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DIESEL MONKEY

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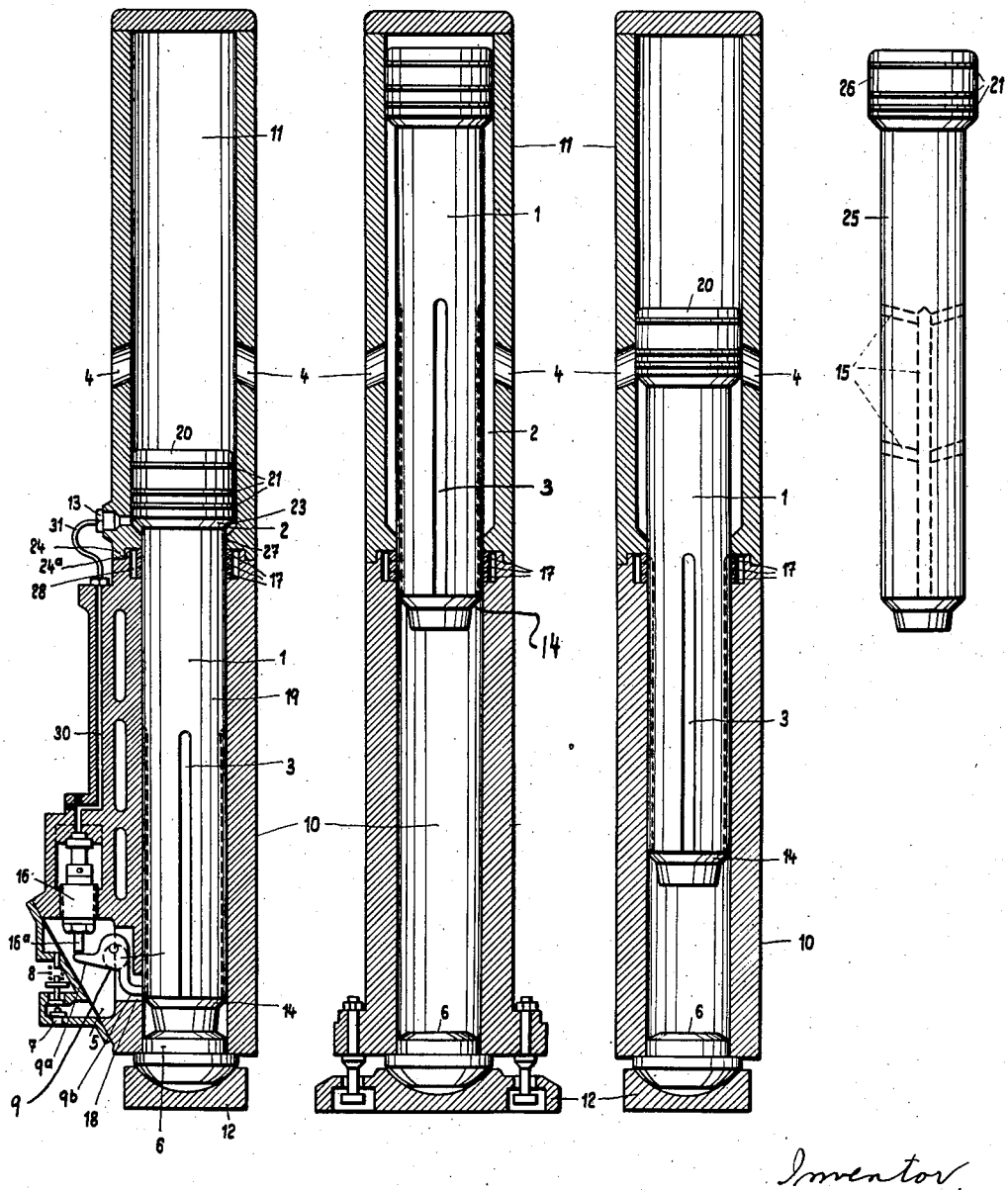
Fig.1 Fig.2 Fig.3 Fig.4



Inventor,
Paul Pfeiffer,
by Frank S. Ackerman,
attorney.

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DIESEL MONKEY

Paul Pfeiffer, Altona, Germany

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Diesel monkeys of the most varied constructions are already known, including those fitted with a positively controlled fuel pump. The suggestion has also already been made to equip Diesel rams with a cylinder and movable stage piston resting on the striking plate, the striking pin passing through the bottom of the cylinder and the injection chamber being formed between the latter and the piston.

The present invention contemplates a further development of a Diesel ram with a stage piston and does away with the disadvantages that were hitherto connected with such differential rams.

With the above in view an object of my invention is to provide an improved differential explosion ram. Other objects and advantages reside in the particular structure of the apparatus, combination and arrangement of the several parts and in the particular mode of operation—all of which will be readily apparent to those skilled in the art upon reference to the drawing in connection with the detailed description to follow.

In the drawing:

Fig. 1 is a vertical section of the contrivance with the ram in its lowermost position;

Fig. 2 is a similar view of the same, but taken at a different angle and shows the ram in its highest position;

Fig. 3 is a similar view of the contrivance and shows the ram in an intermediate position; and

Fig. 4 is an elevation of an alternative form of ram.

With particular reference to Figs. 1–3, it is apparent that the ram of the invention comprises alined upper and lower cylinders 11 and 10 respectively in which a ram 1 is slidably mounted for reciprocatory movement. The upper cylinder 11 is of a larger bore than the lower cylinder 10 and is provided with lateral exhaust ports 4 in its side walls. A fuel injection nozzle 13 is provided in a side wall of the cylinder 11 adjacent the bottom thereof.

The upper end 20 of the piston 1 is enlarged to fit in the cylinder 11 and carries the usual piston rings 21 to insure a tight fit therein. The lower end of the cylinder 11 is provided with an inwardly directed annular shoulder or boss 27 which not only prevents the head 20 of the piston from passing out of the cylinder 11 but also comprises the floor of an annular firing chamber 2. The top of the firing chamber 2 comprises the shoulder 23 of the piston head 20. The abutting ends of the cylinders 11 and 10 may be connected together in any suitable manner, as by the lapped portions 24, 24ª respectively thereof.

The lower cylinder 10 has a bore corresponding to the diameter of the stem 19 of the piston 1. The upper end of the cylinder 10 is annularly recessed as at 26 to seat packing rings 17 which seal the explosion chamber 2 from the cylinder 10.

The outside of the cylinder 10, adjacent the lower end thereof, is formed to provide a pump lever chamber 5 in which is pivotally mounted a bell-crank lever 9, having arms 9ª and 9ᵇ. An opening 18 in the wall of the cylinder 10 connects the lever chamber 5 with the interior of the cylinder 10. An upper portion of the chamber 5 mounts a fuel injection pump 16 having a depending stem 16ª. Fuel is supplied to the pump 16 in any suitable manner (not shown). The pump supplies fuel to the injection nozzle 13 in any suitable manner, as by the conduits 30, 31.

The arm 9ᵇ of the bell crank lever 9 extends slightly into the interior of the cylinder 10 and is adapted to be engaged by a cam surface 14 on the stem 19 of the piston 1 adjacent the lower end thereof. The arm 9ª of the lever 9 is adapted to engage the stem 16ª of the pump 16 to force fuel to the nozzle 13.

The stem 19 is provided with a plurality of longitudinally extending grooves 3 which extend from the cam surface 14 upwardly along the stem a predetermined distance.

The chamber 5 is provided with an air intake valve 7 and a spring loaded air outlet valve 8. The lower end of the cylinder 10 mounts any suitable striking plate 12 against which abuts a suitable striking pin 6 which is fitted in the open lower end of the cylinder 10.

The device operates on the Diesel principle and combustion in the expansible firing chamber is achieved by the heat of compression. The operation is as follows:

With the parts in the position of Fig. 2, the piston 1 descends by gravity. Air has been sucked into the chamber 10 through valves 7 and grooves 3. As soon as the ascending piston reaches the position of Fig. 3, the exhaust ports 4 are uncovered to permit the escape of the exhaust gases. Thereafter, during ascent, the grooves 3 enter the combustion chamber 2 to break the suction of stem 1 and no more air is then drawn into chamber 10. However, as the piston descends, air in chamber 10 is forced through combustion chamber 2 via the grooves 3 and exhaust ports 4 to flush the chamber 2. At the descending Fig. 3 position, the grooves 3 are cut off and no more air is forced into chamber 2. The balance of the air in chamber 10 is forced out through valve 8. Just after the piston 1 descends below the position of Fig. 3, the exhaust ports 4 and grooves 3 are sealed off from the combustion chamber 2, thereby trapping air in the combustion chamber between the shoulder 23 of head 20 and the floor 27.

This air, as aforesaid, has been forced into the combustion chamber 2 through grooves 3 during the previous descent of the ram 1. Some of this air serves to flush the combustion chamber

through the exhaust ports 4. The air exhaust valve 8 is spring loaded to an extent to prevent the escape of air therethrough until the pressure in cylinder 10 is increased by the sealing off of the grooves 3 from the chamber 2. Continued descent compresses the air in chamber 2 and raises the temperature thereof to the ignition point of the fuel.

When the cam 14 of the descending stem 19 engages the lever arm 9b, it swings the lever 9 on its pivot while the lever arm 9a actuates the stem 16a of the pump 16 to force fuel through the nozzle 13 into the combustion chamber 2. Any unused air trapped below the stem 19 is expelled through the air exhaust valve 8 as aforesaid.

The heat of the compressed air ignites the injected fuel and the resultant explosion raises the piston 1. The products of combustion are exhausted through the ports 4. At the same time a supply of fresh air is sucked in through the intake valve 7.

Meanwhile, at the bottom of the stroke the lower end of the stem 19 has struck the striking pin 6 which in turn has transmitted the blow to the work (not shown) via the striking plate 12.

In the modification of Fig. 4, a modified piston 25 is shown. This piston differs from the piston 1 only in that instead of peripheral grooves it has air intake passages 15 formed therein. The device operates in the same manner as the preferred form.

It is to be noted that the length of the stem 19 in both forms permits an extremely long stroke without permitting the stem 19 to leave the cylinder 10. Thus, both the head 20 and stem 19 are continuously guided in their respective cylinders and wobbling and the resultant wear are eliminated.

Having thus described my invention, I claim:

1. In a Diesel monkey including fuel and air supplying means, a pair of alined vertical cylinders, one cylinder having a larger bore than the other, a ram having an enlarged head slidably mounted in the larger chamber and a reduced stem having a sliding fit in the smaller chamber; an expansible, annular combustion chamber in said larger cylinder adjacent its junction with said smaller cylinder, said air supply means comprising a suction operated intake valve in said smaller cylinder adjacent the lower end thereof, said stem being operative to suck air into said smaller chamber through said valve during a portion of the upstroke of said ram, longitudinally extending peripheral grooves on said stem of said ram for delivering air to said combustion chamber on the downstroke of said ram, said grooves terminating short of said enlarged head of said ram to trap a predetermined amount of said air in said combustion chamber during the latter part of the down stroke of said ram.

2. In a Diesel monkey including fuel and air supplying means, a pair of alined vertical cylinders, one cylinder having a larger bore than the other, a ram having an enlarged head slidably mounted in the larger chamber and a reduced stem having a sliding fit in the smaller chamber; an expansible, annular combustion chamber in said larger cylinder adjacent its junction with said smaller cylinder, said air supply means comprising a suction operated intake valve in said lower cylinder adjacent the lower end thereof, said stem being operative to suck air into said smaller chamber through said valve during a portion of the upstroke of said ram, said stem being formed to provide means for delivering air to said combustion chamber on the downstroke of said ram, and means for trapping a predetermined amount of said air in said combustion chamber during the latter part of the down stroke of said ram.

3. In a Diesel monkey including fuel and air supplying means, a pair of alined vertical cylinders, one cylinder having a larger bore than the other, a ram having an enlarged head slidably mounted in the larger chamber and a reduced stem having a sliding fit in the smaller chamber; an expansible, annular combustion chamber in said larger cylinder adjacent its junction with said smaller cylinder, said air supply means comprising a suction operated intake valve in said lower cylinder adjacent the lower end thereof, said stem being operative to suck air into said smaller chamber through said valve during a portion of the upstroke of said ram, said stem being formed to provide means for delivering air to said combustion chamber on the downstroke of said ram, means for trapping a predetermined amount of said air in said combustion chamber during the latter part of the down stroke of said ram, and sealing means carried by said smaller cylinder adjacent its junction with said larger cylinder to seal said combustion chamber off from said smaller cylinder.

4. In a Diesel monkey including fuel and air supplying means, a pair of alined vertical cylinders, one cylinder having a larger bore than the other, a ram having an enlarged head slidably mounted in the larger chamber and a reduced stem having a sliding fit in the smaller chamber; an expansible, annular combustion chamber in said larger cylinder adjacent its junction with said smaller cylinder, said air supply means comprising a suction operated intake valve in said lower cylinder adjacent the lower end thereof, said stem being operative to suck air into said smaller chamber through said valve during a portion of the upstroke of said ram, said stem being formed to provide means for delivering air to said combustion chamber on the downstroke of said ram, means for trapping a predetermined amount of said air in said combustion chamber during the latter part of the down stroke of said ram, and a weighted outlet valve adjacent said intake valve, said outlet valve being operative to discharge surplus air from said smaller cylinder only after the trapping of said air in said combustion chamber.

5. In a Diesel monkey including fuel and air supplying means, a pair of alined vertical cylinders, one cylinder having a larger bore than the other, a ram having an enlarged head slidably mounted in the larger chamber and a reduced stem having a sliding fit in the smaller chamber; an expansible, annular combustion chamber in said larger cylinder adjacent its junction with said smaller cylinder, said air supply means comprising a suction operated valve in said smaller cylinder adjacent the lower end thereof, said stem being operative to suck air into said smaller chamber through said valve during a portion of the upstroke of said ram, said stem being formed to provide passages therethrough for delivering air to said combustion chamber on the downstroke of said ram, said passages being formed to be sealed off from said combustion chamber during the latter part of the downstroke of said ram, whereby to trap a predetermined portion of said air in said combustion chamber.

PAUL PFEIFFER.