Feb. 21, 1961 N. L. JENNINGS ET AL 2,972,502

PROJECTION-TYPE CLEANING APPARATUS

Filed Aug. 25, 1953 4 Sheets-Sheet 1

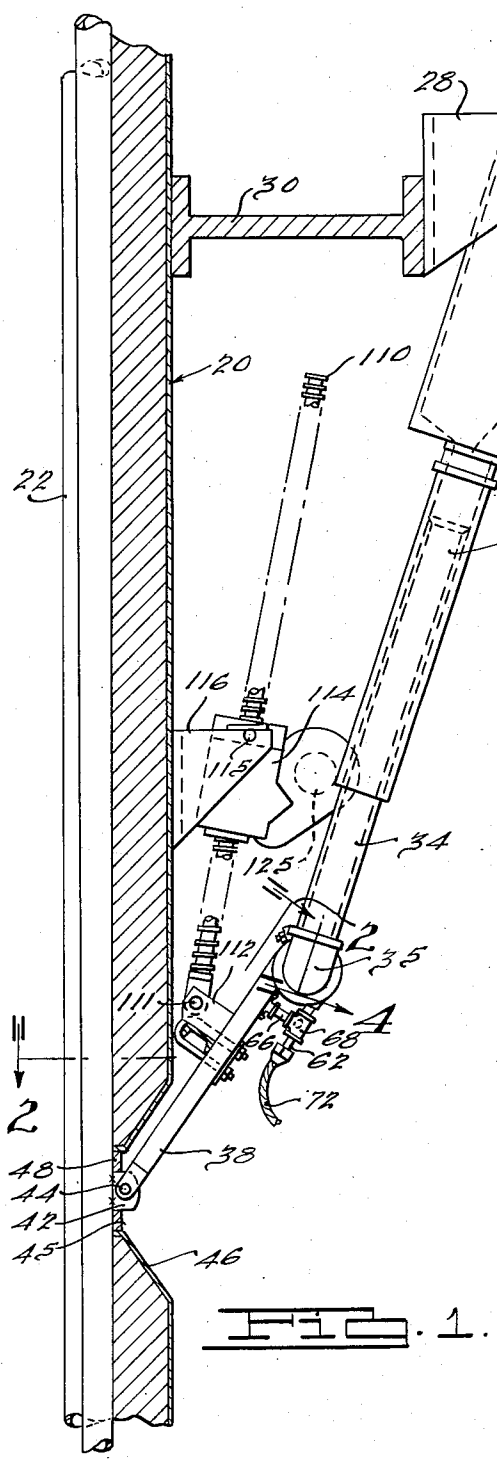

FIG. 1.

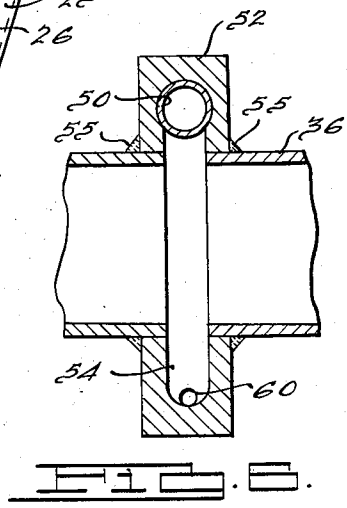

FIG. 2.

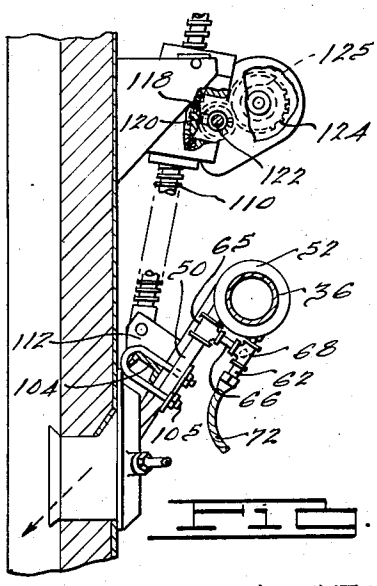

FIG. 3.

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PROJECTION-TYPE CLEANING APPARATUS

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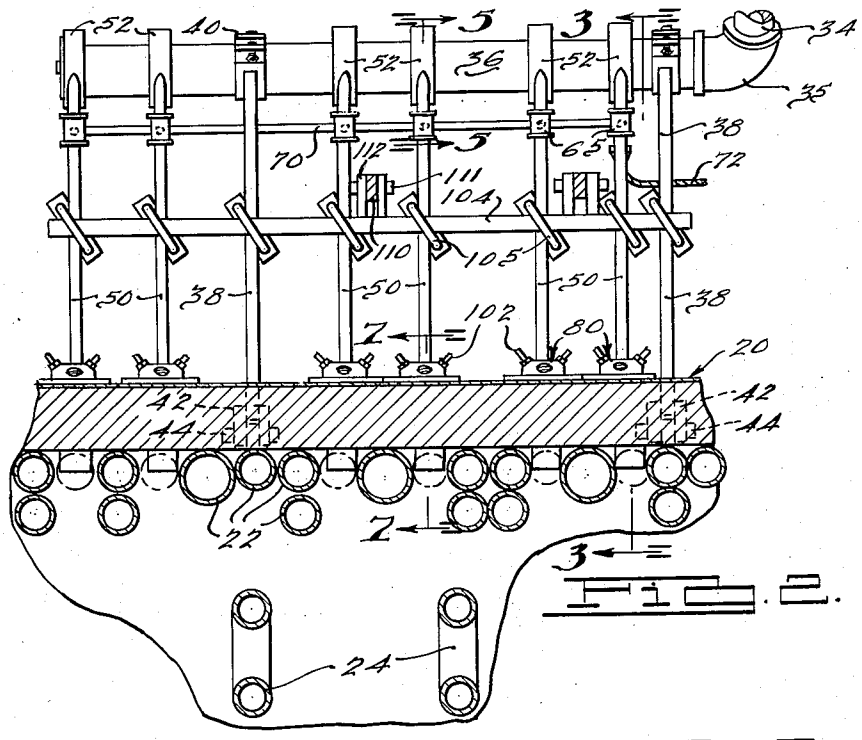

FIG. 2.

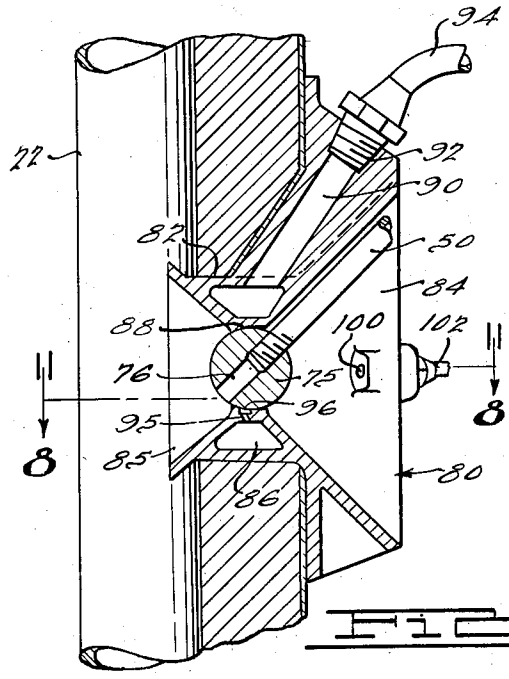

FIG. 7.

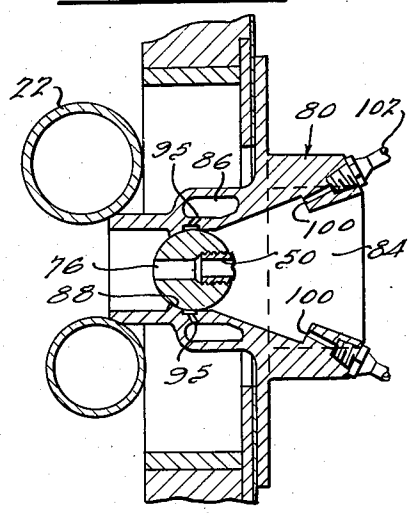

FIG. 8.

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PROJECTION-TYPE CLEANING APPARATUS

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Fig. 11.

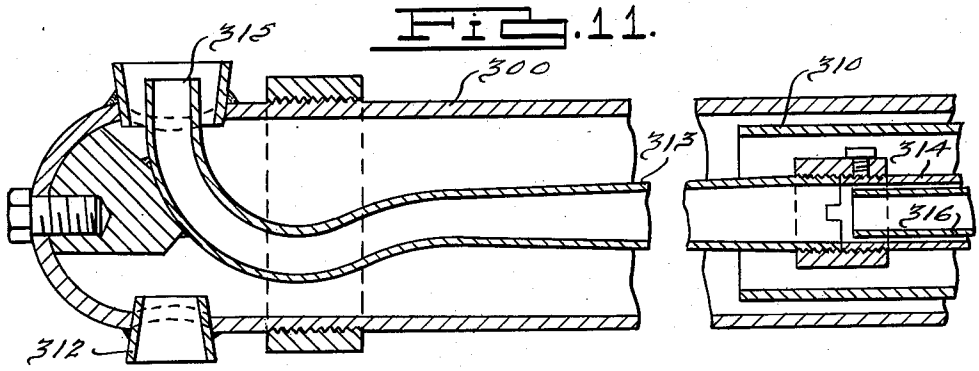


Fig. 4.

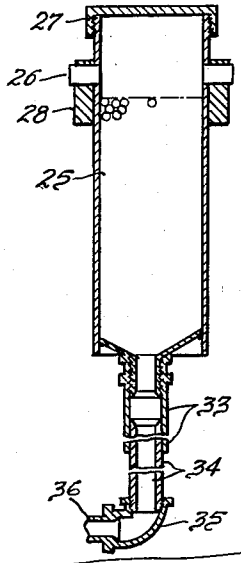
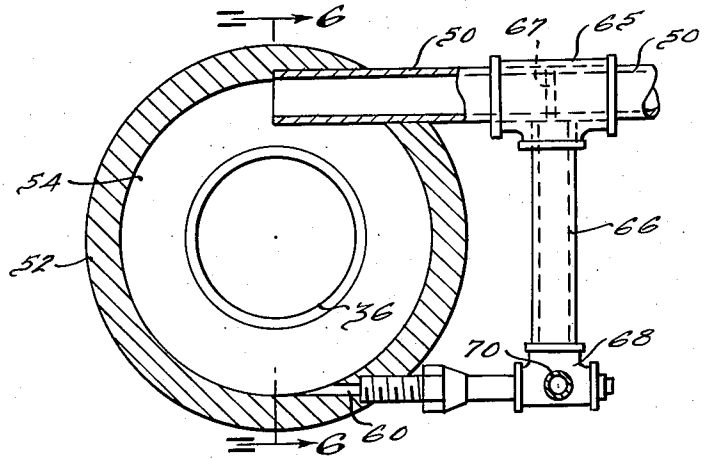


Fig. 5.



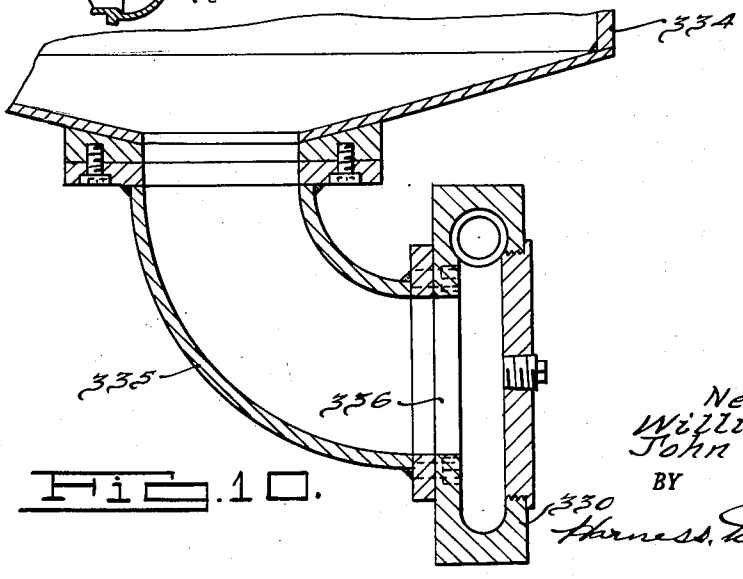


Fig. 10.

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PROJECTION-TYPE CLEANING APPARATUS

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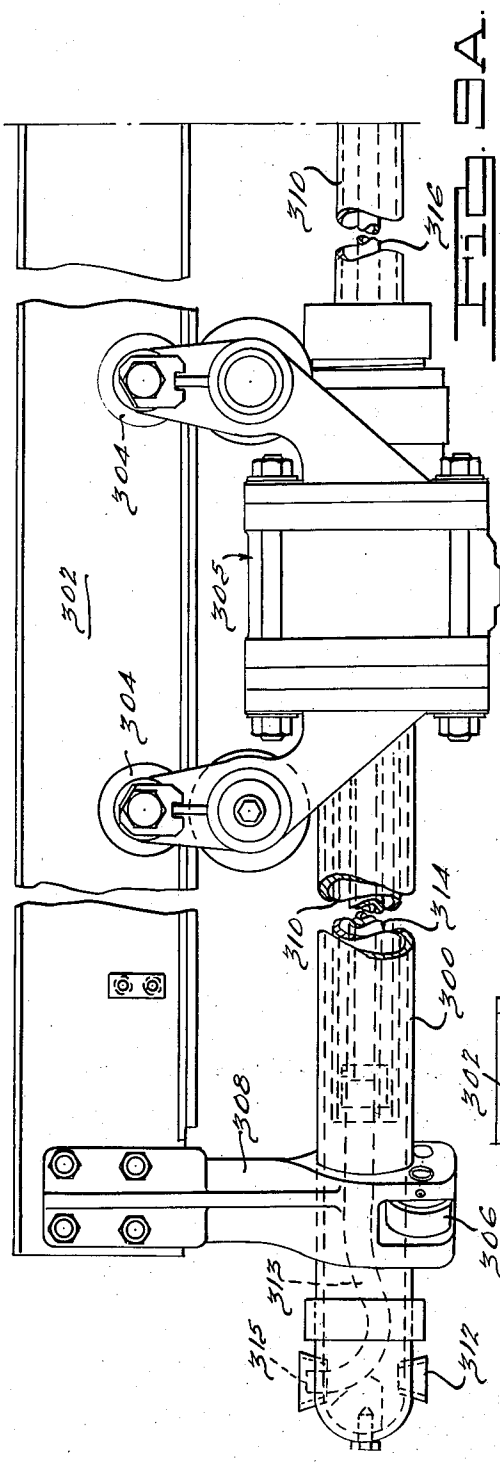

FIG. 5A.

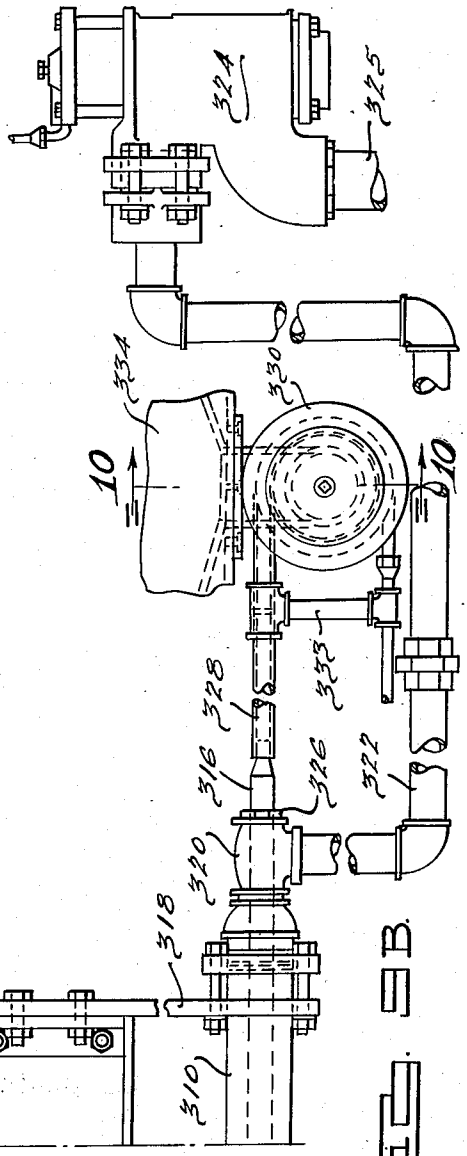

FIG. 5B.

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2,972,502

PROJECTION-TYPE CLEANING APPARATUS

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Filed Aug. 25, 1953, Ser. No. 376,336

15 Claims. (Cl. 302—51)

The present invention relates to the art of cleaning, and is particularly useful in the removal of deposits from surfaces which are not readily accessible. The invention is also particularly adapted to cleaning large surface areas, such, for example, the heat exchanging surfaces inside boilers and other heat exchanging apparatus.

In boilers operating at high temperatures, such as large public utility and industrial boilers, slag deposits have become increasingly difficult to remove, and conventional cleaning devices utilizing steam and/or air as the cleaning agent have in some installations proven inadequate to prevent accumulations of slag. Efforts have heretofore been made to clean such surfaces by the projection of solid material thereagainst, but such projecting devices have failed of general adoption for a number of reasons. The primary object of the present invention may be summarized as being the provision of improved means for cleaning boiler surfaces and the like with projected solid pellets.

An important object of the invention is also to provide an improved projecting device by means of which pellets may be projected at high velocity and with great accuracy against the surfaces to be cleaned.

Another object of the invention is to provide improved projection-type cleaning apparatus of the indicated variety which is adapted to project cleaning pellets accurately in a predetermined pattern and which is effective to cleanse relatively large areas located at a considerable distance from the pellet projecting apparatus.

Still another object is to provide such apparatus which is very compact in construction, which may be located outside of the boiler setting or walls of the heat exchanging apparatus, and which is readily accessible for servicing, which is rugged and reliable in operation and which employs improved principles of operation permitting accurate regulation of the velocity and trajectory of pellets projected thereby, as well as accurate regulation of the rate of feed.

A further object is to provide such an improved projecting mechanism which is so constructed that it is not subject to clogging or jamming, yet may be quickly and easily loaded by merely dumping the pellets into a receptacle.

Still another object is to provide improved mounting and controlling means for a plurality of such projecting devices.

Still another object is to provide improved means whereby steam, air, and/or other gaseous cleaning agents may be projected by means of the same projecting apparatus which is utilized to project solid pellets, whereby loose, dry deposits such as soot, may be rapidly removed by blasts of air, steam or the like, while adherent deposits, such as slag, are dislodged by pellets projected from the same projecting apparatus.

Another object related to that last stated is to provide such improved projecting apparatus for the controlled discharge of solid pellets, which apparatus is adapted for

installation in standardized types of retractable soot blowers in such fashion that the cleaning pellets may be discharged in a trajectory controllable by and in accordance with the pattern of the soot blower, and the projecting apparatus may be extended into the hottest portions of a furnace during operation and withdrawn therefrom to a more protected position when not in use.

Still another object is to provide such improved cleansing apparatus which may be controlled by automatic regulating mechanism and which is adapted for operation without direct manipulation by or attendance of a human operator.

Other objects and advantages of the invention will become apparent upon consideration of the present disclosure in its entirety.

In the drawings:

Figure 1 is a fragmentary vertical sectional view of a boiler, showing pellet projecting apparatus constructed in accordance with the present invention, with parts broken away;

Fig. 2 is a sectional view taken substantially as indicated by the line and arrows 2—2 of Fig. 1;

Fig. 3 is a sectional view similar to Fig. 1 but with certain parts omitted and other parts broken away, taken substantially on the line 3—3 of Fig. 2 and looking in the direction of the arrows;

Fig. 4 is a sectional view taken substantially on the line 4—4 of Fig. 1, and looking in the direction of the arrows;

Fig. 5 is a sectional view taken substantially on the line 5—5 of Fig. 2, and looking in the direction of the arrows, but on a larger scale;

Fig. 6 is a cross-sectional view taken substantially on the line 6—6 of Fig. 5, and looking in the direction of the arrows;

Fig. 7 is a sectional view taken substantially on the line 7—7 of Fig. 2, and looking in the direction of the arrows, but on a larger scale;

Fig. 8 is a horizontal section taken substantially on the line 8—8 of Fig. 7, and looking in the direction of the arrows;

Fig. 9A is a side elevational view partly broken away showing my invention in another modified form;

Fig. 9B is a side elevational view analogous to Fig. 9A but constituting in effect a rearward extension thereof, showing the parts which would extend to the right of the parts shown in Fig. 9A;

Fig. 10 is a sectional detail taken substantially on the line 10—10 of Fig. 9B, and looking in the direction of the arrows; and

Fig. 11 is a diametric sectional view, centrally broken away, of the outer portion of the lance tube assembly.

Referring now to the drawings, and particularly to Figs. 1–8 showing a preferred embodiment of the invention which is adapted to project spherical pellets such as small balls or marbles formed of a suitable material which will not damage the tubes. We have successfully used as pellets, wooden balls, balls formed of plastic, both solid and hollow, hollow plastic balls filled with water, and balls formed of bituminous material such as asphalt. The asphalt balls preferably incorporate a suitable binder such as asbestos fibers, although other binders, which may be of combustible material may also be employed.

In the construction shown in Figs. 1–8 inclusive, a boiler wall is fragmentarily illustrated at 20. Water wall tubes are also illustrated, designated 22. The boiler is illustratively presumed to be of the positive pressure type. In such boilers, operated at high temperatures, great difficulty has been encountered in dislodging slag from certain of the tubes, such as the platen tubes shown at 24 in Fig. 2, and it has become common practice to shut

down such boilers periodically and remove the slag by hand, which is a very costly procedure. With the aid of our improved pellet projecting apparatus, it is possible to remove such slag and effectively clean the boiler while the boiler is in operation.

The projecting apparatus shown in Figs. 1–8 includes a plurality of projecting nozzles, six being shown, although this is subject to variation. The pellets are stored in a magazine chamber **25** shown as cylindrical in form and which is preferably so constructed as to withstand the air pressure employed in the projecting system. The chamber **25** is rockably supported by means of trunnions **26** in a bracket yoke **28** carried by a beam **30** which may, as shown, constitute a part of the boiler wall supporting frame structure. The rocking axis of the chamber **25** defined by the trunnions **26** may be horizontal and parallel to the boiler wall. At its upper end the chamber has an airtight cover **27** removable for reloading as shown. At its lower end, the cylinder **25** has an opening **32** through which the pellets may be discharged. Communicating with such opening and rigidly attached to the chamber **25** is a downwardly extending tube **33**. Another tube **34** is slidably interfitted with the tube **33** and extends downwardly therefrom having at its lower end an elbow **35** which connects tube **34** to a horizontally mounted manifold tube **36**. The elbow **35** is oscillatable about the axis of the manifold tube **36**.

The manifold tube **36** is carried by a frame structure including a pair of links **38** which are attached at their outer ends to the manifold tube, as by bracket means **40**, and at their inner ends pivotally attached to the boiler structure for rocking movement about a horizontal axis parallel to the boiler wall. Such pivotal attachment may, as illustrated, be effected by bracket means **42** welded to the water wall tubes, and pivot pins **44** supported in such bracket means and in turn supporting the links **38**. An opening is left in the boiler wall, as indicated at **45**, in the region of each of the brackets **42**, such opening being bounded by inclined walls as **46** permitting the links to swing in vertical paths to extreme upper and lower positions wherein they lie at relatively small angles with respect to the water wall, but the openings **45** are substantially sealed, as by means of closure plates **48**. It will be observed that by this arrangement the rocking axis defined by the pins **44** lies close to the inner face of the boiler wall **20**, and such axis is preferably in alignment with the rocking axis of the pellet discharge tubes **50** through which the pellets are conducted from the manifold tube **36** and discharged into the interior of the boiler.

Each discharge tube **50** is connected to the manifold **36** by means of a pellet feeding device. The pellet feeding devices may be alike in construction, so that description of one will suffice. Figs. 5 and 6 show the details of construction thereof. The body of each pellet feeding device, generally designated **52**, may be annular in form and provided with an annular internal chamber **54** which opens into the interior of the manifold tube **36** throughout the entire periphery of the tube, as brought out in Fig. 6. In effect, therefore, the manifold tube is interrupted within each feeding device and each feeding device constitutes a coupling device for connecting together the adjacent coaxial sections of the manifold tube structure, to which the body **52** is welded as indicated at **55**.

Each discharge tube **50** is connected to its pellet feeder in such manner as to open tangentially into the chamber **54**. In the feeding of the pellets, the pellets are whirled in the chamber **54** in a direction such that they are discharged tangentially from the chamber through the tube **50**. Such whirling action is imparted to the pellets by air, fed into the chamber **54** through a tangential air inlet orifice **60** opening thereinto through the body **52**, the inlet **60** being coupled to a T **68** as shown in Fig. 5. The air enters the chamber **54** via inlet **60** approximately 180° from the point of discharge of the pellets through tube **50**. Air pressure is also supplied to the tube **50** at a position slightly spaced from the outlet from the feeding chamber **54**. As shown in Fig. 5, the tube **50** is formed in two sections which are slightly spaced from one another to define an opening **67** in tube **50** located within the T **65** which is connected to an air supply tube **66**. Tube **66** is coupled by the T **68** to the inlet **60**. All of the T's **68** may be supplied through a single air feed pipe **70** which is adapted to be connected as by means of a flexible hose **72** (Fig. 3) to a suitable source of air under pressure.

At its furnace end each discharge tube **50** is attached to a ball **75** having a diametrically arranged hole **76** therein which forms the discharge nozzle through which the pellets are projected. The ball **75** is so mounted that the open end of the hole **76** therein discharges into the boiler. The ball constitutes a closure for the opening in which it is mounted. A frame assembly, generally designated **80**, supports each ball and provides the opening through which the pellets are admitted into the boiler. Each frame assembly is supported in an appropriately contoured opening as **82** in the boiler wall. An outer portion of the frame has a fanlike opening **84** disposed vertically and proportioned to permit the discharge tube **50** to sweep therethrough during its vertical rocking movements, and an inner portion of the frame directed into the interior of the boiler is provided with a corresponding fanlike opening **85** through which the pellets may be discharged in trajectories of varying elevation. A cooling chamber **86** in the frame structure surrounds the ball retaining socket portion **88** in which the ball **75** is rockably mounted, and the cooling chamber is connected through a passage **90** to an air inlet **92** to which an air supply tube as **94** is adapted to be connected as shown in Fig. 7. Air chamber **86** is connected as by means of passages **95** to an annular groove **96** which circumscribes the interior of the ball socket **88**. It will be appreciated that the ball must be fitted relatively loosely in the socket because of the temperature changes to which the apparatus is subjected. The air fed into the groove **96** provides an effective seal against the discharge of gases of combustion through the space between the ball and socket. The socket **88** may be of partly spherical form at the front end, which lies closest to the interior of the furnace, and may be cylindrical at its outer or rear end so that the ball can be inserted and removed from the rear, being held against dislodgment by the links **38**. The centers of the balls **75** are located substantially upon the same axis as the pins **44**.

Means is provided for directing air blasts in an inward direction through the socket opening **88** when the balls **75** and the pellet projector apparatus are removed. Thus if it is necessary to remove any or all of the projector apparatus together with one or more of the balls **75**, an inflow of air can be assured at the ball opening to effectively seal such opening. Such air blast means may, as shown, comprise a pair of air discharge orifices as **100**, one of which is formed in each side of the outer fan portion **84** of the frame, said orifices being directed toward the interior of the furnace in a direction to project air through socket opening **88**. An air supply conduit, as **102**, is coupled to each orifice **100**, and means is thereby provided for directing into the socket opening a sufficient air blast to insure against puffing from the furnace when the pellet projecting apparatus is dismounted for servicing.

The assembly consisting of the manifold **36**, links **38**, and pellet discharge tubes **50** constitutes a swinging frame and may be stiffened as by means of the cross bar **104** secured to the links **38** and ball discharge tubes **50** as by means of the U-bolts **105**. Vertical swinging

movement of the frame assembly may be effected by suitable power driving means, which may as shown, comprise a screw shaft **110** pivotally connected at its lower end as by a pivot pin **111** to a bracket **112** attached to the cross bar **104**. The screw shaft extends upwardly through a casing **114** mounted as by means of trunnions **115** in a bracket **116** attached to and projecting outwardly from the boiler wall. The screw shaft is driven vertically by a nut **118** journaled in the casing **114** and held against axial movement in the casing, the nut being threadedly fitted upon the screw shaft and drivable by a concentric worm wheel **120** which is in turn rotatable by a worm **122** drivable through suitable gearing **124** by a motor **125**, the motor and gearing being attached to and carried by the casing **114**. The motor is of the reversible type, and it will be appreciated that reversal of the motor will be automatically effected by suitable limit switches or the like although such control details do not form a part of the present invention. When the motor is energized, the rotation of the nut actuates the screw **110** which is held against rotation about its axis by its connection to the bracket **112**. The movement of the screw shaft swings the frame structure including the discharge tubes **50** in a vertical arc. During such movement the tubes **33**, **34** slide with respect to one another and the casings **25** and **114** rock on their trunnion supports to the extent required.

The sliding fit between the tubes **33**, **34** is substantially airtight and the chamber **25** and other portions of the pellet system are also airtight. The air introduced into the discharge tube **50** at the gap **67** therein augments the outflow of air and increases the velocity of the pellets, and also imposes a back pressure on the balls in the chamber **25** and feed tubes, reducing the tendency to clog and assisting the free flow of the balls into and longitudinally along the manifold and into the several ball feeders **52**. The air rotating in the annular chamber **54** in each ball feeder separates the balls and prevents any danger of clogging, accelerates them and successively drives them in a circular path and thence outwardly through the tube **50** connected thereto. The balls are further accelerated by the air delivered through the gap **67** and are projected into the boiler through tube **50** and the hole **76** in the ball joint **75** at high velocity. The direction of discharge of the balls is such as to cause them to strike desired tubes to be cleaned, such for example as the platen tubes **24**.

By the vertical rocking movement which may be imparted to the frame assembly and tubes **50** by energization of the motor **125**, the balls may be caused to strike the tubes along a substantial length thereof. When our improved apparatus is used while the furnace is in operation, the slag, being soft, tends to peel and fall from the tubes as soon as a part of it is severed by the impact of the pellets. An installation such as the one shown may be provided for cleaning all of the surfaces which are subject to undesirable slag formation. Alternatively, the structure may be modified for use in other locations and with different types of heat exchangers.

In the modification shown in Figs 9A, 9B, 10 and 11, the parts are so arranged that the solid pellets may be discharged from a soot blowing device which is also adapted to discharge a fluid cleaning agent such as air and/or steam. A lance tube **300** is supported for horizontal sliding movement by a beam **302** beneath which the lance tube is suspended by trolley wheels as **304** and by a carrier housing **305** which also serves as a housing for certain of the mechanism employed to rotate and reciprocate the lance tube. The lance tube is also supported by means of rollers **306** journaled in a stationary hanger bracket **308**. Cleaning fluid is adapted to be fed to the rotatable and reciprocable lance tube through a stationary feed tube **310** over which the lance tube telescopes. The construction of the soot blower components including the driving and feeding means will be recognized as of a conventional type commonly known in the trade as a long-retracting blower, and no detailed description will be required. The lance tube is provided at its outer end with one or more discharge nozzles as **312** opening directly into the interior of the lance tube and through which the cleaning fluid is adapted to be discharged in the conventional manner.

A pellet feeding tube assembly **313**, **314** is secured within the lance tube in substantially axial position, to travel therewith. The outer end section **313** of the feeding tube assembly is curved to extend angularly outwardly through a discharge opening **315** at the end of the lance tube through which pellets may be discharged into the interior of the boiler. The end section **313** is also graduatedly reduced so that its discharge end is only slightly larger than the pellets. This provides for acceleration of the pellet balls just before their discharge, but allows them to roll more freely, and with less chance of blockage, through the somewhat larger pellet feeding tube sections **314**, **316**. The stationary pellet feeding tube **316** is supported at its rear end from suitable stationary supporting means presently to be described, and projects forwardly into the tube **314** far enough so that the tubes **314**, **316** do not separate when the lance tube is fully projected.

The tubes **314**, **316** are slidably interengaged but are fittted closely enough to avoid undue escape of air. At the rear end of the blower assembly, the fluid feed tube **310** is supported by a stationary bracket **318**. A T fitting **320** arranged behind the bracket **318** communicates interiorly with the space within feed tube **310**. The side opening of the T **320** communicates through suitable piping **322** with the blowing fluid control valve **324** and the blowing fluid supply pipe **325**, such parts being indicated as of conventional character. The pipe **316** is substantially smaller than the T openings and substantially smaller than the internal diameter of the tube **310**, so that there is free communication around the pipe **316** through the T **320** between the piping **322** and the tube **310**. The rear opening of the T **320** is sealed with respect to the exterior of the pipe **316** as by a packing gland **326**, which also supports pipe **316**. The projecting rear end of the pipe **316** is coupled to a pellet supply pipe **328** which is in turn connected to a pellet feeder **330**, the construction of which may correspond to that of the pellet feeder **52**, supply means for the pellet actuating air being connected to the conduit **332**, which corresponds to the conduit **62** of the first embodiment, and to the conduit **333**, which corresponds to the conduit **66**. The spherical pellets may be stored in a pressure hopper chamber **334** which communicates through a suitable connecting elbow **335** with an axial inlet opening **336** through which the pellets are fed into the feeder **330**.

It will be appreciated that the pellets may be fed through the tubes **316**, **314**, **313**, and projected from the discharge opening **315**, while the discharge opening is rotated and moved longitudinally through the interior of the boiler with the lance tube and that, if desired, the pellets may be discharged simultaneously with the cleaning fluid, to assist in the dislodging of fouling material.

In the initial installation of my improved pellet projecting devices, the angle of discharge may be accurately pre-fixed by bending the pellet discharging tubes to and fixing them in desired positions. Thus in the case of the first embodiment the tubes **50** may be bent laterally, in a direction longitudinal with respect to bar **104**, before the clamping U-bolts **105** are tightened, and in such lateral bending the ball **75** is merely turned in its socket to the extent required, thereafter, merely by tightening the U-bolt, the tube **50** will be held in any desired bent or distorted shape which will modify the angle of discharge as may be desired. The discharge tube **313** of the second embodiment may also be bent to and inserted in any of various angular positions to direct the pellet discharge accurately in the desired direction.

While it will be apparent that the preferred embodiments of the invention herein described are well calculated to fulfill the objects and advantages first above stated, it will be appreciated that the invention is susceptible to variation, modification and change without departing from the fair meaning and proper scope of the appended claims.

We claim:

1. In a cleaning apparatus for projecting pellets or the like, in combination with a source of fluid under pressure, a magazine for pellets to be projected, said magazine having an outlet, a feeding device connected to said outlet and having a feed chamber therein, a curved wall peripherally encompassing the entire interior of said feed chamber and having an inlet opening into said chamber through said wall, substantially tangentially whereby fluid may circulate in said chamber throughout more than 360°, a portion defining a feeder outlet extending through said peripheral wall substantially tangentially from the interior to the exterior of said chamber, and means for feeding fluid into said chamber through said inlet and for feeding pellets into said chamber, said chamber being otherwise substantially closed, whereby fluid and pellets may be discharged through said feeder outlet.

2. In a cleaning device for projecting pellets or the like, in combination with a source of fluid under pressure, a magazine for pellets to be projected, said magazine having an outlet, a feeding device connected to said outlet and having a feed chamber therein, a curved wall peripherally encompassing the entire interior of said feed chamber and having an inlet ouening into said chamber through said wall, substantially tangentially whereby fluid may circulate in said chamber throughout more than 360°, a portion defining a feeder outlet extending through said peripheral wall substantially tangentially from the interior to the exterior of said chamber at a position angularly spaced from the feeder inlet, a pellet inlet passage portion also communicating interiorly with said chamber and whereby pellets may be delivered into the path of air flowing through said feed chamber from said fluid inlet to said outlet, said chamber being otherwise substantially closed, whereby fluid and pellets may be discharged through said feeder outlet.

3. A device as set forth in claim 2 wherein said pellet inlet passage portion extends into said chamber substantially axially with respect to the axis of curvature of said peripheral wall.

4. In cleaning apparatus as defined in claim 1, a booster fluid connection portion communicating with said outlet at a position spaced from said chamber and extending in a direction at an angle to said previously mentioned angle of discharge, whereby a supplemental fluid supply is introduced into the flow of pellets and propellant after discharge thereof from said chamber and whereby a back pressure is created acting upon said chamber.

5. A cleaning device for boilers and the like comprising in combination with a source of fluid under pressure, a magazine for pellets to be projected against surface areas to be cleaned, said magazine having an outlet for pellets, means rockably supporting said magazine, pellet feeding means, means supporting said pellet feeding means for rocking movement upon movement of said magazine about an axis offset from the axis of rocking movement of the magazine, an outlet tube for passing pellets therethrough from said magazine outlet, said outlet tube being associated with said magazine so as to be actuatable therewith and movably aimed at said areas to be cleaned, said pellet feeding means including a chamber for whirling pellets and propellant in an arcuate path in said chamber to accelerate said pellets before they enter said outlet tube, and telescopic tubular conveying means connecting said magazine to said feeding means at a point spaced from the rocking axis of the latter.

6. In a cleaning device for projecting pellets or the like, in combination with a source of fluid under pressure, a magazine for pellets to be projected, said magazine having an outlet for pellets, a feeding device connected to said outlet and having a feed chamber therein with a curved peripheral wall, a feeder outlet portion extending outwardly from said chamber and forming a substantially tangential extension of said wall, a feeder inlet portion extending generally axially into said chamber with respect to the axis of curavture of said peripheral wall and connected to the outlet of the magazine, a pellet delivery tube connected to said feeder outlet portion and adapted to conduct pellets toward a desired point of discharge, and a supplemental air inlet connected to said pellet delivery tube and adapted to deliver air thereinto at a position between said feed chamber and point of discharge.

7. A cleaning apparatus as defined in claim 1 wherein said booster fluid connecting portion communicates with said outlet in a direction substantially perpendicular to the direction of flow of fluid and pellets from said outlet.

8. Means as set forth in claim 5 wherein said tubular conveying means is also connected to said magazine at a point spaced from the rocking axis of the magazine.

9. In a cleaning device as defined in claim 5, a driving motor, and means operatively connecting the motor to the pellet feeding means to swing said feeding means about said axis of rocking movement thereof.

10. In a cleaning device for projecting pellets into a heat exchanger setting or the like having an external wall, apparatus in combination with a source of fluid under pressure and pellets comprising a tubular member for passing pellets and gaseous propellant therethrough, means for pivotally attaching the tubular member to such a wall, means for feeding pellets into and through said member and for discharging the same into the heat exchanger in a direction away from the axis of pivotal attachment of said tubular member, said means including a chamber and being adapted to whirl pellets and propellant in an arcuate path in said chamber to accelerate the pellets before they enter said tubular member, and means for rocking said member to vary the angle thereof, said member having a discharge orifice directed inwardly with respect to said setting.

11. In a cleaning device for projecting pellets into a heat exchanger setting or the like having an external wall, apparatus in combination with a source of fluid under pressure and pellets comprising a tubular member, for passing pellets and gaseous propellant therethrough, means for pivotally attaching the tubular member to such a wall, means for feeding pellets into and through said member and for discharging the same into the heat exchanger in a direction away from the axis of pivotal attachment of said tubular member, said means including a chamber and being adapted to whirl pellets and propellant in an arcuate path in said chamber to accelerate the pellets before they enter said tubular member, means for rocking said member to vary the angle thereof, said member having a discharge orifice directed inwardly with respect to said setting, and said actuating means being located upon the opposite side of said pivotal attachment from the side toward which said solid cleaning material is discharged.

12. In a cleaning device, means for feeding and discharging solid cleaning pellets or the like into an enclosure at different angles including in combination with a source of fluid under pressure and pellets, an outlet tube for passing pellets and fluid propellant therethrough, means including a chamber for whirling pellets and propellant in an arcuate path in said chamber to accelerate the pellets before they enter said tube, a portion defining a socketlike opening adapted to bound an opening in such an enclosure, a rockable member in said socketlike opening having a passage extending therethrough, and

a projector element connected to said member and having a discharge portion directed through said passage.

13. A cleaning device as defined in claim 12 wherein said socketlike opening and said rockable member are of generally spherical shape, said projector element being movable in a plane to change the elevation of the discharge of pellets through said opening.

14. In combination with a cleaning device as set forth in claim 12, an internally open fluid channel interiorly surrounding said socketlike opening, said channel being open on the inner wall of said socketlike opening, and means for discharging fluid into said channel and thereby feeding fluid into any space which may exist between the socketlike opening and the rockable element.

15. In combination with a cleaning device as set forth in claim 12, fluid jet portions also carried by said portion which defines said socketlike opening, said jet portions having a discharge orifice spaced outwardly from said socketlike opening directed inwardly toward said opening, whereby fluid discharged from said orifice may be directed into the enclosure through said socketlike opening when said rockable member is removed from such socketlike opening.

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