O. E. JÖRGI SEN.

ENGINE REGULATING DEVICE.

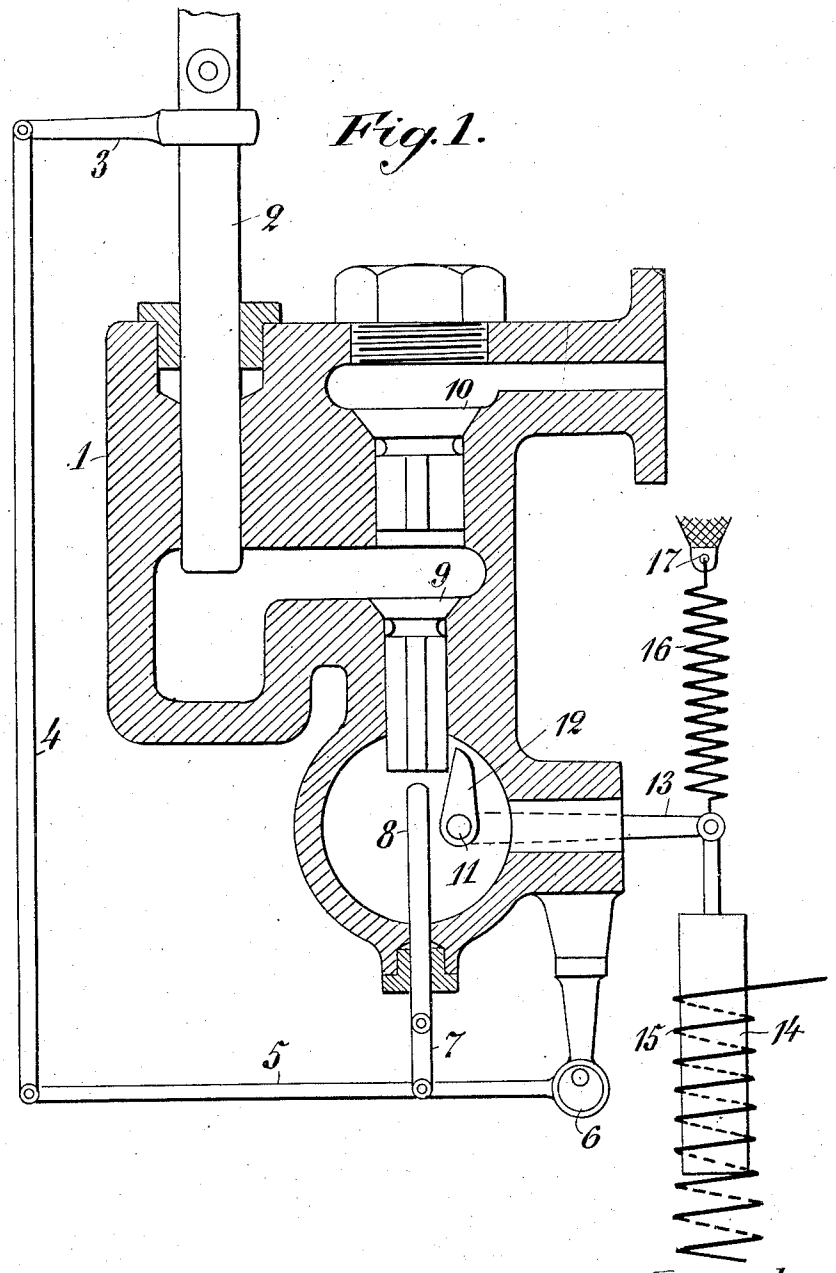
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1,411,631.

Patented Apr. 4, 1922.

2 SHEETS—SHEET 1.

Fig. 1.



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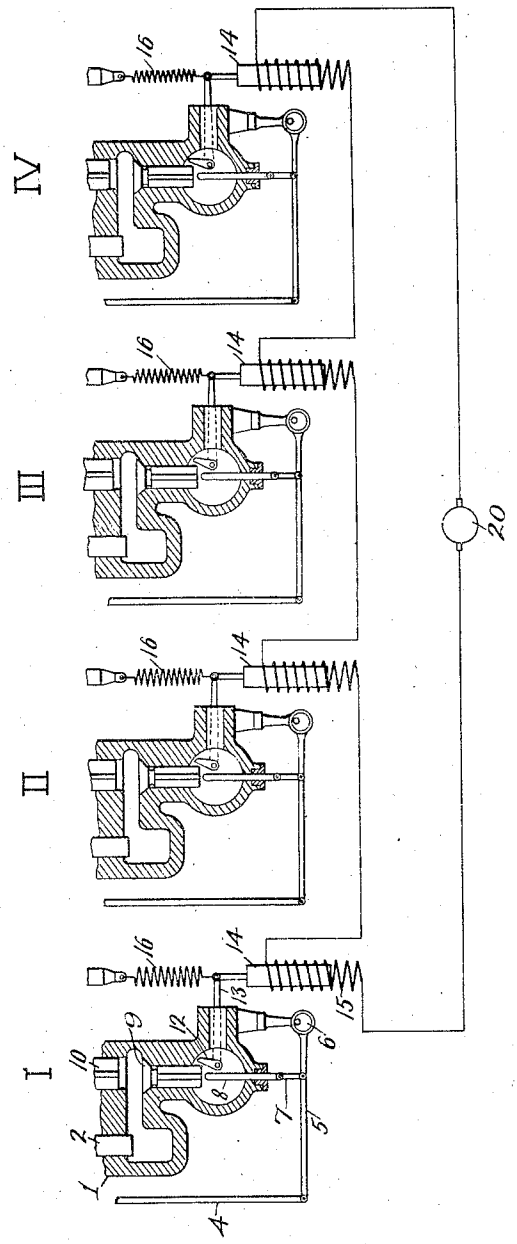


Fig. 2.

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UNITED STATES PATENT OFFICE.

OLAV ESKIL JÖRGENSEN, OF COPENHAGEN, DENMARK.

ENGINE REGULATING DEVICE.

1,411,631. Specification of Letters Patent. Patented Apr. 4, 1922.

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To all whom it may concern:

Be it known that OLAV ESKIL JÖRGENSEN, citizen of the Kingdom of Denmark, residing at No. 16 Fredericiagade, Copenhagen, Denmark, has invented certain new and useful Improvements in Engine Regulating Devices, of which the following is a specification.

In multi-cylinder Diesel-engines fitted with a fuel pump for each working cylinder, the regulation is ordinarily effected by the regulator automatically regulating the amount of oil which each of these pumps feeds into the fuel-valve corresponding to the pump. The regulation acts in such a manner that the engine, in burning this quantity of oil, develops exactly the horsepower required for keeping the engine running at the normal number of revolutions and against the resistance constituting the load on the engine. Regulation according to this principle is impossible, unless the amount of fuel supplied to the engine for combustion is actually ignited and consumed, but the regulation will fail, unless this assumption holds good. Experience shows that there is a certain minimum amount of fuel-oil which is the smallest quantity which may be sprayed into the cylinder of a Diesel-engine and ignited there, when using the fuel-valve adjustment and the primary air pressure required in order that the engine may develop its normal horsepower, when the amount of oil corresponding thereto is supplied to the cylinder. If the regulation has the effect that the fuel amount, for slight load, sinks below this limit, the ignition will fail, and the horsepower and, thereby, the speed of the motor will decrease, until the regulator counteracts this decrease in speed by increasing the amount of oil supplied to the cylinder, so that ignition appears again. The amount of oil which the regulator now causes to be pumped into the cylinder corresponds to a larger performance of work than the one required from the engine, and the speed will thereby be increased so that the regulator must again enter into operation, in order to reduce the quantities of oil supplied.

During the above described condition, no real regulation of the engine may be said to be effected. The inadequate regulation may be avoided by constructing the regulating device in such a manner that one or more of the cylinders of the machine are cut out entirely by stopping completely the supply of fuel of this cylinder or these cylinders, while the amount of oil supplied to each of the still working cylinders is increased in such a manner that the normal ignition in these is secured.

The present invention has for its object to effect the above mentioned cutting out and reinsertion of cylinders automatically in case of Diesel-engines fitted with several cylinders and working in connection with dynamo machines. The cylinders are cut out and taken into use again thereby that the intensity of the electric current delivered from the dynamo is utilized for regulation of the number of working cylinders, while the centrifugal regulator, in usual manner, regulates the amount of oil supplied by each pump to the corresponding cylinder.

In the drawing:

Fig. 1 is a sectional view of the fuel pump for one of the engine cylinders, illustrating apparatus constructed in accordance with the invention; and

Fig. 2 is a diagrammatic view illustrating an embodiment of the invention arranged for a four cylinder engine.

On the engine there is provided for each cylinder, a fuel pump as the one indicated in the drawings, in which 1 indicates the pump housing, 2 the plunger, which is connected to the regulating pin 8, through arm 3, by means of the draw bars 4 and 5. Each draw bar 5 is pivoted about an eccentrically journalled shaft 6 which controls the several units, and is connected to a link 7. The regulating pins 8 determine, in known manner, the moment when the respective suction valves in the pumps may drop down on their seats. Hereby the amount of oil which a plunger 2 may pump up through its pressure valve 10 into the fuel space of the engine cylinder will be regulated. The regulation of the amount of fuel is effected, in known manner, by the regulator adjusting the eccentrically journalled shaft 6 and, thereby, raising or lowering the regulating pins 8. Hereby the amount of oil pumped is decreased or increased.

Below each suction valve, there is provided a pawl 12, which is attached to the shaft 11 in such a manner that it will rotate together with this shaft. On the shaft 11, there is provided an arm 13 at the end whereof there is hung a core 14 partially

enclosed in a coil 15, which is passed by all or part of the current generated by the dynamo conventionally indicated by 20, driven by the Diesel-engine. The arm 13 is further connected to a spring 16, whose other extremity is attached to a fixed point 17.

The device acts in the following manner. Each core 14 will be attracted by the magnetic force which is developed in the coil 15 and increases with the load of the engine. The spring 16 will pull the arm 13 upward with a force depending on the dimensions and elongation of the spring. These quantities are selected and varied progressively among the several cylinders in such a manner that each pawl 12, at a quite definite loading, swings into the position where its top end stands below the suction valve 9, so that the latter is prevented from dropping down on its seat. As here illustrated as an example, the several springs 16 vary progressively in strength, the spring of cylinder unit I being the strongest. As the magnetic force of the coil decreases, the springs 16 overcome this force in the order of their strength to operate the pawls 12 as above described. That is, the spring 16 of cylinder unit I will first overcome the force of the corresponding coil 15 to swing the pawl as above described. Upon further decrease in the magnetic force of the coils the next weaker spring, that of cylinder unit II becomes effective, and so on. This prevention of the closure of the suction valve is entirely independent of the regulating pin 8. When the pawl 12 is turned in below the suction valve, the pump will be inoperative, as the suction valve is then permanently kept lifted by the pawl 12. By the suction valve being rendered inoperative, the result is attained that the corresponding engine cylinder is also cut out and with the construction described the cylinders are progressively cut out as the magnetic force decreases. If, now, load on the engine increases, the magnetic attraction exerted on the cores 14, by the coils 15, will be increased. By this increase in magnetic force the springs 16 are overcome to reinstate the cylinders, inversely in the order of the spring's strength. That is, the spring of the cylinder last cut out, being weaker, is first overcome by the force of the coil. This force pulls the core 14 downward against the spring, the arm 13 is rotated to withdraw the pawl 12, and the suction valve 9 may again drop down on its seat, it being now regulated only by the regulating pin 8, which is governed by the centrifugal regulator. In the same manner, upon further increase of the magnetic force, the earlier cut-out cylinders are reinstated as the force of their coils 15 overcomes the force of their springs 16.

Claims:

1. In a multi-cylinder internal combustion engine, a fuel oil pump for each cylinder, means for regulating the amount of fuel-oil pumped, and means, including an electric circuit adapted to receive current from a dynamo driven by the engine, for regulating the number of working cylinders.

2. In a multi-cylinder internal combustion engine, a fuel-oil pump for each cylinder, means for regulating the amount of fuel-oil pumped, and means, including an electric circuit adapted to receive current from a dynamo driven by the engine, for progressively cutting out and reinserting a plurality of cylinders.

3. In a multi-cylinder internal combustion engine, a fuel-oil pump for each cylinder, means for regulating the amount of fuel-oil pumped, an electric circuit adapted to receive current from a dynamo driven by the engine, and means controlled by said circuit for rendering a given pump inoperative.

4. In a multi-cylinder internal combustion engine, a fuel-oil pump for each cylinder, suction valves associated with said pumps, regulating means for controlling the seating of said valves, an electric circuit adapted to receive current from a dynamo driven by the engine, and means controlled by said circuit for preventing a given suction valve from seating, thereby to render the corresponding pump inoperative.

5. In a multi-cylinder internal combustion engine, a fuel-oil pump for each cylinder, suction valves associated with said pumps, an abutment associated with at least one valve and movable into a position to hold the valve away from its seat, a coil adapted to receive current from a dynamo driven by the engine, a core associated with said coil, and a connection between said core and said abutment whereby movement of the core moves the abutment.

6. In a multi-cylinder internal combustion engine, a fuel-oil pump for each cylinder, and means for progressively rendering a plurality of said pumps inoperative, including for the several cylinders coils adapted to receive current from a dynamo driven by the engine, cores within said coils and balancing members, the combined effects of which vary among the several sets.

In testimony whereof he affixes his signature.

OLAV ESKIL JÖRGENSEN.