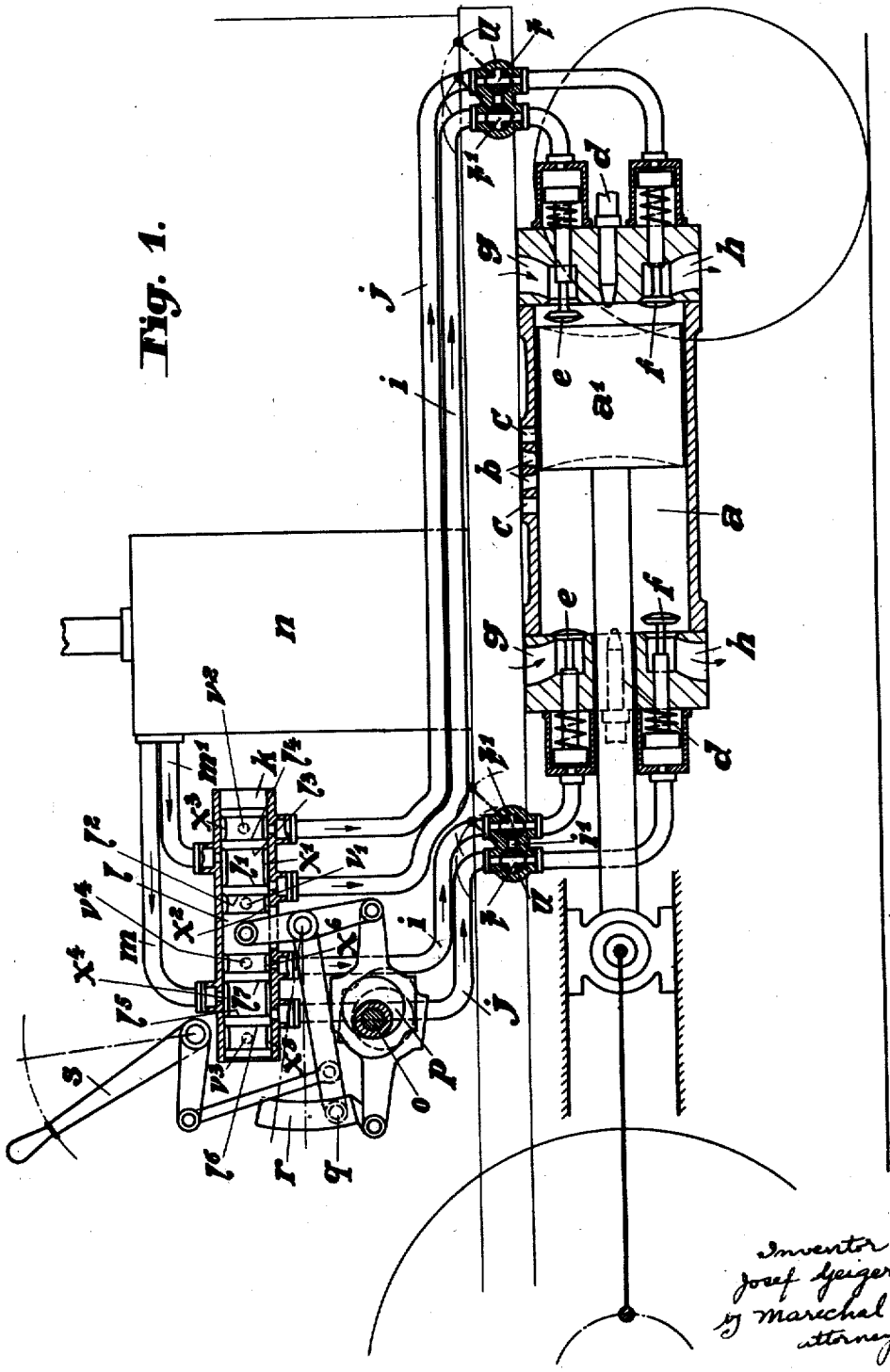
Oct. 13, 1931. J. GEIGER 1,826,873

DIESEL LOCOMOTIVE HAVING POWER CYLINDERS CONNECTED TO THE DRIVING MECHANISM

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Fig. 1.



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Fig. 3

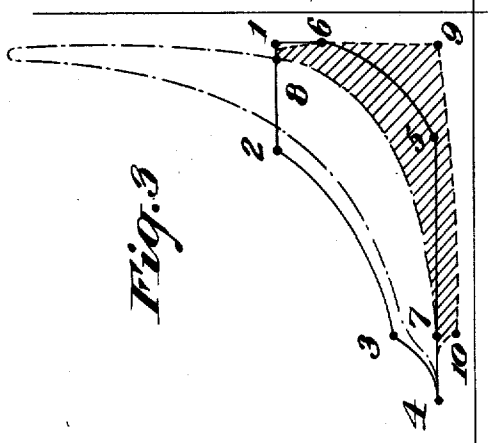


Fig. 2

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DIESEL LOCOMOTIVE HAVING POWER CYLINDERS CONNECTED TO THE DRIVING MECHANISM

Application filed February 1, 1929, Serial No. 336,740, and in Germany February 16, 1928.

This invention relates to vehicles such as Diesel locomotives or the like, having power cylinders normally operating on the Diesel principle.

The principal object of this invention is the provision of a vehicle or locomotive of this character having starting air valve means by which the starting of the engine can be effected, means being provided for changing the operation of the cylinder from its normal Diesel principle of operation so that it operates as an air compressor to impose a load or braking effect on the vehicle driving mechanism.

Other objects and advantages of the invention will be apparent from the following description and from the accompanying drawings in which—

Fig. 1 is a vertical section, shown partly diagrammatically, of a working cylinder of a locomotive embodying the present invention, the various parts being shown in engine starting positions;

Fig. 2 is a section corresponding to Fig. 1, but showing the various parts in position for creating a braking effect on the driving mechanism; and

Fig. 3 is a view of a working diagram of the present invention, representing both starting and braking operations.

In accordance with this invention, which is applicable to Diesel driven motor vehicles or the like, compressed air driving or starting means are provided, operating directly upon the propelling mechanism, and the normal Diesel cylinder or cylinders are adapted to operate as braking cylinders while the vehicle is descending a hill. Under such conditions a special control mechanism is reversed so that during operation of the cylinder as a brake the compressed air inlet valves or devices are held closed while the outlet valves or devices are opened for the escape of air compressed in the cylinder. Preferably the outlet valve or valves are opened, during braking, shortly before the beginning of a piston stroke from top dead center, and the valve is held open during the stroke so that the air compressed by the piston during a compression stroke may be released and will not be effective as a driving force for the piston.

Referring more particularly to the drawings by reference letters and numbers, the Diesel cylinder a represents the working cylinder, or one of the working cylinders, of the locomotive or other motor driven vehicle. In the form of construction shown, the cylinder is of the double acting type and is operably connected by means of the piston a^1 directly to the propulsion mechanism. Air inlet slots b which may be connected to a suitable source of pressure air for supplying the Diesel cylinder, and exhaust slots c through which the burned gases of combustion may pass out to the atmosphere are provided preferably in the cylinder walls at the center of the cylinder, and in each cylinder end or cover are supported the injection nozzles d for the fuel and the starting devices or valves e and f respectively. The valves e and f control the flow of compressed or starting air through the inlet and outlet channels g and h respectively. The valves e and f may be operated in any desired manner, preferably by means of a fluid pressure system. As herein shown they are adapted to be operated by compressed air.

The valve housings at both sides of cylinder ends are connected to a suitable control means such as the control cylinder k, by conduits i and j. In the control cylinder k is a movable control piston l or the like. The control cylinder k is connected with the controlling air reservoir n by conduits m and m_1, air pressure in the reservoir being maintained as by means of a suitable compressor, not shown. The control piston l is adapted to be automatically operated during the operation of the engine by means of a suitable mechanism designated p, which is connected to the engine as by means of a conventional gear drive, not shown, and which may be the well-known Heusinger drive or other drive mechanism of any suitable type well known in the steam locomotive art. A control lever s, adapted to be manually operated, is conveniently provided for reversing operations, the connection q to the connecting link r being controlled by this hand lever, which may be set for forward or reverse starting or braking

operations. As shown in Fig. 1 the lever s and the other parts of the apparatus are shown in positions corresponding to engine starting.

The conduits i and j at each end of the cylinder, are connected together at housings u each embodying a switching device in the form of two associated three-way cocks t and t^1, which may be adjusted so that both conduits are open, or so that each conduit i for an intake valve is connected across to the associated conduit j for actuating the valves f upon an impulse in the conduits i.

Referring more particularly to Fig. 1, showing the position of the parts during starting, the piston a^1 is shown at the right dead center position. The three-way cocks t and t^1 are so arranged that the conduits i and j of both cylinders are open. The control piston l is now in such a position that the control ring l^1 of control piston l has begun to open the right hand conduit i. The control air under pressure received from the reservoir n flows through the pipe m_1 and through the chamber x^1 of the control piston which is defined in part by the ring l^1, and from the chamber x^1 the air flows into the conduit i and forces the inlet valve e to its open position. As herein shown the valve e carries a piston member which is forced down against the action of a suitable spring by the pressure supplied through the conduit i, to open the valve. Now starting air may flow through the passage g which is connected to a suitable source of starting air under suitable pressure, such as the reservoir n (the pipe connections which may be conventional not being shown), the air flowing into the work cylinder and forcing the piston a^1 to the left. The control piston l although initially moved towards the left at the start of the movement of piston a^1, has its direction of movement reversed during the travel of the piston a^1 so that the direction of movement of the piston b is then towards the right. While moving to the right, the control ring l^1 of the piston l closes the conduit i whereupon the control ring l^2 connects the conduit i with the chamber x^2 so that the controlling air in the conduit i may escape through the exhaust opening v^1 and permit the inlet valve e to close again. At this time the work cylinder is filled with air under pressure, the filling of the cylinder being represented by line 1—2 of the diagram shown in Fig. 3. From the point 2 of this diagram to point 3 the starting air is expanded within the cylinder from the time the inlet valve e closes and during the continued movement of the piston. At the point 3 of the diagram the working piston a^1 opens the exhaust slot c through which the air in the cylinder escapes while the piston is approaching the left dead center position corresponding to point 4 in the diagram. Before the dead center position is reached, the control piston l connects the control air with the conduit j by means of the control ring l^3, and starting valve f is thus opened by the pressure of the control air. Any air which may be in the cylinder, such as air entering the cylinder through the inlet slots b, is forced through the outlet valve f and passage h to atmosphere when the piston moves on its return stroke. During this operation the control piston again reverses itself and starts to move to the left so that the control ring l^3 of the control piston disconnects the conduit j from the compressed air source as indicated at point 5 of the diagram. During the continued movement of the control piston toward the left, the control ring l^4 connects conduit j with the chamber x^3. The control air in conduit j can now flow through the chamber x^3 into the exhaust opening v^2 and thus escape, permitting the exhaust valve f to close. As indicated by part 5—6 of the diagram, the air remaining in the cylinder after the valve f closes is compressed until the piston reaches the end of its stroke, and at point 6 of the diagram the control piston l again connects the conduit i with the control air source so that an inflow of air occurs as indicated by part 6—1 of the diagram, and a pressure stroke corresponding to part 1—2 of the diagram then obtains.

The operation of the parts on the other side of the piston takes place in a similar manner. Shortly before the work piston a^1 reaches its right hand dead center position, the control piston l having moved to the left, the control ring l^5 opens the left hand conduit j on the left hand side of the cylinder. The control air flows from reservoir n through m into the space x^4 to conduit j and opens the outlet valve f and maintains it open until the piston l reverses and the control ring l^6 of the control piston l moving in the opposite direction, has connected the conduit j with the chamber x^5 (see point 5 of the diagram). This causes the exhausting of the air in the conduit through the opening v^3 and permits the outlet valve f to close. While the work piston a^1 continues to move towards the left dead center (space 5—6 of the diagram) the piston l moves further to the right and its control ring l^7 connects chamber x^4 with the left hand conduit i so that the inlet valve e opens as soon as the work piston has reached its left dead center position (point 6 of the diagram). This action or operation is now repeated, as has been described in connection with the other side of the piston, whereby the exhausting of conduit i is obtained through chamber x^6 and opening v^4.

The previously recited steps take place during engine starting conditions, during which the engine operates as an air motor, and when the engine reaches a speed at which the igni-

tion may be started, so that the device may continue to operate on the Diesel principle, the control air in the conduits m and m_1 is shut off. The starting valves e and f consequently remain closed while the engine operates as a Diesel. The fuel pump is brought into operation simultaneously with the shutting off of the control air and introduces combustible material into the cylinder for Diesel operation.

If it is desired to apply a braking effect to the locomotive, as where the latter is descending a grade, the fuel pumps are rendered inoperative. The three-way cocks t and t^1 are simultaneously adjusted so that the conduits i and j of both ends of the cylinder are interconnected in such a manner that each conduit i connects with its associated conduit j through the three-way cocks as shown in Fig. 2, in which the various parts are shown in their braking positions. Simultaneously with the adjustment of the three-way cocks, the control lever s is moved into the position shown in Fig. 2 thus changing the control elements of the control piston l so that the outlet valve is opened later (point 8 instead of point 5 of the diagram). The air introduced into the cylinder a through the inlet slots b will be compressed as the work piston a^1 returns from the right towards the left, as indicated by part 7—8 of the diagram. At the point 8 the control ring l^7 of the piston l, moving toward the right, opens the conduit i so that the control air flows through this conduit, through the three-way cocks to the outlet valve f which is thus opened. The air compressed in the cylinder now escapes through this open valve. During the stroke reversal of the work piston a^1 the control piston l meanwhile closes the conduit i (point 9 of the diagram) with its control ring l^7. The conduit i may be relieved of pressure through the opening v^4 upon further movement of the control piston and as soon as the control ring l^8 has moved over the conduit i. The outlet valve f now closes, and during the return of the piston a^1, a slight rarefaction of the air within the cylinder occurs, up to point 10 of the diagram corresponding to the opening time of the inlet slots c of the cylinder. Thus the cylinder may fill with fresh air through the slots b until the piston reaches the end of its stroke (point 4 of the diagram). Upon reversal of the piston the aforesaid operation is repeated, similar operations taking place at opposite side of the piston in proper sequence. The intaken air is compressed during the return of the piston and shortly before the end of the stroke is relieved or taken away through the opening of the outlet valve f. This relief of the air from the outlet valve f may be directly into the atmosphere or into a compressed air reservoir such as the reservoir n in which the starting air is stored, so that the braking effect obtaining while the engine is operating as an air compressor is utilized for the replenishment of the starting air. Where the outlet valves f are connected to the reservoir n to save the compressed air, suitable valves are provided to close the passage to the reservoir n and simultaneously open the passages h to atmosphere. It will now be apparent that by reason of the construction described the usual braking devices of locomotives or motor vehicles, when desired, may be supplemented by the additional braking effect of the driving engine when operating as an air compressor, the relief of the compressed air from the cylinder during such operation taking place so that the compressed air will not be effective to force the piston down again on what would correspond to a working stroke of the engine.

While the form of apparatus herein described constitutes a preferred embodiment of the invention, it is to be understood that the invention is not limited to this precise form of apparatus, and that changes may be made therein without departing from the scope of the invention which is defined in the appended claims.

What is claimed is:

1. In a Diesel locomotive, a driving engine comprising a Diesel cylinder, valve means for said cylinder, fluid pressure means for operating said valve means and including a control valve for controlling the fluid pressure supplied to said valve means for changing from Diesel operation to operation as an air compressor.

2. In a Diesel locomotive having an engine cylinder, starting air valve means for said cylinder comprising an air inlet valve and an air outlet valve, means for operating said valves so the cylinder operates as an air motor during engine starting, and means for altering the operation of said valves so that the said inlet valve is maintained closed throughout a complete cycle of operations and the outlet valve is periodically opened to relieve compressed air from the cylinder for the application of a braking effect on the locomotive.

3. In a Diesel locomotive having an engine cylinder, starting air valve means for said cylinder comprising an air inlet and an air outlet valve, fluid pressure means for operating said valves so the cylinder operates as an air motor during starting, and means for adjusting said fluid pressure means so that the inlet valve is maintained closed and the outlet valve is opened near the end of a stroke to relieve compressed air from the cylinder, for the application of a braking effect on the locomotive.

4. In a Diesel locomotive having a driving cylinder of the Diesel type, starting air valve means for said cylinder comprising an air inlet and an air outlet valve, fluid pressure means for operating said valves so the cyl-

inder operates as an air motor during starting and including a fluid conduit for each valve, and means for altering said fluid pressure means for the application of a braking effect on the locomotive including a device for interconnecting said fluid conduits and supplying fluid under pressure to the conduit leading to the air outlet valve while the other conduit remains closed.

5. In a Diesel locomotive having a driving cylinder of the Diesel type, starting air valve means for said cylinder comprising an air inlet and an air outlet valve, fluid pressure means for operating said valves so the cylinder operates as an air motor during starting and including a fluid conduit for each valve, and means for altering said fluid pressure means so that compressed air is periodically relieved from said cylinder.

6. In a Diesel locomotive having a driving cylinder of the Diesel type, starting air valve means for said cylinder comprising an air inlet and air outlet valve, fluid pressure means for operating said valves so the cylinder operates as an air motor during starting and including a fluid conduit for each valve, means for altering said fluid pressure means so that compressed air is periodically relieved from said cylinder for the application of a braking effect on the locomotive, and means for collecting the compressed air so obtained.

In testimony whereof I have affixed my signature.

JOSEF GEIGER.

inder operates as an air motor during starting and including a fluid conduit for each valve, and means for altering said fluid pressure means for the application of a braking effect on the locomotive including a device for interconnecting said fluid conduits and supplying fluid under pressure to the conduit leading to the air outlet valve while the other conduit remains closed.

5. In a Diesel locomotive having a driving cylinder of the Diesel type, starting air valve means for said cylinder comprising an air inlet and an air outlet valve, fluid pressure means for operating said valves so the cylinder operates as an air motor during starting and including a fluid conduit for each valve, and means for altering said fluid pressure means so that compressed air is periodically relieved from said cylinder.

6. In a Diesel locomotive having a driving cylinder of the Diesel type, starting air valve means for said cylinder comprising an air inlet and air outlet valve, fluid pressure means for operating said valves so the cylinder operates as an air motor during starting and including a fluid conduit for each valve, means for altering said fluid pressure means so that compressed air is periodically relieved from said cylinder for the application of a braking effect on the locomotive, and means for collecting the compressed air so obtained.

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JOSEF GEIGER.

CERTIFICATE OF CORRECTION.

Patent No. 1,826,873. Granted October 13, 1931, to

JOSEF GEIGER.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 2, line 19, for "cylinders are open" read cylinder ends are open; page 4, line 23, claim 6, before "air" insert an; and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 17th day of November, A. D. 1931.

M. J. Moore,
Acting Commissioner of Patents.

(Seal)

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