G. C. DAVISON.

RELIEF VALVE CONTROL FOR DIESEL ENGINES.

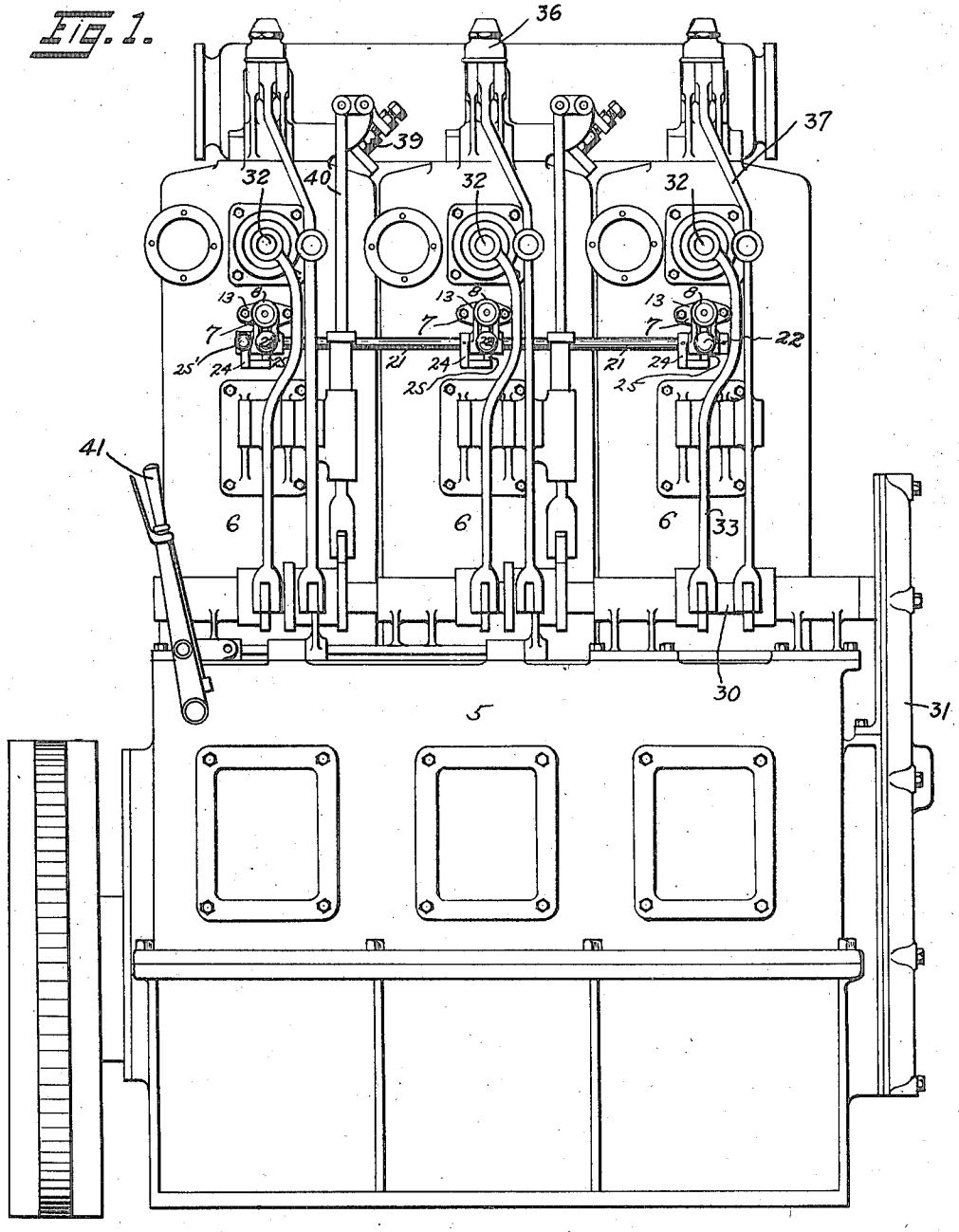
APPLICATION FILED MAR. 15, 1916.

1,254,780.

Patented Jan. 29, 1918.

3 SHEETS—SHEET 1.

Fig. 1.



INVENTOR

G. C. Davison

BY

Pennie Davis Marvin & Edmonds,

ATTORNEYS.

G. C. DAVISON.

RELIEF VALVE CONTROL FOR DIESEL ENGINES.

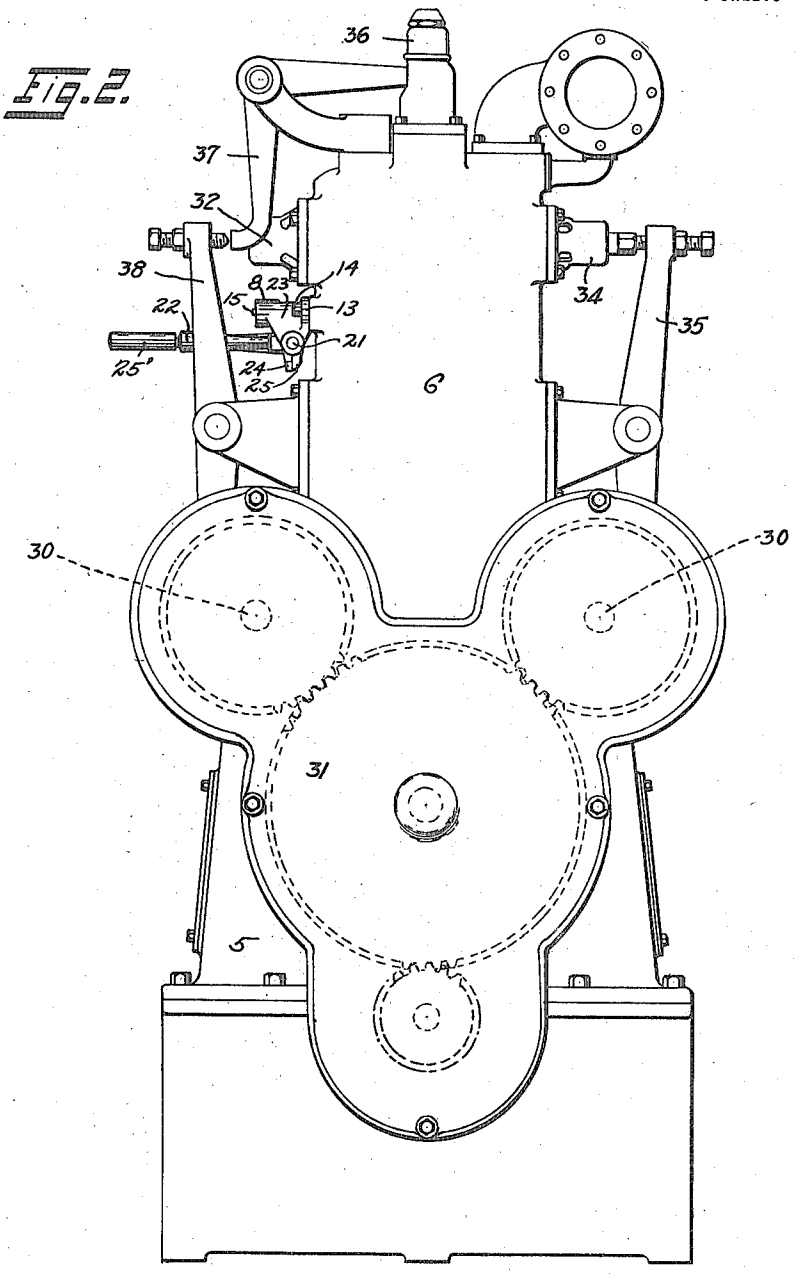
APPLICATION FILED MAR. 15, 1916.

1,254,780.

Patented Jan. 29, 1918.

3 SHEETS—SHEET 2.

Fig. 2.



WITNESSES:

INVENTOR

G. C. Davison,

BY

Pennie Davis & Marvin.

ATTORNEY

G. C. DAVISON.

RELIEF VALVE CONTROL FOR DIESEL ENGINES.

APPLICATION FILED MAR. 15, 1916.

1,254,780.

Patented Jan. 29, 1918.

3 SHEETS—SHEET 3.

Fig. 3

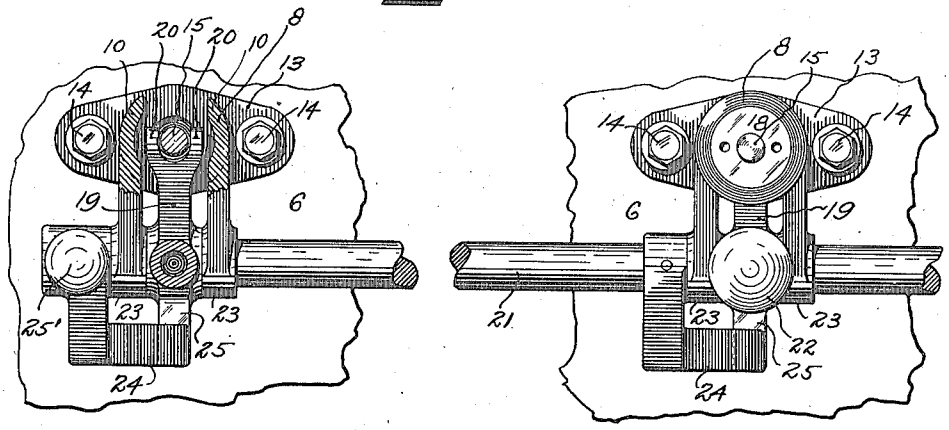
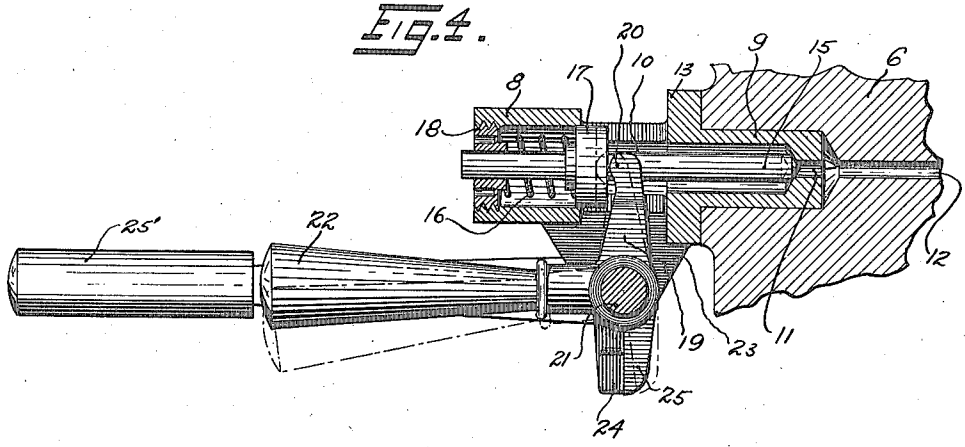


Fig. 4.



INVENTOR

G. C. Davison,

BY

Pennie Davis & Marvin.

ATTORNEY

UNITED STATES PATENT OFFICE.

GREGORY C. DAVISON, OF NEW LONDON, CONNECTICUT, ASSIGNOR TO ELECTRIC BOAT COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW JERSEY.

RELIEF-VALVE CONTROL FOR DIESEL ENGINES.

1,254,780. Specification of Letters Patent. Patented Jan. 29, 1918.

Application filed March 15, 1916. Serial No. 84,284.

To all whom it may concern:

Be it known that I, GREGORY C. DAVISON, a citizen of the United States, residing at New London, in the county of New London and State of Connecticut, have invented certain new and useful Improvements in Relief-Valve Controls for Diesel Engines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to internal combustion engines and is directed to the provision of an improved form of relief mechanism for the cylinder or cylinders of such an engine whereby an outlet from the cylinder may be established either automatically or manually. The provision of such a relief mechanism is highly desirable for various purposes, as for instance to protect the engine against the development of an excessive pressure within the cylinder to facilitate stopping the engine quickly and to facilitate rotating the engine shaft manually when such rotation of the shaft is desirable for any reason.

One of the features of the invention involves the provision of a spring-actuated relief valve which may open automatically in response to predetermined high pressure conditions within the cylinder and which is provided with means for actuating the relief valve manually so connected to the movable member of the valve as to permit the latter to move freely when it is actuated automatically. The invention further involves the provision of such a relief valve mechanism in a multi-cylinder engine having the device for actuating the several valves manually so constructed that any one valve may be opened individually, or if desired, all of the several relief valves of the several cylinders may be opened simultaneously.

Another feature of the invention involves the specific construction of the relief valve mechanism including the mounting of all of the manual actuating mechanism of the valves of several cylinders upon the casings of the valves whereby the entire relief valve mechanism of a multi-cylinder engine may be removed together to facilitate removal of or access to other parts of the engine.

The preferred embodiment of the engine is illustrated in the accompanying drawings, in which Figure 1 is a side elevation of an internal combustion engine of the heavy oil type, having my improved relief valve mechanism applied thereto; Fig. 2 is an end elevation of the engine; Fig. 3 is an enlarged detail view of certain of the parts shown in Fig. 1; and Fig. 4 is a transverse sectional view of one of the relief valves.

Referring to these drawings, the crank case of the engine is indicated at 5 and the cylinders 6 are mounted thereon, any desired number of cylinders being provided. The valves of the engine are actuated by cams upon cam-shaft 30 which is driven from the engine shaft by means of gears inclosed within a casing 31. The inlet valves are indicated at 32, and each of these is actuated by a lever 33 pivotally mounted upon the corresponding cylinder as shown. The exhaust valves 34 are located upon the opposite sides of the cylinders and each is actuated by a lever 35 also pivotally mounted upon the corresponding cylinder. The spray-valves 36 are mounted upon the upper ends of the cylinders and each is actuated by a bell-crank lever 37 pivotally mounted on a cylinder as shown in Fig. 2 and actuated by a lever 38 pivotally mounted upon the corresponding cylinder at the side of the lever 33 of the inlet valve of that cylinder. Also certain of the cylinders may be provided with valves 39 for admitting compressed air for starting, each of these valves 39 being actuated by a push-rod 40 as shown in Fig. 1. A handle 41 may be provided for moving certain of the cams on one of the cam-shafts 30 in the direction of the axis of that shaft so as to make the starting-valves operative and the spray-valves inoperative, or vice versa, as desired.

Each of the cylinders is provided with a relief valve 7 having a cage or casing 8 whose inner end is reduced as shown at 9 and is received in an opening in the cylinder wall. The end of the reduced portion 9 of the cage is provided with a port 11 in alinement with a passage 12 extending through the cylinder wall to the interior of the cylinder. The valve-cage is provided with a flange 13 and cap-screws 14 extend through openings in this flange and into the cylinder wall to secure the valve to the cylinder. Adjacent to the flange 13 the cage is slotted on its upper and lower sides

and the manual operating mechanism extends through the lower one of these slots.

Mounted within each valve-cage 8 is a stem 15, the inner end of which is of conical form and is adapted to close the passage 11 through the inner end of the cage. The stem 15 is pressed toward the position for closing the valve by a spring 16 which lies within a casing formed by the outer end of the cage. This portion of the cage is in the form of a cylinder closed at its end by a cap 18, through which the outer end of stem 15 slides, and a piston 17 mounted on the stem 15 is adapted to reciprocate within this cylinder.

Each relief valve is provided with a lever 19 for opening the valve manually. This lever 19 extends upwardly through the opening in the valve-cage 7 and its upper end is bifurcated and straddles the stem 15. All of the levers 19 for the relief valves of the several cylinders are mounted loosely upon a shaft 21 which is adapted to rock in bearings provided in pairs of supporting webs 23 depending from the several valve-cages. Each lever 19 is formed integral with a handle 22 and on depression of any handle 22 from the full-line to the broken-line position shown in Fig. 4 the lever 19 connected to that handle is turned about shaft 21 and the end of that lever 19 engages the piston 17 of the corresponding relief valve and opens that valve against the tension of its spring 16.

Each of the levers 19 which are loosely mounted upon the rock-shaft 21 is provided with a projection 25 extending downward from the rock-shaft. Adjacent to each of these extensions 25 is an L-shaped lever 24 which is rigidly secured to the rock-shaft 21 and the lateral extension at the lower end of each of these levers 24 lies in front of the lower end of the extension 25 of lever 19. Also the shaft 21 has a single handle 25′ rigidly secured thereto.

With the parts constructed in the manner above described any one of the several relief valves is free to be actuated automatically in response to a predetermined high pressure developed within the cylinder of that valve, the valve-stem 15 being moved outwardly against the tension of its spring 16 to open a passage from the interior of the cylinder and being restored by its spring when the high pressure conditions are relieved. The connections of the manual actuating devices to the movable members of the valves are such that the manual mechanism does not interfere in any way with such automatic operation of the valves. If desired, any one of the several relief valves may be actuated manually by depression of its handle 22 and on such depression of a handle 22 the valve corresponding thereto is opened but no other of the several valves is in any way affected because of the fact that the several levers 19 and their handles 22 are loose upon the shaft 21. On release of the depressed handle it is raised to its initial position and the corresponding valve is moved to the closed position by the spring 16. If it be desired to open all of the relief valves of the several cylinders simultaneously the handle 25′ is depressed. This rocks the shaft 21 and with it all of the L-shaped levers 24, which latter engage the extensions 25 of the levers 19 and therefore actuate all of those levers together to open the several relief valves simultaneously.

If it be desired to remove any one of the springs 16 or valve-stems 15 it is only necessary to remove the proper screw-cap 18 and the mechanism for actuating the movable member of the valve manually in no way obstructs the removal of the spring and stem. Also, if it be desired to facilitate removal of a cylinder or for any other reason, the entire relief valve mechanism of the several cylinders may be removed as a unit by merely withdrawing the cap-screws 14, since all of the mechanism for actuating the relief valves manually is mounted directly upon the cages of those valves.

I claim:—

1. In an internal combustion engine, a cylinder, a relief valve adapted to open automatically upon the occurrence of a certain high pressure within the cylinder, and means for operating the valve irrespective of the pressure within the cylinder including a hand actuated instrumentality located closely adjacent the cylinder and a hand actuated instrumentality located at a point removed from said cylinder.

2. In a multi-cylinder internal combustion engine, a plurality of cylinders, a relief valve associated with each of the cylinders adapted to open automatically upon the occurrence of a certain high pressure within the corresponding cylinder, means for operating any one of the valves individually irrespective of the pressure within the cylinder with which it is associated, and means for operating all of said valves simultaneously irrespective of the pressure within the cylinders.

3. In a multi-cylinder internal combustion engine, a plurality of cylinders, a relief valve associated with each of the cylinders adapted to open automatically upon the occurrence of a certain high pressure within the cylinder with which it is associated, a plurality of controllers for manual actuation one located adjacent each of the valves and any one of which controllers may be actuated to open the adjacent relief valve irrespective of the pressure within the cylinder with which that relief valve is associated, and a master controller adapted to be actuated to open all of the relief valves simul-

taneously irrespective of the pressure within any cylinder.

4. In a multi-cylinder internal combustion engine, a plurality of cylinders, an automatically operating relief valve associated with each cylinder, a lever associated with each relief valve for opening the same manually, and a lever associated with the said levers for manually opening all the relief valves simultaneously.

5. In a multi-cylinder internal combustion engine, a plurality of cylinders, an automatically operating relief valve associated with each cylinder, a lever associated with each relief valve for opening the same manually, and a lever associated with the said levers for manually opening all the relief valves simultaneously, each of said first-mentioned levers being disconnected from the last-mentioned lever so that any one of the levers first-mentioned may be moved independently of the said last-mentioned lever.

6. In a multi-cylinder internal combustion engine, a plurality of cylinders, an automatically operating relief valve associated with each cylinder, a rock-shaft extending parallel with the line of cylinders, a lever for manually opening each valve loosely fulcrumed on the rock-shaft and carrying a handle-arm and an arm engaging a movable member of the corresponding valve, and means carried by said rock-shaft for rocking the shaft to open all of the relief valves simultaneously.

7. In a multi-cylinder internal combustion engine, a plurality of cylinders, an automatically operating relief valve associated with each of the cylinders, a rock-shaft extending parallel with the line of cylinders, a lever for each valve loosely fulcrumed on the rock-shaft and carrying a handle and an arm having operable engagement with one of the movable parts of the valve, said rock-shaft being journaled in bearings carried by certain of said valves and means carried by said shaft for rocking the latter to open all of said relief valves simultaneously.

8. In a multi-cylinder internal combustion engine, a plurality of cylinders arranged in line, an automatically operated relief valve on each cylinder, the several valves being arranged in line, a rock-shaft extending parallel to but displaced from the line of the relief valves, a plurality of operating levers loosely mounted on the rock-shaft and each engaging the movable member of a relief valve so that rocking the lever on the rock-shaft opens the corresponding relief valve, means for rocking the rock-shaft, and means mounted on the rock-shaft and engaging said levers but disconnected therefrom so that rocking movement of the rock-shaft operates all of said levers simultaneously.

9. In a multi-cylinder internal combustion engine, a first cylinder, a second cylinder, an automatic relief valve for each cylinder, and manually operated means for opening the relief valves of both cylinders simultaneously irrespective of the pressures in the cylinders, said means including manually operated devices for independently opening the relief valve of either cylinder irrespective of the pressure in that cylinder.

10. In a multi-cylinder internal combustion engine, a first cylinder, a second cylinder, an automatic relief valve for each cylinder, and manually operated means for opening the relief valves of both cylinders simultaneously irrespective of the pressure in the cylinders, said means including manually operated levers disconnected from the valves but each independently actuable to open one of the valves irrespective of the pressures in the cylinders.

In testimony whereof I affix my signature.

GREGORY C. DAVISON.