

June 13, 1944.

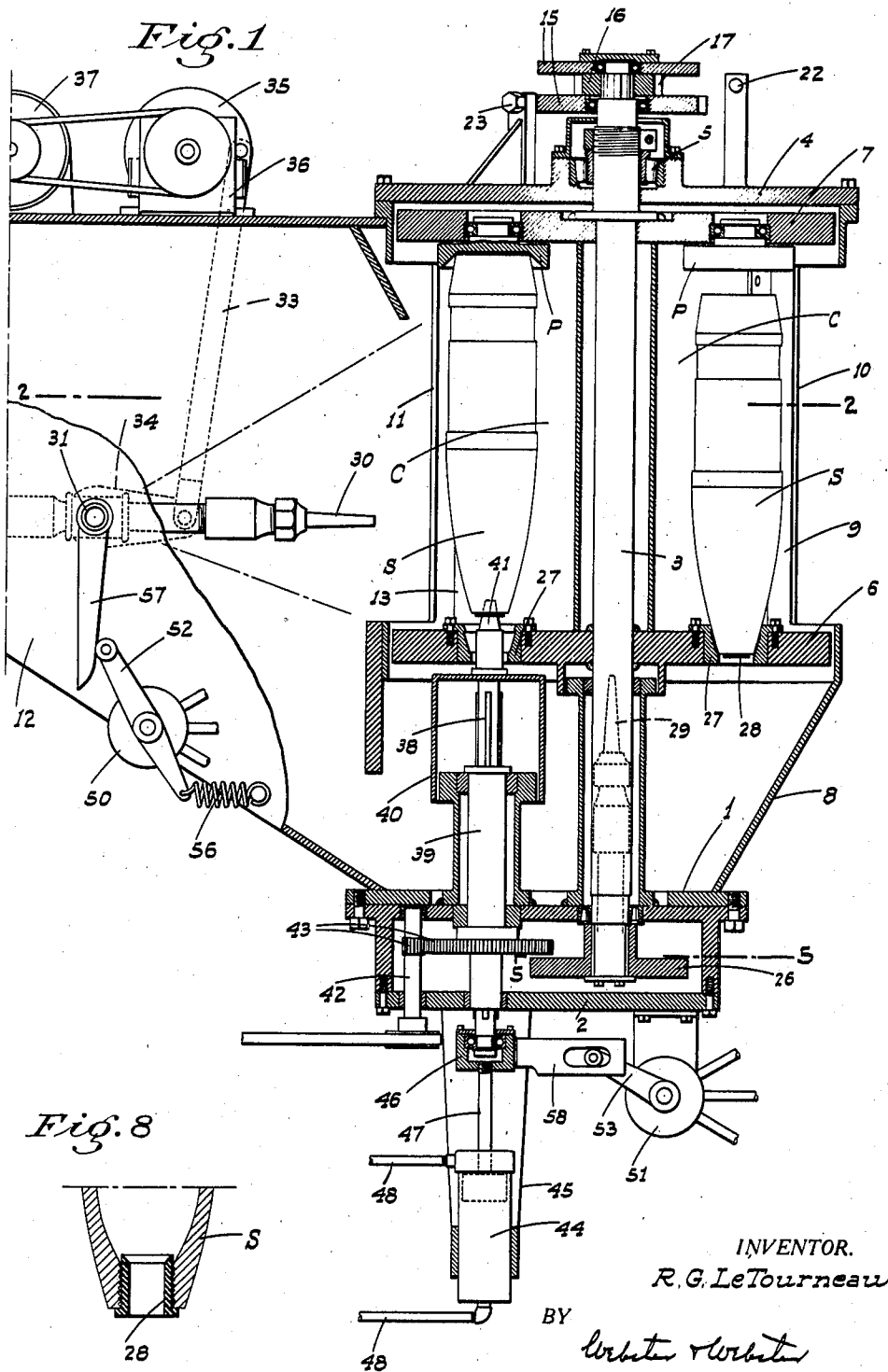
R. G. LE TOURNEAU

2,351,272

SAND BLASTING MACHINE

Filed June 23, 1942

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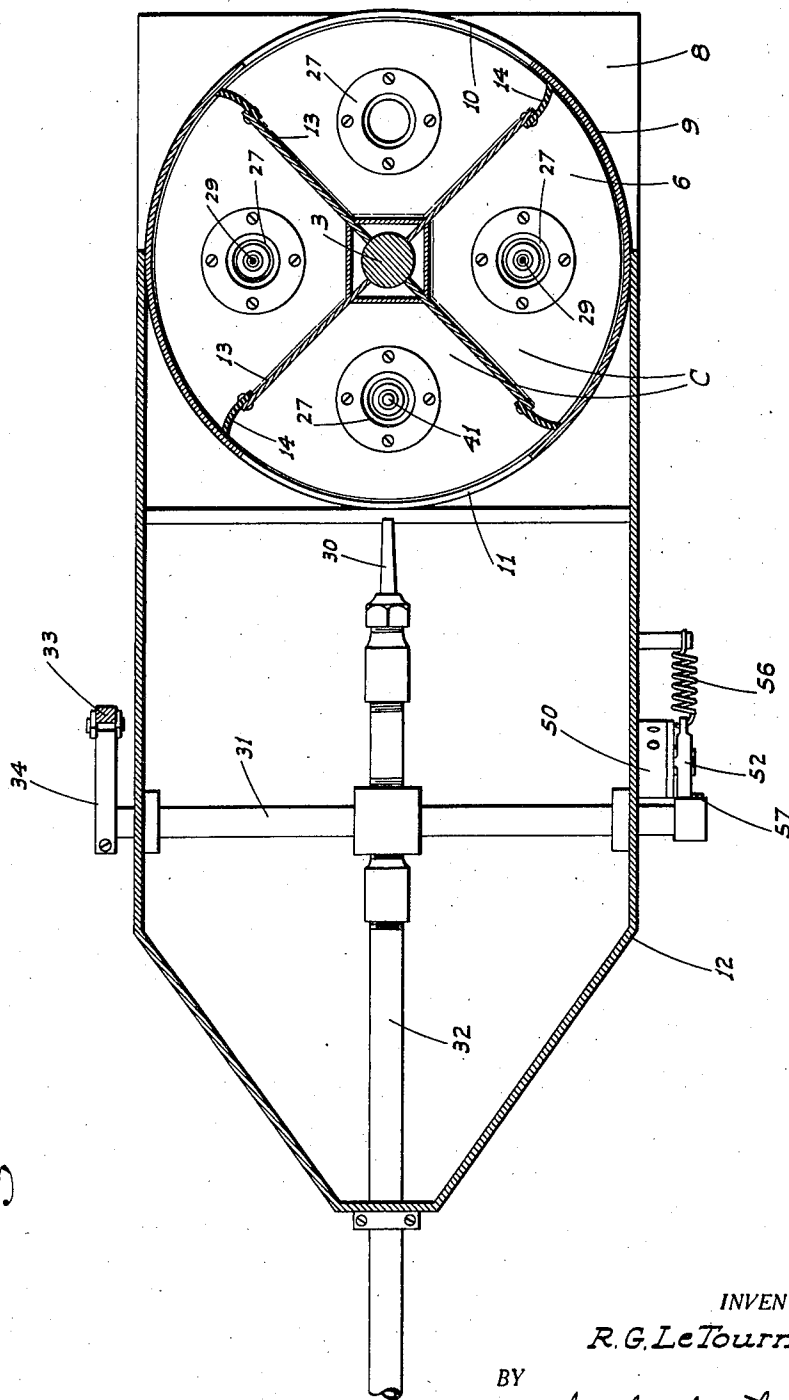
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Fig. 2



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Fig. 3

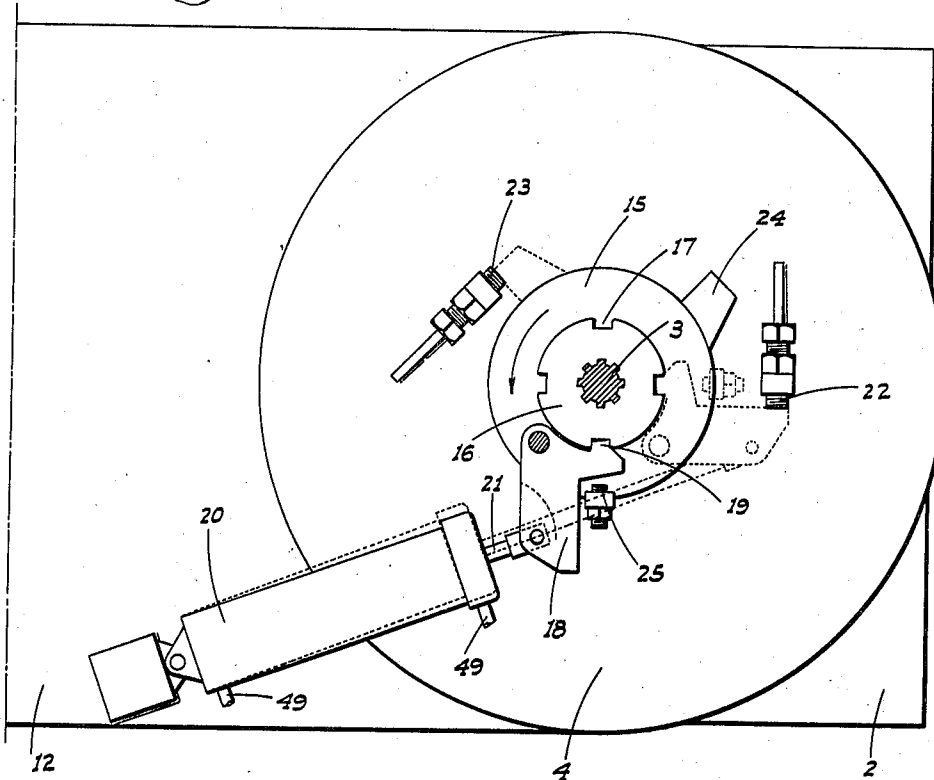


Fig. 4

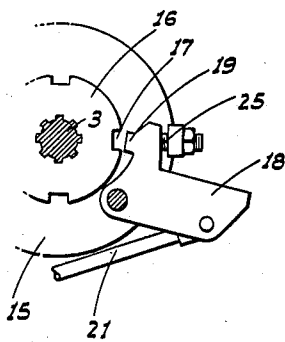
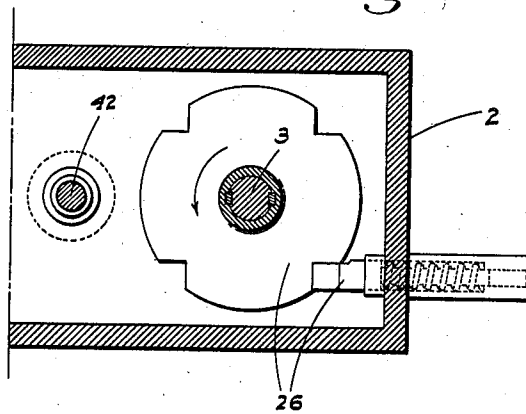


Fig. 5



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Fig. 6

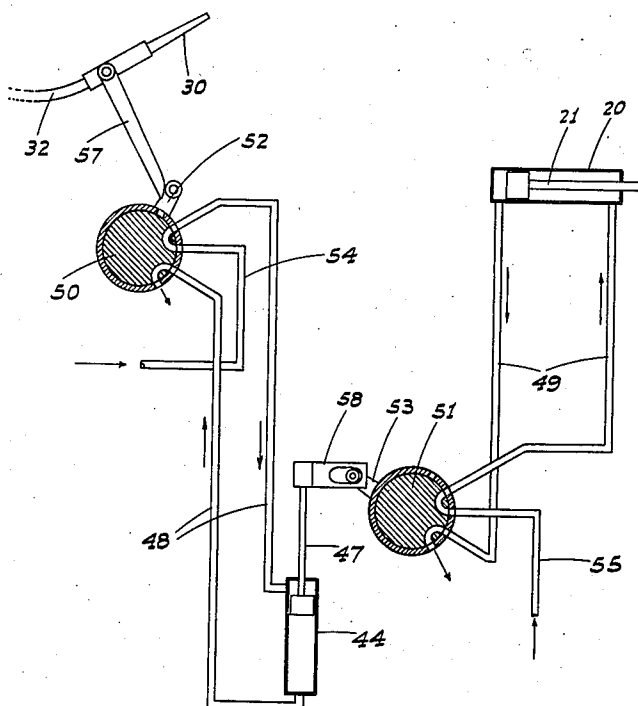
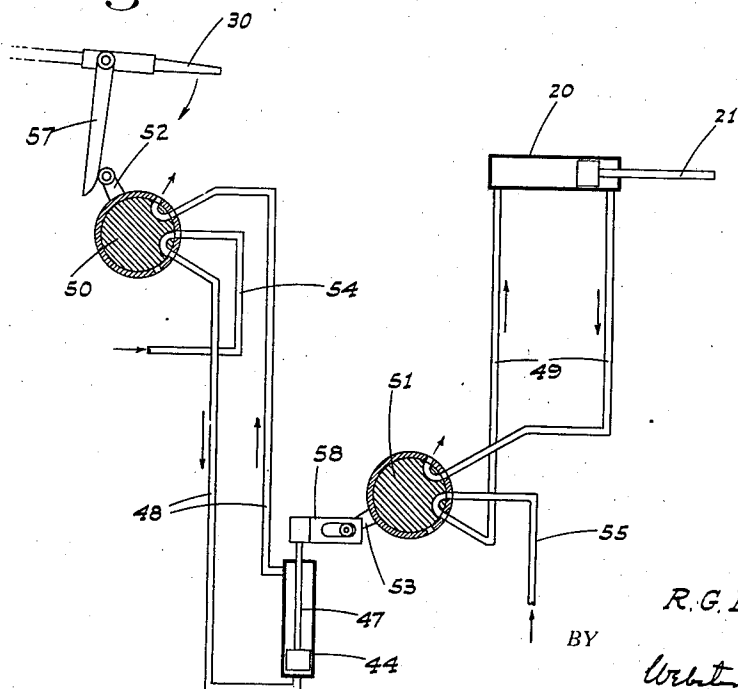


Fig. 7



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SANDBLASTING MACHINE

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16 Claims. (Cl. 51—15)

The present invention is an improved sand blasting machine, particularly a machine for sand blasting the exterior and interior of hollow members open at one end; the machine being especially designed to sand blast ordnance shells during the course of manufacture thereof.

The principal object of the invention is to embody in a sand blasting machine such structure as is operative to automatically function to sand blast the exterior and interior of a hollow member open at one end.

A further object of the invention is to provide a sand blasting machine which includes, in combination with a turntable arranged to support a plurality of circumferentially spaced hollow members open at one end, mechanism to automatically and intermittently rotate the turntable through a partial revolution of predetermined extent; there being sand blasting nozzles disposed to blast the interior of the members when the turntable is in one position, and to separately blast the interior of the members when the turntable is in a different position.

An additional object is to incorporate in a sand blasting machine, as in the preceding paragraph, mechanism which is operative to rotate the members during the sand blasting of the exterior thereof; such blasting being accomplished through the medium of a nozzle mounted and actuated for swinging movement lengthwise of the member being treated.

The invention also has for an object the provision of a unique pneumatic actuating assembly to control both the intermittent rotation of the member supporting turntable, and the rotation of the member during the external sand blasting operation; such controls functioning in a predetermined cycle, as will hereinafter appear in detail.

A further object of the invention is to produce a simple and inexpensive device and yet one which will be exceedingly effective for the purpose for which it is designed.

These objects I accomplish by means of such structure and relative arrangement of parts as will fully appear by a perusal of the following specification and claims.

In the drawings similar characters of reference indicate corresponding parts in the several views:

Figure 1 is a fragmentary sectional elevation of the machine, illustrating artillery shells as the members being sand blasted.

Figure 2 is a sectional plan on line 2—2 of Fig. 1.

Figure 3 is a fragmentary plan view of the

power actuated pawl and ratchet assembly which intermittently rotates the turntable shaft.

Figure 4 is a fragmentary plan view of the assembly shown in Fig. 3, but here showing the pawl released from the ratchet wheel preparatory to return to normal position.

Figure 5 is a fragmentary section on line 5—5 of Fig. 1, illustrating the spring pressed pawl and the cooperating ratchet wheel which prevent reverse rotation of the turntable.

Figure 6 is a diagrammatic view of the pneumatic actuating assembly showing the pistons of the cylinders in the position they occupy during the exterior sand blasting cycle of one of the supported members; the main control valve having been actuated as at the end of such cycle but the pistons have not reacted.

Figure 7 is a diagrammatic view of the pneumatic actuating assembly showing the pistons of the cylinders in the position they occupy at the end of the turntable rotating cycle; the main control valve having been released as at the end of such cycle but the pistons have not reacted.

Figure 8 is a fragmentary section of a shell showing the thread-protecting ferrule mounted therein.

Referring now more particularly to the characters of reference on the drawings, the numeral 1 indicates a horizontal base suitably supported, and including a gear box or housing 2 therebelow. A vertical shaft 3 is journaled adjacent its lower end on base 1 and projects some distance thereabove to a head 4, where it is journaled as at 5; such shaft extending below base 1 and above head 4 as shown. Between base 1 and head 4 the shaft 3 is fitted with a turntable unit which includes a lower turntable disc 6 and an upper turntable disc 7 of the same diameter. The head 4 is supported by a case 8 which extends between the base and said head in surrounding relation to shaft 3; said case being circular, as at 9, and close fitting about the turntable unit, and this portion of the case having a front opening 10 and a rear opening 11. At the rear and in surrounding relation to rear opening 11, the case is extended laterally, as indicated at 12, to enclose said opening 11 and a movable sandblast nozzle, as will subsequently appear.

The turntable unit is separated into a plurality of separate chambers C by means of radial, upstanding partitions 13 secured on shaft 3 between discs 6; the outer edges of these partitions being fitted with flexible sweeps 14 which ride the inside surface of the circular portion 9 of case 8. The chambers C, with rotation of shaft 3 suc-

cessively register with the openings 10 and 11, and the shaft is correspondingly rotated a quarter turn at timed intervals by the following actuating assembly.

A pair of circular plates 15 are rotatably mounted on shaft 3 above head 4, while a ratchet disc 16 of smaller diameter is fixed on the shaft therebetween; the ratchet disc having four equally spaced notches 17 in the periphery thereof. A bellcrank shaped pawl 18 is pivoted between circular plates 15 adjacent but outwardly of ratchet disc 16, and one leg projects therefrom to a point beyond plates 15. The pawl includes a tooth 19 on the other leg positioned to engage in one of the notches 17.

A pneumatic power cylinder 20, of double acting type, is pivotally and horizontally mounted on case 8 in such position that the piston rod 21, which is pivoted at its outer end to the projecting leg of the pawl, functions on the advancing stroke to engage tooth 19 in one of the notches 17 and to then rotate plates 15, ratchet disc 16, and shaft 3 a quarter turn. Adjustable stops 22 and 23 on head 4 limit forward travel of pawl and plates 15 respectively to the desired quarter turn; the lowermost one of the latter having a projecting finger 24 which engages stop 23. On the retracting stroke of piston rod 21, the tooth is withdrawn from disc 16 and the pawl and plate assembly back up to position for a subsequent advancing cycle. A stop 25 limits movement of the pawl in a tooth retracting direction. A holding ratchet assembly, indicated generally at 26 and including a ratchet and spring pressed pawl, cooperate with shaft 3 within housing 2 and functions in opposition to the above described shaft rotating or actuating assembly, whereby to prevent counter rotation of said shaft, or drifting in a forward direction.

The members to be sand blasted, which are here shown as being ordnance shells, are disposed one in each chamber C; the opening 10 in case portion 9 being to permit placement and removal of said shells. In each chamber C the lower turntable disc is formed with an opening therethrough with an open socket 27 to receive the shell nose down and in supporting relation, as shown in Fig. 1. The shells are hollow, and open ended at the nose; this open end being threaded and fitted with a protective ferrule 28 of rubber or the like.

When the shells and corresponding chambers C are in the number two and four positions (considering the opening 10 the number one position) sand blast nozzles 29 upstanding from base 1 within case 8 below disc 6 discharge a constant sand blast stream through the corresponding sockets 27 into the interior of the shells supported thereon. These nozzles are fed from any suitable source.

The exterior sand blasting of the shells occurs at number three position, or when the corresponding chamber is in register with opening 11, and is accomplished by the following mechanism:

A sand blast nozzle 30 is disposed in case extension 12 and projects toward opening 11 intermediate the upper and lower ends of the latter; such nozzle being fixed on a cross shaft 31 for vertical swinging and reciprocating movement whereby with such movement to sand blast the shell in said registering chamber C from end to end; the shell being rotated as will be described hereinafter. The nozzle 30 is fed by a flexible hose 32 which is fed from the same source as nozzles 29.

The shaft 31 is rocked by means of a connecting rod 33 extending between a radial arm 34 on shaft 31, and a crank plate 35 driven at slow speed by a reduction gear box 36 on top of case extension 12; the gear box being driven by an electric motor 37. With actuation of motor 37, the nozzle 30 alternately sweeps up and down assuring sand blasting of the shell from end to end.

The shells, when in number three position, are rotated by means which comprises a vertical spindle 38 which is slidably but relatively non-rotatably disposed by splining in a vertical drive sleeve 39 journaled in connection with housing 2 and projecting above base 1; the sleeve being enclosed as shown, and the spindle above the sleeve carrying a dust hood 40 which protects all but the spindle tip 41. The sleeve 39 is driven from a counter shaft 42 by a pinion and gear 43; the counter shaft being constantly driven in suitable manner.

The spindle during each exterior sand blasting operation is elevated or slides upward so that the tip 41, which is tapered, frictionally engages the ferrule 28 of the adjacent shell in driving relation thereto, and also raises such shell from the corresponding socket 27 until the then upper end of the shell seats in a rotary and conforming centering plate P mounted on and depending from the upper turntable disc 7 in each chamber. When engaged between spindle tip 41 and centering plate P, a shell rotates and yet cannot fall from correct position.

The spindle 38 at the end of each exterior sand blasting operation lowers until the tip 41 clears turntable plate 6, whereupon the latter is free to make the next quarter turn under the influence of cylinder 20. Raising and lowering of spindle 38 is effected by a double acting power cylinder 44 mounted on a bracket 45 below housing 2; a cage and bearing 46 connecting the piston rod and lower end of rotary spindle 38.

In order to automatically control the movement of the pistons of cylinders 20 and 44, and in proper order in the sequence of operations, the following arrangement is employed:

The cylinders 20 and 44 each are connected with opposite end conduits 48 and 49 respectively; the conduits for each cylinder leading to a separate rotary two-way valve and which valves are indicated at 50 and 51. These valves include radial control levers 52 and 53 respectively, and upon movement of these levers from one position to another position, the valves reverse the air pressure feed to the cylinders and vent the opposite end thereof; the valves being supplied with air pressure from conduits 54 and 55.

The valve 50 is mounted on case extension 12 being held in the position shown in Fig. 7 by means of a tension spring 56. A radial trigger arm 57 is mounted on shaft 31 in position to strike valve lever 52 as the nozzle 30 swings upward; the exterior sand blasting cycle completing at the top of the up-stroke. The piston rods of cylinders 20 and 44 are in the relative positions shown in Fig. 6 during each exterior blasting operation; the piston rod 47 being advanced and the piston rod 21 retracted, valve 51 then being in a position to hold said rod 21 retracted.

As the nozzle 30 swings upward before the end of the stroke, trigger arm 57 engages lever 52 and turns valve 50 to the position shown in Fig. 6 as the stroke is completed. The cylinder 44 then reacts and its rod 47 retracts, causing retraction of spindle 38 to a point clear of turntable disc 6.

The turntable unit is now ready to be advanced a quarter turn by cylinder 20 and this results upon retraction of rod 47; the cage 46 carrying a slotted link 58 which engages with lever 53 of valve 51 and turns the same to feed pressure into the opposite end of cylinder 20; said valve being mounted in an adjacent position on and depending from housing 2. It will therefore be seen that as the spindle 38 and link 58 lower, the valve 51 assumes the position shown in Fig. 7, and the piston rod 21 is advanced to rotate the shaft 3 and turntable unit a quarter turn.

At the end of this turntable rotating cycle, which is quite rapid, the cylinders are in positions as in Fig. 7, but as the nozzle 30 begins the next downward sweep, and trigger arm 57 backs away from lever 52 and spring 56 reverses the valve 50, causing rod 47 of cylinder 44 to advance and elevate the spindle 38 and the corresponding shell. As rod 47 advances, valve 51 is reversed and rod 21 of cylinder 20 retracts preparatory to the subsequent turntable rotating cycle.

In short, the automatic actuation and reversal of valves 50 and 51 reciprocates the pistons of cylinders 20 and 44 at predetermined intervals, with the reciprocation of the piston rod of cylinder 20 having a slight lag relative to that of cylinder 44 whereby the apparatus functions to alternately elevate and rotate a shell at the number three position for exterior sand blasting, and rotate the turntable unit a quarter turn after the spindle 38 lowers and clears the turntable disc 6.

The operator of the machine removes each treated shell through opening 10 as the corresponding chamber comes into register therewith, and, as each cycle is of some duration, has sufficient time to replace an untreated shell.

The repeated or double blasting of the shell interior is necessary for the reason that a greater length of blasting time is required for the internal than for the external blasting, and to which latter operation the speed of the machine is geared.

From the foregoing description it will be readily seen that I have produced such a device as substantially fulfills the objects of the invention as set forth herein.

While this specification sets forth in detail the present and preferred construction of the device, still in practice such deviations from such detail may be resorted to as do not form a departure from the spirit of the invention, as defined by the appended claims.

Having thus described my invention, what I claim as new and useful and desire to secure by Letters Patent is:

1. In a sand blasting machine, a horizontally movable platform, drive means to move the platform through a predetermined path, said platform having a plurality of openings therethrough in spaced aligned relation lengthwise of said path, the platform being adapted to support a plurality of upstanding hollow members open at the lower end, and separately in register at said end with the openings, a pair of sand blast nozzles, one disposed to discharge into the interior of one of said members through the corresponding opening and the other disposed to simultaneously discharge against the exterior of one of said members, control mechanism for the drive means arranged to effect step by step movement of the platform and a predetermined time lag between each step, said openings successively aligning with said one nozzle upon such movement of the platform, and means to rotate said members

when each has moved to position for blasting by said other nozzle; said last named means including a driven spindle disposed below the platform in position to align with said openings at each step, and means to elevate the spindle when the platform is stationary whereby said spindle projects through one of said openings, and engages and rotates the corresponding member.

2. A sand blasting machine as in claim 1 in which said control mechanism functions to cause said last named means to elevate the spindle at approximately the beginning of each time lag, and to lower the spindle clear of the platform at approximately the end of each time lag.

3. In a sand blasting machine, a turntable disc, means supporting the disc for rotation, a cylindrical case closely surrounding the disc and projecting thereabove, upstanding partitions mounted on the disc, said partitions with the case forming separate chambers in the latter, means on the disc in each chamber to support an upstanding member to be sand blasted, said case having an opening therethrough in the side, automatically controlled, power driven means arranged to impart step by step rotation to the disc and to successively register said chambers with said opening, and a sand blast nozzle disposed to sand blast the exterior of a supported member when the corresponding chamber is out of register with said opening; said nozzle being positioned exteriorly of the case and the case having another opening registering with said corresponding chamber and through which other opening said nozzle discharges.

4. In a sand blasting machine, a turntable disc, means supporting the disc for rotation, a cylindrical case closely surrounding the disc and projecting thereabove, upstanding partitions mounted on the disc, said partitions with the case forming separate chambers in the latter, the disc having an opening therethrough in each chamber, means in each chamber to support an upstanding hollow member open at its lower end and with said end in register with the corresponding opening, automatically controlled, power driven means to impart step by step rotation to the disc, a sand blast nozzle mounted beneath the disc in position to successively register with and discharge through said openings into said members, and another sand blast nozzle mounted laterally of the case and in position to discharge toward the same, the case having an opening in the side through which said other nozzle discharges to blast the corresponding member, and the chambers successively registering with said opening in the case as the disc rotates step by step.

5. A sand blasting machine as in claim 4 in which said nozzles blast any given member at different steps of the disc; there being drive means to rotate each member only when its chamber is in register with said opening in the case, said drive means including a rotary drive element movable axially into the open lower end of said member.

6. A sand blasting machine as in claim 4 in which said nozzles blast any given member at different steps of the disc; there being separate means operative to swing said other nozzle to and from lengthwise of the members, other separate means operative to rotate each member only when its chamber is in register with said opening in the case, and control mechanism for said member rotating means functioning under the influence of said nozzle swinging means.

7. In a sand blasting machine, a turntable disc, means supporting the disc for rotation, a cylindrical case closely surrounding the disc and projecting thereabove, upstanding partitions mounted on the disc, said partitions with the case forming separate chambers in the latter; the disc having an opening therethrough in each chamber, means in each chamber to support an upstanding hollow member open at its lower end and in register with the corresponding opening, means to impart step by step rotation to the disc, a sand blast nozzle mounted to successively register with and discharge through said openings into said members at one step, a driven vertical spindle journaled below the disc to successively align with said openings at another step, means to raise and lower the spindle, the spindle when aligned with an opening and raised therethrough engaging and rotating the corresponding member, another sand blast nozzle positioned to blast the exterior of said members at said other step, and timed control mechanism for said disc rotating means and spindle raising and lowering means, said mechanism being operative to recurrently actuate the disc rotating means whereby to impart a step movement to the disc, and to alternately actuate the spindle raising and lowering means to raise the spindle and subsequently lower the same after a predetermined time lag.

8. A sand blasting machine as in claim 7 in which the disc rotating means and the spindle raising and lowering means each include a power cylinder, and a separate fluid pressure system for each cylinder; said control mechanism including a valve in each system, and the valve in the system corresponding to the disc rotating means being actuated by the power cylinder in the system corresponding to the spindle raising and lowering means.

9. A sand blasting machine as in claim 7 in which the disc rotating means includes a pawl and ratchet unit, a power cylinder connected to the pawl, and a fluid pressure supply system for said cylinder; said control mechanism including a valve interposed in said system.

10. A sand blasting machine as in claim 7 in which the disc rotating means and the spindle raising and lowering means each include a power cylinder, and a separate fluid pressure system for each cylinder; said other nozzle being mounted for vertical swinging movement and so actuated, and said control mechanism including a valve in each system; the valve in the system of the spindle raising and lowering means being actuated by means connected with said swinging nozzle, and the valve in the system of the disc rotating means being actuated by said spindle raising and lowering means.

11. In a sand blasting machine, a movable platform adapted to support hollow members open at one end and with said open end exposed, drive means to impart intermittent step-by-step movement of the platform through a predetermined path, a nozzle disposed to discharge a blast against the exterior of said members as each reaches a predetermined point in said path, and means to rotate each member as the same reaches said point; said member rotating means comprising a driven spindle normally disposed clear of the supported members, said spindle being mounted for movement to project one end of the same in driving engagement into the open end of a

member at said point, and means operative to move the spindle into engagement with each member as it reaches said point and to withdraw the spindle from said member after a predetermined time lag.

12. In a sand blasting machine, a movable platform adapted to support hollow members open at one end and with said open end exposed, drive means to impart intermittent step-by-step movement of the platform through a predetermined path, a nozzle disposed to discharge a blast against the exterior of said members as each reaches a predetermined point in said path, and means to rotate each member as the same reaches said point; said member rotating means comprising a driven spindle normally disposed clear of the supported members, said spindle being mounted for movement to project one end of the same in driving engagement into the open end of a member at said point, and means operative to move the spindle into engagement with each member as it reaches said point and to withdraw the spindle from said member after a predetermined time lag, said spindle actuating means being a fluid pressure actuated power cylinder.

13. A machine as in claim 11 in which the nozzle is mounted for swinging movement relative to a member at said point, and means to swing the nozzle; the spindle actuating means being responsive to swinging movement of said nozzle.

14. A machine as in claim 11 in which each member at its open end is removably fitted with an internal spindle engaging ferrule.

15. In a sand blasting machine, a movable platform adapted to support hollow members open at one end and with said open end exposed, drive means to impart intermittent step-by-step movement of the platform through a predetermined path, a nozzle disposed to discharge a blast against the exterior of said members as each reaches a predetermined point in said path, said nozzle being mounted for swinging movement relative to an adjacent member, means to swing said nozzle, and means to rotate each member as the same reaches said point, said last named means including a single driven element mounted for axial movement and operative to successively and frictionally engage in driving relation in the open end of the members.

16. In a sand blasting machine, a movable platform adapted to support hollow members open at one end and with said open end exposed, drive means to impart intermittent, step-by-step movement of the platform through a predetermined path, a nozzle disposed to discharge a blast against the exterior of said members as each reaches a predetermined point in said path, said nozzle being mounted for swinging movement relative to an adjacent member, means to swing said nozzle, and means to rotate each member as the same reaches said point, said last named means comprising a driven spindle mounted to successively engage in driving relation in the open end of each member at said point, and means operative to so engage the spindle with each member as it reaches said point and to withdraw the spindle from said member after a predetermined time lag, said last named means being responsive to swinging movement of the nozzle.

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