April 15, 1952 C. F. LUMB 2,592,923

SOOT BLOWER WITH MECHANISM FOR CONVERTING ROTARY MOTION INTO STRAIGHT LINE MOTION SUCCEEDED BY ROTARY MOTION

Filed Aug. 31, 1949 2 SHEETS—SHEET 1

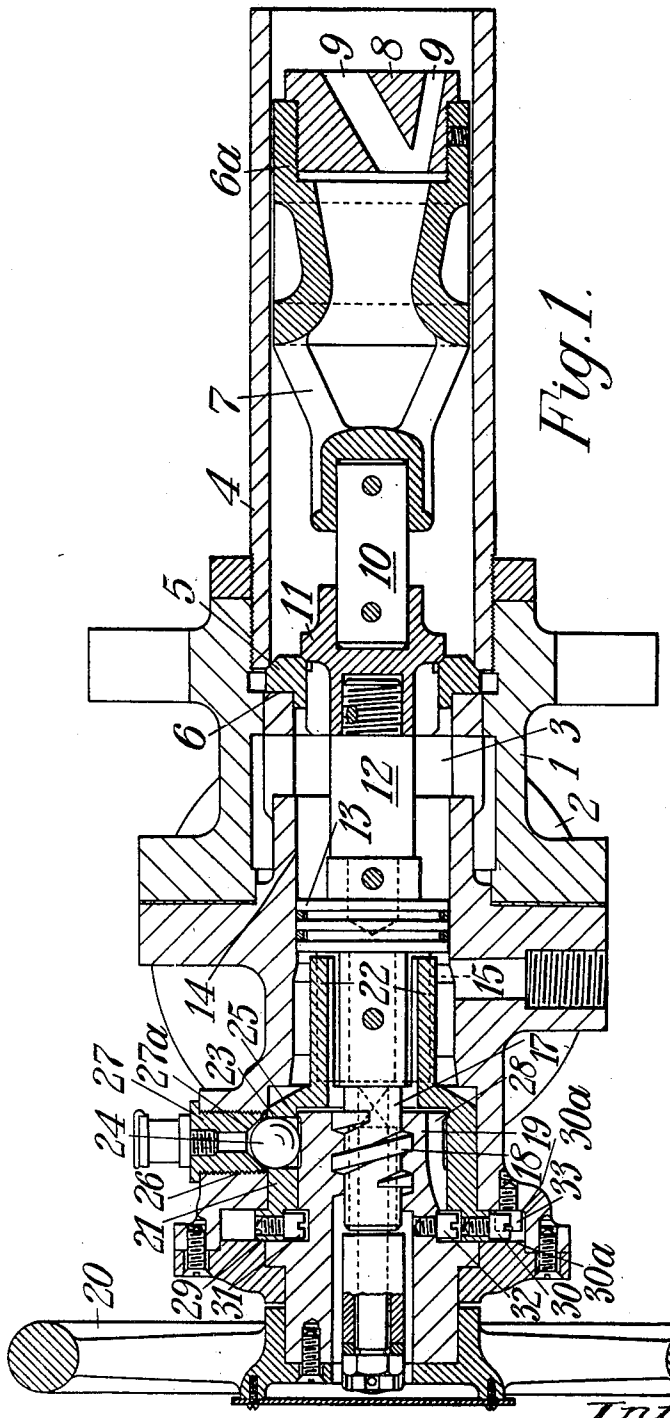

Fig. 1.

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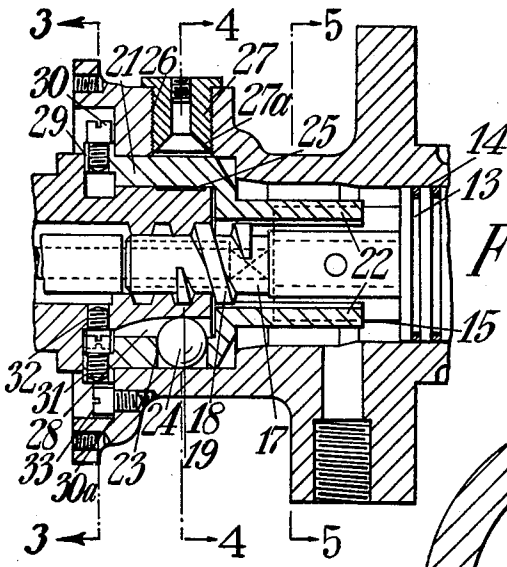

Fig. 2.

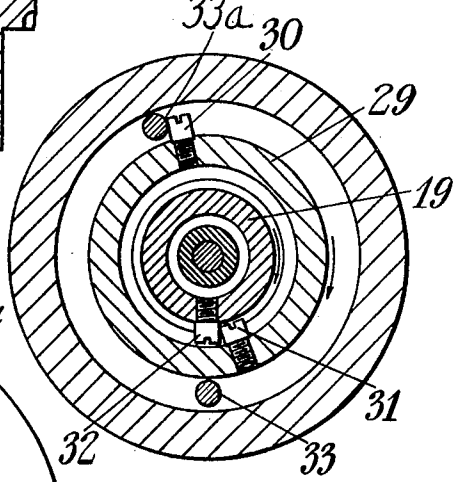

Fig. 3.

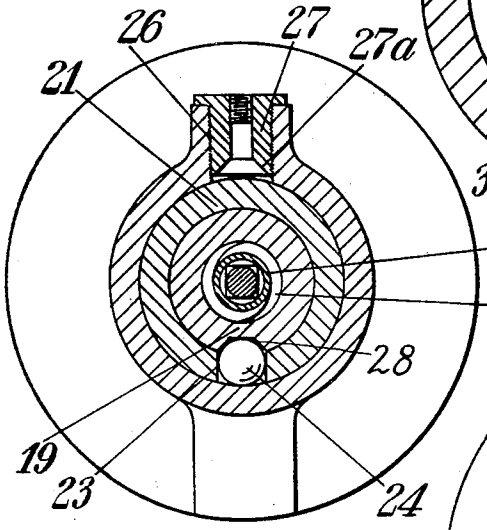

Fig. 4.

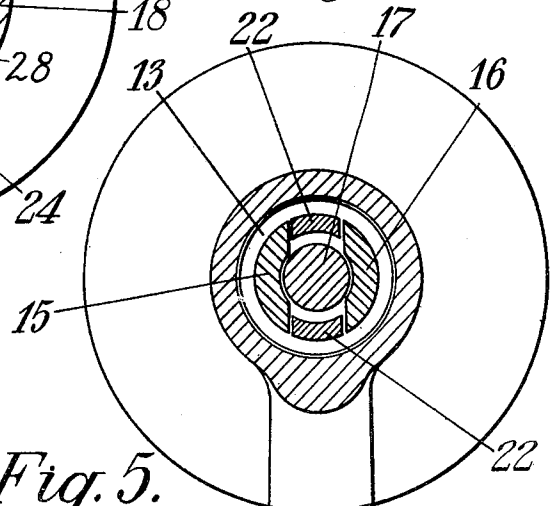

Fig. 5.

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SOOT BLOWER WITH MECHANISM FOR CONVERTING ROTARY MOTION INTO STRAIGHT LINE MOTION SUCCEEDED BY ROTARY MOTION

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1 Claim. (Cl. 15—317)

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This invention relates to apparatus for cleaning boiler tubes and the like, commonly termed soot blowers.

Soot blowers are known wherein a steam or air ejector is movable by rotary operating means including screw and nut means inwardly into and outwardly from a steam or air chest to open and close a control valve and retract and project the ejector to inoperative and operative position and is also rotatable after the projecting movement to cause traversing of the steam or air over the tube area, automatic coupling means being associated with the screw and nut means whereby it is ensured that rotary movement of the ejector takes place immediately after the projecting movement during rotation of the operating means in one direction and retraction of the ejector immediately after rotary movement thereof during return movement of the operating means. The invention may also be applied to apparatus for projecting water for de-scaling boiler surfaces subject to the products of combustion of the furnace.

The primary object of the invention is to provide an improved mechanism and more specifically an improved arrangement of the automatic coupling means.

Referring now to the accompanying drawings:

Figure 1 is a sectional elevation of a soot blower with the moving parts in positions they occupy when the ejector is in retracted position and the steam supply to the latter cut off;

Figure 2 is a sectional elevation broken away on the left and right but showing some of the parts in positions in which the ejector is in extended position, steam is being supplied to the ejector and the latter has been rotated 180° after extension;

Figure 3 is a transverse section taken on the line 3—3, Figure 2;

Figure 4 is a transverse section taken on the line 4—4, Figure 2, and Figure 5 is a transverse section taken on the line 5—5, Figure 2.

In carrying the invention into effect according to one mode the apparatus comprises a tubular steam chest 1 having a steam supply branch provided with a flange 2 for connection to a steam pipe. The steam when the apparatus is to be used flows from the steam supply branch and fills the space 3 between a piston and valve hereinafter specifically referred to. Into the outer end of the steam chest there is screwed a tubular extension 4 of the steam chest which holds a valve seat 5 of the ring formation in position against an annular shoulder 6 in the steam chest.

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The tubular steam ejector 6a is accommodated in the extension 4 of the steam chest and comprises a hollow piston, having openings 7 adjacent its inner end, through which steam passes to the interior of the piston from the extension 4, and secured to the outer end of the piston is a nozzle 8, from which steam issues and impinges against the tubes to be cleaned. The steam issues from passages 9 inclined to the axis of the ejector 6. The ejector piston may be provided with piston rings on its inner end. The piston is connected by a tie rod 10 with a shut down valve 11 which co-operates with the valve seat 5, the valve being in turn connected by a tie rod 12 with a sealing piston 13 movable in a cylindrical bore 14 in the steam chest.

Operating mechanism now to be described produces movements of the ejector in sequence as follows:

1. Projection of the ejector 6a from the extension 4 to operating position, and opening of the valve 11.

2. Rotation of the ejector 6a

These projecting and rotating movements of the ejector and opening of the valve take place when an operating member is moved in one direction, and opposite rotation of the ejector and retraction of the latter and closing of the valve taking place when the operating member is moved in the opposite direction. The piston 13 has extending rearwardly therefrom a pair of of projections 15, 16 (see Fig. 5) segmental in cross section and an axially aligned rod 17 the inner portion of which has a screw thread 18. The screw thread engages in an internal screw thread in a nut 19 secured at its outer end to a hand wheel 20 constituting the operating member. The inner end of the nut fits rotatably within a tubular rotary sleeve member 21 which in turn fits rotatably within that part of the casing to the rear of the steam chest. The rotary member 21 has a pair of forwardly projecting tongues 22 (see Figs. 2 and 5) which extend between the projections 15 and 16 on the

piston 13 whereby the ejector assembly can move axially relatively to the rotary member 21, but when the latter is rotated the ejector will be rotated therewith. The rotary member 21 has a bore 23 extending transversely through its side wall and in the bore but free to move therein is a ball 24 which, with the parts in the positions shown in Figure 1, is supported on the reduced portion 25 of the periphery of the nut 19. The casing has a bore 26 therethrough in axial alignment with the bore 23 when the parts are in the positions shown in Fig. 1, and having screw fitted therein a sleeve 27 having a coned recess 27*a* at its lower end and surmounted by a cup for supplying lubricant to the ball, the bore 23 and the adjacent surface of the nut 19. The latter has a groove 28 formed in its periphery parallel to the axis thereof having its side surfaces divergent in a direction outwardly from the axis (see Fig. 4). The rotary member has a flange 29 which rotatably fits between oppositely facing surfaces 30*a* of the casing and having a pair of stops 30 and 31 the former projecting outwardly beyond the flange 29 and the latter inwardly thereof. The nut 19 has a stop 32 secured thereto which projects into an internal annular recess in the rotary member and the casing has a spaced pair of stops 33 and 33*a* which project into the space between the oppositely facing surfaces 30*a* of the casing for the purpose of limiting the rotation of the rotary member 21.

The operation is as follows:

Rotation of the handwheel in anti-clockwise direction viewed from the left of Figure 1, rotates the nut 19 only, which by engagement with the threads 18 on the rod 17 causes the latter to be moved axially to the right, the rod 17 being held against rotation by the interengagement of the piston projections 15 and 16 with the tongues 22 of the rotary member 21, which itself is prevented from rotation by the ball 24 which is located and held in its upper position, shown in Figure 1, by the peripheral surface 25 of the nut 19. The ejector assembly is, therefore, moved to the right, the shut-off valve 11 being lifted from its seat 5 to admit steam to the extension 4 of the steam chest, whence it flows through the openings 7 of the piston and is discharged from the inclined passages 9 of the ejector nozzle. These movements of the parts as set out above are continued by further rotation of the handwheel in the same direction as long as the ball 24 is maintained in position of engagement in the coned recess 27*a* by the peripheral surface 25 of the nut 19 on which it rides. When, however, the handwheel has moved the nut 19 through an angle of, say, 180°, the groove 28 in the nut will have reached a position of alignment with the bore 23 in the rotary member 21 which carries the ball 24. In this position, the stop 32 on the nut 19 will have come into contact with the stop 31 carried internally on the rotary member 21 so that further relative rotation between the nut 19 and the rotary member 21 is prevented and further rotation of the nut carries the rotary member round with it, the rotary member being released from engagement with the casing through the ball 24 due to the ball being displaced out of the recess 27*a* by riding up the coned sides of the recess and into the groove 28 in the nut to assume a position as shown in Figure 4. Where the ball 24 is initially located in the recess 27*a* in an arrangement as shown in Figure 1, that is, substantially vertically above the axis of the nut 19, displacement of the ball into the groove 28 when aligned will be assisted by gravity, but otherwise the displacement of the ball 24 is provided as described above. Since the nut 19 and rotary member 21 are now locked together and the rotary member is free to rotate, further rotation of the handwheel results in a rotational drive of the ejector assembly through the engagement of the projections 22 on the rotary member with the projections 15 and 16 on the sealing piston 13. In order to limit the rotational movement of the ejector nozzle, the rotation which can be imparted to the nut 19, after it has been locked with the rotary member 21, is limited by the engagement of the stop 30 carried outwardly by the rotary member 21 with the stop 33*a* secured at a predetermined position on the interior of the casing. This final limit position is shown in Figure 3, movement of the nut 19 in an anticlockwise direction having been arrested by engagement between the stops 30 and 33*a* and the clockwise-pointing arrows showing the direction of rotation of the nut 19 for reversing the operation described above, the reverse sequence being set out briefly below.

From the position shown in Fig. 3, rotation of the nut 19 in the direction of the arrow (clockwise as viewed) causes similar rotation of the rotary member 21 (to which the stop-carrying flange 29 shown in Figure 3 is connected), the nut and rotary member being locked together for rotation in this direction only by the ball 24. When the rotary member 21 has been rotated until the bore 23 therein is located opposite the recess 27*a* in the casing, the outwardly projecting stop 30 on the rotary member comes into engagement with a second limit stop 33 on the casing which prevents further rotative movement of the rotary member with the nut 19, thus causing further rotation of the nut 19 to displace the ball 24 up into the recess 27*a* due to the camming action of the inclined sides of the groove 28 so that it is clear of the groove 28 and rides on the periphery 25 of the nut. At this point rotation of the ejector assembly ceases and further rotation of the handwheel results in retraction of the ejector assembly with, finally closing of the valve 11.

If desired the fixed stop 33 on the casing may be omitted or it may be carried by a ring adjustable by rotation in the casing about the axis of the nut and provided with suitable means for locking it in the desired position according to the angular limit required for the rotation of the ejector nozzle.

I claim:

A soot blower comprising a housing, an inlet for supplying cleaning fluid to the housing, a rotatably mounted blower tube, a normally closed valve for controlling flow of cleaning fluid from the housing to the blower tube, means for opening the valve and rotating the blower tube consisting of an internally screwed nut rotatably mounted in the housing and having a recess in its outer periphery, a screw threaded member in engagement with the thread in the nut and in axial alignment with and fixed to the valve, a sleeve member rotatably mounted in the casing and surrounding the nut, means carried by said sleeve member and engaging means carried by the screw threaded member for preventing relative rotation of said member while permitting relative axial movement thereof, a ball coupling member in a bore extending through said sleeve

member transverse to the axis thereof, the ball being normally in engagement with the said outer periphery of said nut and projecting into an opening in the casing to hold said sleeve member against rotation and being inwardly displaceable in said bore into said recess in the nut when aligned therewith so that it will engage in said bore and said recess in the nut and become clear of said opening in the casing to permit rotation of the sleeve and prevent relative rotation of the nut and sleeve, whereby rotation of the nut first causes axial movement of the screw threaded member to open the valve to permit fluid to flow from the housing into the blower tube, and

further rotation of the nut in the same direction causes rotation of the sleeve and the blower tube.

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