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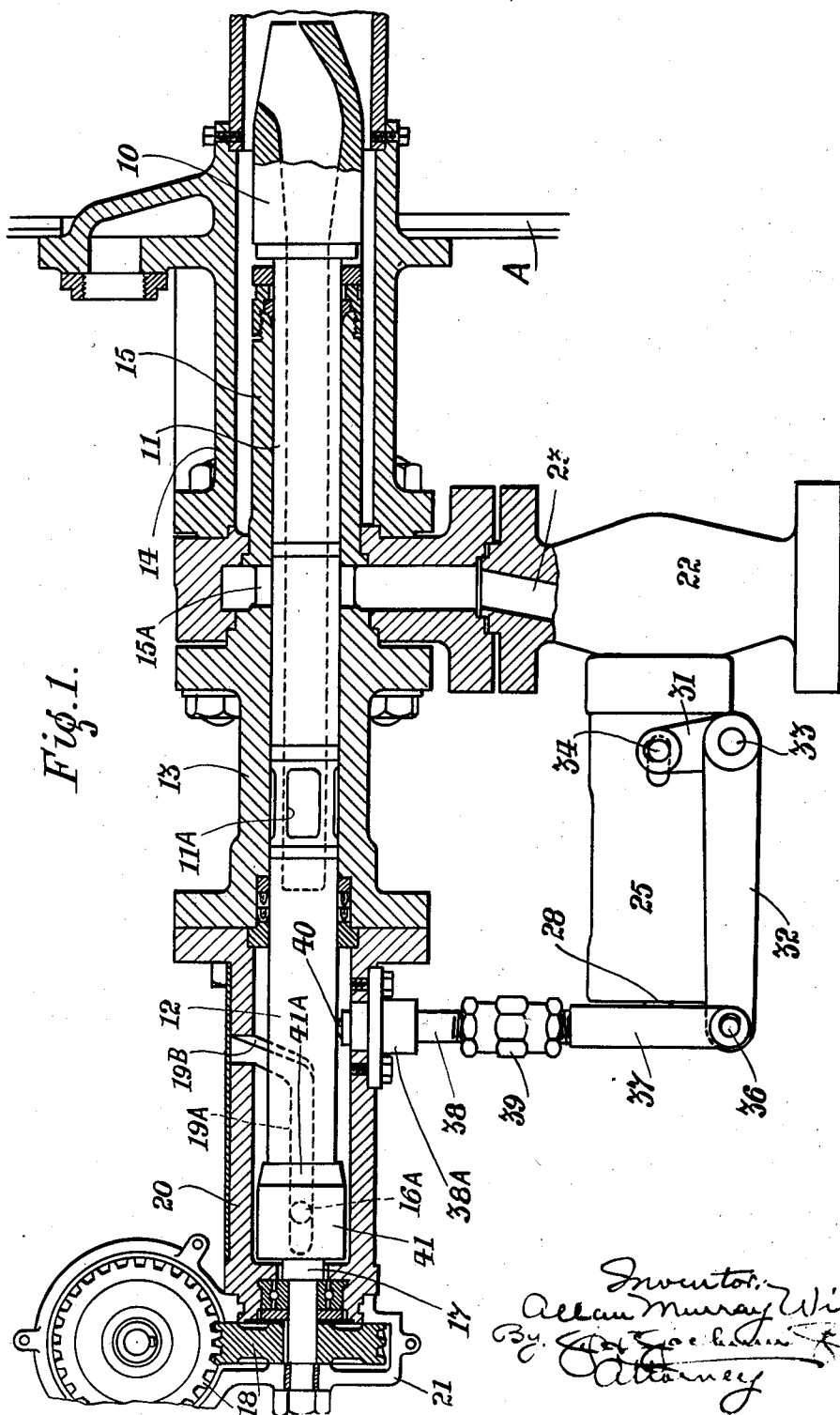
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2,298,995

SOOT-BLOWER

Filed Feb. 13, 1941

2 Sheets-Sheet 1



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Fig. 3.

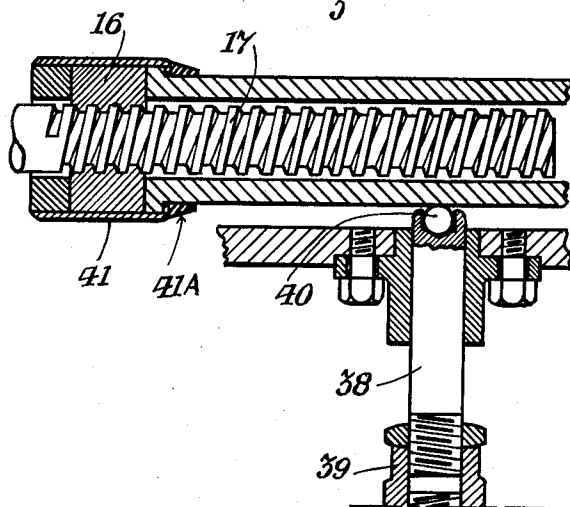
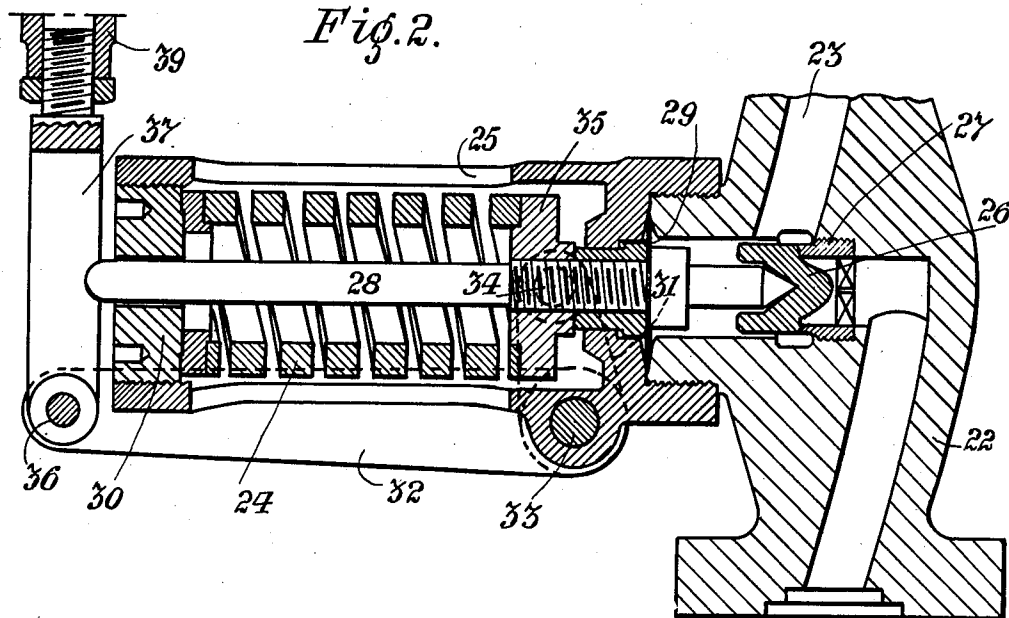


Fig. 2.



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UNITED STATES PATENT OFFICE

2,298,995

SOOT BLOWER

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In Great Britain November 11, 1939

3 Claims. (Cl. 122—392)

This invention relates to soot-blowers which are used in association with steam-boilers and other heat exchangers for the purpose of periodically ejecting cleaning fluid (namely steam) on tubes and other parts to remove soot, scale and other matter likely to be deposited thereon.

Soot-blowers are known in which, when the blower is operative, a component moves to-and-fro lengthwise of the blower, and it is to soot-blowers of this type that the present invention relates. Usually, said component is the fluid ejector, which comprises a nozzle element and a tube on which the nozzle element is provided, and said component is movable axially between an inoperative range in which it is sheltered from the heat of the furnace or other zone in the heat exchanger and an operative range in which cleaning fluid is ejected on the parts to be cleaned.

The invention is particularly, although not exclusively, applicable to soot-blowers of the type stated in which the motion of the fluid ejector is controlled by a screw device and a cam device, the screw device serving to move the fluid ejector to and from the operative range and the cam device serving to turn, or control turning of, the ejector angularly when in the operative range so as to sweep the fluid over the parts to be cleaned.

An object of the present invention is to make provision whereby a soot-blower of the type stated will be rendered more suitable than heretofore for direct connection to a high pressure system (for example, to steam piping delivering cleaning steam at pressures ranging upwards from a thousand lbs. per square inch).

Another object of the invention is to provide in a soot-blower embodying in its construction a valve which passes cleaning fluid to the fluid ejector when the ejector is in its operative range of motion and cuts off the cleaning fluid when the ejector is in its inoperative range, a pressure-reducing valve in interlocked relationship with the soot-blower valve, so that both valves open and close approximately in unison with one another.

Another object of the invention is to operate such a pressure-reducing valve, which may be a nearly balanced valve, by the to-and-fro movable component of the soot-blower to cut-off the supply of cleaning fluid to the soot-blower valve while the ejector is in its inoperative range.

Other objects of the invention will be clear from the following specification and claims.

An embodiment of the invention will now be

described by way of example with reference to the accompanying drawings, in which:

Fig. 1 is a sectional elevation of a soot-blower having the invention applied thereto.

Figs. 2 and 3 are sections, each drawn to a larger scale than Fig. 1, of constructional details.

The steam ejector comprises a tubular unit 10, 11, 12 extending through a steam chest 13. A wall box 14 forming an extension of the chest 13 is adapted to be mounted on a boiler wall A or other structure. The tubular unit includes a ported portion 11 which works as an internal sleeve valve in a ported cylinder 15 forming an integral extension of the steam chest. The respective ports are denoted 11A and 15A. The tubular unit is connected at the end opposite the nozzle 10 to a nut 16 (Fig. 3) forming one element of a screw device of which the male element 17 is a screw rotatable manually or by power, through the intermediary of screw gears 18.

A pin 16A which projects from the nut 16 engages in a cam slot 19A, 19B cut in a casing 20 which constitutes a detachable extension of the steam chest 13. As Fig. 1 shows, the portion 19A of the cam slot is straight, whereas the portion 19B is cut helically at a steep inclination. The casing 20 forms a support and bearing for an angularly adjustable casing 21 in which the screw gears 18 are housed.

In operation, the screw 17 is rotated first in one direction to advance the tubular unit 10, 11, 12 into a position in which the nozzle 10 projects from the boiler wall into the interior of the boiler furnace or other zone. During the advance of pin 16A along the straight portion 19A of the cam slot, no rotation of the unit 10, 11, 12 occurs. As soon as the range represented by the portion 19B is reached by pin 16A, the unit rotates as it advances. The screw 17 is turned back and forth any desired number of times to the extent of the range represented by the portion 19B, and in this motion the nozzle moves to and fro endwise beyond the boiler wall and turns to and fro in its motion. Finally, the unit 10, 11, 12 is fully withdrawn into the inoperative position in which it is shown in full lines in Fig. 1.

There is provided in inter-locked relationship with the blower sleeve valve 11 a valve assembly which reduces the pressure of steam passing through it to the sleeve valve. The nature of the interlock is such that steam is passed to the sleeve valve only when the ejector 10 is in the operative range, the valve assembly automatically

cutting off steam from the sleeve valve whenever the ejector is inoperative.

The pressure-reducing valve assembly includes a spring-loaded pressure-reducing valve 22, to which high pressure steam is supplied from an internal source. As shown the valve 22 may be similar in construction to a known type of safety valve with external spring. The valve 22 is arranged to control the steam-conduit 23 leading to the soot-blower sleeve valve 11. The spring 24 is housed in a fixed casing 25. The valve proper 26 is maintained in operative relationship with its seat 27 by a pointed stem 28 which is connected with the valve casing by a flexible diaphragm 29. The closing pressure exerted on the valve proper by the spring is regulatable by an adjustable abutment 30, which is screwed into the spring casing 25.

The pressure-reducing valve is connected by a mechanical transmission constituted as a link-and-lever mechanism to a cam follower which is actuated by a cam moving with the tubular unit 10, 11, 12 of the soot-blower. The said mechanism comprises a bell-crank lever 31, 32 fulcrumed at 33 on the spring casing 25, one arm 31 being slotted to receive a pin 34 projecting through the casing 25 from the spring seat 35 on the valve stem 28 and the other arm 32 having a pin-and-slot connection at 36 with a link 37, 38. A turnbuckle 39 interposed between the link components 37 and 38 serves to adjust the otherwise fixed extent of valve opening by the cam action. The cam follower is a ball 40 carried by the link component 38, which is guided through a bush 38A on the casing 20. The cam is a sleeve 41 on the nut 16, said cam including a conical face 41A.

The spring load is set so as to be some predetermined comparatively small amount, say 100 lbs., in excess of the thrust due to the steam pressure on the valve proper when closed. That is, when the valve is closed it is nearly balanced.

In operation, the cam mechanism forces the pressure-reducing valve to open just as the blower valve 11 is being or has been opened and permits the pressure-reducing valve to close under the spring pressure just as the blower valve is being or is about to be closed.

As the drawings show, the cam 41 is capable of imparting only a very short displacement to the link 37, 38, and this very short displacement is reduced by the lever 31, 32 before finally being transmitted to the valve 26. Thus, the valve 26 has imparted to it only a minute lift when it is opened by the cam action, and it is definitely limited to this minute lift because the spring 24 imposes on the valve a load which is greater than the opposing steam pressure on the valve. The effect of the limited minute opening of the valve is to provide a constriction which finely wire-draws the high pressure steam and thus greatly reduces the pressure of the steam which accordingly reaches the ports 11A of the tubular unit 10, 11, 12 in a low pressure condition.

The abutment 30 can be utilised as a means of forcing the valve to close and remain closed in opposition to the steam pressure. Thus, by screwing down the valve in this way one can isolate the soot-blower from the steam system. Thus, if any part of the blower is out of order,

the blower can be partly dismantled for inspection or repair.

An example of a soot-blower to which my present invention is applicable is described in my United States Patent 1,773,801.

I claim:

1. In a soot blower of the type comprising a tubular unit movable to and fro lengthwise of the interior of the blower in the operation thereof and embodying in its structure a nozzle and a sleeve valve which opens to pass cleaning steam to said nozzle only when the nozzle is in operative position, a conduit supplying cleaning steam to said sleeve valve, screw means applied to said unit for moving said unit so that said nozzle moves to and from said operative position, and a cam device applied to said unit and co-operating with said screw means to impart a rotational motion to the nozzle when in said operative range, the combination of a pressure-reducing valve in said conduit subjected to a valve-opening force by the steam, a valve-closing spring arranged external to the blower interior and adapted to act on said reducing valve in opposition to and with a force greater than the valve-opening force of the steam, a valve-opening mechanism applied to said reducing valve, and a cam on said tubular unit acting on said mechanism in co-operation with said spring to open said reducing valve to a fixed minute extent providing a constricted opening as said sleeve valve is opened under control of said screw means so that said reducing valve wire-draws the steam and reduces it in pressure for passage through said sleeve valve to said unit.

2. In a soot blower of the type including a tubular ejector movable into an operative zone, and an internal valve provided on said ejector and opened by endwise movement thereof into the operative zone to admit cleaning steam to said ejector, a steam conduit leading from a source of high pressure steam to said internal valve, an additional valve in said conduit, a cam on said ejector, a mechanical transmission applied to said additional valve and operable by said cam to force and maintain said additional valve slightly open to provide a constricted opening when said ejector is moved endwise to open said internal valve, and a spring limiting said additional valve to the constricted opening enforced by said cam and said transmission, so that said additional valve wire-draws the high pressure steam and reduces it to low pressure steam for said ejector.

3. In a soot blower of the type including a movable ejector unit and a valve opened by endwise movement thereof to admit cleaning steam thereto, a conduit for ingoing steam to said valve, a second valve in said conduit, a mechanical transmission applied to said second valve, means of said unit actuating said transmission to force and maintain said second valve slightly open and provide a constricted opening when said unit is moved endwise to open the first-mentioned valve, and means limiting said second valve to the constricted opening enforced by said transmission so that said second valve wire-draws the ingoing steam and reduces it in pressure for said unit.

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