

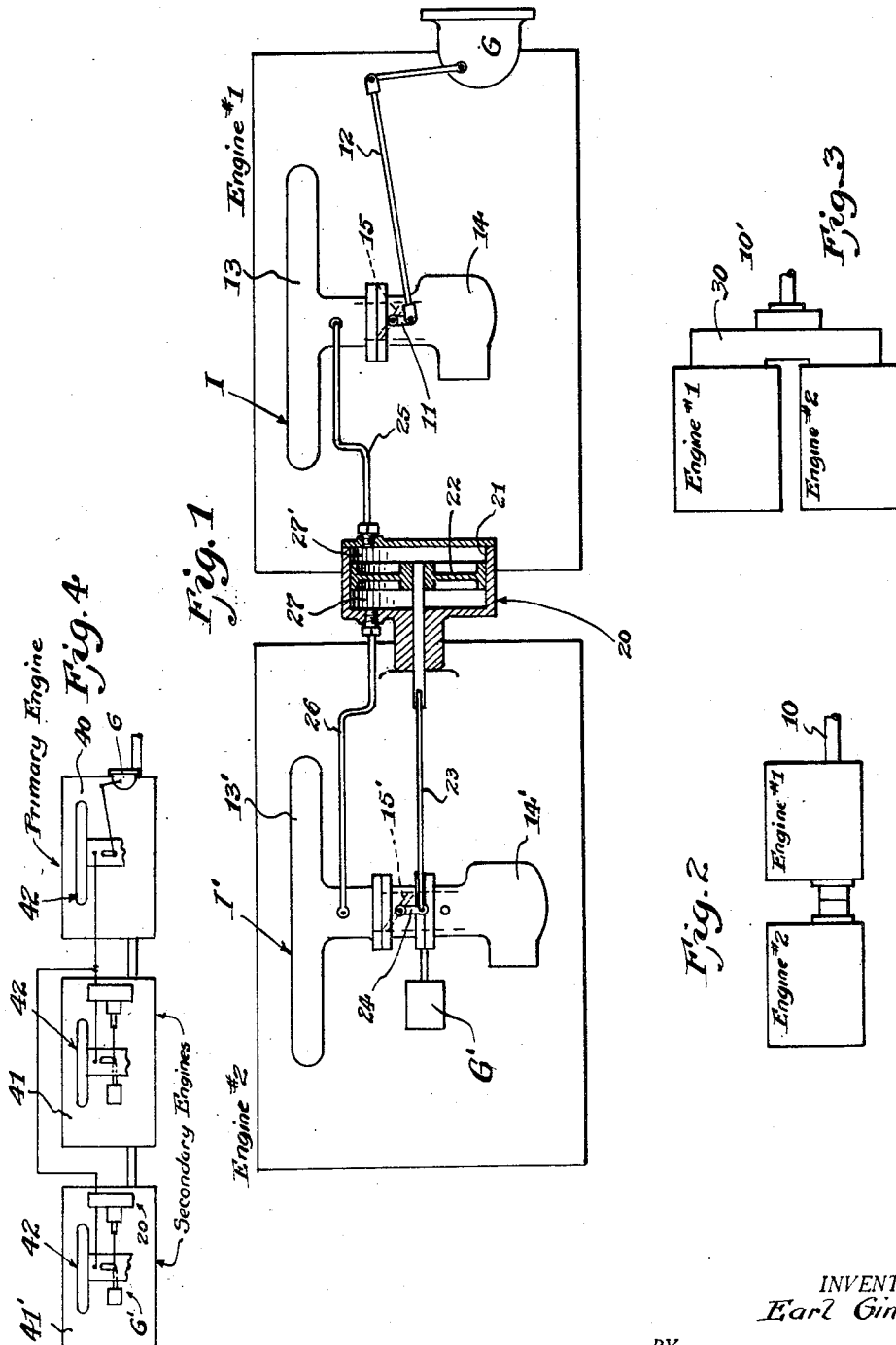
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MULTIPLE ENGINE POWER PLANT

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MULTIPLE ENGINE POWER PLANT

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1

My invention relates to power plants and more particularly to assemblies comprising two or more internal combustion engines connected to the same shaft.

In multiple engine power plants of the type described, the type most often employed comprising a pair of engines, difficulties have been experienced in so adjusting the operation of said engines as to make them all carry substantially equal loads. Because of the difficulty in synchronizing the speed and loading of such engines, it is often found that one of the engines carries more of the load than the others and consequently will have a shorter life. Various types of balance valves have been provided for equalizing the loads, but such valves as have been employed heretofore have a short life and also do not function to maintain uniform distribution of the loads to the various engines comprising the power plant.

It is an object of my present invention to overcome the aforesaid difficulties by providing an assembly comprising a pressure responsive actuator associated therewith and responsive to suction pressure of the engine induction systems to enable all such engines to carry the same percentage of load.

A further object of my present invention is to construct an improved power plant comprising a plurality of engines connected with the same shaft, by providing an improved pressure responsive actuator associated with the secondary engines, and more particularly comprising a cylinder and sliding piston assembly, for equalizing the loading of said engines.

For a more detailed understanding of my invention, reference may be had to the accompanying drawing of my invention illustrating a preferred embodiment thereof, in which like parts are referred to by like characters throughout the several views, and in which:

Fig. 1 is an elevational view of the power plant embodying my invention,

Fig. 2 is a diagrammatic view of one power plant assembly,

Fig. 3 is a diagrammatic view of another power plant assembly, and

Fig. 4 is a diagrammatic view of still another power plant assembly.

When two or more internal combustion engines are assembled together to provide a power plant unit, and which are connected to the same shaft, it is desirable to have them all running at substantially the same speed and carrying substantially the same load. With such assemblies it is

2

desirable to provide a primary engine which is adjusted to run at a certain predetermined speed by means of a control consisting of a mechanical governor controlling the speed and load of said engine. The other engines of the unit hereafter designated as secondary engines, carry governors of standard construction which are preferably adjusted so that these secondary engines may operate at a higher speed than the primary engines, preferably about 50 R. P. M. higher speed. The operation of said secondary engines is controlled by means of a pressure responsive actuator which throttles said engines so that the load carried by said power plant is substantially uniformly distributed to a plurality of engines comprising said power plant assembly.

In the improved construction illustrated in the drawing and in detail in Figs. 1 and 2 thereof, it will be observed that I have provided a pair of engines designated engine #1 and engine #2, which are both connected to a shaft 10. A mechanical governor G is associated with engine #1 and actuates a throttle 11 by means of linkage 12. Engines #1 and #2 are respectively provided with induction systems I and I' which comprise intake manifolds 13 and 13' and carburetors 14 and 14'. These carburetors are connected with the intake manifold in the customary manner and each carries a butterfly throttle valve for controlling the amount of fuel mixture admitted to the intake manifold. The throttling means 11 of engine #1 is operated to control the position of the butterfly valve 15 to control the speed and load of engine #1.

The pressure responsive actuator 20 is preferably carried by engine #2 and it comprises a cylinder 21 and a sliding piston 22, said piston being connected by suitable linkage 23 with the throttle valve lever 24 connected with butterfly valve 15'. Engine #2 carries a standard governor G' which is preferably adjusted so that engine #2 would have about 50 R. P. M. higher speed than engine #1 if they were not rigidly coupled together. The cylinder 21 is connected by a conduit 25 with the intake manifold 13, and the cylinder portion to the other side of said piston valve 22 is connected by a pipe or conduit 26 with the intake manifold 13'.

Thus this pressure responsive actuator equalizes the operation of these two engines which are connected to the same shaft 10. If engine #2 begins to have a tendency to operate at a slower speed and carry more of the load the suction pressure in cylinder portion 27 will be increased, thus opening valve 15' and increasing

the torque of the engine until same is substantially the same as engine #1. Likewise the suction pressure of intake manifold 13 is communicated to the cylinder portion 27' on the other side of the valve 22.

While Figs. 1 and 2 illustrate engines #1 and #2 arranged in tandem, it is obvious that said engines may be arranged side by side as shown in Fig. 3 and connected through suitable gearing 30 to the same shaft 10'. The control of the secondary engine (engine #2) is had in accordance with the principles described in connection with the construction of Fig. 1.

It is obvious that more than two engines may be connected together with the same shaft if so desired and Fig. 4 illustrates such an assembly. The assembly shown in Fig. 4 comprises a primary engine 40 and secondary engines 41 and 41'. These engines are each provided with an induction system 42 and are connected in a like manner as the engines in Fig. 1. Thus, when more than a pair of engines are connected together to operate as a unitary power plant a pressure responsive actuator is associated with each of said secondary engines.

Thus by having the intake manifold suction applied to one side of the piston valve from the #1 or primary engine, and the intake manifold vacuum from the other engines, designated secondary engines, connected with the other side of the piston, it is obvious that the two or more engines may be controlled to run at substantially the same load and because they are connected with the same shaft, they will run at the same or different speeds as their gearing to the common power shaft dictates. The present pressure responsive actuator comprising a cylinder and piston assembly is rugged and most efficient. Same does not readily wear out and consequently the power plant will operate continuously for long periods of time with a minimum of service. This actuator makes it possible to connect a plurality of engines together, and to operate same as a unit without having one engine wear out in advance of the others because of being subjected to more load.

Thus, the pressure responsive actuator herein illustrated is of simple construction but very rugged and it is apparent that same will have a long life. The present construction provides for uniform distribution of the load of all the engines of the power plant assembly and is so connected with the throttling means of said engines as to operate all said engines at the same speed.

It will be apparent to those skilled in the art to which my invention pertains, that various modifications and changes may be made therein without departing from the spirit of my invention or from the scope of the appended claims.

I claim:

1. A multiple engine power plant comprising at least a pair of engines operatively connected with the same shaft, a mechanical governor associated with one of said engines to control its speed and load, induction systems associated with

each of said engines and comprising an intake manifold, a carburetor, a throttle valve and an actuating arm secured to the valve, said mechanical governor aforesaid connected with the throttle valve of said engine with which it is associated, a horizontally movable single-disc, pressure responsive actuator associated with said dual engine power plant, said actuator having connections connecting one side of said valve to the intake manifold vacuum of the mechanically governed engine aforesaid and the other side of said valve to the intake manifold vacuum of said other engine, said other engine provided with a mechanical speed controlling governor adjusted for a higher speed than the governor of said first engine, said pressure responsive actuator being directly connected with the engine throttle valve actuating arm of said last mentioned engine, said pressure responsive actuator comprising a cylinder and piston assembly, the piston sliding axially in said cylinder.

2. A multiple engine power plant comprising at least a pair of engines operatively connected with the same shaft, a mechanical governor associated with one of said engines to control its speed and load, induction systems associated with each of said engines and comprising an intake manifold, a carburetor, a throttle valve and an actuating arm secured to the valve, said mechanical governor aforesaid connected with the throttling means of said engine with which it is associated, a horizontally movable single-disc pressure responsive actuator associated with said dual engine power plant, said pressure responsive actuator having connections connecting one side of said valve to the intake manifold vacuum of the mechanically governed engine aforesaid and the other side of said valve to the intake manifold vacuum of said other engine, said pressure responsive actuator being directly connected with the engine throttle valve actuating arm of said last mentioned engine, said last mentioned engine provided with a mechanical speed controlling governor adjusted for a slightly higher speed than the speed of said first mentioned engine, and therefore normally ineffective.

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