N. McCARTY.

GOVERNED PUMP.

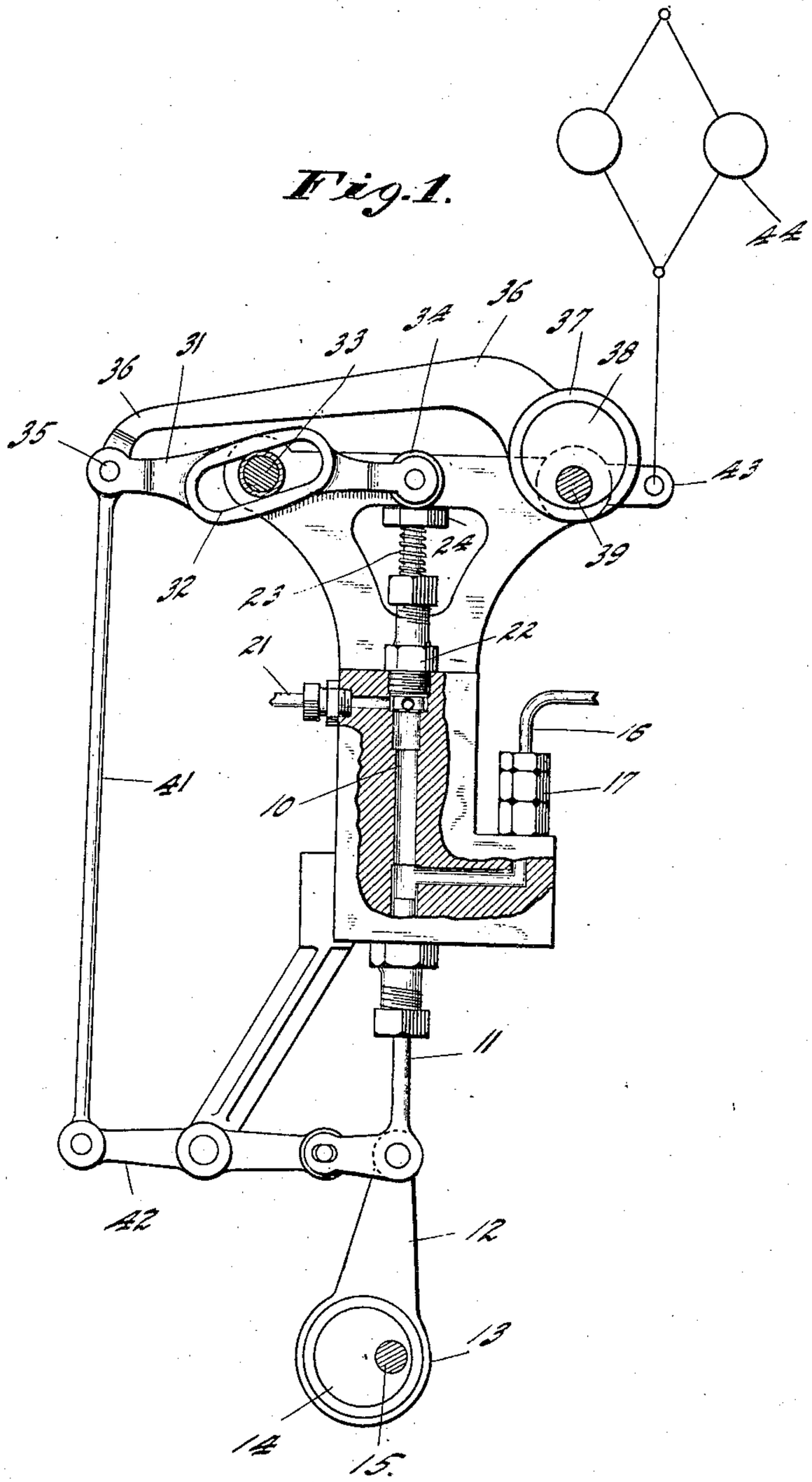
APPLICATION FILED DEC. 18, 1908.

929,000.

Patented July 27, 1909.

2 SHEETS—SHEET 1.

Fig. 1.



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2 SHEETS—SHEET 2.

Fig. 2

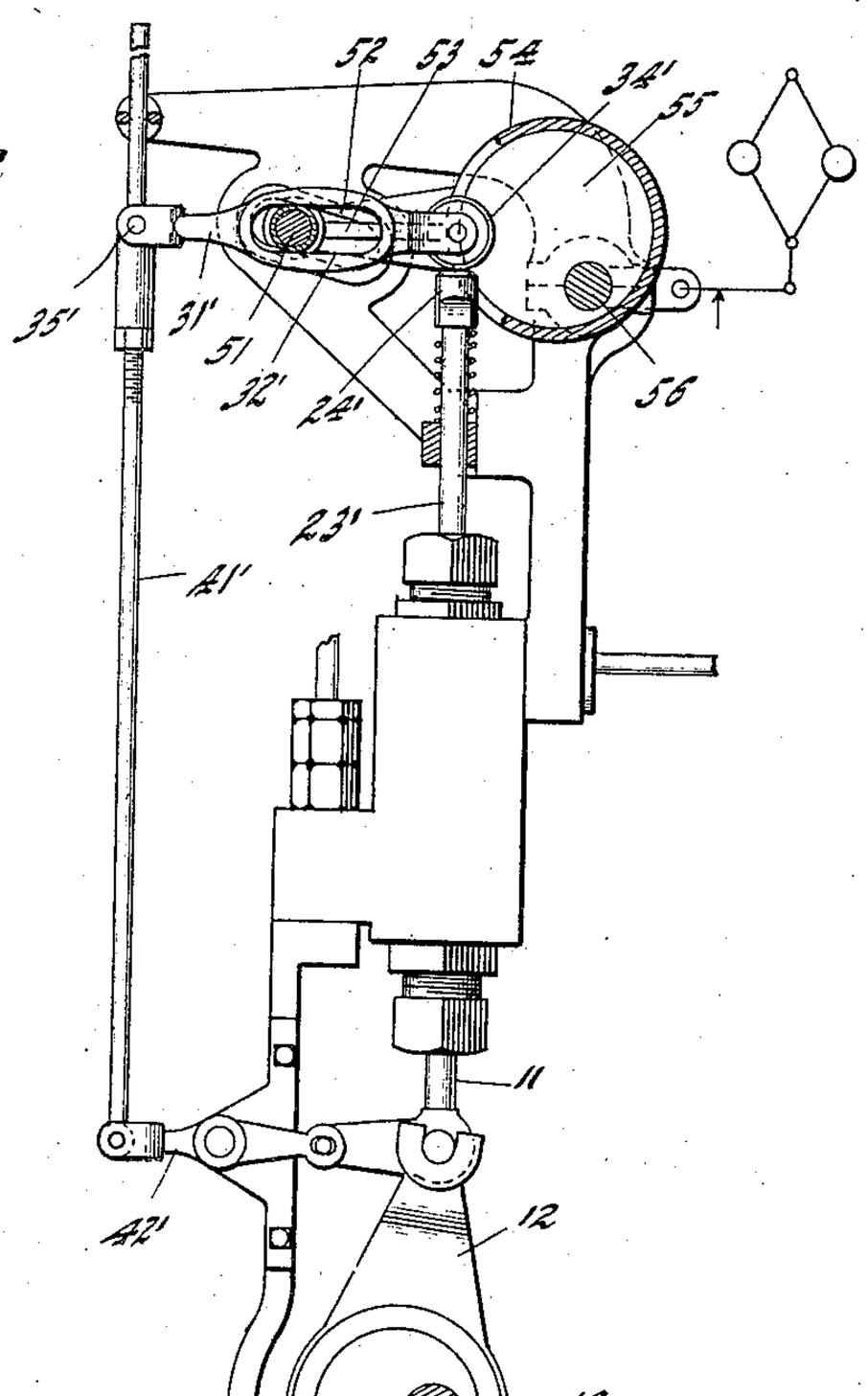
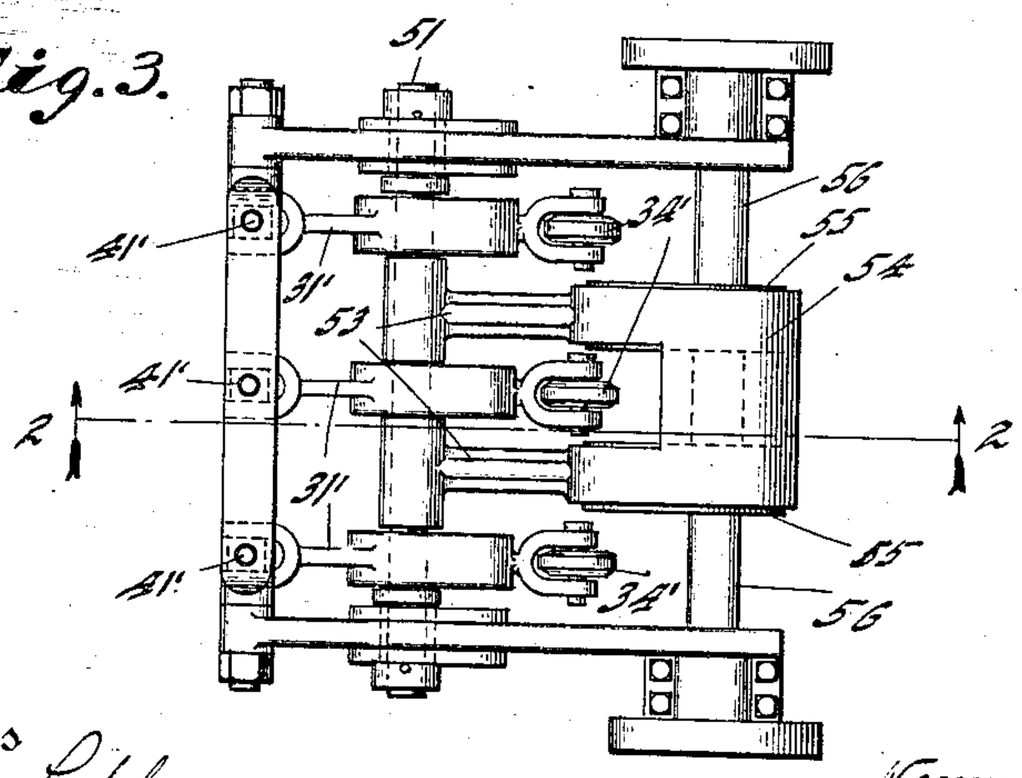


Fig. 3.



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UNITED STATES PATENT OFFICE.

NORMAN McCARTY, OF INDIANAPOLIS, INDIANA, ASSIGNOR TO ATLAS ENGINE WORKS, OF INDIANAPOLIS, INDIANA, A CORPORATION OF INDIANA.

GOVERNED PUMP.

No. 929,000. Specification of Letters Patent. Patented July 27, 1909.

Application filed December 18, 1908. Serial No. 468,168.

To all whom it may concern:

Be it known that I, NORMAN McCARTY, a citizen of the United States, residing at Indianapolis, in the county of Marion and State of Indiana, have invented certain new and useful Improvements in Governed Pumps, of which the following is a specification.

In the operation of internal combustion engines wherein the liquid fuel is injected into the combustion chamber subsequent to the time when a preliminary air charge has been compressed to an igniting temperature, the speed regulation is accomplished by regulating the flow of liquid fuel into the combustion chamber and a common mechanism for accomplishing this regulation comprises a pump having a suction, or supply inlet valve which yields and permits back flow to the reservoir during a greater or lesser portion of the time of displacing action of the ejection piston, such mechanism being fairly illustrated in Patent No. 654,140 issued July 24, 1900 and Patent No. 729,613 issued June 2, 1903. The devices illustrated in the above mentioned patents do not, in practice, operate in such manner as to prevent jumping of the speed control governor and require a considerable movement of the speed control governor.

The object of my present invention is therefore to produce a mechanism by means of which a speed controlled governor may control accurately and with great sensitiveness, the position and operation of the suction valve of a pump in coöperation with the displacing piston having a uniform displacing stroke.

The accompanying drawings illustrate my invention.

Figure 1 is an elevation in partial vertical section of one form of my device, Fig. 2 a similar view of another form, and Fig. 3 a plan of the construction shown in Fig. 2.

In Fig. 1, 10 indicates a pump chamber into which may be projected a displacing piston 11 by any suitable means, such as an arm 12 carried by an eccentric strap 13 surrounding an eccentric 14 carried by a shaft 15 driven by the motor (not shown) to be controlled. Leading from pump chamber 10 is a discharge pipe 16 with a check valve 17 arranged between said pipe and the pump chamber so as to prevent back flow from pipe 16 into the pump chamber. It is to be understood that in devices of this character the pump operates against a very considerable pressure which is maintained in the feeding atomizer of the motor so that there is constantly maintained in pipe 16 a very considerable pressure.

Leading into pump chamber 10 is a feed pipe 21 which leads from a supply reservoir (not shown) preferably somewhat above the pump chamber so that the liquid fuel may flow by gravity into the pump chamber whenever the suction valve 22 is opened and piston 11 is withdrawn from the pump chamber. The suction valve 22 is yieldingly held closed by a spring 23 and at the outer end of its stem is provided with a head 24 by means of which the suction valve may be controlled against the action of the spring 23.

As will be seen from the Lauster patent, referred to above, it has heretofore been proposed to control the suction valve against the action of its closing spring, by means of a fixed-ratio lever, the fulcrum of which is automatically shifted in order to change the relation of the controlling lever to the suction valve. It will be seen that, in such a construction the controlling spring of the suction valve has a direct line of action, through a system of levers, upon the balls of the speed controlled governor in the same direction as the spring of the speed controlled governor, *i. e.* in such a way as to require a greater speed of the motor to attain a governing position of the governor balls and that, so soon as the suction valve is seated, this assisting force of the controlling spring of the suction valve is withdrawn from the governor and the then speed of the motor tends to immediately vary the position of the governor balls, thus causing a jumping of the governor and consequent unstability of the governed parts. In order to obviate this difficulty I provide a lever, the ratio of the arms of which may be automatically varied in order to vary the movement of the suction valve relative to the displacing piston, and so mount said lever with relation to its fulcrum that it not only has its ratio varied but also has a movement relative to the suction valve so that its position is changed and its effect upon the suction valve therefore changed.

In Fig. 1, I show a lever 31 having an inclined intermediate slot 32 which is adapted to receive a fixed fulcrum 33. Lever 31 at one end carries a roller 34 adapted to engage head 24 of valve 22 while at the other end

said lever 31 is pivotally connected at 35 with an arm 36 carried by an eccentric strap 37 surrounding an eccentric 38 carried by a rock shaft 39. Lever 31 is also connected at 35 with a link 41 which is connected to one end of the lever 42 the opposite end being connected to the displacing piston 11. Connected to rock shaft 39 is an arm 43 which connects to an ordinary speed controlled governor 39.

In Fig. 2, instead of a fixed fulcrum, as in Fig. 1, I provide a fulcrum 51 which is mounted in an inclined stationary guide 52 and is movable back and forth in said guide by means of an arm 53 carried by an eccentric strap 54 embracing an eccentric 55 carried by a rock shaft 56 connected to a speed controlled governor as in Fig. 1. Fulcrum 51 projects into a slot 32′ of a lever 31′ which carries a roller 34′ adapted to engage head 24′ of a suction valve stem 23′. The opposite end of lever 31′ is connected at 35′ with a link 41′ connected to one arm of a lever 42′ the opposite arm of which is connected to the displacing piston 11.

It will be seen that, in either of the constructions illustrated, a variation of the ratio of the controlling lever is obtained by the action of the speed controlled governor, so that, for a given and uniform stroke or movement of one end of the controlling lever, the opposite end of said controlling lever is given a greater or lesser movement in the same time so that the closing movement of the suction valve is hastened or retarded relative to the displacing movement of the displacing piston and the volume of discharge from the pump into the discharge pipe 16 is thus varied and controlled. In addition to the variation of ratio of the controlling lever the bodily movement of the lever toward or from the suction valve, produced by the inclination of the slot 32 in the form shown in Fig. 1, and by the inclination of the slot 52 in the form shown in Fig. 2, further increases the variation of the controlling lever relative to the suction valve without requiring a greater movement of the speed controlled governor. It will also be noticed that the force exerted upon lever 31 by the controlling spring of the suction valve is all frictionally absorbed before it reaches the eccentric 38 or 55 and has practically no effect either in resistance or assistance of the usual controlling spring of the speed controlled governor.

I claim as my invention:

1. The combination, in an explosive engine, of a suction valve for the liquid fuel, a pump piston for supplying the fuel, a lever coöperating with the suction valve, a connection between said lever and the pump piston, and means for varying the relation between the lever and its fulcrum to vary the lever ratio and to shift the lever toward or from the suction valve.

2. The combination, in an explosive engine, of a suction valve for the liquid fuel, a pump piston for supplying the fuel, a lever coöperating with the suction valve, a connection between said lever and the pump piston, and means for varying the relation between the lever and its fulcrum to vary the lever ratio.

3. The combination, in an explosive engine, of a suction valve for the liquid fuel, a pump piston for supplying the fuel, a lever coöperating with the suction valve, a connection between said lever and the pump piston and means for shifting said lever longitudinally and transversely on its fulcrum.

4. The combination, in an explosive engine, of a suction valve for the liquid fuel, a pump piston for supplying the fuel, a lever coöperating with the suction valve, a connection between said lever and the pump piston and means for shifting said lever longitudinally on its fulcrum.

5. A pump comprising, a main chamber having an inlet valve and an outlet valve, a pump piston associated with said chamber, a controlling lever engaging the inlet valve to control the time of closing of said valve relative to the movement of the pump piston, a connection between said lever and the pump piston, and means for varying the ratio of the lever arms and shifting the lever toward or from the inlet valve.

6. A pump comprising, a main chamber having an inlet valve and an outlet valve, a pump piston associated with said chamber, a controlling lever engaging the inlet valve to control the time of closing of said valve relative to the movement of the pump piston, and means for varying the ratio of the lever arms and shifting the lever toward or from the inlet valve.

7. A pump comprising, a main chamber having an inlet valve and an outlet valve, a pump piston associated with said chamber, a controlling lever engaging the inlet valve to control the time of closing of said valve relative to the movement of the pump piston, a connection between said lever and the pump piston, and means for varying the ratio of the lever arms.

8. A pump comprising, a main chamber having an inlet valve and an outlet valve, a pump piston associated with said chamber, a controlling lever engaging the inlet valve to control the time of closing of said valve relative to the movement of the pump piston, and means for varying the ratio of the lever arms.

9. A pump comprising, a main chamber having an inlet valve and an outlet valve, a pump piston associated with said chamber, a controlling lever engaging the inlet valve to control the time of closing of said valve relative to the movement of the pump piston, a

connection between said lever and the pump piston, an eccentric, an arm strapped thereon, a sliding connection between the lever and its fulcrum inclined transversely of the lever, and a connection between the eccentric arm and the lever whereby a movement of the eccentric will shift the lever upon its fulcrum.

10. A pump comprising, a main chamber having an inlet valve and an outlet valve, a pump piston associated with said chamber, a controlling lever engaging the inlet valve to control the time of closing of said valve relative to the movement of the pump piston, a connection between said lever and the pump piston, an eccentric, an arm strapped thereon, a sliding connection between the lever and its fulcrum, and a connection between the eccentric arm and the lever whereby a movement of the eccentric will shift the lever upon its fulcrum.

11. A pump comprising, a main chamber having an inlet valve and an outlet valve, a pump piston, associated with said chamber, a controlling lever engaging the inlet valve to control the time of closing said valve relative to the movement of the pump piston, an eccentric, an arm strapped thereon, a sliding connection between the lever and its fulcrum inclined transversely of the lever, and a connection between the eccentric arm and the lever whereby a movement of the eccentric will shift the lever upon its fulcrum.

12. A pump comprising, a main chamber having an inlet valve and an outlet valve, a pump piston associated with said chamber, a controlling lever engaging the inlet valve to control the time of closing of said valve relative to the movement of the pump piston, an eccentric, an arm strapped thereon, a sliding connection between the lever and its fulcrum and a connection between the eccentric arm and the lever whereby a movement of the eccentric will shift the lever upon its fulcrum.

In witness whereof, I, have hereunto set my hand and seal at Indianapolis, Indiana, this third day of December, A. D. one thousand nine hundred and eight.

NORMAN McCARTY. [L. S.]

Witnesses:
ARTHUR M. HOOD,
THOMAS W. McMEANS.