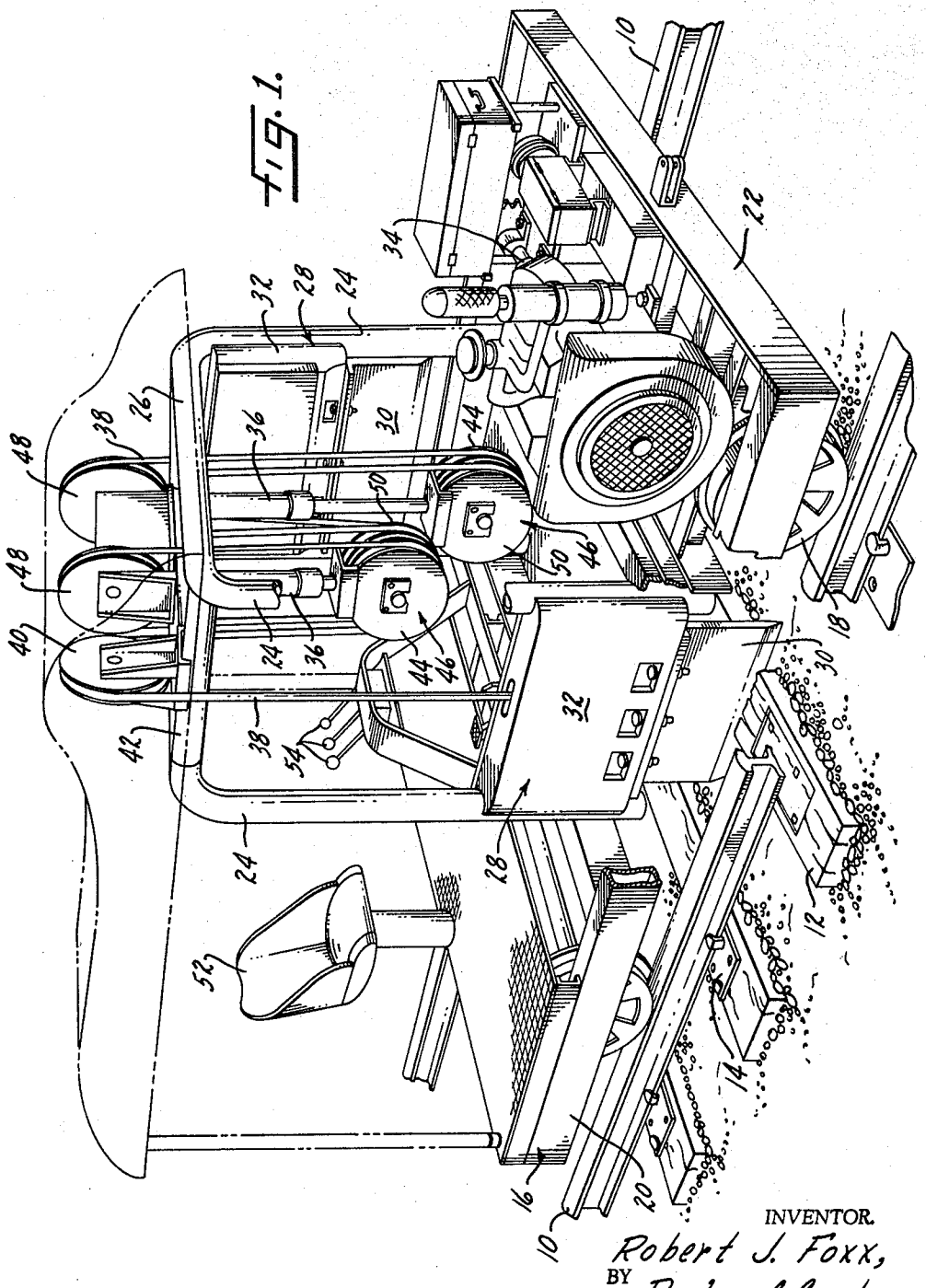
June 22, 1965 R. J. FOXX 3,190,324

FLUID PISTON AND CYLINDER ASSEMBLY FOR USE IN RAILWAY TIE CUTTERS AND THE LIKE

Filed July 27, 1962 3 Sheets-Sheet 1

FIG. 1.



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FIG. 4.

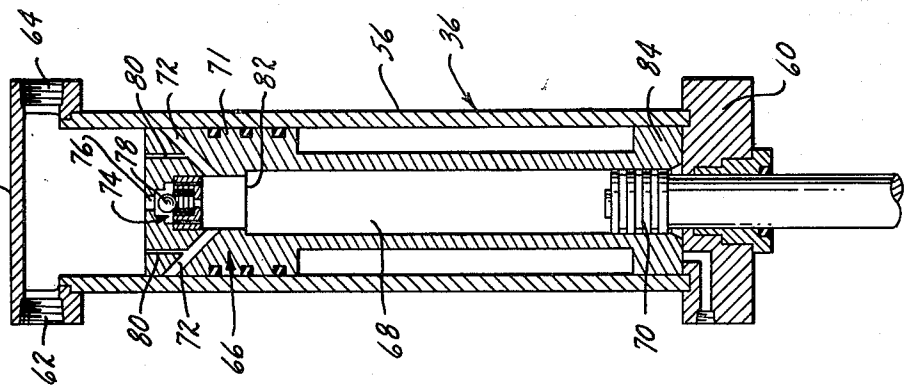


FIG. 3.

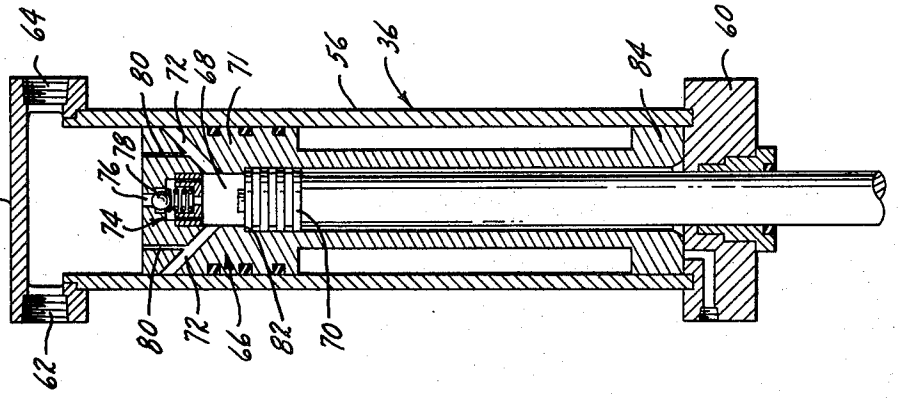
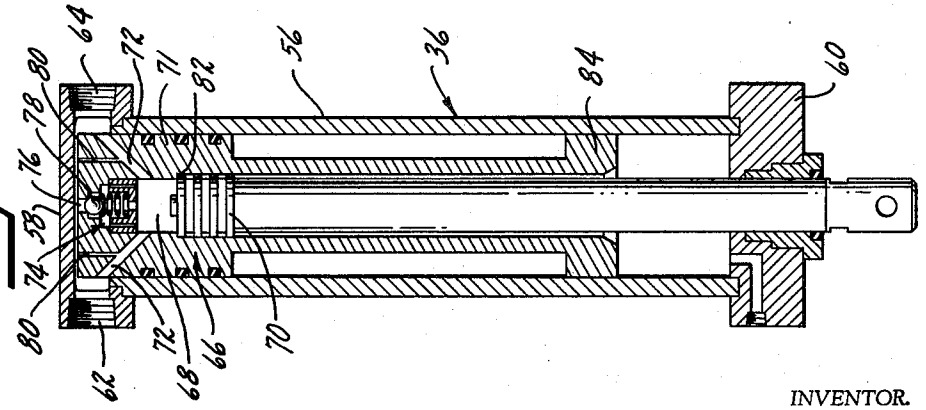


FIG. 2.



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FIG. 7.

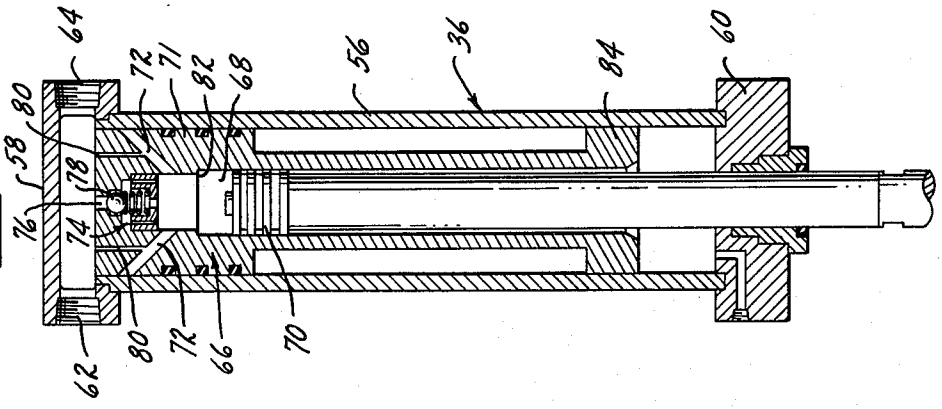


FIG. 6.

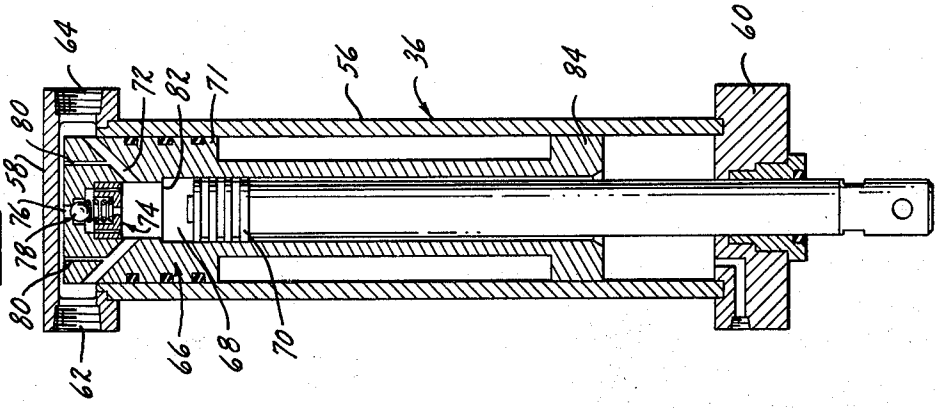
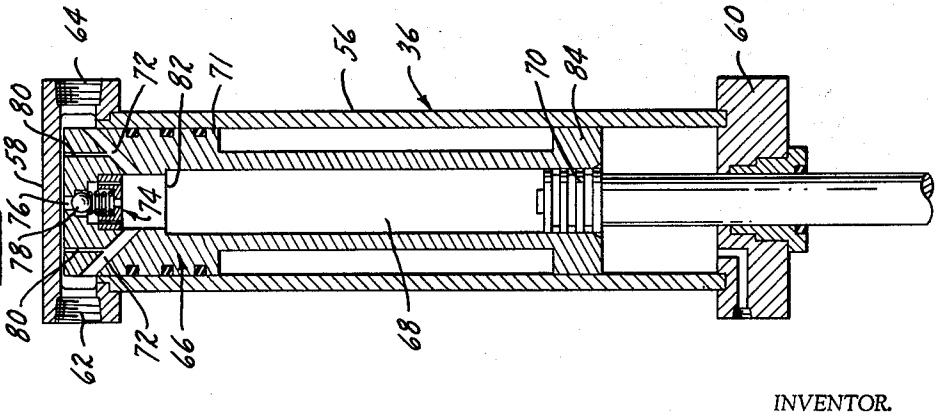


FIG. 5.



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3,190,324

FLUID PISTON AND CYLINDER ASSEMBLY FOR USE IN RAILWAY TIE CUTTERS AND THE LIKE

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Filed July 27, 1962, Ser. No. 212,902
13 Claims. (Cl. 144—2)

This invention relates to a method and apparatus for disposing of used ties. In particular, the invention relates to improvements on the machine and method illustrated in co-pending application Serial No. 161,546, filed December 22, 1961, in the name of Weltzin B. Blix and now Patent No. 3,128,808 dated April 14, 1964.

A primary purpose of the invention is an improved hydraulic ram for use on a self-propelled tie cutter.

Another purpose is an improved self-propelled tie cutter having means for pulling or removing the blade or blades from the ties.

Another purpose is an improved method of cutting ties beneath the rails in a railroad track.

Another purpose is an improved ram or jack which can move at low speed with high thrust and at a higher speed with lower thrust.

Other purposes will appear in the ensuing specification, drawings and claims.

The invention is illustrated diagrammatically in the following drawings wherein:

FIGURE 1 is a front perspective of a self-propelled tie cutter, with a portion of the frame cut away for clarity, and

FIGURES 2 through 7 illustrate a hydraulic jack used in raising and lowering the weighted blades, with each figure illustrating the jack in a different position of operation.

As is conventional, the railroad track may include rails **10** and suitable spaced cross ties **12**. The rails are held to the ties by suitable spikes and tie plates **14**. Positioned for movement on the rails is a self-propelled device which may include a frame indicated generally at **16** mounted on suitable railroad wheels **18**. The frame **16** may have a pair of side frame members **20** which are held together by suitable cross bars or the like **22**.

Mounted on the frame **16** are a pair of upright spaced guide rails **24**, there being one set of guide rails for each side of the frame. The guide rails may take any form, and as shown herein, are large diameter tubes or the like. Spaced generally parallel support bars **26** may connect corresponding guide rails and, in fact, the guide rails and support bars may be formed of a single member.

Mounted for vertical reciprocation between each pair of guide rails is a weighted blade indicated generally at **28**. The blade may include a lower knife portion **30** and an upper weight **32** which is bolted or otherwise suitably secured to the blade. The guide rails **24** position the blade for reciprocation toward and away from the tie to be cut. As shown herein, the support structure for the blades is rigid and both of the blades are positioned to cut the same tie at point generally adjacent and inside each of the rails. The invention should not be limited to the particular structure shown as in some applications it may be desirable to have an arrangement whereby the blades are swiveled to cut switch ties or other rail arrangements in which the ties are skewed and not perpendicular to the rails.

Mounted on the front of the frame **16** is a motor and pump combination **34** which may be used to drive the vehicle and which supplies hydraulic fluid is a pair of rams **36** mounted on the upper support structure. The pump may be connected to the rams by any suitable conduit or the like. Each of the weighted blades **28** is moved by a cable **38** which runs over a pulley or the like **40** mounted on a cross bar **42**. Each cable **38**, after passing around the pulley **40**, runs down and around the outside pulley sheave **44** of a pulley arrangement **46** positioned at the bottom of each of the rams **36**. From the outside pulley **44** each cable **38** runs up and around a second pulley **48** which is mounted on top of a framework made up of the cross members **42** and the support members **26**. From pulley **48** each cable **38** runs down and around the inside pulley **50** of the pulley arrangement **46** and then up to the framework where each cable is suitably secured. All of the details discussed above may be found in the above-mentioned co-pending application.

The pulley and cable arrangement shown will move the weighted blades in an upward direction when the ram is extended downward, as described hereinafter, as is the right-hand ram in FIGURE 1. The blades are released for a substantially free drop toward the tie by rapidly draining the fluid from the rams **36**.

The rear of the frame may mount a suitable seat **52** and controls **54** positioned for easy access by the operator.

Turning now to FIGURES 2–7, the rams **36** will be described in detail. Each of the rams includes an outer cylinder **56** having a suitable cap **58** at its upper end and a suitable cap **60** at its lower end. There may be an inlet port **62** and an outlet port **64** in the cover **58**. Positioned for reciprocation within cylinder **56** is a first piston or large piston **66** having an inner chamber **68**. Within the chamber **68** there is a second piston or small piston **70** which extends out through the bottom of the jack for connection to the pulley arrangement **50**.

The first piston **66** has a piston head **71** with a plurality of ports or passages **72**, which as shown herein slant downwardly and inwardly toward the chamber **68**. Mounted in the piston head **71** adjacent the passages **72** is a check valve arrangement indicated generally at **74**. The check valve arrangement **74** may include a passage **76** in communication with the inlet and outet ports and the chamber **68**, and a spring-biased valve closure element of ball **78**. In the arrangement shown, fluid pressure on top of the piston head **71** will move the ball valve **78** away from its seat and permit the fluid to flow into the interior of the chamber **68**. One or more vent passages **80** complete the structure of the piston head **71**.

FIGURE 2 illustrates the position of the ram when the blades **30** are embedded in a tie after having been dropped to sever it. Both the first and second pistons are in the up position. In order to remove a blade from the tie and move it upward for the next drop, a suitable fluid, preferably hydraulic fluid, is introduced through inlet port **62**. At the same pressure the large area will be easier to move. So the large piston **66** will start to move downward, pushing the small piston **70** along with it. In this connection, when in the up position of FIGURE 2, the small piston **70** is butted against a shoulder **82** near the top of the chamber **68**. Both pistons will start to move downwardly together, as is illustrated in FIGURE 3. Because of the larger area of the large piston it will initially start the downward movement, even though it is possible for some fluid to flow through passages **72** into chamber **68** above the small piston. Once the large piston has started moving down passages **72** will be masked off or closed by the cylinder **56**. This again is illustrated in FIGURE 3. The large piston will continue to move downward until its bottom skirt **84** contacts the bottom cap **60**. This also is illustrated in FIGURE 3.

As the large piston has a substantially larger cross sectional area or effective area than the small piston **70**, the

thrust provided by the large piston will be substantially greater than the small piston. This is advantageous for initially removing or pulling a blade out of the tie. At times, a blade may become stuck in the tie and a large thrust is necessary to remove it. This is accomplished by the large piston which moves first when the blade is moved toward the up position. The large piston completes its travel when its bottom skirt 84 hits the bottom cap 60 of the cylinder, as shown in FIGURE 3. Then the fluid pressure within the cylinder will open check valve arrangement 74, as illustrated in FIGURE 4, and supply fluid pressure above the small piston. The pressure introduced into the chamber 68 will move the small piston downwardly at a rather rapid rate which will cause quick withdrawal of the blade to the up position. As one example of comparative piston sizes, I may utilize a small piston having a cross sectional area one-fifth as large as the large piston. In this case the large piston would provide five times as much thrust, whereas the small piston would move five times as fast in retracting the blade. FIGURE 4 illustrates the position of the rams 36 when the blades are in the fully up position and ready to be dropped again onto the ties.

In order to start the fall of a blade downward, inlet port 62 is closed and outlet port 64 is open. Since the ports 72 in the large piston are covered by the cylinder walls, and the check valve 74 prevents flow of fluid from chamber 68, the fluid in chamber 68 will be trapped causing the large and small pistons to initially move together until the passages 72 of the large piston are uncovered when the large piston reaches the end of its stroke, as shown in FIGURE 5. The small piston is then allowed to move up in chamber 68, as shown in FIGURE 6. Thus, the volume above the large piston exhausts first until the large piston's uptravel is completed, followed by the uptravel of the small piston as the volume in chamber 63 exhausts. FIGURE 5 illustrates the position of the pistons after the end of large piston movement. FIGURE 6 illustrates the position of the small and large pistons after the small piston has practically moved to the top of the chamber 63 and has discharged most of the fluid.

The uptravel of the large piston corresponds to the initial movement of the falling blades. Since the blades start from rest, they will accelerate from zero velocity to a maximum when they hit the ties. Thus, the period of large piston travel corresponds to the slowest speed of the blades, starting from zero to some intermediate velocity. The period of small piston travel corresponds to the higher speed of the blades, starting from the intermediate velocity of the highest velocity when the blades hit the ties. The present arrangement matches blade velocity at any instant with piston velocity at any instant since the slowest piston travel comes first.

By the time the blade, in its free fall, begins to reach a sufficiently high velocity such that the volume displacement of the big piston passing through the outlet 64 might otherwise become prohibitive, the small piston takes over which, in effect, substantially reduces the gallonage displacement and enables the blade to continue in a free fall without any braking or restricting force due to pressure buildup from the high gallonage.

FIGURE 7 illustrates the next upward movement of the blades. Although the small piston did not move completely up to the top of chamber 68, possibly because of the height of the tie, the fluid trapped in the chamber will easily be discharged through vent openings 80 and will therefore present no problem.

The use, operation and function of the invention are as follows:

The apparatus disclosed is designed to run along a section of railroad track and to destroy or chop used ties beneath the rails. As is conventional, before the ties are chopped it is preferred that the spikes be removed, although it may not be necessary to remove the tie plates in every instance. Once the blades are positioned over the tie to be cut, they may be dropped either simultaneously or

independently and they may be dropped any number of times as what is important is to destroy or cut the tie. As an example, a 2,500-pound weight may be used above each blade, although this is not a limitation and the weight of the blades may vary from 500 to 2,500 pounds. Preferably the blades are positioned to chop inside of each of the rails and to chop the tie into three separate pieces.

The present invention is particularly concerned with an improved form of hydraulic ram for raising and lowering the blades. At times the blade may become stuck in a tie and it is necessary to exert a rather large force to remove them. However, once the blades are out of the tie a smaller force is all that is necessary to raise them to the up position ready for the next drop. The present hydraulic ram has a pair of pistons, a large piston and a small piston. The large piston which has a larger cross-sectional area will supply a very large thrust for initially removing the blade from a tie after which the small piston takes over and rapidly moves the blades to the up position. The small piston will have a substantially faster movement because of its smaller size.

The above arrangement of piston sizes is also advantageous in dropping the blades. When the blades are first released, the slower rate of travel of the blade will match the large volume to be discharged by the large piston. When the faster rate of travel of the blade begins, the smaller volume to be discharged due to the smaller piston takes over, thus approaching a constant volume of fluid to be discharged. In other words, the blades constantly accelerate without restriction as they move down toward the ties.

The hydraulic ram shown may have many other uses and should not necessarily be restricted to a tie disposing machine.

While I have shown separate inlet and outlet ports, I could use one port with a suitable three or four-way valve connected on the outside so that the single port would function both as an inlet and outlet.

Whereas the preferred form of the invention has been shown and described herein, it should be realized that there are many modifications, substitutions and alterations thereto, within the scope of the following claims.

I claim:

1. In a device for cutting ties beneath the rails of a railroad track, a frame, wheels mounted on said frame for moving it over the railroad track, a weighted blade mounted on said frame for movement toward and away from the tie to be cut, means for moving said blade toward and away from the tie to be cut including a fluid ram and means for actuating it,

said ram including a cylinder, a first piston reciprocal in said cylinder and a chamber in said first piston, a second piston reciprocal in said chamber, inlet and outlet port means in said cylinder, passage means in said first piston extending toward and opening adjacent the cylinder wall, said passage means connecting said chamber with the inlet and outlet port means when the first piston is in one position, said passage means being closed by said cylinder during a portion of the movement of said first piston, an additional passage in said first piston connecting the inlet and outlet port means with said chamber, and a check valve in said additional passage.

2. The structure of claim 1 further characterized by and including an inlet port and an outlet port at one end of said cylinder, said second piston extending through the opposite end of said cylinder.

3. The structure of claim 2 further characterized in that the passage means in said first piston are positioned at the end of the piston adjacent the inlet and outlet ports.

4. The structure of claim 1 further characterized in that the port means in the cylinder and the passage means in said first piston are arranged to pass fluid into said cylinder and chamber to move both pistons together

for a predetermined distance at the beginning of each up-and-down stroke, and to thereafter provide limited movement for said second piston.

5. The structure of claim 1 further characterized in that said first piston has a cross sectional area substantially larger than said second piston, and, for the same fluid pressure, delivers substantially larger thrust.

6. The structure of claim 1 further characterized by and including an inlet port and an outlet port at one end of said cylinder, said second piston extending through the opposite end of said cylinder, and vent passages in the end of said first piston adjacent said inlet and outlet ports, said vent passages being in communication with said chamber.

7. For use in a device for cutting ties beneath the rails of a railroad track and having a frame, wheels mounted on the frame and a weighted blade movable up and down on the frame,

a fluid jack including a cylinder, a first piston reciprocal in said cylinder and a chamber in said first piston, a second piston reciprocal in said chamber, inlet and outlet ports at one end of said cylinder, passages in said first piston extending laterally toward the cylinder at the end adjacent said inlet and outlet ports, said passages connecting said chamber with the inlet and outlet ports when the first piston is in the up position said passages being closed by said cylinder during a major portion of the movement of said first piston, an additional passage in said first piston connecting the inlet and outlet ports with said chamber, and a check valve in said additional passage.

8. The structure of claim 7 further characterized by and including small vent passages in said first piston connecting said inlet and outlet ports with said chamber.

9. A fluid ram including a cylinder, a first piston reciprocal in said cylinder and a chamber in said first piston, a second piston reciprocal in said chamber, inlet and outlet ports at one end of said cylinder, passages in said first piston extending laterally toward the cylinder at the end adjacent said inlet and outlet ports, said passages connecting said chamber with the inlet and outlet ports when the first piston is in the up position, said passages being closed by said cylinder during a major portion of the movement of said first piston, an additional passage in said first piston connecting the inlet and outlet ports with said chamber, and a check valve in said additional passage.

10. The structure of claim 9 further characterized in that said first piston has a cross section area, substantially larger than said second piston, and, for the same fluid pressure, delivers substantially larger thrust.

11. The structure of claim 9 further characterized in that said second piston extends outwardly through the end of said cylinder opposite the inlet and outlet ports.

12. A fluid ram including a cylinder, a first piston reciprocal in said cylinder and a chamber in said first piston, a second piston reciprocal in said chamber, inlet and outlet port means in said cylinder, passage means in said first piston extending toward and opening adjacent the cylinder wall, said passage means connecting said chamber with the inlet and outlet port means when the first piston is in one position, said passage means being closed by said cylinder during a portion of the movement of said first piston, an additional passage in said first piston connecting the inlet and outlet port means with said chamber, and a check valve in said additional passage.

13. The structure of claim 12 further characterized in that said pistons move separately during a portion of each stroke of said second piston and together during a portion of each stroke of said second piston.

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