C. G. WELD.

INTERNAL COMBUSTION ENGINE.

APPLICATION FILED OCT. 15, 1908.

942,227. Patented Dec. 7, 1909.

2 SHEETS—SHEET 1.

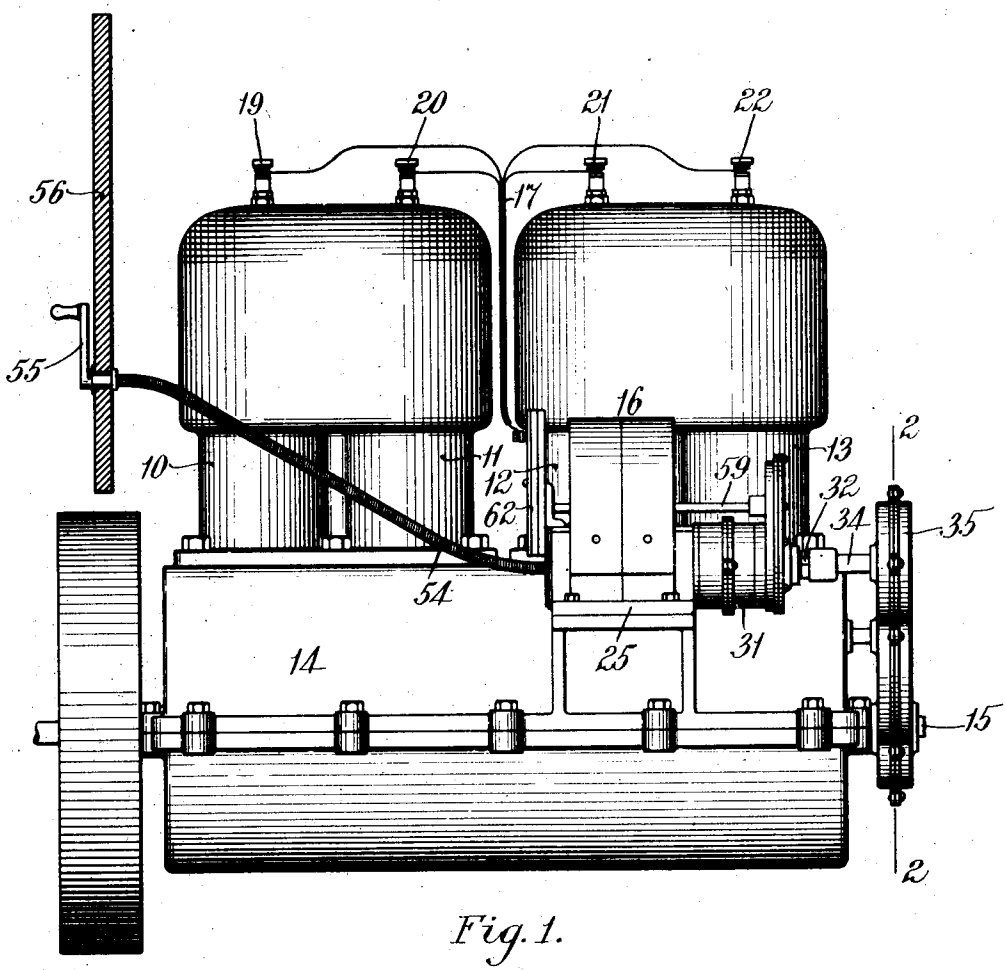
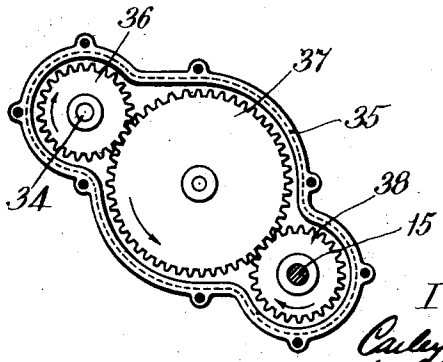


Fig. 1.



Witnesses.

Franklin E. Low.

Sydney E. Taft.

Fig. 2.

Inventor:

Carley G. Weld,

by his attorney

Charles S. Gooding.

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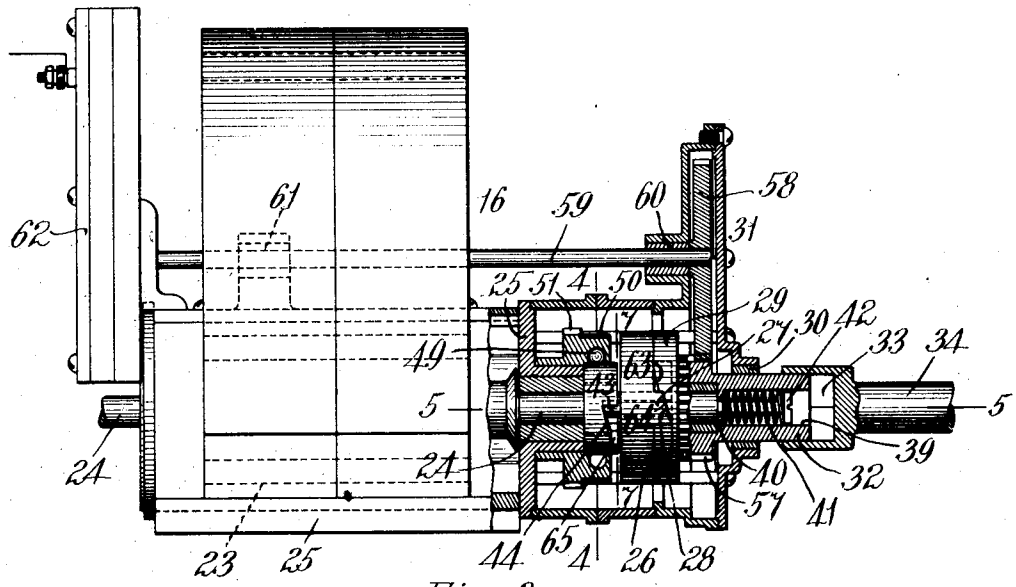

Fig. 3.

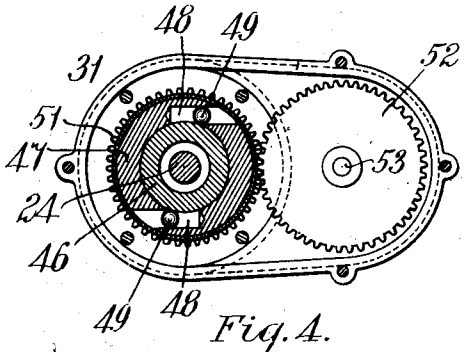

Fig. 4.

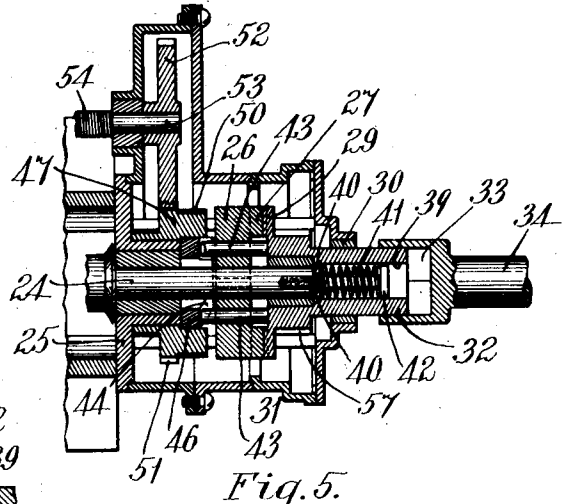

Fig. 5.

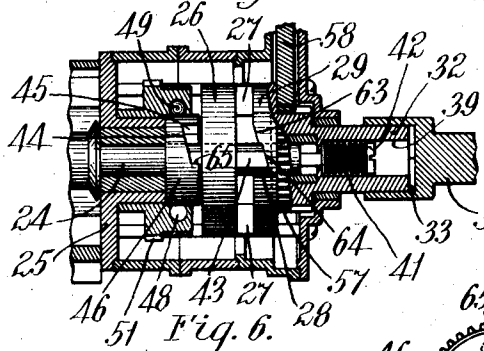

Fig. 6.

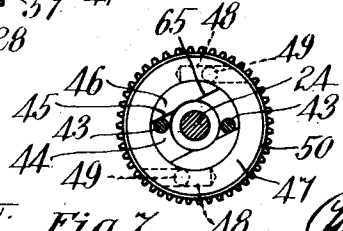

Fig. 7.

Witnesses.

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UNITED STATES PATENT OFFICE.

CARLEY G. WELD, OF NORTH CHATHAM, MASSACHUSETTS.

INTERNAL-COMBUSTION ENGINE.

942,227. Specification of Letters Patent. Patented Dec. 7, 1909.

Application filed October 15, 1908. Serial No. 457,816.

To all whom it may concern:

Be it known that I, CARLEY G. WELD, a citizen of the United States, residing at North Chatham, in the county of Barnstable and State of Massachusetts, have invented new and useful Improvements in Internal-Combustion Engines, of which the following is a specification.

This invention relates to improvements in internal combustion engines of that class in which a magneto is employed to generate the current of electricity to ignite the gas in the cylinders.

The object of the invention is to provide means whereby when the engine is stopped with a charge of gas in one of its cylinders it may be started without cranking, *i. e.*, without rotating the crank shaft by hand.

To this end the invention consists primarily in an internal combustion engine having in combination an ignition apparatus comprising a magneto normally in driving connection with a moving part of the engine, as for example, being driven by suitable gearing from the crank shaft, there being means whereby the magneto armature may be disconnected from such driving connection so as to be rotated independently of the moving parts of the engine, whereby a current of electricity may be generated by the magneto and conducted to the proper cylinder to cause the ignition of the charge of gas therein to start the engine.

The invention further consists in an engine having an ignition apparatus of the character described and the provision of means for automatically effecting an operative connection of the armature of the magneto with the moving parts as soon as the engine has been started.

The invention finally consists in the combination and arrangement of parts set forth in the following specification and particularly pointed out in the appended claims.

Referring to the drawings: Figure 1 is a side elevation of an internal combustion engine embodying my invention. Fig. 2 is a detail sectional elevation taken on line 2—2 of Fig. 1 looking toward the left. Fig. 3 is an enlarged detail elevation, partly in section, of the magneto and the connection between the same and the gearing by which the magneto is driven, this view showing the parts in their normal position. Fig. 4 is a detail sectional elevation taken on line 4—4 of Fig. 3, looking toward the left. Fig. 5 is a detail plan section taken on line 5—5 of Fig. 3. Fig. 6 is a detail sectional elevation showing a portion of the mechanism illustrated in Fig. 3, but with the clutch which connects the magneto shaft with its driving shaft thrown out of engagement leaving the magneto armature and armature shaft free to be rotated independently of the moving parts of the engine. Fig. 7 is a detail sectional elevation taken on line 7—7 of Fig. 3, looking toward the left.

Like numerals refer to like parts throughout the several views of the drawings.

In the drawings, referring now particularly to Fig. 1, the internal combustion engine having my improved ignition apparatus applied thereto may be of any suitable or desired type, but is preferably of the familiar multi-cylinder type, in which cylinders 10, 11, 12 and 13 are mounted upon a crank case 14 having journaled therein a crank shaft 15, it being understood that the internal arrangement of cranks, connecting rods and pistons may be provided, all of which are well known to those skilled in the art.

On any suitable support, as for example, on the crank case 14, is mounted a magneto 16 which may be of any desired type connected by wiring 17 to spark plugs 19, 20, 21 and 22 arranged in a familiar manner in the heads of the cylinders 10, 11, 12 and 13, respectively, it being understood that there may be any suitable or desired means for distributing the current to said spark plugs in rotation so as to ignite the charges of gas in the cylinders.

The magneto 16 comprises an armature 23 of any suitable or desired construction fast to an armature shaft 24, said shaft being journaled in suitable bearings in an armature frame 25.

Referring now particularly to Figs. 3 to 7, inclusive, fast to the armature shaft 24 is a clutch member 26 having two projecting lugs or teeth 27 which normally project into and interlock with corresponding depressions or notches 28 formed in a second clutch member 29, said second clutch member being journaled on the right hand end of the armature shaft 24 and also journaled in a bearing 30 formed in a casing 31.

The clutch member 29 is provided with a square hub 32 which projects into a corresponding square hole 33 formed in a shaft 34 and having sliding connection therewith.

The shaft 34 which is journaled in suitable bearings in a gear casing 35 has fast thereto a gear 36 located within said casing, said gear being operatively connected to the crank shaft 15, as by means of an intermediate gear 37 meshing into said gear 36, said intermediate gear meshing into a gear 38 fast to said crank shaft, it being understood that the ratio of these gears is such as to rotate the shaft 34 in proper time with the crank shaft of the engine, the gears 36 and 38 being in a one to one ratio.

The hub 32 is provided with a cylindrical recess 39 extending thereinto from the right hand end thereof, said recess terminating at its left hand end at a shoulder 40. A helical compression spring 41 located in the recess 39 bears at one end against the shoulder 40 and at its other end against the head of a screw 42 having screw-threaded engagement with the armature shaft 24, said spring acting to normally hold the clutch member 29 in driving connection with the clutch member 26, as shown in Figs. 3 and 5.

The clutch member 26 carries two pins 43, 43 slidably arranged in suitable holes in said member to move longitudinally of the armature shaft 24, said pins bearing at their right hand ends against the clutch member 29, as clearly shown in Fig. 5, the left hand ends of said pins being beveled to engage corresponding inclined surfaces 44 formed by depressions or notches 45 formed in a clutch member 46 loosely mounted on the armature shaft 24.

The clutch member 46 constitutes a part of a familiar type of clutch known as a ball or roller clutch, the second member 47 of said clutch being suitably journaled on the magneto frame 25. The member 47 is provided with opposite holes 48, 48 extending thereinto from the periphery thereof, said holes containing balls or rollers 49 which are adapted to engage the periphery of the member 46, the arrangement being such that when the clutch member 47 is rotated clockwise, Fig. 7, said balls engage the clutch member 46 and cause the same to be rotated in unison with the clutch member 47 in a well known manner, whereas on the other hand if the clutch member 46 be rotated clockwise the member 47 will not be rotated thereby. A retaining ring 50 surrounding the member 47 prevents the balls 49 from falling out of their respective holes 48.

On the periphery of the member 47 is formed a spur gear 51 which meshes into a spur gear 52 fast to a shaft 53 journaled in the casing 31. Fast to the shaft 53 is a flexible shaft 54 which is fast to a crank 55 located at any suitable point. Where the engine is used on a motor car the crank 55 will preferably be journaled on the dash board of the car, shown in section at 56.

Formed on or fast to the clutch member 29 is a gear 57, said gear meshing into a gear 58 fast to a shaft 59, said shaft being journaled in a bearing 60 in the casing 31 and in a bearing 61 on the magneto frame 25. The left hand end of the shaft 59 extends into a distributer casing 62 in which may be located any suitable or desired type of distributers, not shown, connected to said shaft, such distributers which are well known being employed for the purpose of distributing the current at the proper time to the various spark plugs, the gears 58 and 57 being in the ratio of two to one. It will be noted that the width of face of the gear 57 is double that of the gear 58, this provision being made for the reason that the member 29 and the gear 57 slide relatively to the gear 58, as will be hereinafter fully described.

Having thus specifically described the ignition apparatus, I will now proceed to describe its general operation. It will be understood that the parts normally occupy the relative positions shown in Figs. 3 and 5. Assuming that the engine has been stopped and that a charge of gas remains in one of the cylinders, the engine may be started in the following manner. The operator grasps the crank 55 and rotates the same in the proper direction to cause the gear 52 to rotate the gear 51 clockwise, Figs. 4 and 7, the result being that the balls 49, 49 engage the periphery of the clutch member 46 and cause the same to be rotated in unison with the clutch member 47. As the clutch member 46 starts to rotate the left hand ends of the pins 43 ride up the inclines 44 and are moved thereby toward the right, said pins thus acting to force the clutch member 29 toward the right against the tension of the spring 41 until the teeth 27 have been partially withdrawn from the depressions or notches 28. Referring to Figs. 3 and 6, it will be noted that the clutch member 29 is provided with inclined faces 63 corresponding to inclined faces 64 formed on the ends of the teeth 27 so that when said teeth have been partially withdrawn from said notches the inclined faces 64 ride up on the inclined faces 63 and the clutch members are then fully disengaged from driving connection, as shown in Fig. 6. Each of the inclines 44 on the clutch member 46 terminates at one end thereof at a shoulder 65. Thus it will be seen that continued rotation of the clutch member 46 after the clutch members 26 and 29 have been disengaged results in the pins 43 bringing up against the shoulders 65, respectively, as shown in Fig. 6, thereby causing the clutch member 26 to be rotated in unison with the clutch member 46 and consequently, rotating the armature shaft 24 to which the clutch member 26 is fast.

It will be understood that in a four or six cylinder motor the distributer is so con-

structed and arranged that when the motor is stopped there is usually an electrical connection through the distributer to the spark plug of the cylinder holding the compressed charge.

It will be observed that the gears 57 and 58 form at all times a connection between the distributer and the crank shaft of the engine so that the distributer is at all times properly positioned with respect to the crank shaft and pistons regardless of the disconnection between the armature shaft and the crank shaft.

One or two rotations of the crank 55 are sufficient to cause the magneto 16 to generate the current necessary to ignite the charge of gas in one of the cylinders whereupon the engine starts. When the engine starts, the rotation of the shaft 34 causes the clutch member 29 to be rotated faster than the clutch member 26 is being rotated by the hand of the operator with the result that the notches 28 are carried into alinement with their respective teeth 27 and the spring 41 acts to move said teeth and notches into their normal operative engagement, as shown in Fig. 3, thereby causing the armature shaft 24 to be rotated by the power of the engine. It will be understood that the pins 43 will now ride down the inclines 44 and resume their normal position, as seen in Fig. 3.

It will be seen that owing to the provision of the ball or roller clutch the crank 55 will not be rotated by the engine after the engine has started to run. The provision of the hereinbefore described means of disconnecting the magneto armature and rotating the same by hand power obviates the necessity of employing a set of batteries and induction coils for starting the engine from the seat without "cranking" the engine.

It will be understood that although the current generator employed is an alternating current magneto, any other suitable generator may be employed and it is to be understood that the invention is not limited to the use of a magneto and where the word magneto is used in the claims it will be understood as meaning a suitable generator for the class of work for which the apparatus is intended.

Having thus described my invention, what I claim and desire by Letters Patent to secure is:

1. An internal combustion engine having, in combination, a moving part adapted to be moved by the explosion of the gas, ignition instrumentalities including a magneto having a rotatable member, a clutch adapted to operatively connect said rotatable member and said moving part, said clutch comprising two members normally in driving connection so as to be incapable of relative rotation in either direction, an actuating member, and means adapted to be operated by said actuating member to move one of said clutch members longitudinally of its axis out of engagement with the other and rotate said rotatable member.

2. An internal combustion engine having, in combination, a moving part adapted to be moved by the explosion of the gas, ignition instrumentalities including a magneto having a rotatable member normally in driving connection with said moving part, a device capable of but a limited amount of rotation relatively to said rotatable member, and means adapted to be operated by the rotation of said device to disconnect said rotatable member from said moving part and rotate said member.

3. An internal combustion engine having, in combination, a moving part adapted to be moved by the explosion of the gas, ignition instrumentalities including a magneto having a rotatable member, a clutch comprising two members connected to said rotatable member and said moving part, respectively, said clutch members being normally positively interlocked so as to be incapable of relative rotation in either direction, an actuating member, and means adapted to be operated by said actuating member to disconnect said clutch members from driving connection with each other and rotate said rotatable member.

4. An internal combustion engine having, in combination, a moving part adapted to be moved by the explosion of the gas, ignition instrumentalities including a magneto having a rotatable member, a clutch comprising two members normally in driving connection with each other, one of said clutch members being connected with said moving part and the other being connected to said rotatable member, a second clutch, and a device to actuate said second clutch to disconnect the members of said first-named clutch from each other, said device being adapted to subsequently impart rotation through said second clutch to said rotatable member.

5. An internal combustion engine having in combination, a moving part adapted to be moved by the explosion of the gas, ignition instrumentalities including a magneto having a rotatable member, a clutch comprising two members, one of which is fast to said rotatable member, while the other is connected to said moving part, a spring adapted to normally hold said clutch members in engagement with each other, a second clutch comprising two members and a rotatable device interposed therebetween, and a device adapted to be operated by the rotation of said second clutch to disengage said first-named clutch members from each other, said second clutch having means to subsequently rotate said rotatable member independently of said moving part.

6. An internal combustion engine having in combination, a moving part adapted to be moved by the explosion of the gas, ignition instrumentalities including a magneto having a rotatable member, a clutch comprising two members, one of which is fast to said rotatable member, while the other is connected to said moving part, a spring adapted to normally hold said clutch members in driving engagement with each other, a pin slidably mounted on said first-named clutch member and adapted to bear at one end against said second-named clutch member, a second clutch comprising two members and a rotatable device interposed therebetween, one of said members of said second-named clutch being provided with an inclined face adapted when rotated to actuate said pin to move the members of said first-named clutch out of driving engagement, said second-named clutch having means to subsequently rotate said rotatable member independently of said moving part, and said spring adapted to finally move the members of said first-named clutch into operative engagement with each other.

7. An internal combustion engine having, in combination, a moving part adapted to be moved by the explosion of the gas, ignition instrumentalities including a magneto having a rotatable member normally positively connected to said moving part, a device capable of but a limited amount of rotation relatively to said rotatable member, and means adapted to be operated by the rotation of said device to disconnect said rotatable member from said moving part and rotate said member.

8. An internal combustion engine having, in combination, a moving part adapted to be moved by the explosion of the gas, ignition instrumentalities including a magneto having a rotatable member, a clutch comprising two members normally positively interlocked, one of said clutch members being connected to said moving part and the other being connected to said rotatable member, a device capable of but a limited amount of rotation relative to said second clutch member, and a second device adapted to be operated by said first-named device to cause the disengagement of said clutch members thereby permitting said rotatable member to be rotated independently of said moving part.

9. An internal combustion engine having, in combination, a moving part adapted to be moved by the explosion of the gas, ignition instrumentalities including a magneto having a rotatable member, a clutch adapted to operatively connect said rotatable member and said moving part, said clutch comprising two members normally positively interlocked so as to be incapable of relative rotation in either direction, and a member adapted when moved to disconnect said clutch members from each other and rotate said rotatable member.

10. An internal combustion engine having, in combination, a moving part adapted to be moved by the explosion of the gas, ignition instrumentalities including a magneto having a rotatable member, a clutch comprising two members adapted to operatively connect said rotatable member and said moving part, said clutch members being normally positively interlocked so as to be incapable of relative rotation in either direction, and a rotatable device adapted when rotated to disconnect said clutch members from each other and rotate said rotatable member.

11. An internal combustion engine having, in combination, a moving part adapted to be moved by the explosion of the gas, ignition instrumentalities including a magneto having a rotatable member, a clutch comprising two members normally in driving connection so as to be incapable of relative rotation in either direction, an actuating member, and means adapted to be operated by said actuating member to disconnect said clutch members from driving connection with each other and rotate said rotatable member.

12. An internal combustion engine having, in combination, a moving part adapted to be moved by the explosion of the gas, ignition instrumentalities including a magneto having a rotatable member, a clutch adapted to operatively connect said rotatable member and said moving part, said clutch comprising two members normally in driving connection so as to be incapable of relative rotation in either direction, an actuating member, and means adapted to be operated by said actuating member to disconnect said clutch members from each other, said means being adapted to be operated by said actuating member to rotate said rotatable member.

13. An internal combustion engine having, in combination, a moving part adapted to be moved by the explosion of the gas, ignition instrumentalities including a magneto having a rotatable member, a clutch comprising two members normally in driving connection so as to be incapable of relative rotation, one of said clutch members being connected to said moving part and the other being connected to said rotatable member, a device capable of but a limited amount of rotation relatively to said second clutch member, and a second device adapted to be operated by said first-named device to cause the disengagement of said clutch members thereby permitting said rotatable member to be rotated independently of said moving part.

14. An internal combustion engine having, in combination, a moving part adapted to be moved by the explosion of the gas, ignition instrumentalities including a magneto having a rotatable member, a clutch comprising

two members normally in driving connection so as to be incapable of relative rotation, one of said clutch members being connected to said moving part while the other is connected to said rotatable member, a device capable of but a limited amount of rotation relatively to said second clutch member, and means carried by said second clutch member adapted to be actuated by said device to cause the disengagement of said clutch members, thereby permitting said rotatable member to be rotated independently of said moving part.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

CARLEY G. WELD.

Witnesses:

LOUIS A. JONES,

ANNIE J. DAILEY.