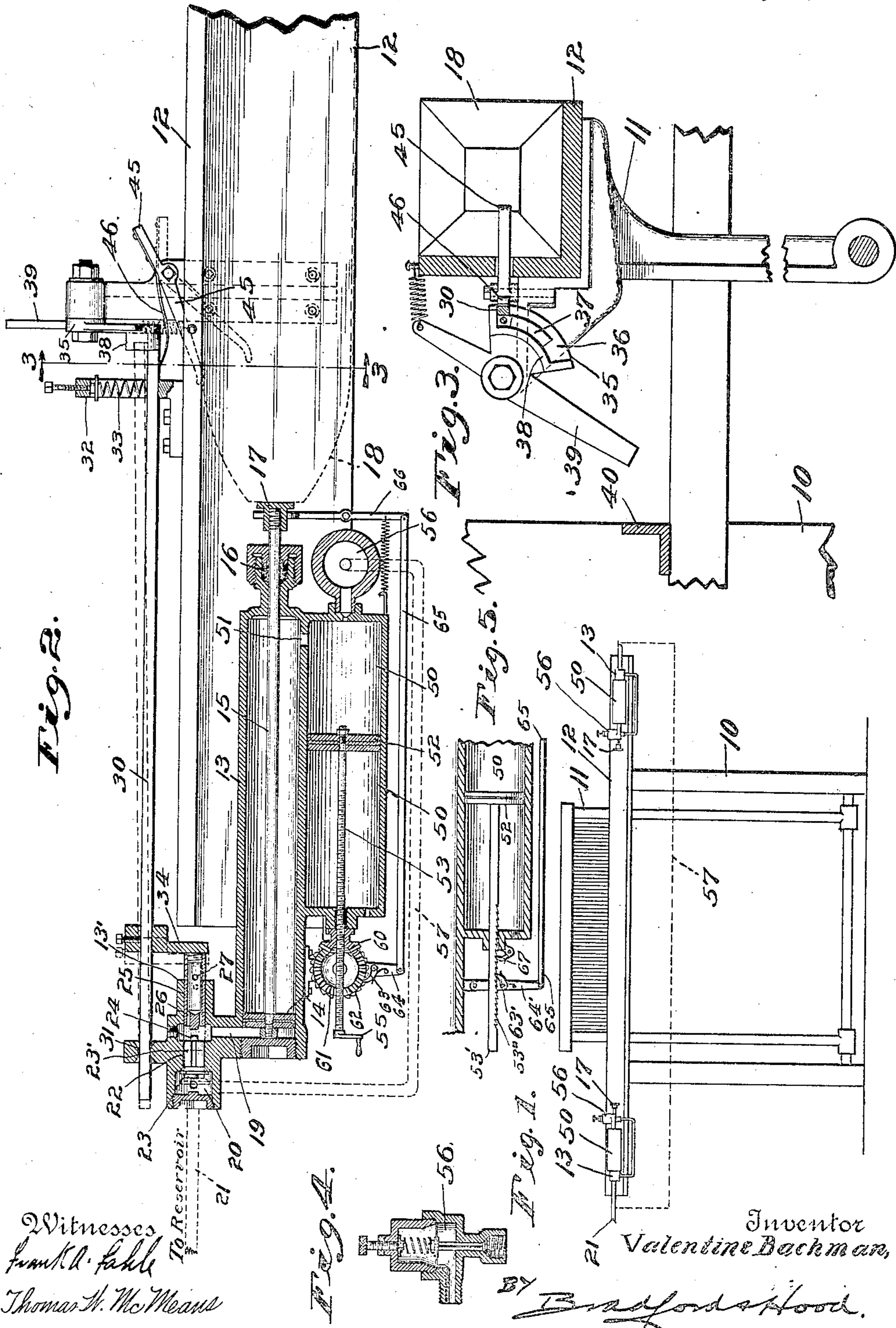


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SHUTTLE THROWER.

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921,658.

Patented May 18, 1909.



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Fig. 4.

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SHUTTLE-THROWER.

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Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, VALENTINE BACHMAN, a citizen of the United States, residing at Indianapolis, in the county of Marion and State of Indiana, have invented certain new and useful Improvements in Shuttle-Throwers, of which the following is a specification.

The object of my invention is to produce an apparatus for attachment to the lathe of a loom for automatically throwing the shuttle, the construction being such that the apparatus may be readily adjusted to throw the shuttle any desired distance and to properly cushion the shuttle at the end of its movement.

The accompanying drawings illustrate my invention.

Figure 1 is a diagrammatic view of a loom showing my apparatus in place; Fig. 2 an axial section of one of the devices, two of such devices being used on each loom; Fig. 3 a section on line 3-3 of Fig. 2, and Fig. 4 a detail of the pressure-reducing valve. Fig. 5 is a modification.

In the drawings, 10 indicates the main frame of the loom and 11 the lathe provided with the usual shuttle race 12. Mounted at each end of the shuttle race is one of my improved throwing devices, each of which comprises a main cylinder 13 having a piston 14 mounted therein. The rod 15 of piston 14 passes through a packing gland 16 and is provided at its outer end with a head 17 adapted to engage the shuttle 18, (shown in dotted lines in Fig. 2). Leading into the outer end of cylinder 13 is a supply passage 19 communicating through chamber 13 with a supply pipe 21 which leads from a suitable source of compressed air or other motive fluid. Arranged between passage 19 and chamber 20, is a valve seat 22 in which is seated an outwardly opening valve 23, said valve being provided with a stem 24 extending into the path of movement of an exhaust valve 25. Valve 23 is supported in the casing by a usual spider shank 23' and is normally closed by the pressure in chamber 20. Valve 25 fits snugly in the casing 13', which may be conveniently formed integral with cylinder 13, and is capable of an axial movement therein. Valve 25 at its inner end is closed except for some comparatively small exhaust passages 26, which form a communication between passage 19 and the exhaust openings 27 which, in the

normal position of the valve lie outside of the casing 13' so as to form a restricted passage between the atmosphere and the power end of cylinder 13. Arranged substantially parallel with the axis of valve 25 is longitudinally-movable operating rod 30 supported at one end in an opening 31 which permits slight swinging of the rod and at the other end supported in a bracket 32 having a spring 33 which normally holds the adjacent end of the rod at one extreme of its possible swing. Rod 30 carries a finger 34 adapted to engage the outer end of the valve 25.

Adjacent bracket 32 I mount a swinging segment 35 provided with a straight face 36 and a cam face 37, said cam face being nearer the center of oscillation of the segment than the straight face 36, and being flanked by a guard flange 38. In order to operate segment 35 I provide it with a finger 39 adapted to be brought into engagement with a stop 40, on frame 10, by the return movement of the lathe 11. The end of rod 30 normally engages the portion 36 of segment 35 and in that position reciprocation of the segment has no effect upon the rod. In order to throw the rod 30 into alinement with the cam 37 of segment 35 I arrange, in the path of movement of the shuttle, a finger 45 which carries a light spring 46, the arrangement being such that, when the shuttle passes into engagement with arm 45, spring 46 thereof will serve to throw rod 30, against the action of spring 33, into alinement with the cam 37 of segment 35.

The operation of the device thus far described is as follows. With the parts in the positions shown in Fig. 2, reciprocation of the lathe in the usual manner will cause finger 39 to engage stop 40 so as to reciprocate segment 35 but this reciprocation will have no effect on rod 30 until a shuttle passes into engagement with arm 45, whereupon said arm is thrown to the position shown in dotted lines in Fig. 2, thus swinging rod 30 to the position indicated in dotted lines in said figure where it is in alinement with the cam 37 of the segment. Thereupon, when finger 39 is brought into engagement with stop 40 and the segment reciprocated, rod 30 will be shifted to the left in Fig. 2 so as to shift the exhaust valve 25 to the left so as to carry ports 27 into the casing 13 and throw the inner end of valve 25 into engagement

with the stem 24 of valve 23, thus permitting pressure to pass from chamber 20 through the passage 19 into the outer end of cylinder 13 so as to drive piston 14 to the right and thus cause head 17 of rod 15 to engage the shuttle 18 and throw the same across the loom along the track 12. If the right hand end of cylinder 13 be tight the power movement of the piston 14 will continue until the pressure in the two ends of the cylinder balance and when this occurs the pressure in the passage 19, acting upon the inner end of valve 25, will blow said valve outward until ports 27 are uncovered (this movement also driving rod 30 to its normal position) whereupon the pressure in the left hand end of cylinder 13 may escape through ports 26 and 27 and the pressure within the right hand end of cylinder 13 will operate to move the piston 14 a portion of the way back to normal position. When the shuttle is again delivered to the mechanism by corresponding mechanism on the other side of the lathe, it will engage head 17 and drive piston 14 to the position shown in Fig. 2 but the air within the left hand end of piston 13 will serve as a cushion to this blow owing to the restricted character of the ports 26 and 27.

As previously stated, the amount of movement of piston 14 to the right will depend upon the compression within the right hand end of the cylinder, and in order that this may be adjustable I provide a reservoir 50 which communicates with the right hand end of cylinder 13 through a passage 51. In the reservoir 50 I mount a piston 52 having a rod 53 threaded and provided at its outer end with means 55 by which it may be readily adjusted longitudinally so as to shift piston 52 within chamber 50 and alter its sides. Communicating with the active end of chamber 50 is a pressure-reducing valve 56 which is also connected by a pipe 57 with pipe 21, the arrangement being such that any desired normal pressure may be maintained in reservoir 50 and the right hand end of cylinder 13, said pressure being simply sufficient to move the piston 14 back far enough so that a proper cushioning effect for the returning shuttle may be had. With a given pressure within chamber 50 in the right hand end of cylinder 13 and a given operating pressure in the left hand end of cylinder 13, the amount of throw of the piston 14, upon opening of valve 23, will be dependent upon the size of that portion of chamber 50 in communication with the right hand end of cylinder 13, i. e., the greater the active volume of chamber 50, the greater the throw of piston 14 before the pressures upon opposite sides of said piston can be equalized, the consequence being that by an adjustment of piston 52 the throw of piston 14 can be nicely adjusted to accommodate a shuttle of any weight through any desired distance, so that

the shuttle will be caused to traverse its track and be delivered to the cooperating throwing mechanism with just the right amount of force.

Where the material carried by the shuttle is quite heavy, the weight of the loaded shuttle lessens quite rapidly and less force is required at each throw to propel it across the lathe. It is desirable therefore that means be provided for automatically successively decreasing the effective throwing force as the shuttle lightens and for this purpose I have made that portion of the chamber 50 which is in communication with cylinder 13 automatically collapsible in the following manner. Threaded on rod 53 is a gear 60 which meshes with a gear 61 provided with a ratchet 62. Engaging ratchet 62 is a pawl 63 carried by a lever 64 connected by link 65 with a lever 66 arranged to be operated by piston rod 15 or shuttle to drive said lever in one direction, the arrangement being such that piston 52 is automatically advanced step-by-step in cylinder 50 so as to ensmall that portion of the cylinder which is in communication with cylinder 13 and thus, by decreasing the volume, or capacity, of that portion of chamber 50, successively increase the resistance against the forward or shuttle-throwing movement of rod 15. It will be seen therefore that, while the throwing force remains the same the resistance to such force is successively increased as the shuttle is successively lightened so that the effective throwing force upon the shuttle bears a substantial constant ratio to the weight or load of the shuttle.

In Fig. 5 I show a construction in which the shuttle is cushioned in its return by the automatic resistance increaser. In this form piston 52 has a rod 53' having ratchet teeth 53''. Lever 64' carries a pawl 63' adapted to engage teeth 53'' and lever 64' is connected by link 65 with lever 66. A pawl 67 is provided to hold the piston 52 in its advanced positions against the air pressure in the righthand end (Fig. 2) of cylinder 50.

I claim as my invention:

1. In a shuttle thrower, the combination with the main cylinder and piston therein having a piston rod for engaging the shuttle, of a valve for controlling admission of motive fluid, a separate exhaust valve for said cylinder, and means acting on one of said valves for closing the exhaust valve and opening the admission valve.

2. In a shuttle thrower, the combination with the main cylinder and a piston therein having a piston rod for engaging the shuttle, of a valve for controlling admission of motive fluid to one end of the cylinder, an exhaust valve operatively engaging the admission valve, and means controlled by the movement of the shuttle for closing the exhaust valve and opening the admission valve.

3. In a shuttle thrower, the combination of the main cylinder and piston therein having a piston rod adapted to engage the shuttle, of an admission valve for controlling the entrance of motive fluid to one end of the cylinder, an exhaust valve having an exhaust passage adapted to engage the admission valve to open the same, and means for shifting the exhaust valve to close the exhaust and open the admission valve.

4. In a shuttle thrower, the combination of the main cylinder and piston therein having a piston rod adapted to engage a shuttle, of an admission valve for controlling the entrance of motive fluid to one end of the cylinder, an exhaust valve, having a restricted exhaust passage, adapted to engage the admission valve to open the same, and means controlled by the movement of the shuttle for shifting the exhaust valve to close the exhaust and open the admission valve.

5. In a shuttle thrower, the combination with the main cylinder and piston therein having a piston rod adapted to engage a shuttle, of means for admitting motive fluid to one end of said cylinder, and means for varying the effective resistance capacity of the substantially-tight opposite end of the cylinder.

6. In a shuttle thrower, the combination with the main cylinder and piston therein having a piston rod adapted to engage a shuttle, of means for admitting motive fluid to one end of said cylinder, and means for maintaining a desired normal pressure within the opposite end of the cylinder with the piston in the main cylinder at the beginning of its throwing stroke.

7. In a shuttle thrower, the combination with the main cylinder and piston therein having a piston rod adapted to engage a shuttle, of means for admitting motive fluid to one end of said cylinder, means for varying the effective resistance volume of the substantially-tight opposite end of the cylinder, and means for maintaining a desired normal pressure within said opposite end of the cylinder with the piston in the main cylinder at the beginning of its throwing stroke.

8. In a shuttle thrower, the combination with a main cylinder having a piston mounted therein and having a piston rod adapted to engage a shuttle, of means for admitting a motive fluid to one end of said cylinder, a chamber communicating with the opposite end of said cylinder and a piston adjustably mounted in said chamber whereby the effective volume of said opposite end of the main cylinder may be varied.

9. In a shuttle thrower, the combination with a main cylinder having a piston mounted therein and having a piston rod adapted to engage a shuttle, means for admitting a

motive fluid to one end of said cylinder, a chamber communicating with the opposite end of said cylinder and a piston adjustably mounted in said chamber whereby the effective volume of said opposite end of the main cylinder may be varied, and means for maintaining the desired pressure in said opposite end of the cylinder and chamber when the parts are in normal position.

10. In a shuttle thrower, the combination with the throwing mechanism comprising a throwing member and an admission valve to admit motive fluid thereto, of a valve shifting member adapted to shift said admission valve, an operating cam for operating said shifting member, means for normally holding said shifting member and cam in inactive relation, a race-way for the shuttle, a member arranged in the path of the moving shuttle to bring the shifting member and cam into operative relation, and means for operating said cam.

11. In a shuttle thrower, the combination with the main cylinder and piston therein having a piston rod adapted to engage a shuttle, of means for admitting motive fluid to one end of said cylinder, and means for automatically successively diminishing the effective volume of the substantially-tight opposite end of the cylinder.

12. In a shuttle thrower, the combination with the main cylinder and piston therein having a piston rod for engaging the shuttle, of means for admitting motive fluid to one end of said cylinder, and means for automatically and successively increasing the resistance against the shuttle-throwing movement of the piston rod.

13. In a shuttle thrower, the combination with the main cylinder and piston therein having a piston rod adapted to engage a shuttle, of means for admitting motive fluid to one end of said cylinder, means controlled by the movement of the shuttle for successively decreasing the effective volume of the substantially-tight opposite end of the cylinder, and means for maintaining the desired normal pressure within said opposite end of the cylinder with the piston in the main cylinder at the beginning of its throwing stroke.

14. In a shuttle thrower, the combination with a main cylinder having a piston mounted therein and having a piston rod adapted to engage a shuttle, of means for admitting a motive fluid to one end of said cylinder, a chamber communicating with the opposite end of said cylinder and a piston adjustably mounted in said chamber whereby the effective volume of said opposite end of the main cylinder may be varied, and means for automatically advancing said adjustable piston step-by-step to successively decrease the effective volume thereof.

15. In a shuttle thrower, the combination with a main cylinder having a piston mount-

ed therein and having a piston rod adapted
to engage a shuttle, means for admitting a
motive fluid to one end of said cylinder, a
chamber communicating with the opposite
5 end of said cylinder and a piston adjustably
mounted in said chamber whereby the effective
volume of said opposite end of the main
cylinder may be varied, means for maintain-
ing the desired pressure in said opposite end
10 of the cylinder and chamber when the parts
are in normal position, and means for auto-
matically advancing said adjustable piston
step-by-step to successively decrease the effective
volume thereof.
15 16. In a shuttle thrower, the combination

with a shuttle throwing piston, of means for
maintaining a pressure resisting the throw-
ing action of said piston, and means actuated
by the shuttle in its return to successively in-
crease said resisting pressure and cushion the
return of the shuttle. 20

In witness whereof, I, have hereunto set
my hand and seal at Indianapolis, Indiana,
this 22 day of January, A. D. one thousand
nine hundred and eight.

VALENTINE BACHMAN. [L. s.]

Witnesses:

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THOMAS W. McMEANS.