G. W. HAURY.

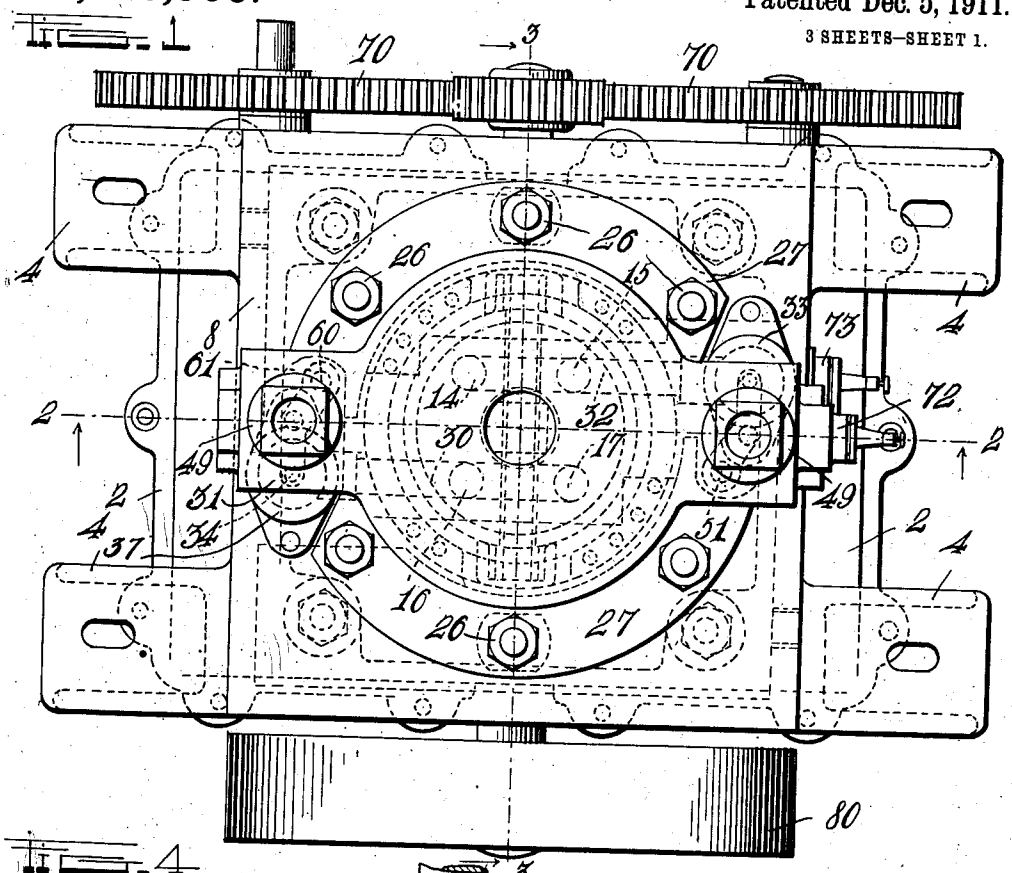
HYDROCARBON ENGINE.

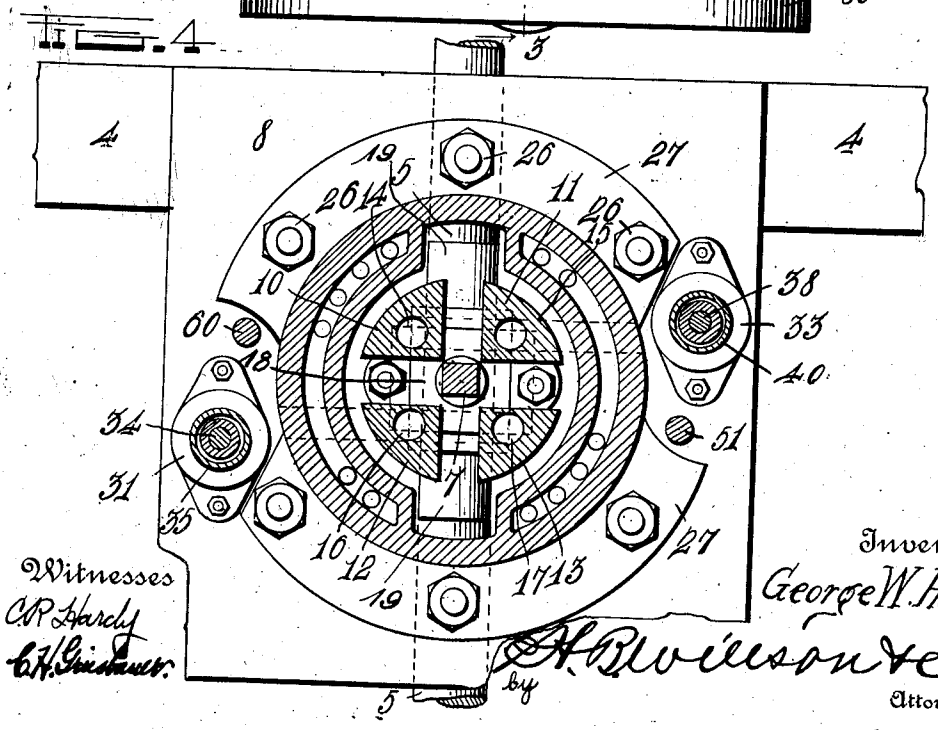
APPLICATION FILED DEC. 21, 1909.

1,010,906.

Patented Dec. 5, 1911.

3 SHEETS—SHEET 1.





Witnesses

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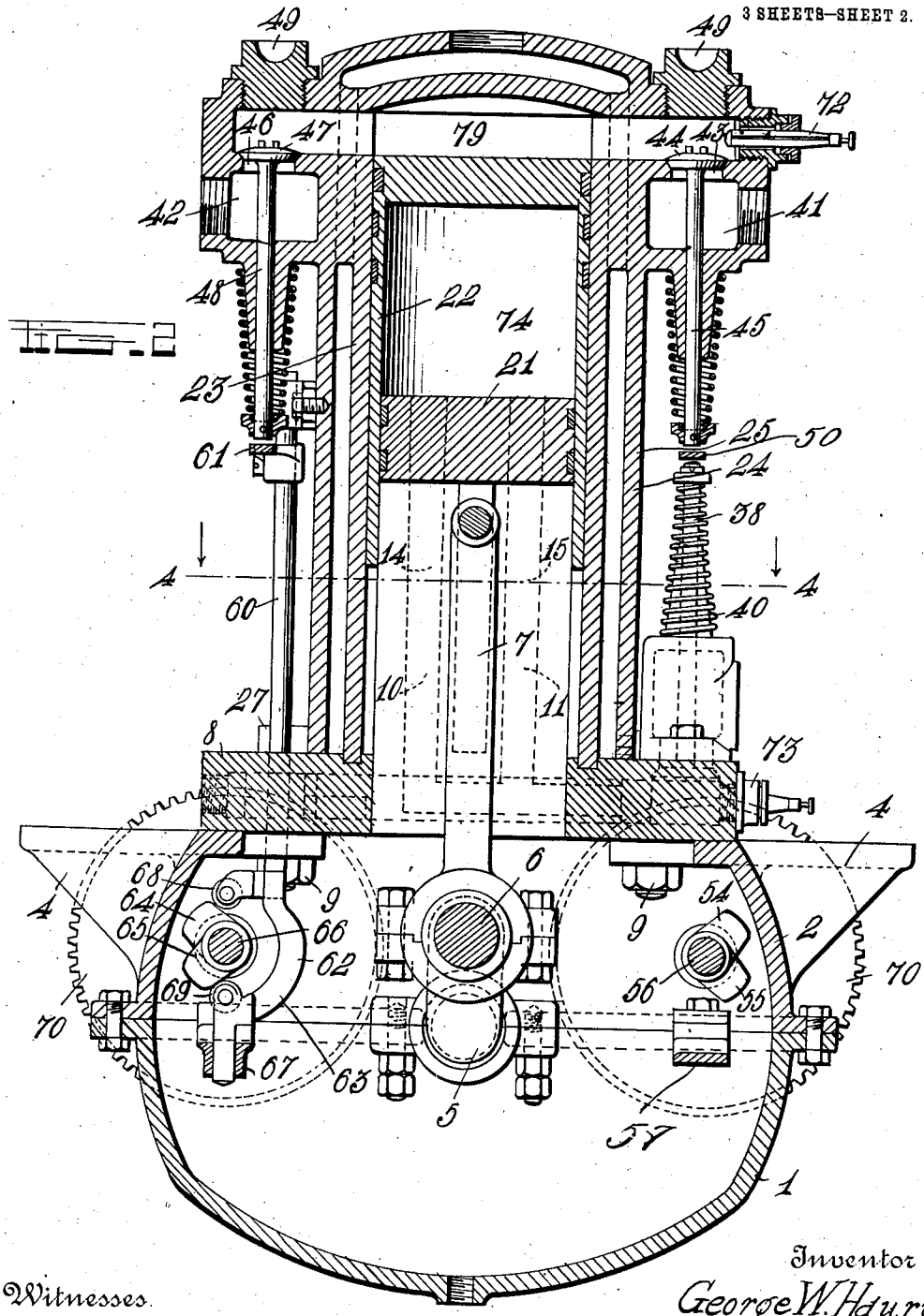

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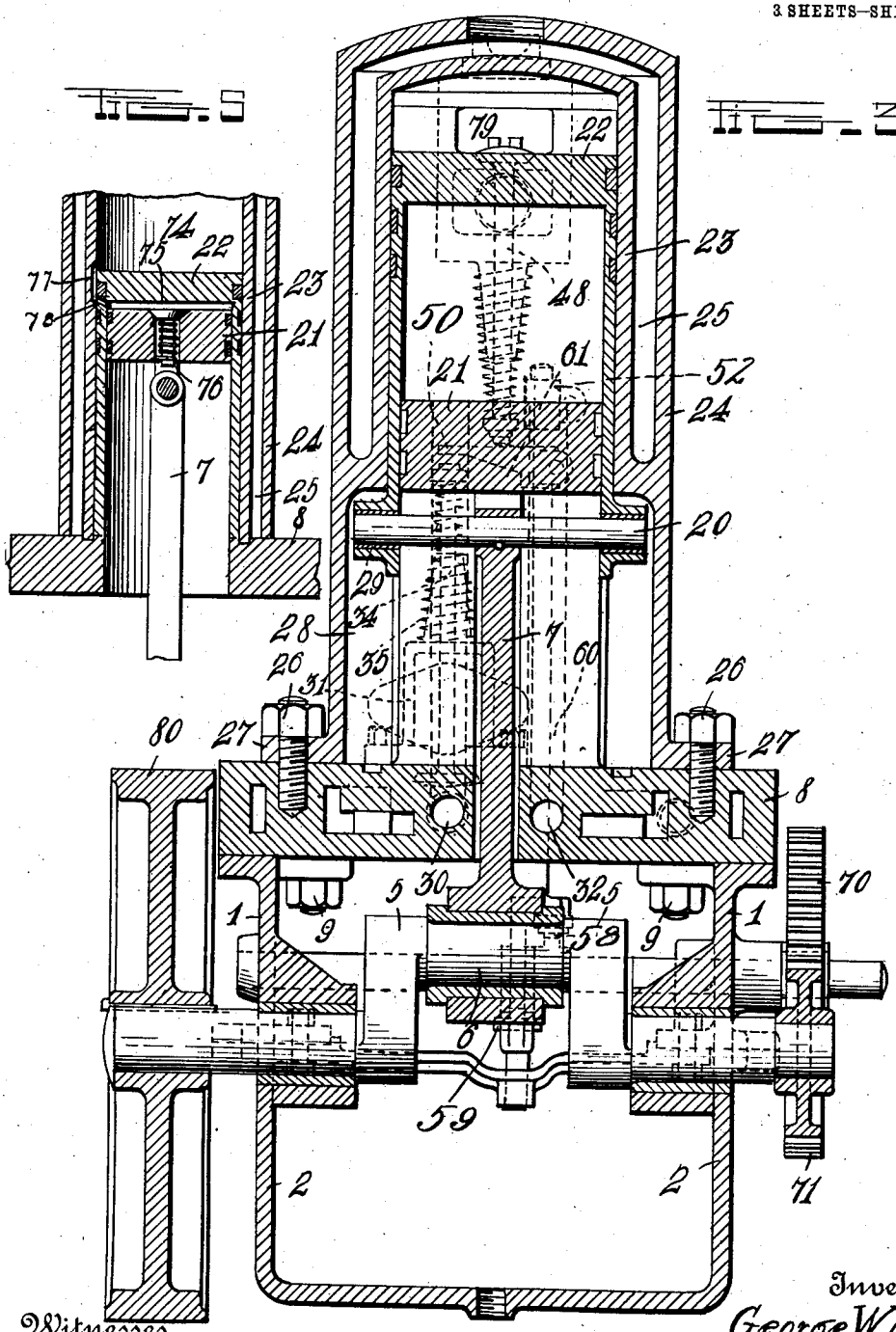

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UNITED STATES PATENT OFFICE.

GEORGE W. HAURY, OF LOUISVILLE, KENTUCKY.

HYDROCARBON-ENGINE.

1,010,906. Specification of Letters Patent. Patented Dec. 5, 1911.

Application filed December 21, 1909. Serial No. 534,260.

To all whom it may concern:

Be it known that I, GEORGE W. HAURY, a citizen of the United States, residing at Louisville, in the county of Jefferson and State of Kentucky, have invented certain new and useful Improvements in Hydrocarbon-Engines; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to hydrocarbon engines.

The object of the invention is the improvement of the present four-cycle type of engine in order to secure more power for a given cylinder area than has heretofore been obtained.

A further object of the invention is the provision of novel means for constructing the engine, whereby a double explosion is obtained during one revolution of the crank shaft.

In ordinary four-cycle engines, there is one explosion for every two revolutions of the crank shaft, thus making a revolution and a half idly or without power. By constructing the engine as will hereinafter be described, I am enabled to reduce the idle movement of the engine by a half revolution and at the same time avoid the vibration inherent in this type of engine.

In the present illustration, only one cylinder is shown, but where two cylinders are employed, there is no more vibration than there would be with the ordinary steam engine, for there would be an explosion upon the downward and upward movement of each crank shaft.

Another object of the invention is to provide a reciprocating piston and valve mechanism to admit fuel and exhaust the burned gases thereof from above and below the piston to permit two explosions to occur in each cycle of two revolutions of the crank shaft. These explosions occur above and below the piston during one revolution and the remaining revolution is idle or without power, thus the value of the present type of four-cycle engine is enhanced by having one complete revolution under power as distinguished from only a half of a revolution under power and as explosions occur above and below the piston, the vibration is broken up into small particles. The life of the engine is thereby lengthened.

With the foregoing and other objects in view, the invention consists of certain novel features of construction, combination and arrangement of parts, as will be more fully described and particularly pointed out in the appended claims.

In the accompanying drawings, Figure 1 is a top plan view of the engine; Fig. 2 is a vertical sectional view taken on the line 2—2 of Fig. 1; Fig. 3 is a vertical sectional view taken on the line 3—3 of Fig. 1; Fig. 4 is a transverse section taken on the line 4—4 of Fig. 2; Fig. 5 is a detail vertical sectional view on the line 2—2 of Fig. 1, showing the piston in its lowermost position.

Referring more especially to the drawings, 1 and 2 represent the separate halves of the crank case, which are flanged and secured together by bolts. The upper part of the section 2 is provided with four lugs 4 by which the engine is mounted upon a suitable support. Journaled between the separate halves of the crank case, in its transverse center, is the crank shaft 5 having a crank 6 formed intermediate its length and upon which is mounted the usual connecting rod 7.

Mounted upon the upper section 2 of the crank case, is the main casting 8, which is secured to the casing by bolts or threaded studs 9 and which has projecting above its center, the four yoke pieces 10, 11, 12 and 13, the two former of which are channeled, as at 14 and 15, to receive the mixture, as will be hereinafter described, and the two latter of which are channeled, as at 16 and 17, to receive the exhaust. While only one of these channels is required for either the intake or the exhaust, it is preferable that both channels be provided, in order that the yokes may be lightened. These yoke members are separated by spaces 18 and 19, the former being arranged for the operation of the connecting pin 20 and the latter being arranged for the connecting rod 7. Mounted upon the top of the yoke members, is the stationary head 21 through which the channels 14, 15, 16 and 17 also pass and which is surrounded by the piston 22, which is hollow and is adapted to reciprocate within the cylinder 23. The cylinder is jacketed, as at 24, to form a water space 25, as is usual, and is secured upon the head 8 by suitable studs 26, which extend through the flanged lower end 27 of the jacket. In order that the piston may have considerable bearing

upon the ends of the connecting pin 20, I cut away the inner cylinder, as at 28, so as to provide a channel for the bearing ends 29 of the piston. The channels 16 and 17 lead, by way of a suitable channel 30, to the exhaust valve 31, which is located upon the head 8, and the channels 14 and 15 are connected to a suitable channel 32, which leads to the inlet valve 33 mounted upon the head on the opposite side of the casing. The exhaust valve 31 is provided with a stem 34, which is actuated to hold the valve upon its seat by a spring 35 which surrounds the rod between a compression nut 36 and the exhaust valve casing 37. The inlet valve 33 is provided with a similar stem 38 which extends up through the valve casing 39 and is actuated by a spiral spring 40 to hold the valve upon its seat. The upper end of the cylinder is enlarged to provide inlet and exhaust chambers 41 and 42, respectively, each of which are provided with inlet and outlet ports.

The inlet port of the intake chamber is shown at 43 and is controlled by a valve 44 upon a spring actuated rod 45 and the outlet port of the exhaust chamber is indicated at 46 and is controlled by a valve 47 upon a spring actuated rod 48. Access may be obtained to these valves by the use of suitable plugs 49 which are threaded into the head portion of the cylinder.

The lower ends of the rods 45 and 48 are arranged as shown in Fig. 2 with respect to the rods 38 and 34. In other words, the lower ends of the upper rods are so positioned with respect to the lower rods as to permit the entrance, between the two, of an operating arm 50. This operating arm 50 which is positioned between the rods 45 and 38 is adjustably mounted upon a valve actuating shaft 51 which reciprocates vertically in a guide 52 secured to the upper portion of the jacket 24 and also through an aperture in the head 21. After extending down into the crank case, the rod is curved outwardly, as at 53, for a purpose to be hereinafter described, and is offset from the vertical plane of the rod, so as to prevent conflict between the cams 54 and 55 mounted upon the cam shaft 56. The lower end of the bent arm 53 is slidably mounted in a guiding brace 57 so that the operation of the cams upon the friction rollers 58 and 59 will not throw the shaft out of alinement. A similar arrangement is followed upon the opposite side of the cylinder for the rods 48 and 34, wherein the valve actuating shaft 60 is shown as having adjustably mounted thereon a valve rod operating arm 61 and upon its lower end with an offset portion 62 which is bowed, as at 63, to accommodate the cam shaft 66. This shaft has mounted upon it, cams 64 and 65, which are engaged by the friction rollers 68 and 69 upon the rod. The lower end of the rod is guided in a brace 67 for a purpose to be described. Each one of these cam shafts 56 and 66 has mounted upon it a gear wheel 70, which is in mesh with a pinion 71 mounted upon the crank shaft 6, so that both are driven simultaneously in the same direction. The ratio of these gears is two to one, so that the cam shafts make only one revolution while the crank shaft is making two.

A suitable spark plug 72 is entered in the casing, immediately above the valve 44 and a similar spark plug 73 is entered in the head at the end of the port 32, immediately below the valve 33. This latter spark plug may be entirely dispensed with, as the arrangement in Fig. 5 is preferably employed to ignite the charge in the lower combustion chamber 74. In this figure, the head 21 is provided with a valve 75 which permits the mixture to enter from the port 75 into the combustion chamber 74. The valve is controlled by a spring 76, so that, upon the upward movement of the piston, the valve is opened by suction and closes immediately the piston begins to descend. When this valve is used, the spark plug 73 is dispensed with and the cylinder is channeled or grooved, as at 77, and the piston is provided with a port 78 which, when in register with the groove, will permit a portion of the burned gases in the chamber 79 to enter the explosion chamber 74 and ignite the mixture therein. This is accomplished by reason of the fact that the top of the piston 22 is below the top of the groove 77 in its lowermost position of compression.

The engine, as shown in Figs. 2 and 3, has just completed its upward stroke under the impetus of the explosion in the chamber 74. As the next revolution of the crank shaft is an idle one or without power, I will now describe this portion of the operation first, the crank shaft revolving in the direction shown by the arrow. In making the first downward stroke of the revolution, the crank shaft turns the cam shaft 66, thus causing a downward pull upon the valve rod 60 due to the cam 65 engaging the roller 69 upon the extension 63. In making the downward stroke, the arm 61 engages the upper end of the valve rod 34 and depresses the valve against the tension of the spring 35, so as to open the port in the exhaust valve casing 31. Also in the downward stroke, the cam shaft 56 is turned and the cam 54 pushes up on the roller 58, thus raising the rod 34 and causing the arm 50 to raise the valve rod 45 and thus push the valve 44 off its seat. The downward movement of the piston causing suction in the chamber 79, the mixture rushes in past the valve rod 45 and fills the explosion chamber to the proper degree. Before the completion of the downward stroke, the

valves 34 and 44 will close under the tension of the springs. In making the upward stroke of the first revolution, the crank shaft 5 will cause the valve 33 to open which will allow the piston to draw a new charge from the carbureter through the valve chamber and the port 15 into the chamber 74. In making this upward movement, the piston compresses the gases drawn into the chamber 79 by its downward movement. The piston is again in position for a second explosion in the chamber 79 or the start of the second cycle. After the explosion in the chamber 79 has occurred, the piston descends and when at its lowermost position, adjacent the head 21, the spark plug 73 is put into operation, or as shown in Fig. 5, the ports 77 and 78 admit the flame from the chamber 79 thus exploding the charge in the chamber 74, and causing the upward stroke of the piston under power.

A suitable fly wheel 80 is secured to the crank shaft 6, in order that the piston may be carried through its idle strokes by momentum.

From the foregoing description, taken in connection with the accompanying drawings, the construction and operation of the invention will be readily understood without requiring a more extended explanation.

Various changes in the form, proportion and the minor details of construction may be resorted to without departing from the principle or sacrificing any of the advantages of the invention as defined in the appended claims.

Having thus described my invention, what I claim is:

1. In a hydrocarbon engine the combination of a cylinder, a crank casing, a crank shaft mounted in said casing, a casting mounted on said casing, a plurality of channeled laterally spaced yoke members projecting above the center of said casting, a rod extending between said members, a hollow reciprocatory piston connected with said rod, a stationary head supported on said yoke members and surrounded by said piston, means to admit charges of the explosive mixture above and below said piston, and means to alternately ignite said charges.

2. In a hydrocarbon engine the combination of a crank casing, a cylinder mounted on said casing, a crank shaft mounted on said casing, a casting mounted on said casing, a plurality of channeled laterally spaced yoke members projecting above the center of said casting, a rod connected with said crank shaft and extending between said yoke members, a piston connected with said rod, a stationary head supported on said yoke members and surrounded by said piston, said head having channels therein registering with the channels in said yoke members, a supply valve connected with one of said channels and an exhaust valve connected with another channel, means controlled by the crank shaft for actuating said supply and exhaust valves, and means for alternately igniting the charges above and below the piston.

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

GEORGE W. HAURY.

Witnesses:

E. EDMONSTON, Jr.,

S. M. MCCOLL.