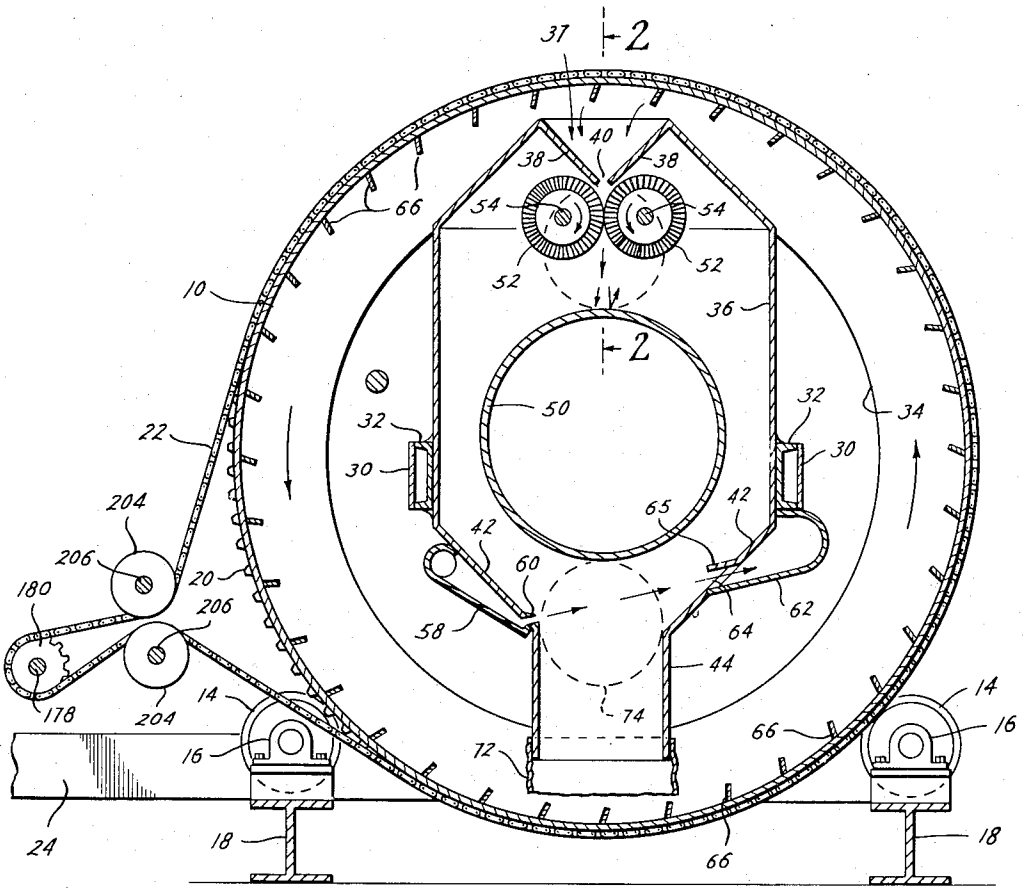
April 24, 1956 C. K. SMITH 2,742,739

APPARATUS FOR TREATING METAL ARTICLES

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Fig. 1



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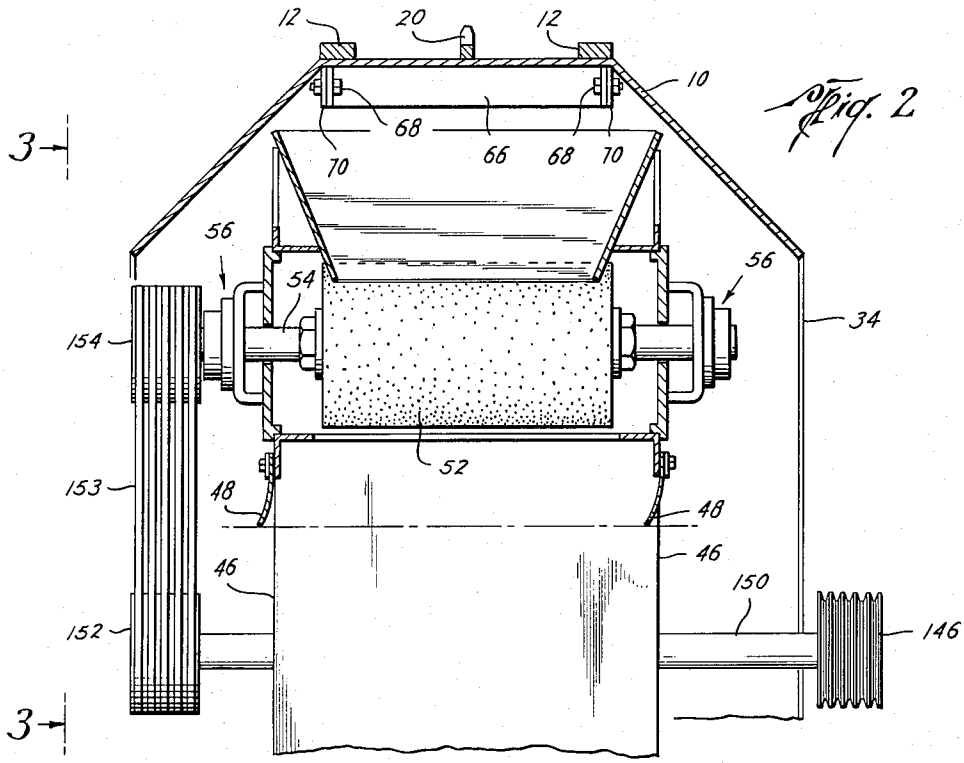


Fig. 2

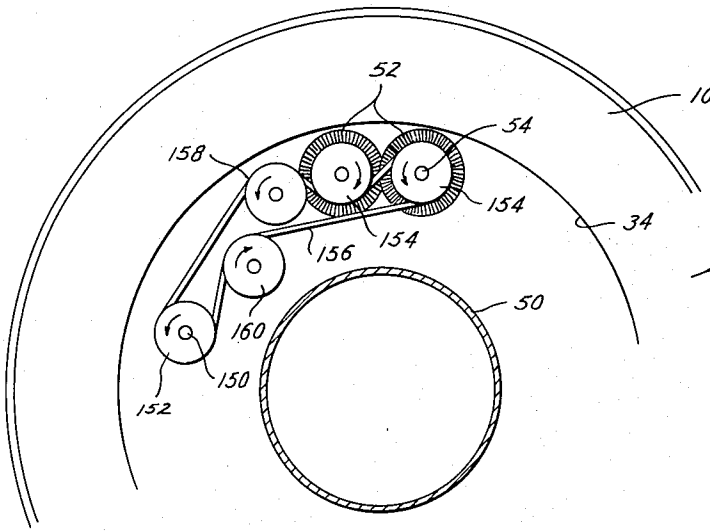


Fig. 3

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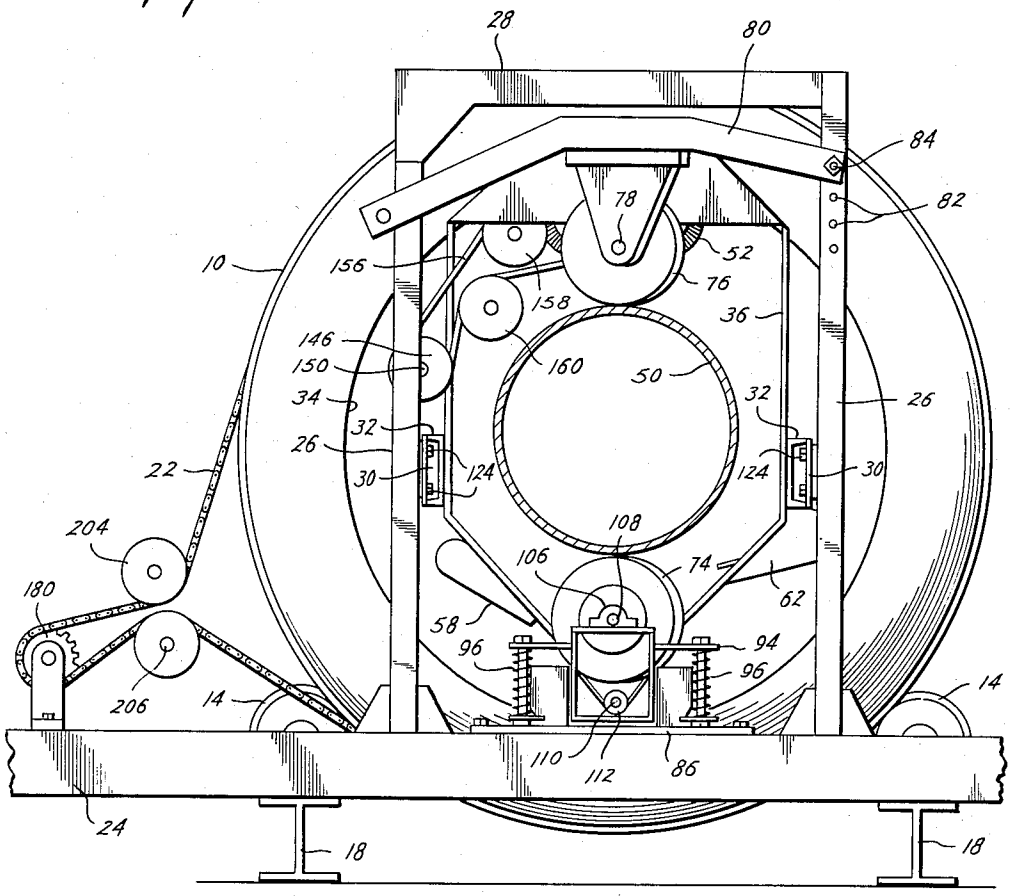
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APPARATUS FOR TREATING METAL ARTICLES

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Fig. 4



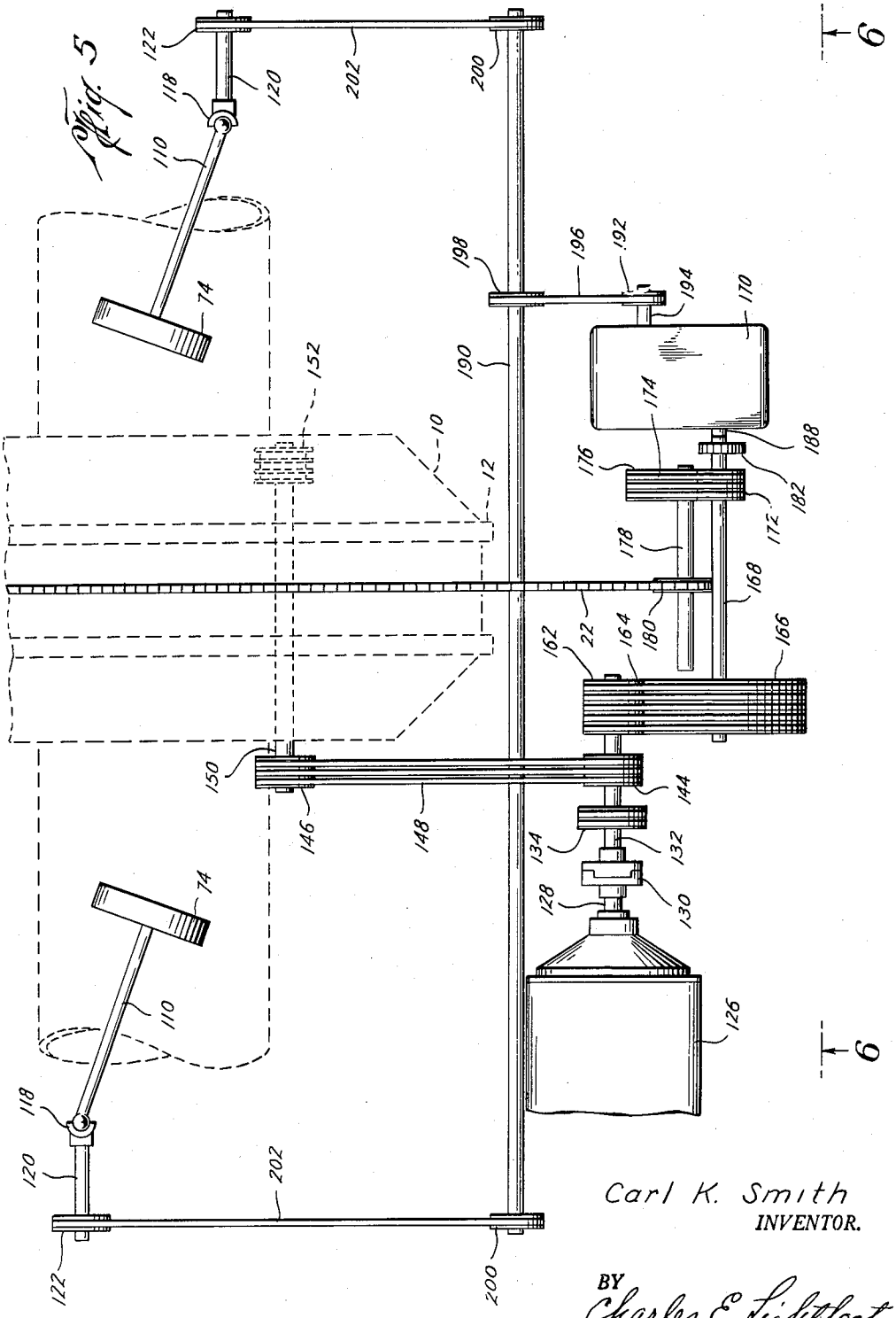
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APPARATUS FOR TREATING METAL ARTICLES

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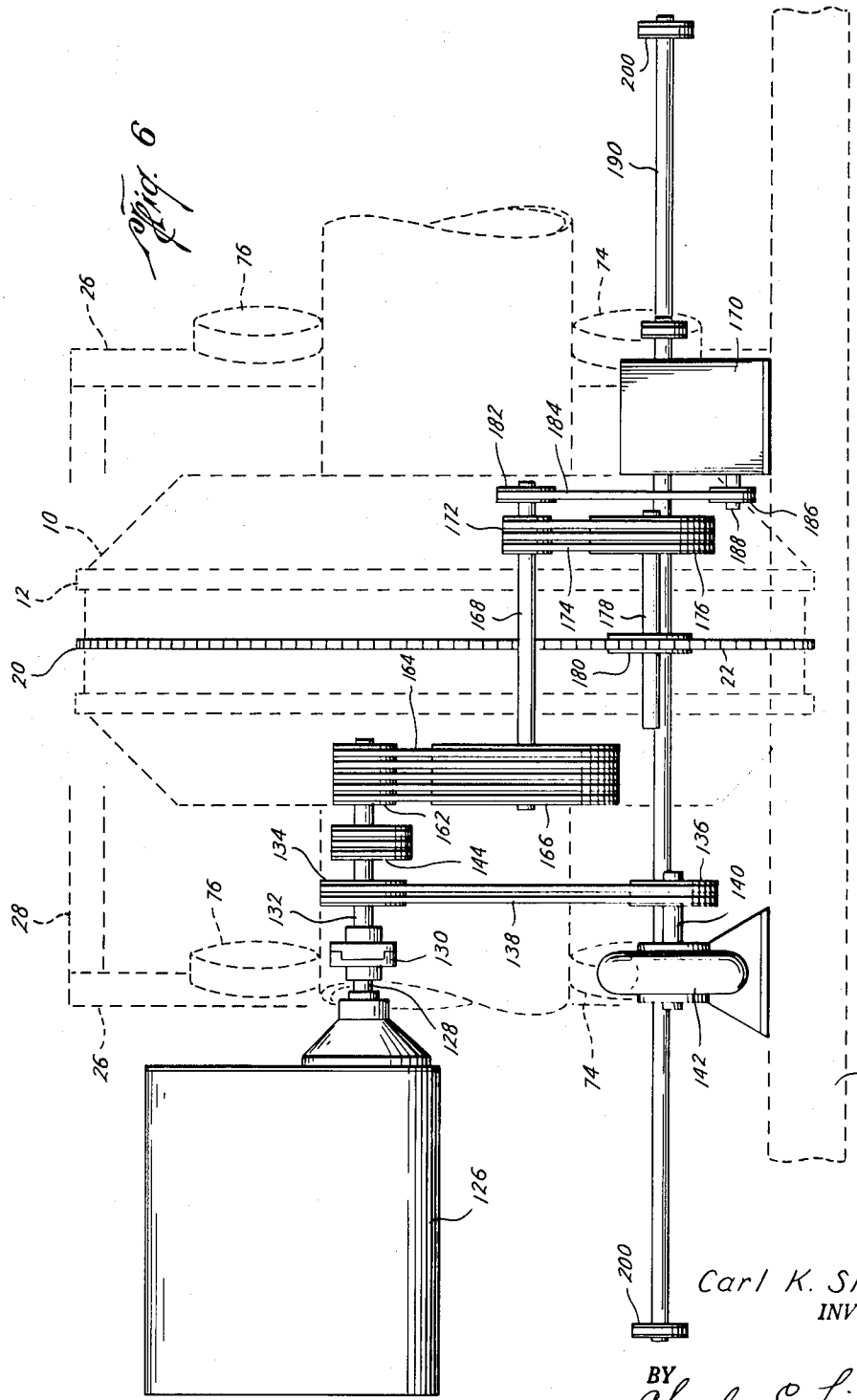
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APPARATUS FOR TREATING METAL ARTICLES

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Fig. 6



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APPARATUS FOR TREATING METAL ARTICLES

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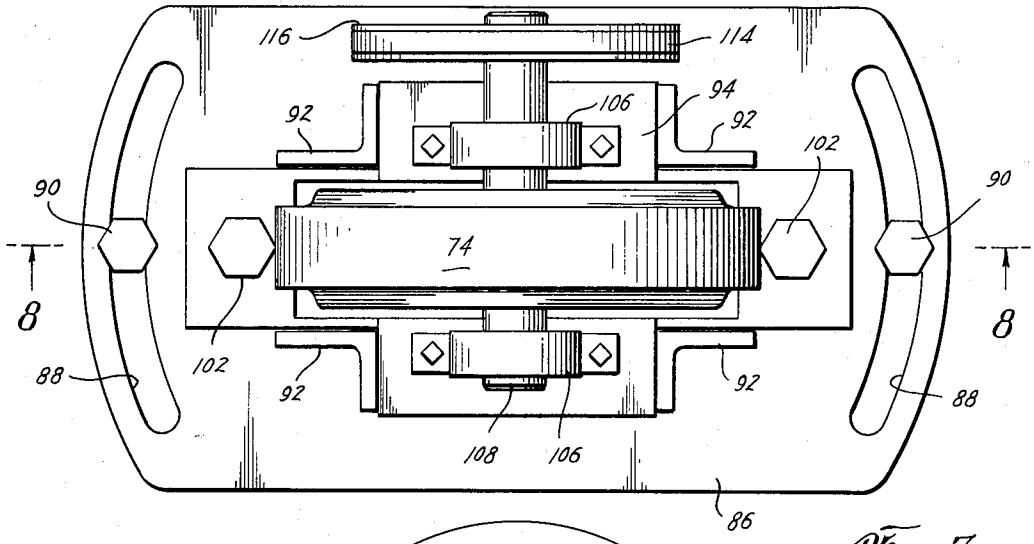


Fig. 7

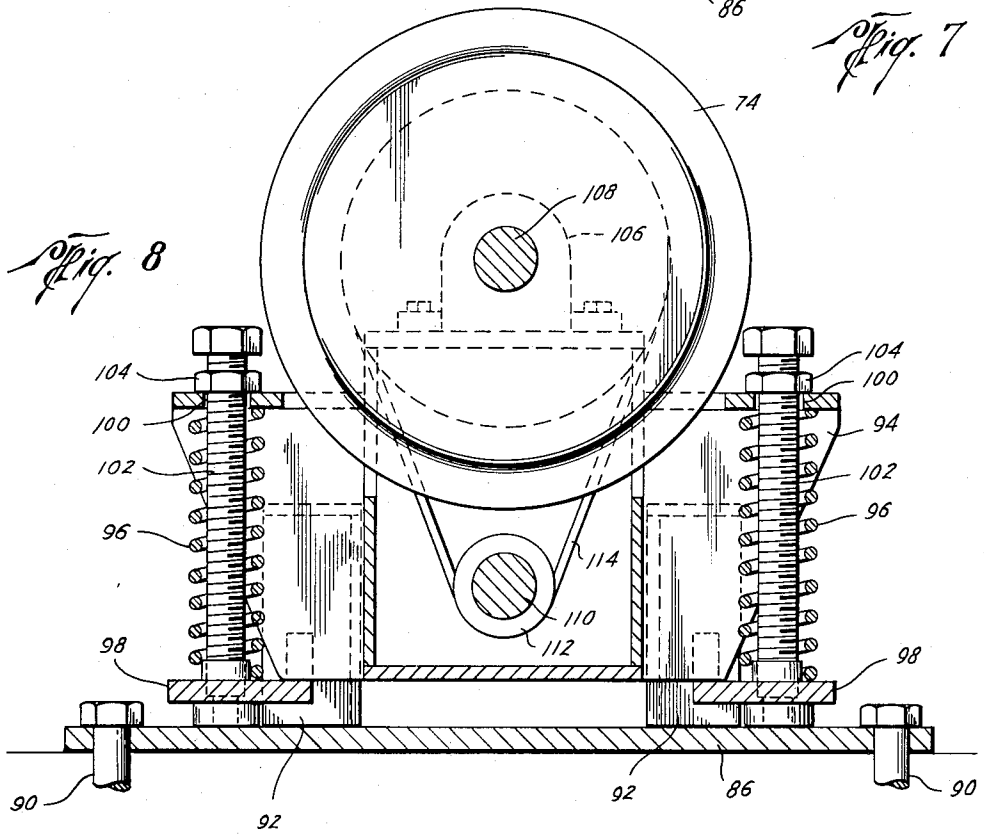


Fig. 8

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2,742,739

APPARATUS FOR TREATING METAL ARTICLES

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Application March 9, 1953, Serial No. 340,945

3 Claims. (Cl. 51—9)

This invention relates to apparatus for treating metal articles, and more particularly to a machine for cleaning pipes and tubular conduits by means of a shot blast.

An important object of the invention is the provision of an improved apparatus for cleaning pipes, which is adjustable to accommodate pipes of widely differing diameters, or which are out of round.

Another object of the invention is to provide pipe cleaning apparatus embodying means for moving a pipe longitudinally of its axis, while rotating the same, and including means for regulating both the speed of rotation and the longitudinal movement of the pipe.

A further object of the invention is the provision of apparatus for cleaning pipes or tubular articles by impelling shot against the surface of the same, and including means for cleaning, collecting and recovering the shot and returning the same to a point from which it may again be directed against the surface to be cleaned.

Another object of the invention is the provision of apparatus of the type referred to, constructed for operation in a continuous cycle, which includes impelling the shot against the surface of the article to be cleaned as the same is rotated, and moved through the apparatus, cleaning and collecting the shot and returning the same to a point for reuse.

Other important objects and advantages of the invention will be apparent from the following detailed description, constituting a specification of the same, when considered in conjunction with the annexed drawings, wherein—

Figure 1 is a vertical, central, cross-sectional view, taken transversely of the axis of rotation of the pipe which is being cleaned, and illustrating details of construction and arrangement of the interior parts of the apparatus;

Figure 2 is a cross-sectional view, taken along line 2—2 of Figure 1, looking in the direction indicated by the arrows;

Figure 3 is a fragmentary rear-end elevational view, taken along the line 3—3 of Figure 2;

Figure 4 is a front end elevational view of the invention;

Figure 5 is a plan view of the power transmission system by which the apparatus of the invention is operated;

Figure 6 is a side elevational view of the apparatus as illustrated in Figure 5, and taken along lines 6—6 of Figure 5;

Figure 7 is a plan view, on a somewhat enlarged scale, showing details of construction of the pipe engaging member of the driving mechanism employed to rotate the article to be cleaned, and to move the same longitudinally of its axis through the cleaning apparatus; and

Figure 8 is a cross-sectional view taken along the line 8—8 of Figure 7, looking in the direction indicated by the arrows.

Referring now to the drawings in greater detail, the invention includes a rotatable drum 10, having spaced, external, annular tracks 12, which are supported on

spaced rollers 14, rotatably carried in suitable bearings 16 mounted on a suitable supporting structure including spaced longitudinally extending I-beams 18, or the like. A ring gear 20 is attached to the exterior of the drum, centrally thereof, and a driving chain 22 surrounds the drum in engagement with the gear 20, by which the drum may be rotated, by means to be later described in detail.

Supported on the longitudinal beams 18 are longitudinally spaced cross members 24, from which upright frame members 26 extend upwardly, in spaced apart relation, these uprights being tied together at their upper ends by cross pieces 28, as best seen in Figures 4 and 6. The uprights 26 carry plates 30 adjustably secured thereto mediate the ends of the uprights, and upon which outwardly facing channels 32 are supported, which extend through openings 34 in the drum.

An inner casing 36 is supported within the drum 10 on the channels 32, the channels being preferably welded to the sides of the casing, to maintain the casing in vertical, inwardly spaced relation to the drums. At its upper end the casing 36 has a shot receiving hopper 37 formed by inwardly and downwardly converging wall portions 38, which hopper has an opening 40 at the bottom, for the discharge of shot therefrom. The casing 36 is also provided with downwardly and inwardly converging wall portions 42, terminating in a downwardly opening chute 44. Side openings 46 are also formed in the inner casing, opposite the openings 34 of the drum 10, and flexible wipers 48, are attached to the marginal portions of the casing surrounding the openings 46, for engagement with a pipe, or other tubular article, indicated at 50, to close the opening about the article, as best seen in Figure 2.

Within the inner casing 36, beneath the hopper opening 40, a pair of impellers 52, are rotatably supported on shafts 54, carried in suitable bearing means, indicated at 56, attached to opposite walls of the casing. The impellers may conveniently take the form of wire brushes or the like, which are arranged to rotate in opposite directions, and between which shot may pass downwardly from the hopper of the casing, to be impelled downwardly against the outer surface of the pipe 50, as the same is rotated and moved longitudinally through the casing. Suitable means, may, of course, be provided for adjusting the impellers 52 toward and away from each other, to regulate the distance between the impellers as may be desirable or expedient. The shafts 54 of the impellers extend at one end beyond the bearings 56, and are provided with suitable driving means thereon, later to be described in greater detail, whereby the impellers may be rotated at any desired speed.

As best seen in Figures 1 and 4, one of the bottom wall portions 42 of the casing is provided with an inlet housing 58, from which a discharge opening 60 leads through the wall of the casing, into the interior thereof, at a location beneath the pipe 50. The inlet housing 58 is connected in communication with a suitable source of pressure fluid such as a blower 142, not shown, whereby fluid under pressure may be discharged through the discharge opening 60 into the casing, at a point beneath the pipe 50. The opposite wall portion 52 of the casing has an exhaust housing 62 attached thereto, into which an inlet opening 64 leads from the interior of the casing, at a point opposite the discharge opening 50, whereby pressure fluid discharged from the opening 60 is directed across the interior of the casing to enter the opening 64. A baffle plate 65 may be positioned above the opening 64. if desired, to deflect the pressure fluid and any particles carried thereby into the opening. The exhaust housing 62 may be connected to a discharge conduit, not shown, leading to any desired location.

By the above described inlet and exhaust mechanism, it will be apparent that as the shot flows downwardly through the casing to be discharged through the chute **44**, air under pressure may be blown through the casing from the inlet housing **58** into the exhaust housing **62**, carrying with it articles of scale, removed from the pipe **50**, or other deleterious material, which may thus be removed and deposited at any desired location. It this manner the shot may be effectively cleaned during the continuous operation of the apparatus.

Suitable blades **66**, are adjustably positioned in circumferentially spaced relation inside the drum **10**, each of the blades being attached by suitable fastening means, such as the bolts **68**, to end brackets **70** suitably secured to the interior of the drum, whereby the angular positions of the blades may be adjusted as desired. These blades are arranged to receive between them the shot discharged from the chute **44** at the bottom of the casing **36**, and to carry the shot upwardly to deposit the same within the hopper at the upper end of the casing. The lower end of the chute **44** may be provided with a flexible tubular element **72**, extending downwardly therefrom, to prevent the shot from being deflected from the interior of the drum through the drum openings **34**.

Exteriorally of the drum, driving rollers **74**, are supported on the cross members **24**, for engagament with the pipe **50**, to rotate the pipe and move the same longitudinally through the apparatus, and upper idler rollers **76** are rotatably supported by suitable bearing means **78** mounted on adjustable arms **80**, pivotally secured at one end to one of the uprights **26**, so that the idler rollers may be moved downwardly into engagement with the pipe **50**, to retain the pipe in driving contact with the rollers **74** under all conditions of operation of the apparatus. The opposite ones of the uprights **26** may conveniently be provided with a series of bolt openings **82**, through which bolts **84** are insertable, which bolts also extend through openings in the arms **80**, whereby the arms are adjustably secured to the upright so that the idler rollers may be moved vertically into engagement with the pipe **50**, and held in contact therewith, to effectively maintain the pipe in engagement with the driving rollers **74**, in the event that the pipe is somewhat out of round.

The driving rollers **74** are supported on the cross members **24** by vertically adjustable bearing means, which is illustrated in detail in Figures 7 and 8. Each of the bearing means includes a base plate **86**, having arcuate end slots **88** therein, through which fastening means, such as the bolts **90** may be inserted, to secure the base plate to the cross member. By loosening the bolt **90**, and turning the base plate **86** the driving roller **74** may be positioned at any desired angle to the axis of the pipe **50**, in order to move the pipe longitudinally through the apparatus while rotating the same. Upright angle members **92** are secured to the base in spaced apart relation, and between the angle members a vertically movable carriage **94** is positioned, which carriage is supported on coil springs **96**, whose lower ends bear on spring plates **98**, and upon whose upper ends the carriage rests. The carriage is provided with openings **100**, through which fastening means, such as the bolt **102** extend, which bolts extend through the coil springs **96**, and are secured at their lower ends to the spring plates **98**. The bolts **102** may conveniently be provided with lock nuts **104**, which may be screwed down against the carriage to limit the upward movement of the same by the coil springs.

The carriage **94** supports suitable bearings, such as those indicated at **106**, through which the shaft **108** of the driving roller **74** extends, this roller being positioned centrally of the carriage. Also journaled in the carriage **94** is a shaft **110**, which carries a pulley **112**, about which a driving belt **114** extends, which belt extends upwardly to pass over a pulley **116** fixed on one end of the shaft **108** extending beyond the carriage. Each of shafts **110** is provided with a universal joint **118**, by which it is connected to a shaft **120**, to be rotated thereby, said shaft **120** being provided with a pulley **122**, adapted to be driven by means later to be described in detail.

As best seen in Figure 4, the plates **30** are secured to the uprights **26** by suitable fastening means such as bolts **124**, and these plates may be provided with vertical slots, through which the bolts extend, whereby the bolts may be loosened to permit the plates to be moved vertically. The channels **32** may thus be moved vertically to adjust the position of the inner casing **36** upwardly or downwardly, in order that the apparatus may be adjusted to accommodate pipes of varying diameters.

The mechanism by which the various parts of the apparatus are driven is best illustrated in Figures 5 and 6, wherein a prime mover, such as an electric motor, is indicated at **126**, whose shaft **128** is connected to suitable clutch mechanism **130**, by which the motor may be coupled to a shaft **132** to rotate the same. The shaft **132** carries a pulley **134**, which is drivingly connected with a pulley **136**, by a driving belt **138**, the pulley **136** being mounted on the shaft **140** of a suitable blower **142**, which serves as a source of pressure fluid to be supplied to the inlet housing **58** attached to the inner casing **36**. A pulley **144** is also mounted on the shaft **132**, which pulley is drivingly connected to a pulley **146**, through the intermediation of a driving belt **148**, the pulley **146** being attached to one end of a shaft **150**, which in turn carries a pulley **152**, connected in driving relation to the impellers **52**.

As best seen in Figure 3 each of the impeller shafts **54** carries a pulley **154**, about which a driving belt **156** passes in a manner to rotate the impellers in opposite directions. The belt **156** also passes over idler pulleys **158** and **160**, suitably supported for engagement with the belt to maintain the same in properly tightened condition to rotate the impellers.

A third pulley **162** is carried by the shaft **132**, by which a driving belt **164** is driven, which belt passes about a pulley **166** attached to a countershaft **168**. The countershaft **168** also carries a pulley **172**, which is suitably belted as indicated at **174** to a pulley **176** attached to another shaft **178**, which carries a sprocket **180** over which the driving chain **22** passes, by which the drum **10** is rotated.

Shaft **168** also carries a sprocket **182**, which is connected in driving relation with another sprocket **186**, through the intermediation of a chain **184**, the sprocket **186** being attached to a shaft **188**, which drives the gear mechanism **170**.

A countershaft **190** is connected to be driven from the gear mechanism **170** through a pulley **192**, attached to the shaft **194** of the mechanism, which is drivingly connected by a belt **196** to a pulley **198** carried by the countershaft. The countershaft carries at its opposite ends pulleys **200**, which are drivingly connected to the pulleys **122** by belts **202**, to rotate the driving rollers **74**, by which the pipe **50** is rotated and moved longitudinally through the apparatus.

Suitable idler rollers **204**, carried by suitably supported shafts **206**, may be provided in engagement with the drive chain **22**, for maintaining the chain tightly engaged with the ring gear **20** of the drum **10**.

By operation of the prime mover **126**, it will be apparent that the drum **10** may be rapidly rotated about the pipe **50** and the impellers **52** may be rotated to impel the shot from the hopper opening **40** downwardly against the outer surface of the pipe, while the pipe is being rotated and moved longitudinally through the apparatus by means of the driving rollers **74**. The gear mechanism **170** is provided for the purpose of suitably regulating the speed of rotation of the driving rollers **74**, whereby the speed of rotation and longitudinal movement of the pipe through the apparatus may be suitably regulated to ac-

complish the most effective cleaning of the pipe by the shot blast.

In making use of the invention, as described above, the pipe **50**, which may be supported on conventional track means, not shown, is extended through the drum and through the inner casing **136**, the rollers **74** being urged upwardly into engagement with the pipe by the coil springs **96**, and the rollers **76** being moved downwardly into engagement with the pipe and secured in contact therewith by the bolts **84**, extending through selected ones of the openings **82** in the uprights **26**. A quantity of shot is placed within the drum **10**, and upon operation of the prime mover **126**, the drum and pipe are rotated in a manner previously described, whereby the shot is elevated by the blades **66**, and deposited in the hopper at the upper end of the inner casing. The shot then passes by gravity through the opening **40** to be received between the impellers **52** and impelled against the outer surface of the pipe. After impinging on the pipe the shot falls downwardly in the casing **136** and passes out through the chute **144** back into the drum, whence it is again elevated by the blades **66** and deposited in the hopper. As the shot passes downwardly into the chute **44** a blast of air is discharged through the shot from the discharged opening **60**, so that scale, dirt, or other deleterious matter is separated from the shot and blown through the opening **64** into the exhaust housing **62**, whence it is removed to any desired location.

By suitably adjusting the speed of rotation of the drum **10**, and the speed of rotation of the impellers **52**, and controlling the movement of the pipe through the apparatus, the outer surface of the pipe may be effectively freed of all scale, corrosion, or the like, so that the pipe will then be in condition for the application of a preservative coating thereto, or for any other desired treatment.

It will thus be seen that the invention provides apparatus for carrying out a continuous cleaning operation on metal pipes or other tubular articles, and which is operable with a minimum of attention and labor, thus greatly reducing the time and expense involved in carrying out such cleaning operations by the use of apparatus of the type commonly employed heretofore for that purpose.

The invention has been disclosed in connection with a particular embodiment of the same, but it will be understood that this is intended by way of illustration only, and that numerous changes can be made in the construction and arrangement of the various parts, without departing from the spirit of the invention and within the scope of the appended claims.

Having thus clearly shown and described the invention, what is claimed as new and desired to secure by Letters Patent is:

1. In pipe cleaning apparatus, a casing adapted to surround a pipe to be cleaned and whose lower end is open, means for supporting the casing in a stationary position, a receptacle in the casing above the pipe and having an opening through which shot may be discharged downwardly in a substantially continuous vertical path against the exterior of the pipe, impeller means in the casing extending across said path in position to engage the shot from said opening and propel the same against the pipe, means supported by the casing in position to direct a stream of fluid under pressure across the path of the shot in the casing beneath the pipe to separate particles of foreign matter from the shot, a rotatable drum surrounding the casing in position to receive the shot discharged from the lower end of the casing, and means in the drum for carrying the shot upwardly upon rotation of the drum to deposit the shot in said receptacle.

2. In pipe cleaning apparatus, a casing adapted to surround a pipe to be cleaned and whose lower end is open, means for supporting the casing in a stationary position, a receptacle in the casing above the pipe and having an opening through which shot may be directed downwardly in a substantially continuous vertical path toward the pipe, impeller means rotatably mounted in the casing extending across said path in position to engage the shot from said opening and propel the shot against the pipe, a rotatable drum surrounding the casing in position to receive the shot discharged from the lower end of the casing, means in the drum for moving the shot upwardly upon rotation of the drum to deposit the shot in the receptacle, rotatable means engageable with the pipe to rotate the pipe and move the pipe longitudinally through the casing, and means for simultaneously rotating said drum, impeller means and rotatable means.

3. In pipe cleaning apparatus, a casing adapted to surround a pipe to be cleaned and whose lower end is open, means for supporting the casing in a stationary position, an upwardly opening receptacle in the casing above the pipe and having an opening through which shot may be discharged downwardly in a substantially continuous vertical path toward the pipe, impeller means rotatably mounted in the casing and extending into said path in position to engage the shot from said opening and propel the shot against the pipe, means supported on the casing for directing a stream of fluid across the path of the shot through the casing beneath the pipe to separate foreign matter from the shot, a rotatable drum surrounding the casing in position to receive shot discharged from the lower end of the casing, means in the drum for carrying the shot upwardly upon rotation of the drum said means being positioned to deposit the shot in the top of said receptacle, rotatable means engageable with the pipe to rotate the pipe and move the pipe longitudinally through the casing, and means for simultaneously rotating said drum, said impeller and said rotatable means.

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