Jan. 18, 1955 DE LOS E. HIBNER, JR., ET AL 2,699,566

SOOT BLOWER CONTROL SYSTEM FOR BLOWING MEDIUM

Filed March 7, 1949 3 Sheets-Sheet 1

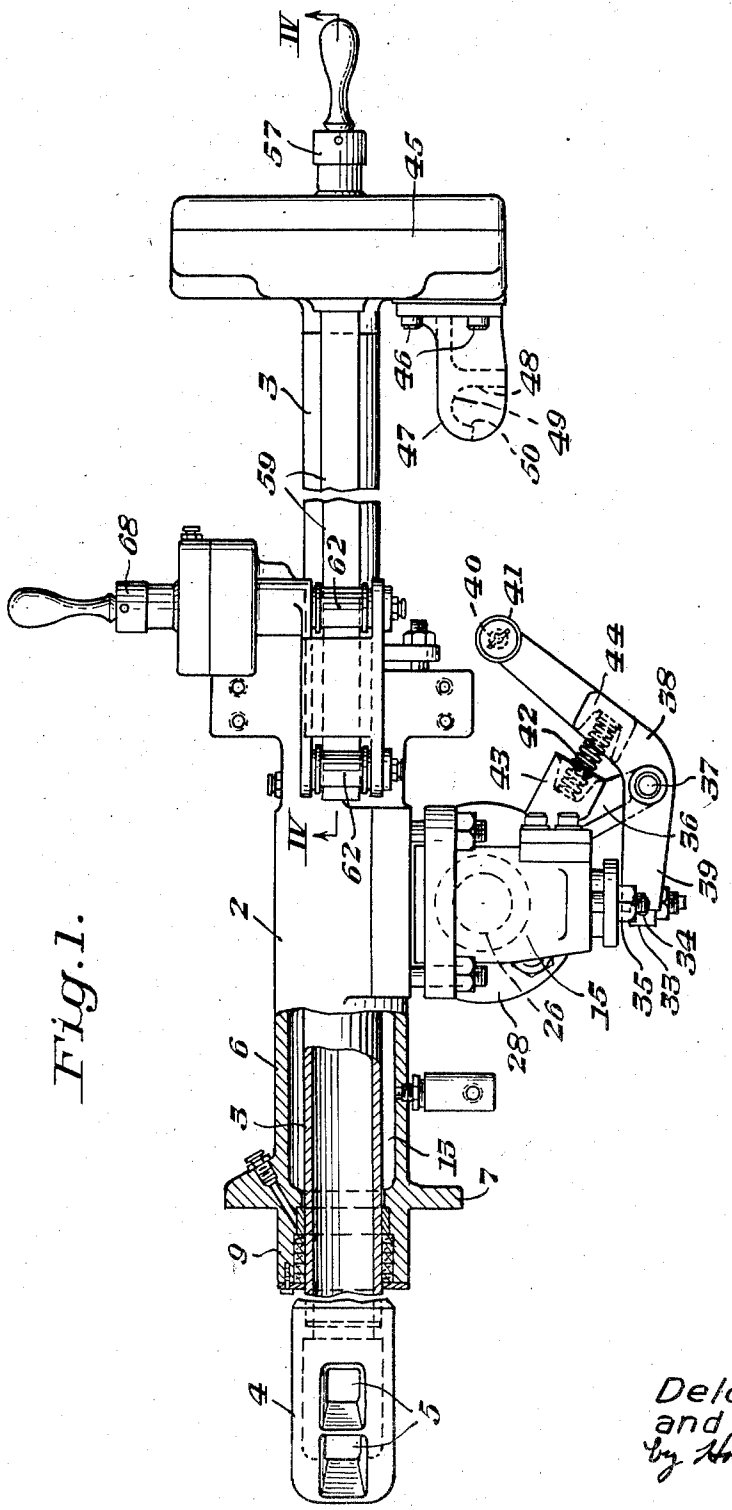


Fig. 1.

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SOOT BLOWER CONTROL SYSTEM FOR BLOWING MEDIUM

Filed March 7, 1949 3 Sheets-Sheet 2

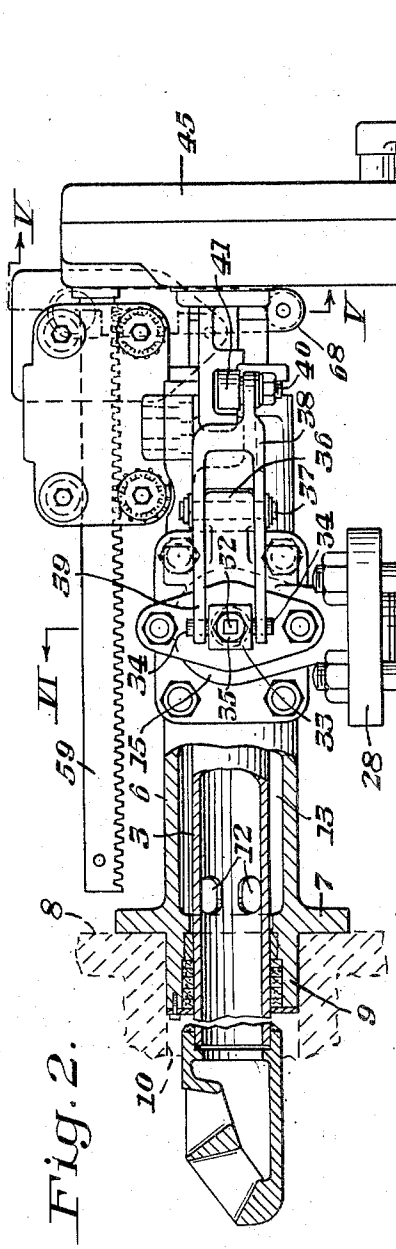


Fig. 2.

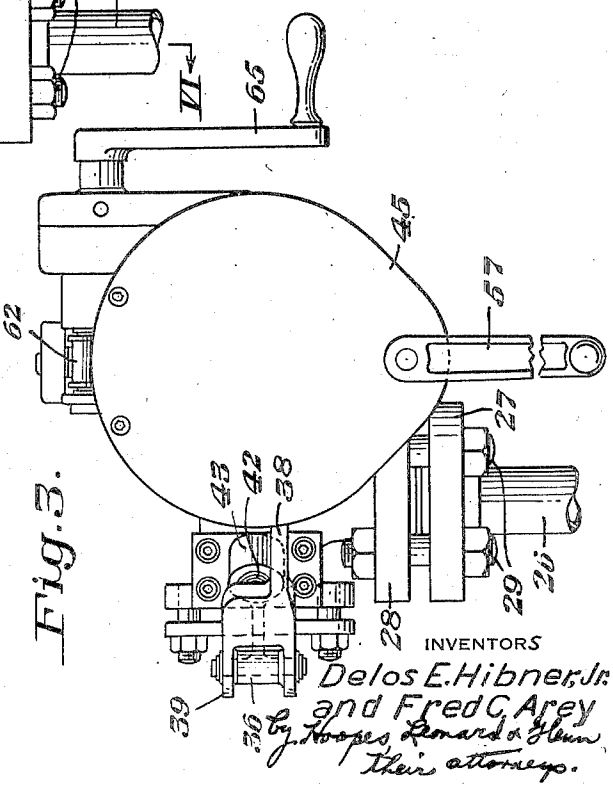


Fig. 3.

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Filed March 7, 1949 3 Sheets-Sheet 3

Fig. 4.

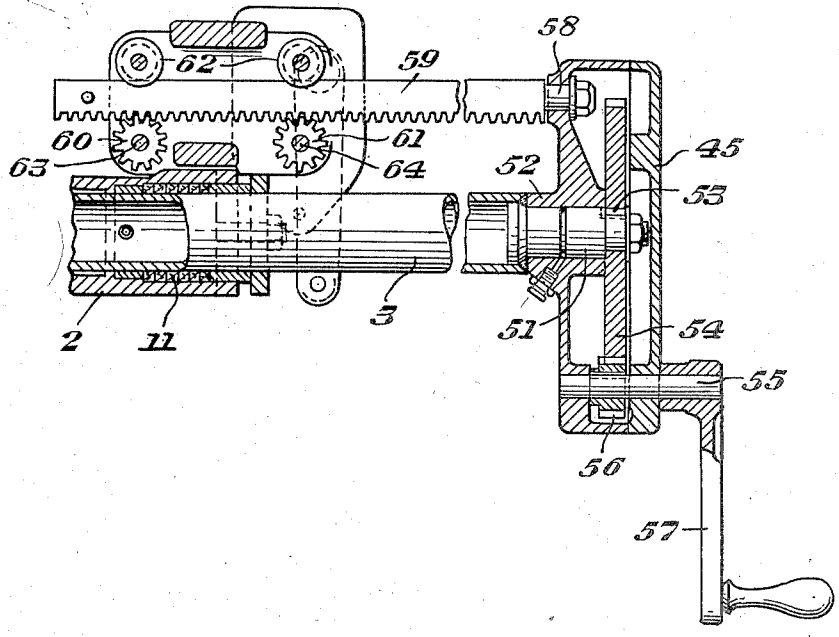


Fig. 5.

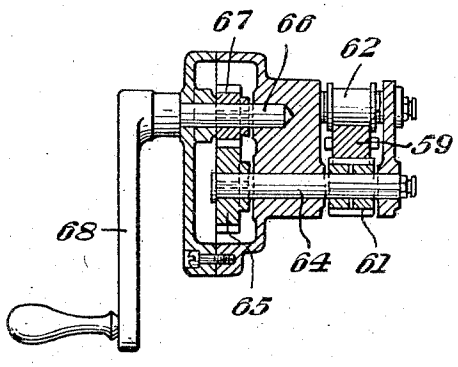
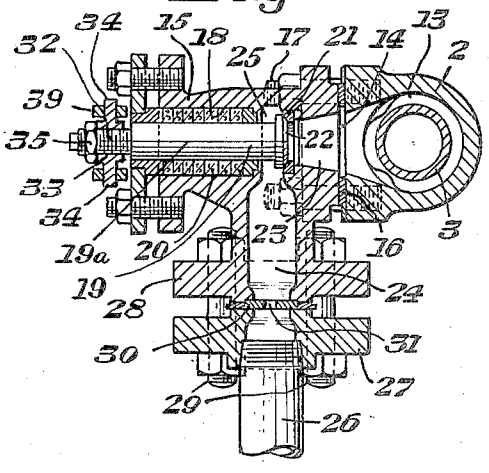


Fig. 6.



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SOOT BLOWER CONTROL SYSTEM FOR BLOWING MEDIUM

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Application March 7, 1949, Serial No. 80,062

9 Claims. (Cl. 15—317)

This invention relates to soot blowers and particularly to soot blowers employing a fluid soot cleaning medium, such, for example, as steam, which is supplied under relatively high pressure. The invention has to do with improvements which materially enhance the utility and improve the operating characteristics of soot blowers.

For purposes of explanation and illustration the invention will be described as embodied in a marine type soot blower although the invention is not limited to soot blowers for marine use but is of general application. Marine soot blowers normally employ steam from the ship's boilers as the fluid soot cleaning medium under pressure which passes through the soot blower and is discharged therefrom to dislodge accumulated soot from boiler and other surfaces. The steam pressure in marine boilers may be relatively high and the pressure of the steam available at the soot blower much greater than the pressure required for efficient operation. Indeed, extremely high pressure, as, for example, pressure in excess of fifteen hundred pounds per square inch, at the soot blower is undesirable as it presents problems in operation of the soot blower as well as being a source of danger. When the soot blower control valve is open and the soot blower is operating the pressure of the fluid soot cleaning medium is exerted against the valve in a direction to oppose its closing and difficulty may be encountered in closing the valve against extremely high pressure. On the other hand, since the control valve in the soot blower is arranged so that when it is closed it is maintained tightly against its seat by the line pressure of the fluid soot cleaning medium, high pressure is an advantage in insuring tightness of the valve closure and inhibiting leakage through the valve when the soot blower is not operating.

We have devised a soot blower which, while it may be employed with fluid soot cleaning medium of either relatively high or somewhat lower pressure, is especially well adapted for use with high pressure medium and perhaps finds its greatest utility in marine use. We utilize the full line pressure of the medium to maintain the soot blower control valve tightly against its seat when the soot blower is not operating but we provide for reducing the pressure of the medium when the soot blower is in operation whereby, among other things, to facilitate closing of the valve when the soot blower is to be shut off. We preferably provide means containing an orifice of small cross-sectional area as compared with the cross-sectional area of the conduit which delivers the medium from the orifice toward the soot blower nozzle. Said means are so disposed in the soot blower that the medium, as for example, steam, delivered to the soot blower passes through the orifice so that when the steam is in motion during operation of the soot blower its pressure is materially reduced upon passage through the orifice yet when the steam is static in the line while the soot blower is not operating the full line pressure of the steam exists up to the valve. Consequently, the provision of the orifice reduces the pressure of the medium passing through the valve during operation of the soot blower, thus facilitating closing of the valve, without affecting the static pressure maintaining the valve closed when the soot blower is not in operation.

The soot blower may have an extensible nozzle portion which is extended or projected inwardly of a boiler or other structure to be cleaned when the soot blower is to be operated but which is withdrawn to a relatively cool position when the soot blower is not operating. We desirably employ the kinetic energy or energy of motion

of the extensible portion of the soot blower to open the soot blower control valve when use of the soot blower is initiated. In this connection it is to be borne in mind that the valve when closed is maintained against its seat by the full line pressure of the fluid soot cleaning medium and it is desirable to exert substantial impact to open the valve against such relatively high pressure. We preferably provide a valve operating device having a projecting portion and we form on or attach to the extensible portion of the soot blower a dog or lug which engages the projecting portion of the valve operating device to actuate that device to open the valve. The sudden impact of the dog against the valve operating device insures quick and positive opening of the valve even against relatively high pressure.

We also provide for positive actuation of the valve operating device to close the valve when the extensible portion of the soot blower is retracted whereby to insure against the valve being maintained in open position by the pressure of the incoming medium. The dog which actuates the valve operating device may have means positively actuating it to close the valve as well as open it, as, for example, a reentrant portion into which a portion of the valve operating device moves when the valve is opened and a part of which presses against that portion of the valve operating device to positively move it to close the valve upon retraction of the extensible portion of the soot blower.

Other details, objects and advantages of the invention will become apparent as the following description of a present preferred embodiment thereof proceeds.

In the accompanying drawings we have shown a present preferred embodiment of the invention, in which

Figure 1 is a view largely in plan but partly in horizontal cross section of a soot blower with a portion cut away, the soot blower being shown in inoperative position;

Figure 2 is a view largely in side elevation but partly in vertical cross section of the soot blower shown in Figure 1 with a portion cut away, the soot blower being shown in operative position;

Figure 3 is an end elevational view of the soot blower;

Figure 4 is a fragmentary vertical longitudinal cross-sectional view taken on the line IV—IV of Figure 1;

Figure 5 is a vertical transverse cross-sectional view taken on the line V—V of Figure 2; and

Figure 6 is a vertical transverse cross-sectional view taken on the line VI—VI of Figure 2.

Referring now more particularly to the drawings, the soot blower shown therein has a body or base portion 2 in which is mounted for axially slidable movement a generally tubular portion 3 having at its extremity a nozzle 4 having discharge passages 5 through which fluid soot cleaning medium under pressure is adapted to be discharged to dislodge accumulations of soot from surfaces to be cleaned. The body 2 has a generally cylindrical portion 6 from whcih projects a radial flange 7 adapted to be disposed against a surface 8 with the end portion 9 of the base 2 within an opening 10 extending to the interior of the boiler fire box of other structure to which the soot blower is applied. The tubular portion 3 is as above stated axially slidable within the base 2, being sealed to the base adjacent the respective ends of the base by sealing means 11. The portion 3 has therethrough ports 12 establishing communication between the interior of the body 2 and the interior of the portion 3. The limits of movement of the portion 3 within the body 2 are such that the ports 12 are always opposite an annular space 13 within the body 2 and about the portion 3 so that there is at all times communication between the interior of the body and the interior of the portion 3.

The body 2 has a generally circular opening 14 at its mid-portion. A casing 15 is applied to the body at the opening 14, being sealed to the body 2 by a gasket 16 and fastened in place by bolts 17. The casing 15 has a bore 18 coaxial with the opening 14 in the body and the stem 19*a* of a valve member 19 is mounted in the bore 18 for sliding movement axially of the bore, sealing means 20 being provided within the bore and about the valve stem 19*a* to prevent the escape of fluid soot cleaning me-

dium under pressure although permitting movement of the valve member.

Disposed within the casing **15** and coaxial with the opening **14** is a valve seat member **21** against which the head or valve proper **22** of the valve member **19** is adapted to seat to close the passage **23** leading to the interior of the body **2**. The casing **15** also has a conduit **24** extending laterally thereto and intersecting the bore **18** in a chamber **25**. When the head **22** of the valve member **19** seats against the valve seat member **21** communication between the chamber **25** and the passage **23** is disestablished while when the head **22** of the valve member **19** is withdrawn toward the left, viewing Figure 6, away from the seat member **21** communication is established from the conduit **24** through the chamber **25** and the passage **23**. The passage **23** opens into the annular space **13** which as above explained is at all times in communication through the ports **12** with the interior of the tubular portion **3**. When the valve is open fluid soot cleaning medium under pressure may pass from the conduit **24** through to the nozzle **4** while when the valve is closed fluid soot cleaning medium cannot pass beyond the valve. The valve head **22** is integral with the inner end of valve stem **19***a* but is of larger diameter so that part of the head **22** extends outwardly as a flange around the stem **19***a*. The valve head **22** and stem **19***a* are on the upstream side of the seat **21** so that when the valve is open the pressure of cleaning medium adjacent the valve is balanced on opposite sides of the projecting portion of the valve head **22** but presses against a central area of the front face of the valve head **22** equal to the cross-sectional area of the sliding portion of the stem **19***a*. This supplies sufficient pressure to hold the valve open against the opposite pressure of the atmosphere and of spring **42** on the outer end of stem **19***a*. When the valve is closed the opposite ends of stem **19***a* are both at atmospheric pressure but the pressure of cleaning medium on the rear of the portion of the valve head **22** projecting from stem **19***a*, and spring **42** act to press the valve against the valve seat **21**.

The fluid soot cleaning medium under pressure, such for example, as steam, is supplied through a conduit **26** which enters a fitting **27**. The casing **15** has a flange **28** and the fitting **27** is bolted to the flange **28** by bolts **29**. An orifice plate **30** having therein an orifice **31** is clamped in place between the flange **28** and fitting **27** so that the orifice **31** is interposed between the supply conduit **26** and the conduit **24** which delivers the medium to the chamber **25**, with the orifice on the upstream side of valve members **19** and **21**. The effect of passage of the medium through the orifice **31** is to reduce its pressure when flowing so that when the soot blower is in operation the pressure of the medium on the downstream side of the orifice **31** is lower than the pressure on the upstream side of the orifice. The amount of pressure reduction obtained is determined by the size of the orifice. In any event the orifice is of small cross-section area as compared with the cross-sectional area of the delivery conduit **24**.

When the soot blower is in operation with the valve open the pressure of the entering medium against the forward face of the valve head **22** presses the valve open. Reduction of the pressure by the orifice **31** consequently reduces the pressure against which the valve has to be moved when it is closed against the seat member **21**. But after the valve has been closed the pressure equalizes in the conduits **26** and **24** so that the full line pressure of the medium is exerted on the valve to maintain it tightly against its seat and prevent leakage.

The valve stem **19***a* has an outwardly projecting threaded stem **32** over which is disposed a collar **33** having opposed trunnions **34**, the collar being maintained in place on the stem **32** by a nut **35**. The casing **15** carries a bracket **36** to which is pivoted at **37** a bent lever **38**. One end of the lever **38** has yoke portions **39** partially embracing the trunnions **34**. Connected to the opposite end of the lever **38** by a pin **40** is a roller **41**. A compression coil spring **42** bears between a portion **43** of the casing **15** and a portion **44** of the lever **38** to maintain the lever normally in the position shown in Figure 1 corresponding to the closed position of the valve as shown in Figure 6.

The tubular portion **3** has an enlarged head **45** at the end thereof opposite the end at which the nozzle **4** is disposed. Bolted to the head **45** by bolts **46** is a dog **47** having a generally J-shaped surface consisting of a straight portion **48** and a curved or reentrant portion **49** terminating at an edge **50**. The dog **47** is positioned so that when the tubular portion **3** of the soot blower is advanced toward the left viewing Figure 1 to operative position the roller **41** is struck by the surface portion **48** which turns the lever **38** in the counterclockwise direction viewing Figure 1 about the axis of the pin **37** against the action of the spring **42** to open the valve **22**. As the valve **22** opens the roller **41** moves into the reentrant portion of the dog **47** against the curved surface **49** and remains there while the soot blower is in use. When use of the soot blower is to be discontinued the portion **3** is moved toward the right viewing Figure 1 and the edge **50** of the dog **47** acts in cam fashion against the roller **41** to positively turn the lever **38** in the clockwise direction viewing Figure 1 about the axis of the pin **37** to close the valve **22** against the seat member **21**. The spring **42** acts in conjunction with the line pressure in the chamber **25** to maintain the valve closed.

The head **45** is hollow as shown in Figure 4. Welded within the extremity of the generally tubular portion **3** is a pin **51** which is journaled in a hub portion **52** of the head **45**. Keyed to the pin **51** by a key **53** is a gear **54**. Journaled in the head **45** is a stub shaft **55** to which is keyed a pinion **56** meshing with the gear **54**. Also fastened to the stub shaft **55** is a crank **57**. Turning of the crank **57** turns the pinion **56** which meshes with the gear **54**. Since the gear **54** is keyed to the pin **51** which is in effect an integral part of the member **3** that member is thus turned about its axis to turn the discharge passages **5** of the nozzle **4** so that the medium is projected in all directions relatively to the axis of the member **3**.

Bolted to the head **45** at **58** is a rack **59**. The rack meshes with two pinions **60** and **61**. It is maintained in mesh with the pinions by rollers **62** disposed atop the rack. The pinion **60** is mounted on a stub shaft **63** for free rotation. The pinion **61** is keyed to a shaft **64** to which is also keyed a gear **65**. Journaled in the base **2** is a shaft **66** to which is keyed a pinion **677**. Also fastened to the shaft **66** is a crank **68**. Turning of the crank **68** turns the pinion **67** which turns the gear **65** and through the pinion **61** moves the rack **59** longitudinally or parallel to the axis of the member **3**. Since the rack **59** is fastened to the head **45** of the member **3**, turning of the crank **68** projects the member **3** toward the left viewing Figure 1 to move the nozzle **4** into operative position. As explained above, when the nozzle reaches operative position the dog **47** operates the lever **38** to open the valve **22**. When operation of the soot blower is to be discontinued the crank **68** is turned in the opposite direction to retract the member **3** which in the manner above explained positively closes the valve **22**.

While we have shown and described a present preferred embodiment of the invention it is to be distinctly understood that the invention is not limited thereto but may be otherwise variously embodied within the scope of the following claims.

We claim:

1. A soot blower comprising a base portion, a portion comprising a nozzle movably mounted in the base portion, a supply conduit through which fluid soot blowing medium under pressure is supplied to the nozzle, a valve openable to establish and closable to disestablish flow of medium from the supply conduit to the nozzle, a dog on the second mentioned portion, a valve operating lever connected with the valve and a roller mounted on the end of the lever projecting into the path of movement of the dog to be engaged and operated thereby to open the valve upon movement of the second mentioned portion in a direction to project the nozzle from the base portion, the dog having a reentrant portion of generally J-shape into which the roller moves when the valve is open and whose edge at the short leg thereof engages and moves the roller to close the valve upon movement of the second mentioned portion of the soot blower in the opposite direction.

2. A soot blower comprising a base portion, a generally tubular portion comprising a nozzle mounted in the base portion for axially slidable movement relatively thereto, a supply conduit, a delivery conduit leading from the supply conduit to the interior of the base portion, a passage leading from the delivery conduit to the outside of the generally tubular portion, the generally tubular portion having port means in the wall thereof establishing communication between the passage and the interior of the generally tubular portion, a valve operable to establish

and closable to disestablish flow of soot blowing medium through the passage and thence through the port means and the interior of the generally tubular portion to the nozzle, the valve being normally maintained closed by the pressure of the medium, means containing an orifice of small cross-sectional area as compared with the cross-sectional area of the delivery conduit through which the medium passes between the supply conduit and the delivery conduit whereby to reduce the pressure of the medium passing from the supply conduit to the delivery conduit and thence to the valve and to the nozzle to facilitate closing of the valve without affecting the static pressure maintaining the valve closed when the valve is closed, a dog on the generally tubular portion and a valve operating device connected with the valve and having a portion projecting into the path of movement of the dog to be engaged and operated thereby to open the valve upon movement of the generally tubular portion axially relatively to the base portion in a direction to project the nozzle from the base portion, the dog having a reentrant portion into which said portion of the valve operating device moves when the valve is open and a part of which presses against said portion of the valve operating device to positively move it to close the valve upon movement of the generally tubular portion in the opposite direction.

3. A soot blower comprising a movable portion including a nozzle, a base portion supporting the movable portion for movement of the nozzle to and from blowing position, a conduit through which fluid soot blowing medium under pressure is supplied to the nozzle, a valve openable to establish and closable to disestablish flow of medium through the conduit to the nozzle, said valve being urged toward open position by pressure of medium in the conduit when the valve is in open position and being urged toward closed position by pressure of medium in the conduit when the valve is in closed position, a first member movably mounted on one of said portions and connected to the valve to open the valve when the first member is moved in one direction and to close the valve when the first member is moved in the opposite direction, and a second member mounted on the other of said portions, said second member being engageable with the first member to move it to open the valve as the movable portion projects the nozzle into blowing position, and said second member being engageable with the first member to move it in the opposite direction to close the valve as the movable portion retracts the nozzle from blowing position.

4. A soot blower comprising a movable portion including a nozzle, a base portion supporting the movable portion for movement of the nozzle to and from blowing position, a conduit through which fluid soot blowing medium under pressure is supplied to the nozzle, a valve openable to establish and closable to disestablish flow of medium through the conduit to the nozzle, said valve being urged toward open position by pressure of the medium in the conduit adjacent the valve when the valve is open, means with a relatively small orifice therethrough in the conduit on the upstream side of the valve, said orifice serving to reduce the pressure holding the valve open when it is in one position, a first member movably mounted on one of said portions and connected to the valve to open the valve when the first member is moved in one direction and to close the valve when the first member is moved in the opposite direction, and a second member mounted on the other of said portions, said second member being engageable with the first member to move it to open the valve as the movable portion approaches the end of its travel to carry the nozzle into blowing position, and said second member being engageable with the first member to move it in the opposite direction to close the valve as the movable portion begins its return travel to retract the nozzle from blowing position.

5. A soot blower comprising a movable portion including a nozzle, a base portion supporting the movable portion for lateral movement of the nozzle to and from blowing position, a conduit through which fluid soot blowing medium under pressure is supplied to the nozzle, a valve openable to establish and closable to disestablish flow of medium through the conduit to the nozzle, said valve being urged toward open position by pressure of the medium in the conduit adjacent the valve when the valve is open and being urged toward closed position by pressure of the medium in the conduit adjacent the valve when the valve is closed, means with a relatively small orifice therethrough in the conduit on the upstream side of the valve, said orifice serving to reduce the pressure holding the valve open when it is in open position without reducing the pressure holding the valve tightly closed when it is in closed position, a first member mounted on one of said portions and connected to the valve to open the valve when the first member is moved in one direction and to close the valve when the first member is moved in the opposite direction, and a second member mounted on the other of said portions, said second member being engageable with the first member to move it to open the valve as the movable portion approaches the end of its travel to carry the nozzle into blowing position, and said second member being engageable with the first member to move it in the opposite direction to close the valve as the movable portion begins its return travel to retract the nozzle from blowing position.

6. A soot blower comprising a movable portion including a nozzle, a base portion supporting the movable portion for lateral movement of the nozzle to and from blowing position, a rack mounted on the movable portion and extending parallel to the line of said movement with a length at least equal to the extent of said movement, a pinion journaled on the base portion and meshing with said rack, reversible drive means connected to rotate said pinion for moving the said movable portion at a substantial lateral speed, a conduit through which fluid soot blowing medium under pressure is supplied to the nozzle, a valve openable to establish and closable to disestablish flow of medium through the conduit to the nozzle, a member movably mounted on one of said portions and connected to the valve to positively open the valve when the member is moved in one direction and to positively close the valve when the member is moved in the opposite direction, and a dog rigidly mounted on the other of said portions, said dog being spaced substantially from the member when the nozzle is retracted and being engageable with the member to apply the momentum of the said movable portion with a sharp impact through said member for positively opening the valve as the movable portion projects the nozzle into blowing position, and said dog being engageable with the member to return it in the opposite direction for positively closing the valve as the movable portion retracts the nozzle from the blowing position.

7. A soot blower comprising a laterally movable portion including a nozzle to be inserted in and retracted from a blowing position, a base mounting the movable portion for such movement, a conduit through which fluid soot blowing medium under pressure is supplied to the nozzle, a valve openable to establish and closable to disestablish flow of medium through the conduit to the nozzle, said valve being urged toward closed position by pressure of medium of the conduit when the valve is in closed position, a member movably mounted on one of said portions and positively linked to move the valve from closed to opened position, and a rigid member rigidly mounted on the other of said portions, said movable and rigid members being spaced a substantial distance apart when the nozzle is in its retracted position and the rigid member being frontally engageable with the movable member to move it in the direction of movement of the movable member to open the valve as the nozzle reaches its blowing position, and means connected to move the portion of the soot blower including the nozzle with substantial lateral speed from retracted to blowing position, the rigid member being effective to apply the momentum of the moving portion with sharp impact through the movable member to open the valve as the nozzle reaches its blowing position, thereby opening the valve against substantial static pressure of blowing medium.

8. A soot blower comprising a laterally movable portion including a nozzle to be inserted in and retracted from a blowing position, a base mounting the movable portion for such movement, a conduit through which fluid soot blowing medium under pressure is supplied to the nozzle, a valve openable to establish and closable to disestablish flow of medium through the conduit to the nozzle, said valve being urged toward open position by pressure of medium in the conduit when the valve is in open position and being urged toward closed position by pressure of medium of the conduit when the valve is in closed position, a member pivotally mounted on one of said portions and positively linked to move the valve from closed to opened position, and a rigid member rigidly mounted on the other of said portions, said pivotally mounted and rigid mem-

bers being spaced a substantial distance apart when the nozzle is in its retracted position and the rigid member beng engageable with the pivotally mounted member to operate it to open the valve as the nozzle reaches its blowing position, and means connected to move the portion of the soot blower including the nozzle with substantial lateral speed from retracted to blowing position, the rigid member being effective to apply the momentum of the moving portion with sharp impact through the pivotally mounted member to open the valve as the nozzle reaches its blowing position, thereby opening the valve against substantial static pressure of blowing medium, the valve being thereafter held open by the pressure of blowing medium passing to the nozzle.

9. A soot blower comprising a laterally movable portion including a nozzle to be inserted in and retracted from a blowing position, a base mounting the movable portion for such movement, a conduit through which fluid soot blowing medium under pressure is supplied to the nozzle, a valve openable to establish and closable to disestablish flow of medium through the conduit to the nozzle, said valve being urged toward closed position by pressure of medium of the conduit when the valve is in closed position, means with a relatively small orifice therethrough in the conduit on the upstream side of the valve, said orifice serving to reduce the blowing pressure when the valve is open, a member movably mounted on one of said portions and positively linked to move the valve from closed to opened position, and a rigid member rigidly mounted

on the other of said portions, said movable and rigid members being spaced a substantial distance apart when the nozzle is in its retracted position and the rigid member being engageable with the movable member to operate it to open the valve as the nozzle reaches its blowing position, and means connected to move the portion of the soot blower including the nozzle with substantial lateral speed from retracted to blowing position, the rigid member being effective to apply the momentum of the moving portion with sharp impact through the movable member to open the valve as the nozzle reaches its blowing position, thereby opening the valve against substantial static pressure of blowing medium.

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