall 15 bounding the pocket on the side toward the

valve has a deep slot 16 cut down into the same through the upper edge. The valve 10 has thereon a neck or stem 17 terminating in a flat head 18. The parts are so proportioned that the valve 5 may be interlocked with the piston by inserting the head 18 into the pocket in the piston, while the stem or neck 17 is received by the slot 16. The head 18 being wider than the slot and extending below the bottom of the latter, when 10 the neck or stem has moved down as far as it can go, the valve cannot again become separated from the piston except by moving it back along the path it followed in becoming interlocked with the piston. To prevent accidental separation of 15 the valve from the piston, a pin 19 may be inserted through the hub just above the head on the valve stem, thereby locking the valve to the piston until the pin is taken out. On the outer side of the piston is a long tubular hub 20 constituting a plunger that has a sliding fit in a cylindrical chamber 21 in the thickened bottom wall or head of the cup-shaped member 11. A strong coil spring 22 lies within the tubular member 20 and engages at one end with that 25 part of the member 11 that closes the outer end of the cylinder 21; the inner end of the spring engaging with that portion of the piston that closes the inner end of the chamber in the tubular hub 20. The spring is placed under such an initial compression that, when the parts are 30 assembled, as shown in Fig. 3, the valve 10 is firmly pressed against the cooperating valve seat on the bushing 9. The wall of the tubular hub 20 has therein, near its inner end, a port or passage 23 which places the chamber in the interior of the hub in communication with the main chamber within which the piston 12 slides. As will hereinafter be explained, steam may be 40 admitted from the main chamber in the head into the cylindrical chamber 21 through a pipe 24 coupled to the bottom or head of the cup-shaped member 11 at the center of the latter, or the cylindrical chamber 21 and the main cylindrical chamber in which the piston 12 slides may 45 be connected to atmosphere through the pipe 24. It will be seen that, when the pipe 24 is supplied with steam at the pressure of the system, the steam pressure on opposite sides of the piston will be balanced, so that the spring will be 50 effective to force the piston into a position that causes the main valve to be closed and held closed. However, if the pipe 24 is connected to atmosphere, thereby relieving the pressure behind the piston, there remains only the force of the spring to hold the valve closed. However, 55 the spring is so proportioned that it will not be strong enough to resist the pressure of the steam on the opposite side of the piston when there is only atmospheric pressure on the side 60 on which the spring is located. Therefore, as soon as the pipe 24 is connected to atmosphere, the piston will be shifted toward the left, as viewed in Fig. 3, and the main valve will be opened and will remain open until steam pressure again builds up behind the piston so as to produce a balanced pressure on the piston and thus permit the spring to move the piston in the direction to close the valve. 65

The pipe 24 may be connected either to the main chamber in the cleaner head or to atmosphere by a suitable pilot valve which is best shown in Figs. 3, 4 and 5. In a thickened part of the wall of the head, just below the opening in which the piston and its cup-shaped cylinder are located, is a chamber 25. At one end this chamber communicates with the main chamber in the head through a passage 26. Fitted within the inner end or portion of the chamber 25 is a cylindrical sleeve 27. This sleeve is provided with a port that may conveniently consist of a number of small 80 holes 28, placed close together; which port or ports communicate with a chamber or pocket 29 formed in the wall of the head adjacent to the chamber 25. A passage 30 extends from the pocket 29 to the exterior of the head. The lower end of the pipe 24 is connected to the passage 30 by means 85 of a suitable coupling 31. Beyond the opposite end of the sleeve 27 from that at which the passage 26 is located is a small pocket or chamber 32 communicating with and, in fact, forming an extension of the chamber 25. To a passage 33 leading from the pocket or chamber 32 is connected an exhaust pipe 34; a suitable coupling 35 being employed for this purpose. Fitted slidably into the sleeve 27 is a comparatively thin piston 36 to 90 which is fixed a stem 37 that extends through the pocket 32 and thence through a cylindrical opening 38 to and beyond the exterior of the head. The pocket 32 is connected to the chamber 25 by a space surrounded by a frusto-conical wall 39 that constitutes a valve seat. On the stem 37 is an enlargement 40 which may also be regarded as a hub on the piston; this enlargement constituting a valve that cooperates with the seat 39. 100 When this valve is engaged with the seat, thereby shutting off communication between the chamber 25 and the pocket 32, the port 28 lies between the piston and the passage 26, so that steam from the main chamber in the head can flow through the passage 26, through the interior of the sleeve 110 27, the port 28, the pocket 39, and the passage 30 to the pipe 24 and thence into the chambers behind the operating piston for the main valve, as heretofore explained. If a force is applied to the outer end of the stem 37, causing the piston 36 to be pushed in until it has moved past the port 28, the pipe 24 will be shut off from the main chamber in the head and will in turn be connected to the exhaust pipe 34 through the pocket 32 and passage 33; the valve 40 being, of course, 120 unseated as soon as the piston is moved toward the right, as viewed in Fig. 4.

It will be seen that normally the pressure of the steam behind the piston 36 will force it toward the left, as viewed in Fig. 4, and hold it there, 125 so that, as soon as the pressure on the outer end of the stem is released, communication between the pipe 24 and the exhaust pipe will immediately be shut off, and communication between the pipe 24 and the main chamber within the head will 130 be reestablished. Therefore, the main valve will normally be held closed and, if opened, will promptly be caused to close whenever the pressure that holds the stem 37 pushed in its released. Furthermore, the main valve being closed, and 135 it being desired to open the same, all that it is necessary to do is to push the stem 37 in and hold it there. The pushing-in of the stem causes the main valve to open, and the main valve will then remain open as long as the stem is held in. 140

The control of the valve stem 37 so as to move it in, hold it in its position, and then release it at the proper time, may be accomplished in any desired way, depending upon the results sought. In the arrangement shown, I have illustrated 145 means for manually pushing in the valve stem, causing it to be locked almost immediately after the starting of the engine, and releasing it after the tubular cleaner element has been turned through a predetermined angular distance which 150

may be a complete revolution, or a stroke in each direction when the movement of the cleaner element is an oscillatory one.

The immediate operating element for pushing in the valve stem 37 is a lug 42 on an oscillatory dog 43 mounted on the side of the head just above the valve stem. In the arrangement shown, the dog is rotatably mounted on a suitable shaft 44 projecting from a boss 45 on the side of the head. As best shown in Figs. 6 and 7, the member 43 has thereon an arm 46 provided on its end with a few gear teeth 47. These teeth mesh with complementary teeth 48 on the hub of a wheel 49 lying across the outer end of the head and mounted on a stationary stub shaft 50 so as to be rotatable thereon about an axis parallel to the axis about which the dog 43 swings. The wheel has a peripheral groove in which lies a chain or other flexible member 51; one end of the chain being fastened to the wheel, as indicated at 52, and the other end depending and being adapted to be grasped by a workman in order to turn the wheel. The parts are so proportioned that, when the chain is pulled, the wheel is turned in a direction to oscillate the dog 43 in the proper direction to push in the stem 37 and thus permit the main steam valve to open. On one side of the wheel is a projecting rib or ledge 53 curved in the arc of a circle about the center of the wheel. The rib or ledge is offset inwardly toward the center of the wheel at one end to provide a step 54. This step is adapted to be engaged by a suitable pawl to lock the wheel in position to hold the stem 37 pushed in. The pawl which I have shown is an arm 55 fixed to and projecting radially from a rock shaft 56 supported in suitable bearings 57 and 58 on the same side of the head as the dog 43; the shaft 56 being parallel with the axis of rotation of the dog. The rock shaft 56 has thereon a second arm 59 lying in the same plane as a cam ring 60 surrounding and stationary on the tubular cleaner element. At one point on the ring 60 is a cam lug or projection 61. The parts are so proportioned that, when the cam element 61 is in engagement with the arm 59, the pawl arm 55 cannot swing down off the end of the curved ledge 53 and upon the step 54 when the wheel is turned, but remains at a sufficient radial distance from the center of the wheel to permit the wheel to be turned freely in either direction. However, when the tubular cleaner element is turned far enough to cause the cam lug to move clear of the arm 59, the pawl arm may drop down upon the step 54 after the wheel has been turned to bring the pawl arm to the end of the curved ledge. After the pawl arm has dropped down on the step, as indicated in Fig. 7, it prevents the wheel from turning back until the rock shaft is again turned so as to lift the pawl arm far enough outwardly to permit it to clear the curved ledge. Obviously, what may be termed the tripping of the pawl may be accomplished by the cam lug 61. With the parts as in Fig. 7, if, after the cam lug has been moved clear of the arm 59, the tubular cleaner element makes a complete revolution, the lug will again come into contact with the arm 59 and, through it, rock the rock shaft so as to unlock the wheel. Or, if the movement of the tubular cleaner element is an oscillatory one, the cam lug simply travels step by step through the predetermined angle that constitutes a stroke of the cleaner element and then travels back again through this same angular distance until it is again engaged with the arm 59. It is not

enough that the wheel be released from the holding means at the end of a blowing operation, but it must be turned back to its idle position so as to permit the valve stem 37 to move out again. In the arrangement shown, I have provided spring means for accomplishing this end. Thus, the dog 43 is provided with a boss 64 and the arm 55 is provided with a boss 62. Between these bosses is placed a compression spring 63 whose ends extend into sockets in the respective bosses. The parts are so proportioned that, when they are in what may be termed their idle positions, as shown in Fig. 6, leaving the stem 37 free, the spring is under an initial compression. Then, as the wheel is turned by pulling on the chain, the boss 64 moves toward the boss 62 which is held stationary because the arm 55 rests on the ledge 53, and therefore further compression of the spring takes place. The energy stored up in the spring helps to swing the pawl arm 55 down into its locking position after it has reached the end of the curved ledge, thereby insuring that the pawl will snap into place as soon as the cam lug has passed clear of the arm 59; thereby bringing the parts into the position shown in Fig. 7. When the cam lug again engages with the arm 59 so as to shift the rock shaft into the position indicated in Fig. 6, and thereby unlocking the wheel, the energy stored up in the spring turns the dog 43 and, because of the intermeshing teeth on the dog and the wheel, the wheel is also turned until finally the wheel and the dog occupy the positions shown in Fig. 6.

It will, therefore, be understood that, when a blowing operation is to be performed, the workman simply pulls on the chain, thereby admitting steam to the cleaner element and to the engine, and retains his hold until the engine has completed a few strokes so as to insure that the cam lug on the cleaner element will have been carried clear of the arm 59. Then, knowing that the pawl arm will have dropped into locking engagement with the wheel, the workman releases the chain and pays no more attention to the apparatus. Thereupon, the blowing operation will continue, the tubular cleaner element being turned step by step, either through a complete revolution or through a partial revolution in one direction and then back again, whereupon the holding pawl for the wheel will be tripped, and the wheel will return to its idle position, permitting the main steam valve to close and shut off steam from both the cleaner or blower element and the engine.

It should be noted that the pressure of the system is constantly exerted on the piston element of the pilot valve, tending to move it into the position that causes the closing of the main valve. Therefore, after the holding panel for the wheel 49 has been tripped, the pilot valve assists the spring 63 in returning the wheel to its normal, idle position.

I have said that the pipe 34 is connected to atmosphere. This may conveniently be accomplished, without permitting steam to escape into the boiler room, by connecting the pipe 34 to the exhaust passage 65 for the engine; the exhaust passage, as shown in Fig. 3, being connected to a waste pipe 66 that may lead to a point outside of the boiler room.

It should also be noted that, although steam will ordinarily be employed as the fluid under pressure delivered to the cleaner element and to the engine, other suitable fluids may be substituted for either or both purposes; and, where I refer

to steam, I mean any suitable fluid under pressure.

While I have illustrated and described with particularity only a single preferred form of my invention, I do not desire to be limited to the exact structural details thus illustrated and described; but intend to cover all forms and arrangements which come within the definitions of my invention constituting the appended claims.

I claim:

1. The combination with a soot blower device comprising a head, a tubular cleaner element rotatably mounted in and projecting from the head, and an engine for turning said element, of a main valve in the head for admitting steam to said element and to the engine, means including a pilot valve in the head to open and close the main valve, and means controlled by said element to operate the pilot valve and cause the main valve to close after the pilot valve has been actuated to cause the main valve to open.

2. The combination with a soot blower device comprising a head, a tubular cleaner element rotatably mounted in and projecting from the head, and an engine for turning said element, of a main valve in the head for admitting steam to said element and to the engine, a pilot valve in the head, means controlled by said pilot valve to open and close said main valve, and means controlled by a part driven by said engine to operate the pilot valve and cause the main valve to close whenever the engine has completed a predetermined number of strokes following the opening of the main valve.

3. The combination with a soot blower mechanism comprising a hollow head, means to deliver steam into the interior of the head, a tubular cleaner element rotatably mounted in and projecting from the head, and an engine for turning said cleaner element, of a main valve for controlling the admission of steam from the head to the said element and to the engine, said head having a cylindrical chamber opening out of the interior thereof and closed at its outer end, a piston connected to said valve and fitting slidably in said cylinder, a compression spring in the cylinder behind the piston and constantly exerting a pressure tending to move the piston away from the closed end of the cylinder and close the said valve, said head having an exhaust port leading to atmosphere, a pilot valve adapted to connect the interior of the cylinder behind the piston to either

the exhaust port or to the steam space in the interior of the head, said pilot valve having a part whereby it may be operated manually to cause the closed end of said cylinder to exhaust, and means controlled by a moving part of said mechanism to cause the pilot valve to be shifted when said cleaner element is in a predetermined angular position so as to connect the latter end of the cylinder to the said steam space in the head.

4. The combination with a soot blower unit including a movable cleaning element and a motor for moving the same, of means for admitting cleaning fluid to said element and causing the motor to be energized, a controller for said means, an actuator for the controller, a spring to move the actuator into its idle position, means to move the actuator into position to cause cleaning fluid to be admitted to said element and the motor to be energized and simultaneously store up energy in the spring, a catch to hold the actuator in the second position, and means operated by a part driven by said motor to release the catch.

5. The combination with a soot blower mechanism comprising a hollow head into which fluid under pressure is admitted, a tubular cleaning element so connected to said head as to be movable relatively to the latter and as to receive cleaning fluid therefrom, a pressure-responsive valve in the head for controlling admission of steam to said element, a pressure-responsive pilot valve in the head for controlling the aforesaid valve, manually actuated means for moving said pilot valve into and locking it in one of its positions, and means movable with said cleaning element for controlling said manually-operated means to release the pilot valve and leave it free to be moved into a second position.

6. The combination with a soot blower mechanism comprising a hollow head into which fluid under pressure is admitted, a tubular cleaning element movably connected to and adapted to receive cleaning fluid from said head, a pressure-responsive main valve in said head for controlling admission of said fluid to said element, a pressure-responsive pilot valve for controlling said main valve, a manually-operated member for moving said pilot valve into one position, a catch for locking said member to prevent the pilot valve from moving out of said position, and means actuated by said cleaning element to trip said catch.

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