

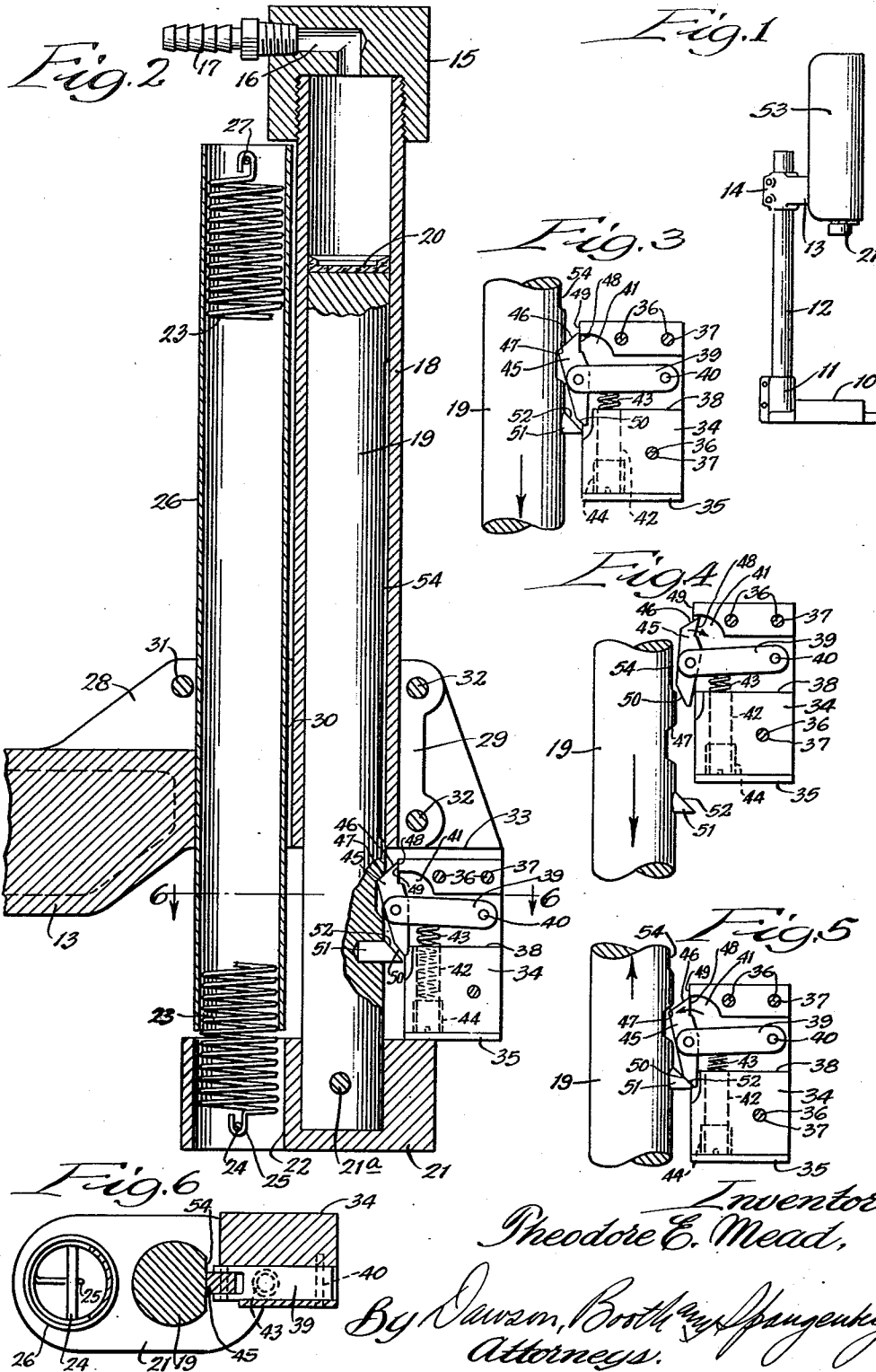
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AIR RAM

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AIR RAM

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9 Claims. (Cl. 121-13)

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This invention relates to pressure fluid mechanism and is particularly useful in connection with an air hammer or ram.

An object of the invention is to provide pressure fluid mechanism in which a ram or driving member is employed and in which free movement of the member is delayed until pressure has accumulated to a point near its maximum above the ram or driving member.

A further object is to provide a pressure fluid driven device capable of delivering blows and in which a minimum of working parts are employed.

A further object is to provide a pressure fluid driven device in which the driven member itself cooperates in the restraining of free movement thereof and finally in the release of the member for free movement.

Yet another object is to provide an airtight fluid pressure mechanism free of valves and which enables a ram or other member to be driven without escape of the pressure fluid.

A further object is to provide fluid driven mechanism which may be adjusted to increase or decrease the length of the stroke of the working member and thereby the force of the stroke delivered.

Other specific objects and advantages will appear as the specification proceeds.

The invention is illustrated in a preferred embodiment, by the accompanying drawing; in which—

Figure 1 is a side view in elevation of apparatus embodying my invention;

Figure 2, a broken vertical sectional view of the structure shown in Figure 1;

Figure 3, a detailed view of the latching mechanism shown in Figure 2 but showing the trigger carried to a lower position;

Figure 4, a view similar to Figure 3 but showing the trigger in release position;

Figure 5, a view similar to to Figure 3 but showing the trigger being raised again to latching or restrained position; and

Figure 6, a transverse sectional view, the section being taken as indicated at line 6 of Figure 2.

In the illustration given, 10 designates a base equipped with a clamping collar 11 which supports the column 12.

Upon the column 12 a supporting arm 13 is mounted and adjustably secured upon the column by the clamping collar 14. The supporting arm 13 supports the power driven ram mechanism as will later be described in detail.

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The fluid pressure driven mechanism comprises a head member 15 having a pressure fluid conduit therein and a threaded connection 17 communicating with the conduit 16 and providing means for the attachment of a flexible tube to the connector member 17. A cylinder 18 threadably engages the head 15 and communicates with the conduit 16.

Within the cylinder 18 is a ram 19 provided at its top with a sealing cup 20 which rests freely upon the top of the piston. The cup 20 is preferably of the type shown in my copending application Serial Number 602,693 for Fluid-Actuated Apparatus and now abandoned.

The ram 19 is fixed at its lower end to a head 21 which may be employed to deliver a blow to the work, the pin 21^a being employed to fix the ram to head 21.

The head 21 is provided with a cylindrical opening 22 adapted to receive a spring 23, a pin 24 within the opening engaging looped end 25 of the spring. Aligned with the opening 22 in head 21 is a spring tube 26, and the upper end of the spring engages a pin 27 carried by the tube.

The cylinder 18 and tube 26 are supported by the arm 13, as shown more clearly in Fig. 2. The arm 13 is equipped with integral flanges 28 and 29 which engage the tubes 26 and 19. Also, the arm 13 is provided with a thin integral web 30 which extends between the cylinder 18 and the cup 20. The flanges 28 and 29 are tightly gripped around the tube 26 and the cylinder 19 by means of bolts which extend through the opening 31 in flange 28 and the openings 32 in flange 29.

The flange 29, which is integrally formed with arm 13, provides a recess 33 adapted to receive a ram control or release unit 34, the lower portion of the flanged structure 29 providing a bottom wall 35 adapted to be engaged by the ram head 21. The control unit 34 may be slipped into the recess 33 and secured therein by screws 36 extending through the openings 37. At the same time, the bottom wall casing 35, which is integral with the arm 13 and flanged structures 28 and 29, provides a firm abutment or stop for the member 21.

The control structure 34 comprises a metal block having a central opening 38 adapted to receive lever arm 39. Lever arm 39 is bifurcated at its forward end, and at its rear end is pivotally mounted upon pin 40. The opening 38 enlarges at its inner top portion to provide a trigger release area 41. The member 34 is provided with a spring recess 42 adapted to receive a spring 43, and an adjustment screw 44 is provided in the

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bottom portion of the unit 34 to provide a means for increasing or decreasing the tension of the spring 43 which bears against the lever arm 39.

Pivotally mounted in the bifurcated end of the lever 39 is a trigger 45. The trigger 45 is provided with an inclined top wall 46 adapted to engage a similarly inclined wall 47 provided by recessing the ram 19. The trigger is provided at its forward top side with a straight face portion 48 adapted to bear against the top face portion 49 of the member 34 when in the locking position illustrated in Fig. 2. The trigger is also provided at its bottom side with an upwardly- and inwardly-inclined wall 50.

The ram 19 is provided at a point below the portion recessed to form wall 47, with a pin 51 having an inclined face 52 adapted to engage inclined face 50 of trigger 45, as shown more clearly in Fig. 5. The pin 51 may be secured within an opening in the ram 19 by a pressure fit or by any other suitable means.

If desired, a hood 53 of the general configuration shown in Fig. 1 may be supported about the cylinders 18 and 26 as a casing or enclosure therefor.

Immediately above the recess of the ram forming an inclined wall 47, I preferably cut away a portion of the ram, as indicated at 54, so that in the free stroke of the ram 19 and in the return stroke thereof, the ram rides freely past the trigger. This flattened or cut-away portion is indicated best in Fig. 2.

In the operation of the device, pressure fluid is admitted through a control valve (not shown) to the fitting 17, and the pressure fluid passes through conduit 16 into the upper portion of the cylinder 18. Free movement of the plunger 19 is restrained for a period of time in which the pressure can build up to a desired degree within the cylinder. The delay or restraining mechanism is provided by the unit 34 and is illustrated best in Fig. 2. It will be noted that the surface 47 of the ram bearing against the inclined surface 46 of the trigger urges the front face 48 of the trigger tightly against the face 49 of member 34. At the same time, spring 43 urges the lever 39 upwardly and resists any downward movement of the trigger 45. Against the increasing resistance and pressure thus provided, the ram 19 moves slowly for a short distance, thus allowing time for the pressure to accumulate within the top of the cylinder 18. The initial slow movement of the ram finally carries the trigger to the positions shown in Figs. 3 and 4. As illustrated in Fig. 4, after the upper portion of the trigger has cleared the face 49 of member 34, it swings inwardly within the release area 41, and the ram 19 is then driven under the accumulated pressure in cylinder 18 downwardly in its work stroke. After the blow has been delivered and pressure exhausted from the cylinder, the head 21 is drawn upwardly by means of spring 23 and the inclined pin face 52 of the ram engages the inclined face of the trigger to thrust the upper end of the trigger inwardly toward the surface 47 and to enable the trigger to clear the upper shoulder of unit 34. In this way, the trigger moves back to its initial position, as shown in Fig. 2, and the device is thus reset for the next delay operation.

In the above operation, it will be noted that there are three main strokes of the piston. The first stroke is an initial movement downwardly, and in the initial movement the progress of the ram 19 is slow because of the resistance afforded

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between the trigger surface 46, ram surface 47, and control unit surface 49, as opposed to trigger surface 48, these resistances being augmented by the resistance of spring 43 which urges the lever 39 and trigger 45 upwardly. The second stroke is one of free movement of the ram 19 after the trigger has swung into the release area 41. The third stroke of the ram is the return movement in which the casing member 35 serves as a stop for the head 21 and the pin 51 and brings about a resetting of the trigger 45. When it is desired to deliver a heavier blow to the work, the ram 19 is raised above the anvil 10 by means of the clamping collar 14 on column 12. Similarly, when it is desired to deliver a lighter blow, the clamping collar 14 may be lowered upon column 12 to decrease the distance between ram 19 and the work or anvil 10.

The cylinder and ram construction shown provides a fully airtight arrangement for all positions of the ram. No valves or other parts are employed which will allow escape of air or other pressure fluid.

By employing the head 21 as a part of the casing for the spring 23 so that the spring extends nearly through the head 21, a much longer spring than could otherwise be used is rendered feasible and therefore a longer life for the spring is attained.

With the structure shown, the ram extends beyond the cylinder and thus encounters no back pressure in its stroke, the cylinder 18 being open at its lower end. If desired, the cam can be quickly removed and a lighter or shorter ram substituted.

The adjustment member 44 within the control unit 34 may be moved upwardly or downwardly to provide the desired resistance for the operation. An adjustment of the member 44 will tension spring 43 so that the operation can be modified to suit the work to be done.

It will be noted that there are only two working parts in the control structure, namely the spring supported lever 39 and the trigger 45 pivotally mounted on the lever 39. The control unit 34 is readily removable for replacement whenever this is desired.

The inclined surface 47 of the ram is preferably at a 40° angle measured from a line perpendicular to the ram at the highest point of the inclination 47. It will be understood, however, that the angle may be modified if desired and if the other angular faces of the control unit are changed.

While in the foregoing description, I have referred to a slow initial movement of the ram, it will be understood that such movement is relative and that the speed of the ram in actual operation is so great that such slow movement is hardly perceptible to the human eye. It will be noted that the resistance of the trigger 45 increases directly with the compression of spring 43. As already indicated, the backward stroke of the ram is made after the valve has closed off the compressed air supply line and air within the upper part of the cylinder is being exhausted through the valve. Thus, in the backward or upward stroke of ram 19, no back pressure is encountered and the ram returns rapidly to its initial position, as shown in Fig. 2.

While in the foregoing description I have set forth a structure in considerable detail, it will be understood that such details may be modified widely by those skilled in the art without departing from the spirit of my invention.

I claim:

1. Control mechanism for a moving member, comprising a casing, a lever pivotally carried thereby, a trigger pivotally mounted on said lever, said trigger having an inclined upper face adapted to engage an inclined face carried by said moving member, said casing being provided with a surface substantially parallel with the axis of said moving member, said trigger having also a bearing surface substantially parallel with the axis of said moving member and adapted to engage said parallel surface of said casing, and spring means normally urging said lever toward said parallel surfaces.

2. Control mechanism for a moving member, comprising a casing, a lever pivotally carried thereby, a trigger pivotally mounted on said lever, said trigger having an inclined upper face adapted to engage an inclined face carried by said moving member, said casing being provided with a surface substantially parallel with the axis of said moving member, said trigger having also a bearing surface substantially parallel with the axis of said moving member and adapted to engage said parallel surface of said casing, spring means normally urging said lever toward said parallel surfaces, and a pin carried by said moving member providing an inclined surface adapted to engage said trigger to reset said trigger when said moving member is moved inwardly.

3. In air ram apparatus, a cylinder open at one end, a ram mounted in said cylinder and equipped at its lower end with a work-delivering head extending freely below said open end of the cylinder, means for supplying a pressure fluid to said cylinder to exert pressure upon the inner end of said ram, a spring-poised lever movably mounted on said cylinder and having a friction member pivotally mounted on the end thereof, said member engageable with said ram to resist outward movement of said ram but permitting an initial movement thereof, means associated with said movably mounted friction member for disabling said friction member at the end of said initial movement to permit free movement of the ram, and means effective upon the release of said pressure fluid in the upper portion of said cylinder for restoring said ram to its initial position and for restoring said friction member to an operative movement-resisting position.

4. Control mechanism for an air ram, comprising a cylinder equipped along one side with an opening, a casing carried by said cylinder and providing a chamber, a lever pivotally mounted in said chamber, a trigger pivotally mounted on said lever and extending through a slot in said casing, a ram movably guided in said cylinder and equipped at its lower end with a work-delivering head, said ram being provided with an upwardly and outwardly inclined face, said trigger also having an upwardly and outwardly inclined face engageable with said face of the ram, the free end of said lever extending generally in a direction at right angles to said ram and said trigger being pivoted at an intermediate point upon the end of said lever and extending generally in a direction parallel with said ram, and spring means normally urging said lever in an upward direction.

5. Control mechanism for an air ram, comprising a cylinder equipped on one side near its bottom with a vertical slot, a casing carried by said cylinder and providing a chamber aligned with said slot, a lever in said casing and having a free end portion aligned with said slot, a trans-

verse pivot securing the other end of said lever to said casing whereby the lever lies in a substantially horizontal position, a trigger having a central portion pivotally mounted upon said lever and equipped at its upper end with an inclined face, a ram movably mounted in said cylinder and equipped with an inclined face adapted to be engaged by said trigger to restrain free movement of said ram, means for supplying pressure fluid to said cylinder and for releasing the same therefrom, an abutment carried by said casing and providing a vertical face adapted to engage a vertical face on said trigger when the inclined surface of said trigger is in engagement with the inclined surface of said ram, and spring means normally urging said lever in an upward direction.

6. Control mechanism for an air ram, comprising a cylinder equipped on one side near its bottom with a vertical slot, a casing carried by said cylinder and providing a chamber aligned with said slot, a lever in said casing and having a free end portion aligned with said slot, a transverse pivot securing the other end of said lever to said casing whereby the lever lies in a substantially horizontal position, a trigger having a central portion pivotally mounted upon said lever and equipped at its upper end with an inclined face, a ram movably mounted in said cylinder and equipped with an inclined face adapted to be engaged by said trigger to restrain free movement of said ram, means for supplying pressure fluid to said cylinder and for releasing the same therefrom, an abutment carried by said casing and providing a vertical face adapted to engage a vertical face on said trigger when the inclined surface of said trigger is in engagement with the inclined surface of said ram, spring means normally urging said lever in an upward direction, and a pin carried by said ram and engageable with the lower end of said trigger to reset said trigger when said plunger is moved upwardly to its initial position.

7. Control mechanism for an air ram, comprising a cylinder, a ram mounted therein and equipped at its lower end with a work-delivering head, said cylinder being provided with a vertical slot, a casing providing a chamber horizontally aligned with said vertical slot, a generally horizontal lever pivotally mounted in said chamber, a trigger pivotally mounted on the end of said lever, spring means urging said lever upwardly, and an abutment plate within said chamber and providing a chamber substantially parallel with the axis of said ram, said trigger also having a bearing surface substantially parallel with the axis of the ram and engageable with said abutment plate surface, said trigger being also provided with an inclined face adapted to engage an inclined face carried by said ram, said abutment plate having an arcuate portion cut away to permit release of said trigger for movement within said chamber when said trigger has cleared said abutment plate.

8. Control mechanism for an air ram, comprising a cylinder, a ram mounted therein and equipped at its lower end with a work-delivering head, said cylinder being provided with a vertical slot, a casing providing a chamber horizontally aligned with said vertical slot, a generally horizontal lever pivotally mounted in said chamber, a trigger pivotally mounted on the end of said lever, spring means urging said lever upwardly, an abutment plate within said chamber and providing a chamber substantially parallel with the

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axis of said ram, said trigger also having a bearing surface substantially parallel with the axis of the ram and engageable with said abutment plate surface, said trigger being also provided with an inclined face adapted to engage an inclined face carried by said ram, said abutment plate having an arcuate portion cut away to permit release of said trigger for movement within said chamber when said trigger has cleared said abutment plate, and a resetting member fixed to said ram below the inclined face thereof and engageable with a lower portion of said trigger to move the inclined surface of said trigger into engagement with the inclined surface of said ram when said ram is returned to its elevated position.

9. Control mechanism for a compressed-air-driven ram, comprising a cylinder, a ram mounted in said cylinder and equipped at its lower end with a work-delivering head, means for delivering compressed air to the upper end of said cylinder to effect downward movement of said ram and for releasing said compressed air, spring means for restoring said ram to its initial position upon release of said compressed air, a pivotally mounted friction member engageable with said ram to resist downward movement thereof

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but yielding in an initial movement, and a spring-poised lever pivotally attached to said resistance member effective after said initial movement for completely releasing said friction member from impeding engagement with said ram.

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