J. B. REPLOGLE.

ENGINE GOVERNOR.

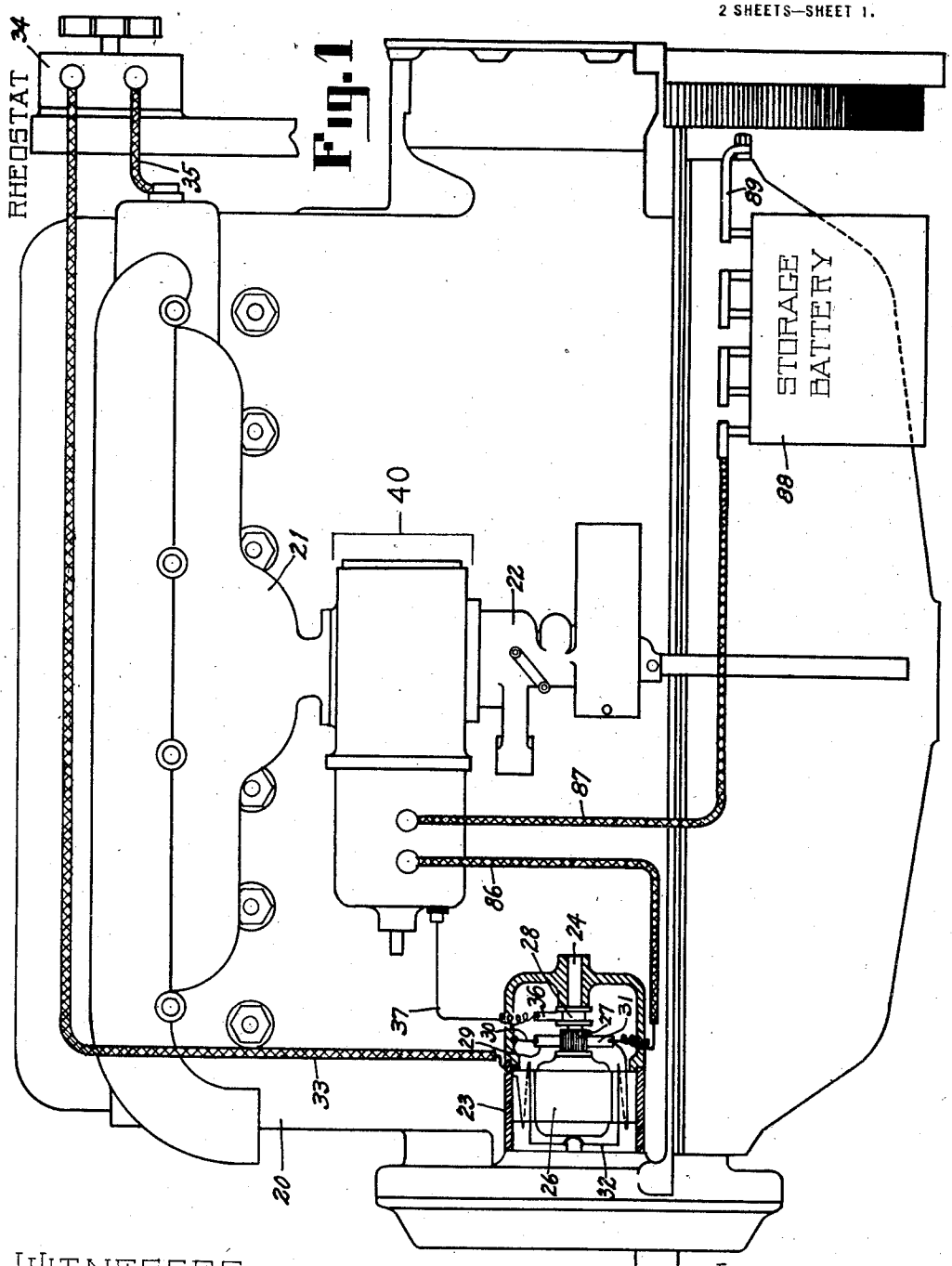
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1,424,140.

Patented July 25, 1922.

2 SHEETS—SHEET 1.

Fig. 1



WITNESSES

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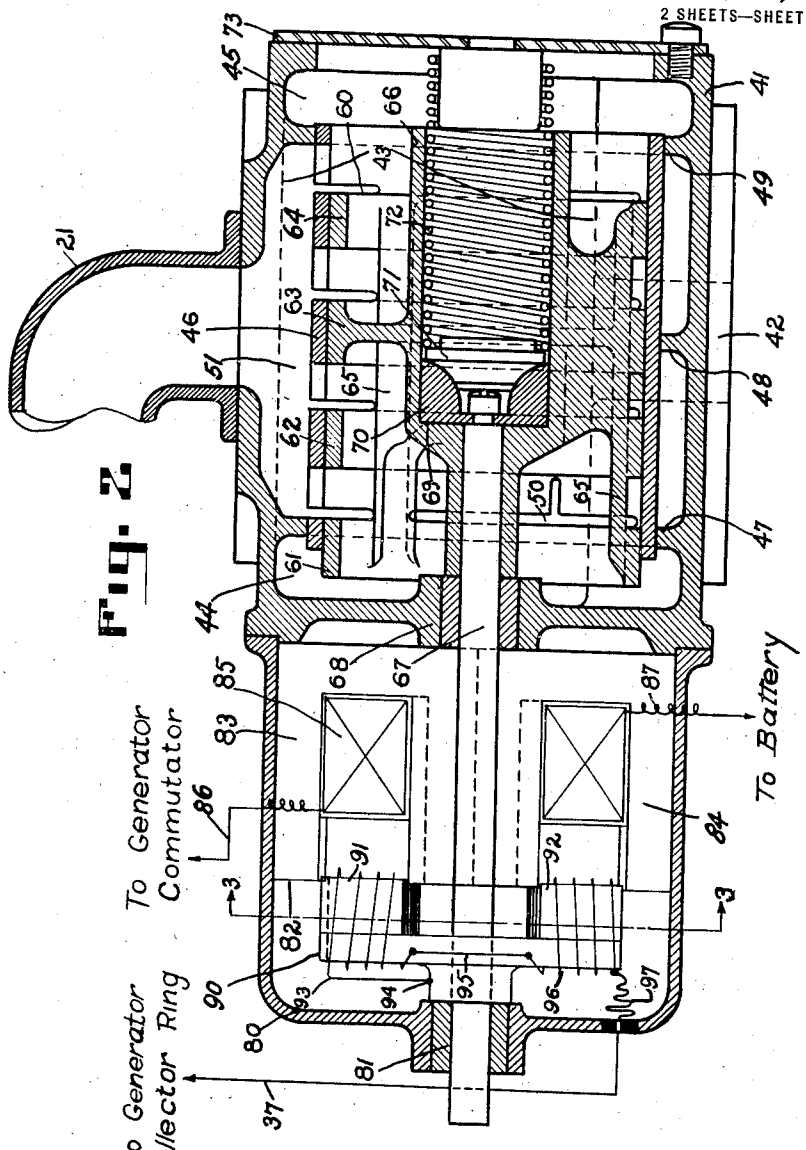


Fig. 2

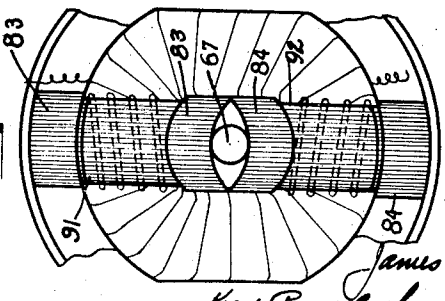


Fig. 3

WITNESSES

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UNITED STATES PATENT OFFICE.

JAMES B. REPLOGLE, OF DETROIT, MICHIGAN, ASSIGNOR TO THE REMY ELECTRIC COMPANY, A CORPORATION OF INDIANA.

ENGINE GOVERNOR.

1,424,140. Specification of Letters Patent. Patented July 25, 1922.

Application filed June 14, 1919. Serial No. 304,275.

To all whom it may concern:

Be it known that I, JAMES B. REPLOGLE, a citizen of the United States of America, residing at Detroit, county of Wayne, State of Michigan, have invented certain new and useful Improvements in Engine Governors, of which the following is a full, clear, and exact description.

This invention relates to electromagnetic throttle governors for steam and internal combustion engines and the like, the controlling current for the governor being derived from a generator driven by the engine.

The type of throttle governor to which the present invention relates includes an electromagnet which controls the position of an armature to which the throttle valve is connected. It is among the objects of the invention to provide means whereby the magnetism which determines the position of the armature will bear the proper relation to the controlling current passing through the electro-magnet winding. It is well known that, due to hysteresis, when the current in an electro-magnet is varied, the variation of magnetism is not in exact correspondence therewith. Therefore it is an object of the invention to minimize the effect of hysteresis in order that the magnetism affecting the position of the armature and throttle valve will be the most closely in correspondence with the controlling current.

Other and further objects and advantages of the present invention will be apparent from the following description reference being had to the accompanying drawings, wherein preferred embodiments of the present invention are clearly shown.

In the drawings:

Fig. 1 is a side elevation of an engine to which the present invention is applied, certain parts being shown in section;

Fig. 2 is a longitudinal sectional view of the throttle governor shown in Fig. 1; and

Fig. 3 is a section taken on the line 3—3 of Fig. 2.

In the drawings, an internal-combustion engine 20 is provided with an intake manifold 21 and the carburetor 22 is connected to the manifold 21 through the throttle governor 40 to be described.

Upon the engine frame is mounted a generator 23 having an armature shaft connected with the engine crank shaft 25 by gearing, not shown. Shaft 24 carries armature 26, commutator 27 and collector ring 28. Generator brush 29 is grounded by wire 30 upon the generator frame and brush 31 is connected at one end with a shunt field circuit 32, the other end of which is connected by wire 33 of a rheostat 34. Rheostat 34 is grounded by wire 35 upon the engine frame. A brush 36 cooperates with collector ring 28 to collect alternating current which is conducted through wire 37 to certain windings of the throttle governor 40.

The throttle governor 40 includes valve housing 41 provided with an inlet passage 42 which communicates with the carburetor 22. Passage 42 is connected by passage 43 with chambers 44 and 45 located at the ends of housing 41, and these passages 44 and 45 lead into valve port member 46 which is supported upon ledges or internal flanges 47, 48 and 49 provided within the housing 41. Port member 46 is provided with a plurality of T-shaped ports 50. In the embodiment of the invention shown there are twelve of these ports 50 arranged in four circular rows of three ports in each row. These ports 50 provide passages between the interior of the port member 46 and the space included between the exterior of said port member 46 and interior of housing 41 which is connected with outlet passage 51 which communicates with the intake manifold 21. These rows of ports are in the present embodiment of the invention arranged to be closed by the valve 60 which includes four annular bands 61, 62, 63 and 64 which are connected together by integral ribs 65 extending outwardly from a centrally disposed hub 66. By means of said hub 66 the valve 60 is mounted upon a valve shaft 67 having a bearing 68 supported by housing 41 and the bearing 81 carried by the magnet housing 80 which is supported by the valve housing 41 in any suitable manner.

The hub 66 is bored to provide a centrally disposed recess 69 within which is located a metallic bearing 70 and graphite or similar thrust bearing 71 and spring 72 disposed between bearing 71 and the end cover plate 73 of the housing 41. The spring 72 normally maintains the valve 60 in open position.

Within the magnet housing 80 is located a direct current electro-magnet 82 which includes two U-shaped laminated cores 83

and 84 located on opposite sides of the shaft 67, and a magnet winding 85 having one terminal connected by wire 86 with generator brush 31 and the other terminal connected by wire 87 with a storage battery 88 which is grounded upon the engine frame by connection 89.

The shaft 67 supports an armature 90 having laminated pole pieces 91 and 92. Pole 91 carries a winding 93, one terminal of which is grounded at 94, and the other end is connected by wire 95 with a coil 96 carried by pole 92. Winding 96 is wound reversely with respect to winding 93 and is connected by flexible conductor 97 with wire 37 leading to the brush 36.

The operation of the governor is as follows: As the speed of the engine increases there will be a corresponding increase of current output from the generator and a consequent increase in the ability of the magnet 82 to attract the armature 90 at a predetermined engine speed. The attractive power of magnet 82 will be sufficient to overcome the action of spring 72 and to cause the pole pieces to move to the right as viewed in Fig. 2 and to occupy a portion of the air gap provided at the poles of the magnet 82. This action will cause the valve 60 to move toward closed position, thereby tending to decrease the admission of power fluid to the engine and to decrease the speed of the engine and the amount of current generated. Finally a balance will be established between the attractive force of the magnet 82 and the restoring force of the spring 72 so that the valve 60 will be maintained in a position which will prevent the increase of speed of the engine above a predetermined limit.

The purpose of the alternating current is to eliminate the effect of what is known as the hysteresis of the steep comprising the field of the magnet and armature. It is a well known fact that, when direct current is sent around a piece of steel so as to cause it to become magnetized electrically, there is an attribute which tends to prevent proportionate reduction of that magnetism when the current causing the magnetization is reduced. Since in the construction described the position of the throttle is determined by the magnetism in the field frame, it is necessary that this magnetism be accurately related to the current producing it, or else there will be a lag in the action of the governor upon the increase or decrease of the controlling current. If any alternating current is applied so as to have its magnetic effect superposed upon that produced by the direct current, the result will eliminate the effect of this hysteresis as determining the resultant magnetism, and the average magnetism will be accurately related to the controlling current, and therefore the position of the armature which is controlled by the magnetism will also bear the proper relation to the controlling current.

In the present invention this alternating current is passed through the windings 93 and 96 for the purpose of "shaking out" residual magnetism in the magnetic circuit so that the controlling current can vary the position of the armature 91, 92 as if no hysteresis were present.

By making the valve ports T-shaped, as shown, the admission of power fluid to the engine is controlled in such a manner as to provide hunting between the action of the engine and the action of the throttle governor. This feature does not of itself form a part of the present invention but is particularly described and claimed in my copending application, Serial No. 290,192, filed April 15, 1919.

While the forms of mechanisms herein shown and described constitute preferred forms of embodiments of the invention, it is to be understood that other forms might be adopted, all coming within the scope of the claims which follow.

What I claim is as follows:

1. In a throttle governor, the combination with a port member; of a valve; electromagnetic means for controlling the position of the valve; and windings adapted to be connected with an alternating current source for reducing hysteresis in said electromagnetic means.

2. In a throttle governor, the combination with a port-member; of a valve; an electromagnet adapted to be connected with a controlling direct current source; an armature actuated by said magnet and connected with said valve; and oppositely wound coils carried by said armature and adapted to be connected with an alternating current source whereby to reduce hysteresis effects.

3. In a throttle governor, the combination with a port-member; of a valve; an electromagnet including two U-shaped cores and a magnet coil adapted to be connected with a controlling direct current source; an armature including pole pieces adapted to move between the branches of said U-shaped cores by magnetic attraction; and oppositely wound coils each surrounding one of said pole pieces and adapted to be connected with an alternating current source whereby to reduce hysteresis effects in said magnet cores and armature.

In testimony whereof I affix my signature.

JAMES B. REPLOGLE.

Witnesses:
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