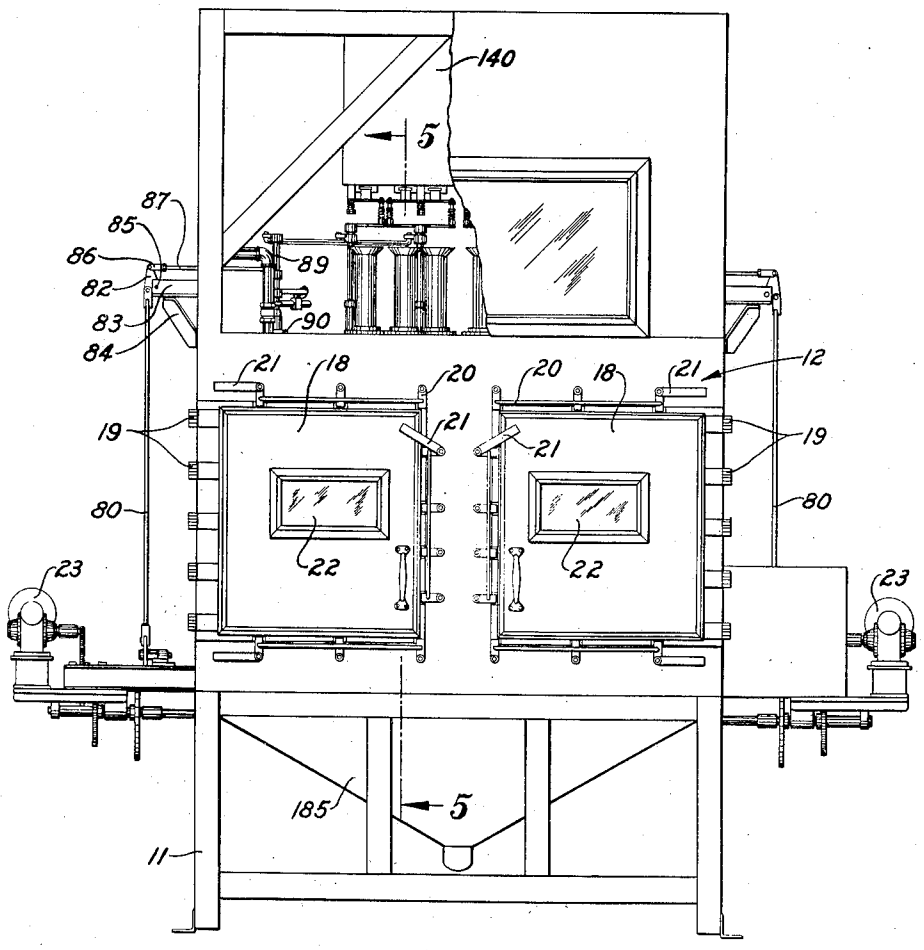
Nov. 29, 1949 B. F. FOWLER 2,489,877

PEENING APPARATUS

Original Filed May 2, 1946 4 Sheets-Sheet 1

Fig. 1



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PEENING APPARATUS

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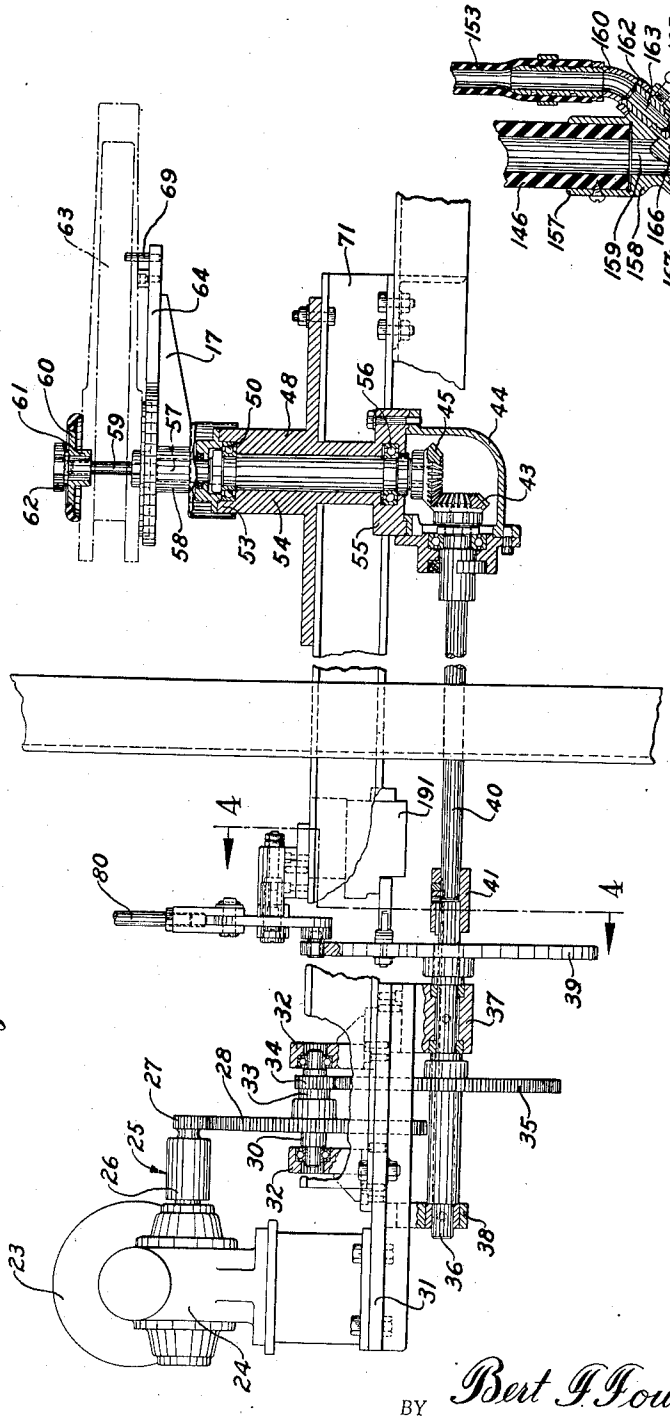


Fig. 2

Fig. 7

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PEENING APPARATUS

Original Filed May 2, 1946 4 Sheets-Sheet 3

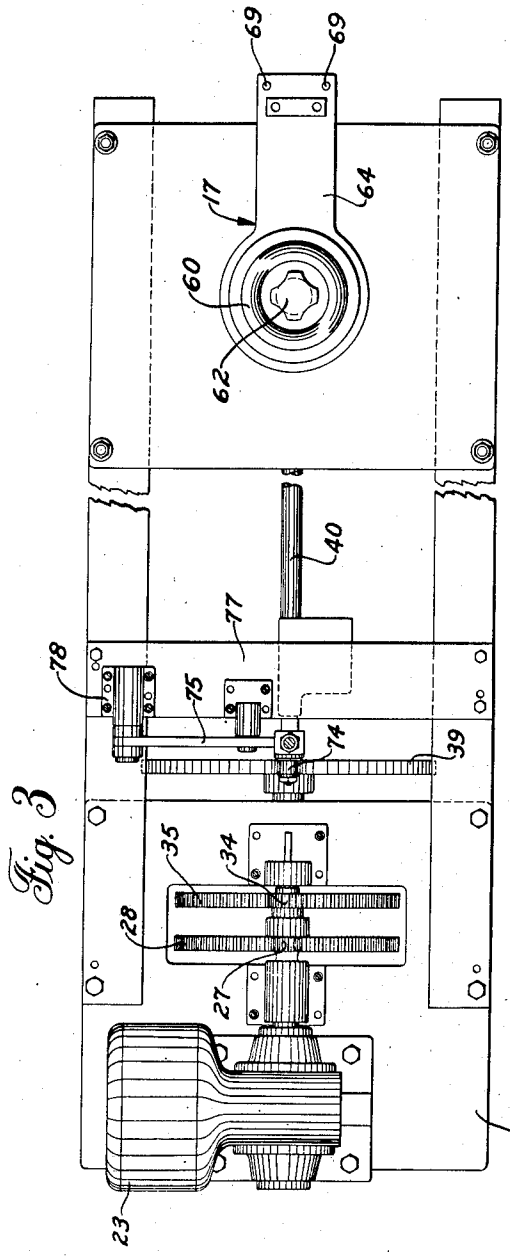


Fig. 3

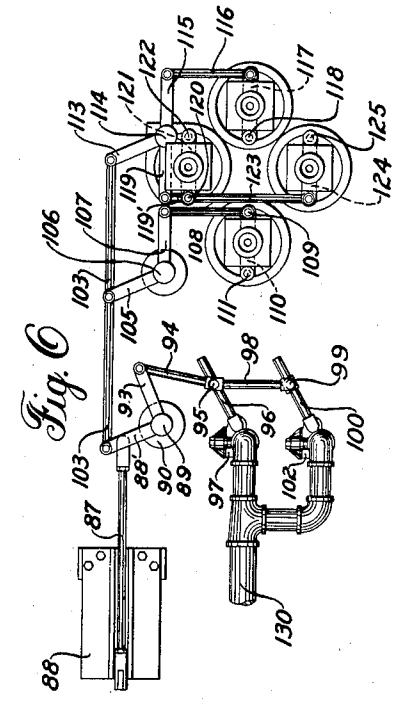


Fig. 6

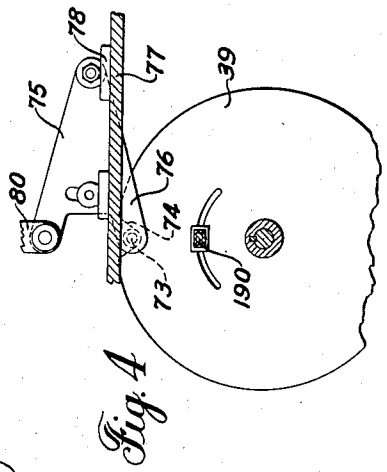


Fig. 4

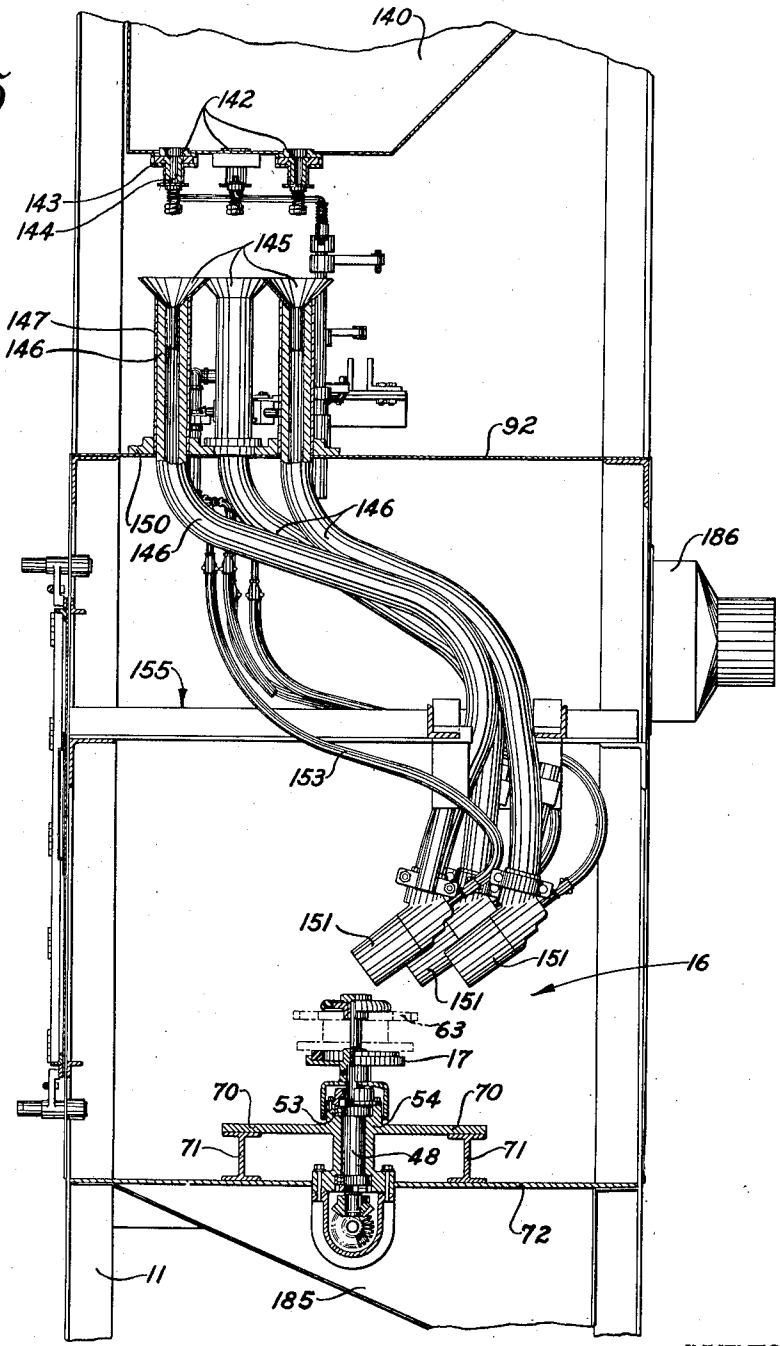
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PEENING APPARATUS

Original Filed May 2, 1946 4 Sheets-Sheet 4

Fig. 5



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Patented Nov. 29, 1949

2,489,877

UNITED STATES PATENT OFFICE

2,489,877

PEENING APPARATUS

Bert F. Fowler, Vero Beach, Calif., assignor to The Studebaker Corporation, South Bend, Ind., a corporation of Delaware

Original application May 2, 1946, Serial No. 666,773. Divided and this application February 9, 1948, Serial No. 7,261

11 Claims. (Cl. 51—15)

1

My present invention relates to an improvement in peening apparatus of the type in which shot is caused to be projected upon metal articles to remove fissures or other imperfections therein and thereby materially increase the mechanical strength of the article.

My present application is a division of my copending application Serial No. 666,773 filed May 2, 1946.

So far as I am aware most prior forms of apparatus of the above character usually comprises a centrifugal wheel upon which shot is caused to be fed and which wheel is rotated at high speed so that the shot is projected by centrifugal force with considerable force upon a metal article being peened.

These prior forms of apparatus are unsatisfactory for several reasons. Perhaps, the foremost disadvantage lies in the fact that it is difficult to control within narrow limits the desired peening of an article with the shot. This difficulty is due to the inability to effect the control in such apparatus of the amount of shot being projected upon an article with a predetermined amount of force so that the resultant peening of the article is not always uniform Further, such prior apparatus is only effective to project shot in the plane of rotation of the centrifugal wheel, and for irregularly shaped articles is unsuitable in that only that part of the article caused to be passed through the plane of rotation of the wheel is caused to be peened.

It is an object of my present invention to provide peening apparatus having nozzle means through which shot is adapted to be discharged comprising work supporting means of a character for subjecting substantially all portions of an article supported thereon to the shot discharged through the nozzle means.

A further object of my invention is to provide peening apparatus having nozzle means through which shot is adapted to be discharged comprising work supporting means for supporting an article to be peened, drive means for driving the work supporting means, and means under the control of the driving means for controlling the delivery of shot and air under pressure to the nozzle means for discharge of the shot through the nozzle means upon the article to be peened.

A further object is to provide an apparatus as last aforesaid having means for automatically controlling the flow of shot and air under pressure to the nozzle means for a predetermined length of time providing a cycle of operation for the apparatus in the peening of article therewith.

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In order to accomplish the aforesaid objects, I propose to provide an apparatus having a work supporting member for supporting an article to be peened. The apparatus further comprises a hopper or other suitable receptacle for supporting shot to be used in the peening operation, and which shot through suitable valve means is adapted to be delivered to a conduit feeding into a nozzle means through which the shot is to be discharged upon the work supported on the work supporting member. The nozzle means further is adapted to have connection through a conduit with a source of air under pressure with air under pressure flowing through the nozzle means being effective to discharge therefrom the shot being fed from the hopper to project the shot upon the article. Thus the shot to be projected upon the article is caused to be delivered to the nozzle means, and the air under pressure is effective to cause the shot to be impinged upon the article with the force thereof being controllable by controlling the amount and pressure of the air delivered to the nozzle. Further the extent of peening is controllable by means providing for predetermining the amount of shot delivered to the nozzle means.

The previously referred to valve means controlling delivery of shot to the conduit leading to the nozzle means together with valve means connecting the air pressure conduit with the nozzle means are caused to be automatically closed upon the completion of a cycle of a predetermined length of time of treatment of an article with the shot. Upon completion of such cycle, the valve means for the shot and the air are caused to be closed terminating the predetermined period of shot blasting of the article.

In the preferred form of my invention the valve means controlling the delivery of shot to the nozzle means and the nozzle means are provided with replaceable orifice members for controlling the amount of shot adapted to be delivered to the nozzle means and the velocity of air under pressure adapted to be delivered there through to control the amount and force with which the shot is caused to be impinged upon an article being treated.

The above and other objects and advantages of my invention will appear from the detail description.

Now, in order to acquaint those skilled in the art with the manner of constructing and utilizing apparatus in accordance with my invention, I shall describe in connection with the accom-

panying drawings a preferred embodiment of my invention.

In the drawings:

Figure 1 is a front elevational view of apparatus constructed in acordance with my invention with the upper housing portion of the apparatus being broken away to illustrate the supply hopper for the shot and associated parts;

Figure 2 is a side elevational view with certain parts being shown in section, and with the enclosing housing of the apparatus removed to show the manner in which an article is adapted to be supported and rotated within the shot blasting chamber of the apparatus of Figure 1;

Figure 3 is a plan view of the portion of the apparatus shown in Figure 2;

Figure 4 is a detail vertical sectional view taken substantially on the line 4—4 of Figure 2 looking in the direction indicated by the arrows illustrating timing cam means for controlling the cycle of operation of the apparatus;

Figure 5 is a detail vertical sectional view taken substantially on line 5—5 of Figure 1, looking in the direction indicated by the arrows with certain of the parts being broken away and shown in section for clearness of illustration;

Figure 6 is a plan view of a portion of the control means for controlling the flow of shot and air under pressure to nozzle means for projecting the shot upon an article being treated; and

Figure 7 is a detail lengthwise sectional view through a preferred form of nozzle means of the apparatus of my invention.

Referring now to Figure 1, the apparatus 10 of my invention comprises a supporting platform 11 formed of suitable structural steel frame members for supporting a housing 12 which in the embodiment of my invention herein disclosed comprises a pair of shot blasting chambers 16—16, in which articles to be shot blasted or peened are caused to be supported upon a work supporting platform means 17, shown in detail in Figures 2, 3 and 4, with each of the chambers 16 being adapted to be closed at the front of the apparatus by doors 18—18 hingedly mounted as at 19 along opposite side edges of the front wall of the apparatus. Suitable known link locking mechanisms 20 are associated with each of the doors 18—18 and are operable through the handle members 21 for opening and closing the doors and through which the work to be shot peened is adapted to be disposed within the chambers 16—16. The doors 18 are further provided with windows 21 through which peening of the articles may be observed.

In the particular form of apparatus 12 shown in the drawings a pair of chambers 16 are shown, and the description of my invention hereinafter will be limited to the means associated with the chamber at the left of Figure 1 for effecting the shot peening of an article disposed therein, it being understood in the apparatus shown the parts hereinafter described are duplicated for the other or right chamber of Figure 1 to provide an apparatus in which two parts may be caused to be shot peened by a single operator of the apparatus.

Referring now more particularly to Figures 2, 3 and 5, it will be observed that the mechanism associated with the left hand chamber 16 of Figure 1 comprises an electric motor 23 housed as an integral unit with a gear reduction mechanism 24 of known construction and in which the armature shaft of the electric motor has connection with the gear means of the gear reduction

unit 24. The output shaft of the gear reduction unit has a pinion means 25 suitably keyed thereto as by means of the intergral sleeve 26 thereof having drive fitting engagement with the output shaft of the gear reduction unit 24. A pinion 27 at the outer end of the sleeve portion 26 has meshing engagement with a gear 28 carried by a shaft 30, the opposite ends of which are suitably journaled in ball bearing assemblies supported within a pair of brackets 32, 32 carried on a horizontal extending frame or panel member 31. A pinion means 33 is also suitably secured to the shaft 30 and the teeth 34 integral therewith has meshing engagement with a gear 35 keyed to a shaft 36 which is journaled intermediate its ends in a suitable bracket 37 and with the shaft 36 at its outer end being rotatably supported in a bracket 38 fixed to member 31. The shaft 36 at its inner end has a cam 39 suitably keyed thereto with the inner end of the shaft 36 having connection with a shaft 40 by means of a keying member 41 of known construction. The inner end of the shaft 40 has a bevel gear 43 fixed thereto with the inner end of the shaft 40 being suitably supported and mounted for rotation in a gear box housing 44 of known construction. The bevel gear 43 is adapted to have constant meshing engagement with a bevel gear 45 fixed to one end of a vertically extending shaft 48 which at its upper end is journaled in a ball bearing assembly 50, the outer race of which is supported in the upper end of a sleeve portion 53 extending coaxially of the shaft 48 of a supporting member 54, and which sleeve portion is enlarged to form a closure plate portion 55 forming part of the gear housing 44 and in which a second ball bearing assembly 56 is provided for rotatably supporting the shaft 48. The shaft 48 at its upper end is provided with a reduced end portion 57 adapted to fit in a socket formed in the work supporting member 17 with the work supporting member 17 being further formed with an annular enclosing housing portion 58 into which the upper end of the sleeve portion 53 surrounding the shaft 48 projects and providing a support for rotation of the work supporting member 17, together with the shaft 48 about the axis thereof. A cap member 60 is provided with an annular sleeve portion 61 fitting over the reduced upper end 59 of the shaft and a nut 62 is adapted to have threading engagement with the upper end of the shaft to secure the member 60 in position to support an article 63 to be treated in the chamber 16 of the apparatus. The article 63 as shown in the embodiment of the apparatus of my invention herein disclosed is an articulating rod which is adapted to be secured in the position shown by the member 60 by the means described and in which the radially projecting arm portion 64 of the work supporting member 17 is provided with a pair of upwardly projecting pins 69 between which the outer end of the articulating rod is disposed so that the articulating rod is caused to be rotated with the work supporting member 17 when the shaft 48 is rotated.

As shown more clearly in Figure 5 the collar or sleeve portion 53 of supporting member 54 is provided with a plate portion 70 secured along opposite side edges thereof on a pair of spaced I-frame members 71—71 extending lengthwise of and parallel of the axis of the shaft 40 and resting upon a panel 72 closing the lower end of the chamber 16 and together with suitable framing members supporting the several parts last described.

Referring now more particularly to Figures 2, 3 and 4, it will be observed that the cam member 39 is provided with a substantially V-shaped notch 73 extending inwardly at a portion of the circumference thereof, and into which notch a roller 74 carried by a pin fixed in an ear or lug 76 of a lever 75 is adapted to have engagement with the edge of the cam member 39. The lever 75 is pivoted at one end in a bracket 78 fixed to a panel 77 supported on the supporting frame of the apparatus and the lever 75 has pivotal connection with a clevis at the lower end of a link 80 extending vertically along the adjacent end of the apparatus with a clevis at the upper end thereof having pivotal connection with a lever 82 pivotally supported in an angle iron member 83 which is supported by a reenforcing channel member 84 laterally of one end of the apparatus. The lever 82 is pivoted to the angle iron member 83 as at 85, and at 86 has pivotal connection with a horizontally extending rod 87 supported for horizontal reciprocal movement in a block 88 (See Figure 6). As shown more clearly in Figure 6, the rod 87 has connection at its other end with an arm 88′ secured to a vertically extending shaft 89 supported in a collar member 90 supported on a transversely extending plate or panel member 92 forming the upper end of the chamber 16. A lever 93 is connected to the shaft 89 and has a link 94 pivoted at one end thereto and at its other end to a connecting joint 95 fixed to the valve actuating handle 96 of an air valve 97 with a second link 98 extending from the connection 95 to a connector 99 fixed to a valve actuating handle member 100 for a second air valve 102. A rod or link 103 has pivotal connection adjacent the outer end of the arm 88′ at one end and intermediate its ends has pivotal connection with an arm 105 fixed to shaft 106 with a second arm 107 also fixed to shaft 106 having pivotal connection at its other end with one end of a link 108, the other end of which has pivotal connection at 109 with a valve 110 pivoted at its opposite end as at 111. The other opposite end of connecting link or rod 103 has pivotal connection with a link 113 fixed to shaft 114 and to which is also fixed a second link 115 having pivotal connection at its outer end with one end of a rod or link 116, the opposite end of which has pivotal connection with one end of valve 117 pivoted at its other end as at 118. A third arm 119 is also fixed to shaft 114 and has pivotal connection at its outer end with a first link or rod 119′ having pivotal connections as at 120 with a valve 121 pivoted as at 122 and with a rod or link 123 extending from the pivotal connection of the link 119′ with the valve 122, having pivotal connection with one end of a valve 124 and with the other end of valve 124 being pivoted as at 125. The arrangement is such that upon rotation of the timing cam 39 the roller 74 is adapted to ride on the periphery of the disk or cam element 39 in which position the connecting rod or link 80 is urged upwardly and which movement of the rod 80 through the lever member 82 effects movement of the rod 87 to the right, as viewed in Figure 6, rotating the several arm members described in a clockwise direction as viewed in this figure, and in which position air under pressure is caused to be delivered from a manifold 130 through the pair of valves 97 and 102, and with the several valve members 110, 117, 121 and 124 being moved to open position the purpose of which will be referred to hereinafter. It will be understood that the manifold 130 has suitable connection to a source of air under pressure, as for example a suitable air compressor (not shown) to provide for the flow of air under pressure through the valves 97 and 102 for a purpose to be described. Upon continued rotation of the cam member 39 the roller 74 drops into the V-shaped notch 73 extending inwardly of the periphery thereof whereupon the lever member 75 is caused to assume the position shown in Figure 4, and in which position downward movement of the rod or link 80 effects closing of the air valves 97, 102 and the several valve members 110, 117, 121, and 124 to closed position by movement of the rod 87 to the left as shown in Figure 3 through the linkage above described.

Referring now more particularly to Figure 5, it will be observed that a hopper 140 is disposed at the upper end of the frame of the apparatus and is adapted to contain the shot used for peening of the articulating rod 63 supported on the work supporting member 17. The hopper 140 has disposed in the lower bottom wall thereof a plurality of discharge metering members 142 mounted in brackets 143 suitably secured thereto and at the lower ends one each of which the valve members 110, 117, 121 and 124, previously described, are disposed below the discharge ends of the bores 144 which are adapted to be opened and closed by these several valve members, and which valve members in their open position as when the roller 74 is engaged with the outer peripheral surface of the timing cam member 39 are in their open position so that shot is adapted to be discharged therethrough into the funnel-shaped members 145 disposed therebelow. The funnel members 145 extend into the open upper ends of a plurality of conduits 146 of rubber or other suitable flexible material, and which at their outer ends are supported in metal sleeve members 147 suitably secured in the annular brackets 150 secured to the upper surface of the transversely extending panel member 92 enclosing the upper end of chamber 16. The conduits 146 each extend to a nozzle 151, shown in detail in Figure 7. Also, as shown in Figure 5, a plurality of air hoses 153, extend from air valves such as the air valves 97 and 102, previously described, with each of the air conduits also extending to one of the nozzle means 151. In the embodiment disclosed each of the air valves 97 and 102 have connection with a pair of conduits 153 one of which extends to a nozzle 151. Suitable angle bracket means indicated generally at 155 provides for the support of the several nozzles 151 of which there are four in the embodiment of the apparatus disclosed, in the position shown in Figure 5, and in a position to direct shot upon the articulating rod 63 for peening the latter. The supporting bracket means further provides for adjusting the positions of the nozzles within the chamber 16.

Referring now more particularly to Figure 7, it will be observed that the shot supply conduit 146 in the nozzle shown is secured in an annular sleeve portion 157 formed integrally of nozzle housing member 158 with the housing 158 being formed with a bore 159 in alignment with the bore of the conduit 146. An air conduit 153 also has connection with a tubular metal sleeve 160 which, as shown in Figure 7, is provided with an enlarged end portion 162 having threaded engagement with a metering orifice member 163 fitting in a bore 164 in the nozzle housing 158. A lock screw 165 provides for securing the metering orifice member 163 in position in the nozzle

housing 158. The nozzle housing member 158 is provided with a cylindrical member 165' having threaded engagement with a tapped counterbore 171 extending coaxially of a bore 166 intersecting the bore 159. An annular washer 167 is disposed adjacent and seats upon a shoulder formed at the outer end of the bore 166 and is secured in position by means of the aforesaid threaded engagement of member 165' with the nozzle housing. A sleeve member 173 is disposed within the member 165' and is retained therein by the turned in outer end of the sleeve 165'. The sleeve 173 is provided with a discharge bore 174 which, at its inner end, is provided with a funnel shaped portion 175 maintained in alignment with a circular opening or passage 177 formed in the washer 167 and into which the outer projecting end of the reduced cylindrical portion 178 of the metering element 163 projects. A resilient nozzle member 180 fits over the sleeve member 165' and at its inner end over the projecting end of the housing 158 at the counterbore 171 thereof receiving the member 165' and at its outer end is provided with a flared opening 182 through which the shot is caused to be projected upon the articulating rod 63 shown in the work supporting member 17. It will be observed upon air under pressure being admitted to the several conduits 153 to each of the nozzles 151 that the shot being fed through the conduits 146 into the bores 159 and the intersecting bore 166 that it is caused by the air being discharged through the reduced portion of the metering orifice members 163 to be discharged through the bores 174 of the members 173 upon the articulating rod 63.

The shot being discharged through the nozzle means 151 may be controlled by the provision of a desired metering member 144 at the lower ends of the hopper for effecting a predetermined rate of flow of shot into the several conduits 146 and together with the incorporation of the nozzle means 151 of an orifice member 163 providing for the delivery of air under pressure at a predetermined velocity to effect the discharge through the nozzle means of the combined air and shot through the bore 174 of the member 173 to provide for the peening of the articulating rod 63 with a predetermined amount of shot and propelled at a predetermined force. The screw 65 provides for the ready substitution of metering orifice member 163, as desired, and the metering orifices 144 at the lower ends of the hopper are suitably carried in the detachable supporting bracket members 143 to provide for the substitution thereof to provide for a predetermined delivery of shot into the conduits 146.

It is believed that from the above description of the embodiment of an apparatus constructed in accordance with my invention that the operation thereof will be readily understood. However, briefly, it will be seen that with the apparatus disposed in the position of the timing cam 39 shown in the drawings that the air valves such as that shown at 97 and 102 for the discharge nozzle member means 151, and together with the valve members for the shot discharge metering elements 142 associated with the hopper containing the shot in closed position that the door 18 may be opened and an articulating rod or other article to be treated suitably assembled upon the work supporting member 17. After the article to be treated has been arranged on the work supporting member the door 18 to the selected chamber 16 is closed and a tripping switch (not shown) is actuated to cause the electric motor through the gear means previously described to effect rotation of the work supporting member 17, and which drive mechanism through the cam 39 is effective to pivot the lever 75 and thereby effect upward vertical movement of the rod 80 to open the discharge valves for the shot and the air valves admitting air into the several conduits 153, one each extending to one of the nozzle means 151. Thus the shot is caused to be projected upon the articulating rod while the same is being rotated within the chamber 16 with the shot being projected in predetermined amount and with predetermined force upon the articulating rod 63. Preferably, the gear ratios between the pair of bevel gears 43 and 45 and the cam member 39 are such that upon one rotation of the cam member 39 the work supporting member is caused to be rotated once, or more if desired, and when the cam member reaches the position shown in Figure 3 the roller 73 drops into the V-shaped notch 74 shutting off the supply of air under pressure to the several nozzles 151 and of shot to the conduits 146 leading to the nozzles 151. As shown in Figure 4 the cam 39 has a switch actuating member 190 associated therewith and which is adapted to trip a switch 191 to stop the electric motor 23 and thus completing one cycle of operation for the apparatus so that the door 18 may now be opened and the treated article removed and another article to be treated arranged upon the work supporting member 17. The lower end of the apparatus is provided with a suitable collector pan 185 for collecting the spent shot which after being cleaned and graded is returned by suitable known means to the hopper. Also, as shown in Figure 5, a suitable conduit 186 to dust collector has connection with the chambers 16. It will be understood as previously related that the mechanism is duplicated for the other compartment 16 shown at the right of Figure 1, so that if desired a single workman may cause the alternate operation of the shot blasting apparatus associated with each of the chambers so that during the removal and insertion of one article in one of the chambers an article in the other of the chambers is undergoing shot peening.

I have above described the general nature and arrangement of an apparatus constructed in accordance with my invention, and it will be observed that the several nozzles may be readily adjusted upon the angle iron supporting bracket means 155 to provide for the arrangement of the nozzles with respect to the work to achieve the most advantageous shot peening of the metal articles being treated. It will be understood that the mechanism for effecting rotation of the work supporting member 17 may vary widely in form as well as the construction of suitable linkage mechanism to effect the opening and closing of the air valves and discharge valves for discharging shot through the nozzle with the mechanism constructed in accordance with the preferred embodiment herein disclosed being shown somewhat diagrammatically in that these parts may vary widely in their form and arrangement in apparatus constructed in accordance with my invention.

Primarily, my invention contemplates the provision of means such as the metering elements 144 providing for the feeding of a predetermined amount of shot through a conduit leading to a discharge nozzle which has associated with it a conduit for directing air under pressure thereto, and which by means of the association therewith of selected metering orifice members 163 provides

for the discharge from the nozzle of the shot delivered thereto with a predetermined amount of force to provide for a predetermined peening of a metal article.

Thus while I have shown what I consider to be the preferred embodiment of my invention, it will be understood that various modifications and rearrangements may be made therein without departing from the spirit and scope of my invention.

I claim:

1. Peening apparatus comprising the combination of work supporting means for rotatably supporting an article to be peened, drive means for rotating said work supporting means, nozzle means for discharging shot upon said article, means including first valve means for delivering shot to said nozzle means, means including second valve means for controlling flow of air under pressure to said nozzle means to discharge the shot delivered thereto by said last named means, and said drive means including means for conjointly controlling opening and closing of said first and second valve means.

2. Peening apparatus comprising the combination of a rotatably mounted work supporting member for supporting an article to be peened, drive means for rotating said work supporting member, nozzle means for discharging shot upon the article adapted to be supported on said work supporting member, a hopper for supporting a supply of shot, first valve means associated with said hopper and operable in its open position to effect discharge of shot from said hopper, first conduit means for receiving shot discharged through said first valve means and conducting the same to said nozzle means, second conduit means for conducting air under pressure to said nozzle means for discharging therefrom shot delivered thereto through said first conduit means, second valve means associated with said second conduit means and operable for closing the same to prevent flow of air under pressure therethrough, and cam means associated with said drive means and said first and second valve means for effecting conjointly opening and closing of said first and second valve means.

3. Peening apparatus comprising the combination of work supporting means for rotatably supporting an article to be peened, drive means for rotating said work supporting means, including a shaft means having gear means between the latter and said rotatably mounted work supporting member for rotating the latter, nozzle means for discharging shot upon the article adapted to be supported on said work supporting member, a hopper for supporting a supply of shot, first valve means associated with said hopper and operable in its open position to effect discharge of shot from said hopper, first conduit means for receiving shot discharged through said first valve means and for conducting the same to said nozzle means, second conduit means for conducting air under pressure to said nozzle means for discharging shot delivered thereto through said first conduit means, second valve means associated with said second conduit means and operable for closing the same to prevent flow of air under pressure therethrough, and means associated with said drive means and said first and second valve means including a cam member rotatable with said shaft means for conjointly controlling opening and closing of said first and second valve means in predetermined positions of said work supporting member.

4. The combination of claim 3 characterized by said drive means including said cam member being adapted to effect closing of the first and second valve means upon a single revolution of said work supporting means.

5. Peening apparatus comprising the combination of a rotatably mounted work supporting member for supporting an article to be peened, driving means including a shaft means having gear means between the latter and said rotatably mounted work supporting member for rotating the latter, nozzle means for discharging shot upon the article adapted to be supported on said work supporting member, a hopper for supporting a supply of shot, first valve means associated with said hopper and operable in its open position to effect discharge of shot from said hopper by gravity, first conduit means for receiving shot discharged through said first valve means and for conducting the same by gravity to said nozzle means, second conduit means for conducting air under pressure to said nozzle means for discharging therefrom shot delivered thereto through said first conduit means, second valve means associated with said second conduit means and operable for closing the same to prevent flow of air under pressure therethrough, and means associated with said drive means and said first and second valve means and including a cam member rotatable with said shaft means for conjointly controlling opening and closing of said first and second valve means in a predetermined position of said work supporting means.

6. Peening apparatus comprising supporting means for rotatably supporting an article to be peened, means for rotating said supporting means, nozzle means for discharging shot upon the article adapted to be supported by said supporting means, means including first valve means for delivering shot to said nozzle means, means including second valve means for delivering air under pressure to said nozzle means, and means associated with said driving means for conjointly opening and closing said first and second valve means at a predetermined position of said work supporting means.

7. Peening apparatus comprising the combination of movable work supporting means, drive means for driving said work supporting means, nozzle means for discharging shot toward said work supporting means, a hopper for supporting a supply of shot, valve means associated with said hopper and operable for discharging shot from the latter at a predetermined rate, first conduit means for receiving shot discharged through said valve means and conducting the same to said nozzle means, second valve means adapted to be associated with a source of air under pressure, second conduit means extending from said second valve means to said nozzle means for conducting air under pressure to the latter to discharge therefrom shot delivered through said first conduit means, and said drive means including means for conjointly opening and closing said first and second valve means.

8. Peening apparatus comprising the combination of movable work supporting means, drive means for driving said work supporting means, nozzle means for discharging shot toward said work supporting means, means including first valve means for delivering shot to said nozzle means, and means including second valve means for controlling flow of air under pressure to said nozzle means to discharge the shot delivered to said nozzle means by said first means, and said drive means including means for conjointly con-

trolling, opening and closing of said first and second valve means.

9. Peening apparatus comprising the combination of movable work supporting means, drive means for driving said work supporting means, nozzle means for discharging shot toward said work supporting means, a hopper for supporting a supply of shot, first valve means associated with said hopper and operable in its open position to effect discharge by gravity of shot from said hopper, first conduit means for receiving shot discharged through said first valve means and for conducting the same by gravity to said nozzle means, second conduit means for conducting air under pressure to said nozzle means for discharging therefrom shot delivered thereto through said first conduit means, second valve means associated with said second conduit means and operable for closing the same to prevent the flow of air under pressure therethrough, and said drive means including means for conjointly controlling opening and closing of said first and second valve means.

10. Peening apparatus comprising the combination of movable work supporting means, drive means for driving said work supporting means,

nozzle means for discharging shot toward said work supporting means, means including first valve means for delivering shot by gravity to said nozzle means, and means including second valve means for controlling the flow of air under pressure to said nozzle means to discharge the shot delivered to said nozzle means by said first means, and said drive means including means for conjointly controlling opening and closing of said first and second valve means.

11. Peening apparatus comprising movable supporting means for supporting an article to be peened, drive means for driving said work supporting means, nozzle means for discharging shot upon said article, means for delivering shot at a predetermined rate to said nozzle means, and means for delivering air under pressure at a predetermined velocity to said nozzle means to discharge the shot delivered thereto with a predetermined force, and said drive means including means for conjointly preventing flow of shot and air under pressure to said nozzle means.

BERT F. FOWLER.

No references cited.

Certificate of Correction

Patent No. 2,489,877 November 29, 1949

BERT F. FOWLER

It is hereby certified that errors appear in the above numbered patent requiring correction as follows:

In the grant, line 1, address of inventor, for "Vero Beach, California", read *Vero Beach, Florida;* in the heading to the printed specification, line 3, for "Vero Beach, Calif." read *Vero Beach, Fla.*;

and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 28th day of March, A. D. 1950.

[SEAL]

THOMAS F. MURPHY,
Assistant Commissioner of Patents.