(No Model.) 2 Sheets—Sheet 1.

W. E. GIBBON.

PETROLEUM OR HYDROCARBON ENGINE.

No. 547,606. Patented Oct. 8, 1895.

Fig. 2.

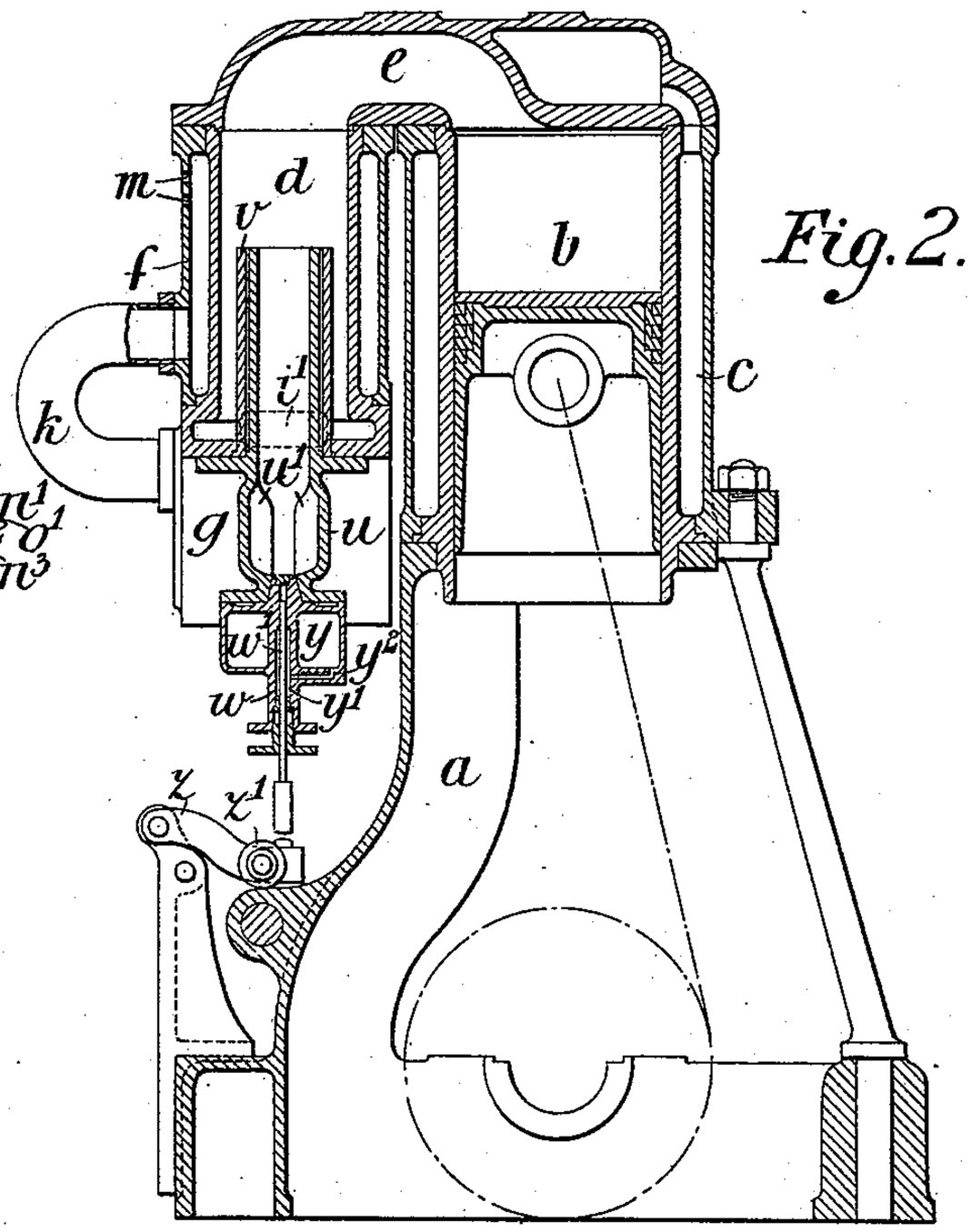


Fig. 3.

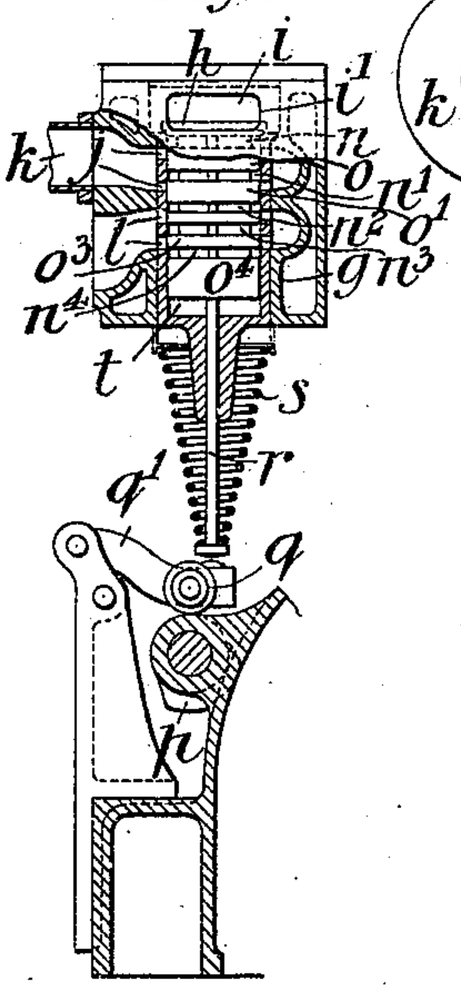
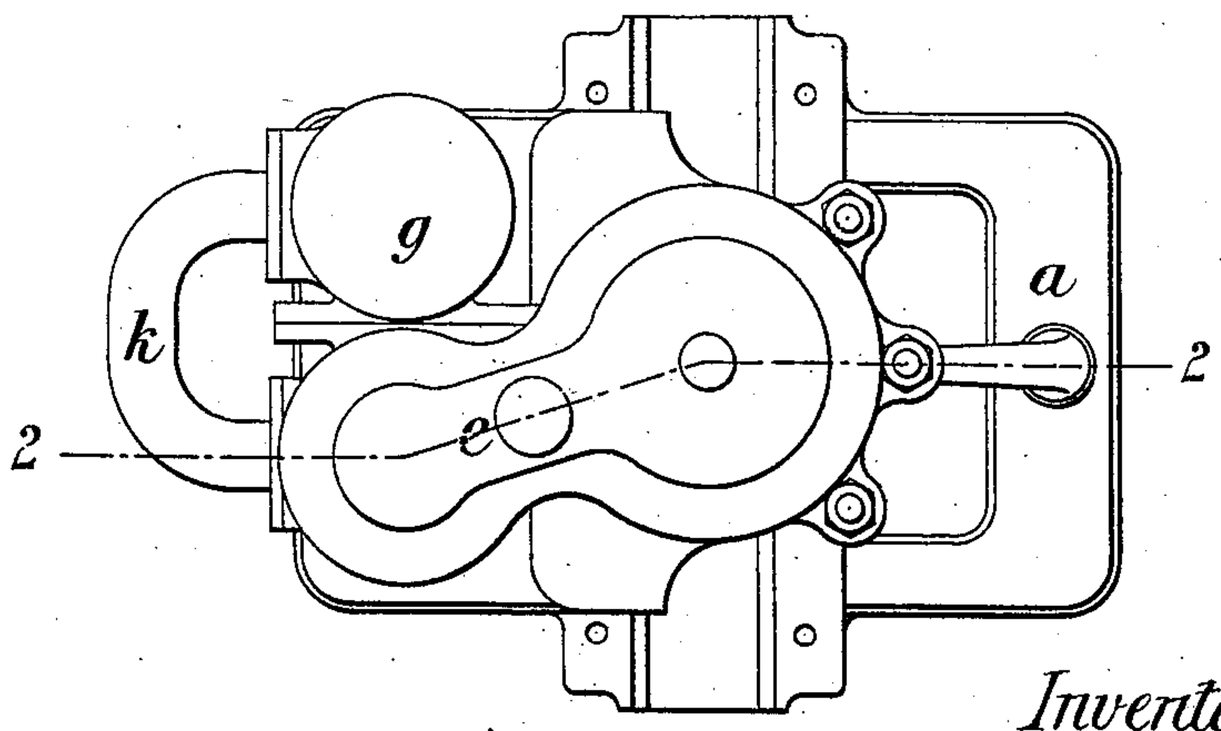


Fig. 1.



Witnesses.

J. D. Kingsbury

G. A. Tauberschmidt,

Inventor

William Edward Gibbon

By Whitaker & Pierce Attys.

(No Model.) 2 Sheets—Sheet 2.

W. E. GIBBON.

PETROLEUM OR HYDROCARBON ENGINE.

No. 547,606. Patented Oct. 8, 1895.

Fig. 6.

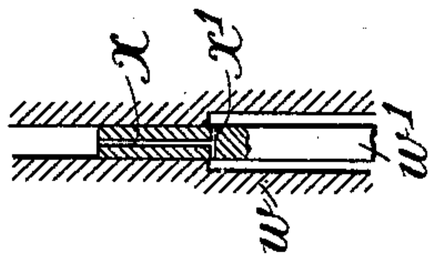


Fig. 5.

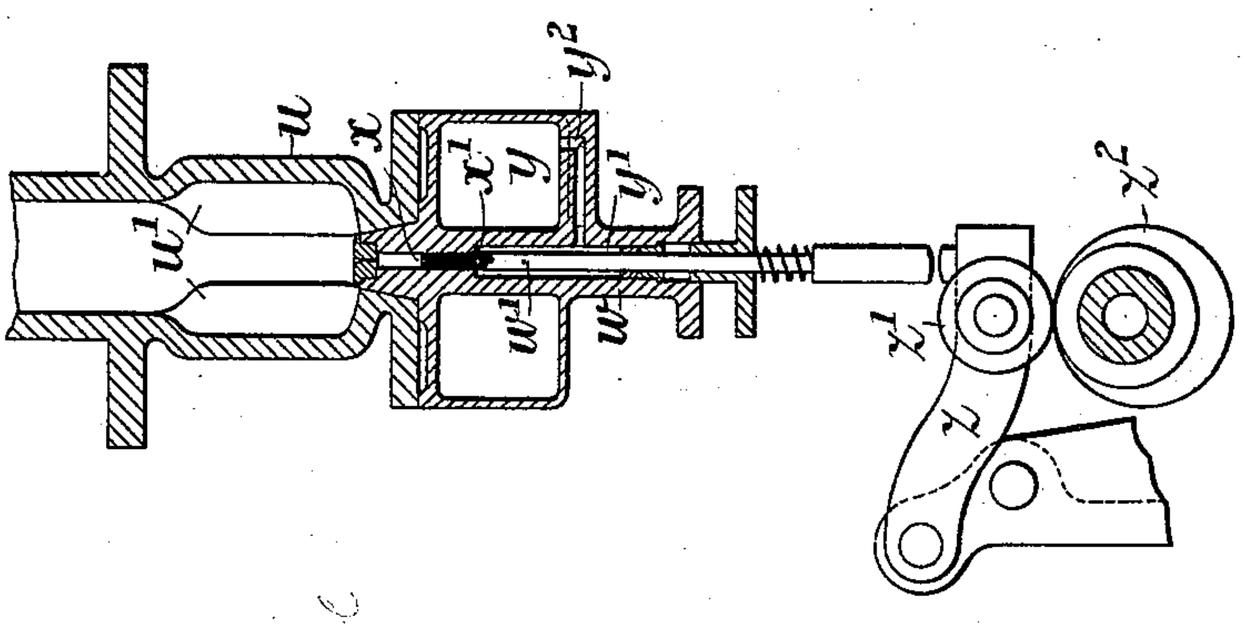
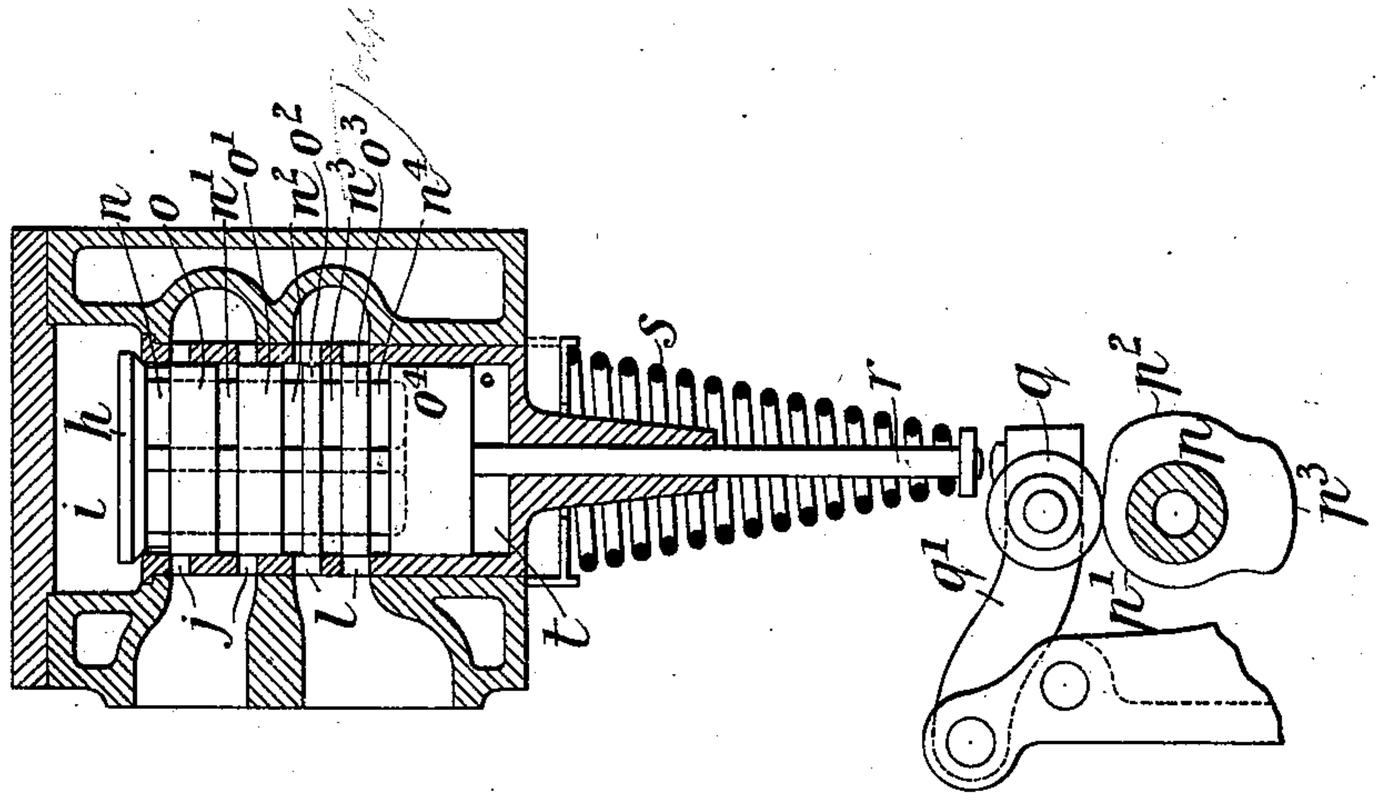


Fig. 4.



Witnesses.

J. D. Knight

G. A. Tauberschmidt.

Inventor.

William Edward Gibbon

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UNITED STATES PATENT OFFICE.

WILLIAM EDWARD GIBBON, OF COLCHESTER, ENGLAND.

PETROLEUM OR HYDROCARBON ENGINE.

SPECIFICATION forming part of Letters Patent No. 547,606, dated October 8, 1895.

Application filed April 10, 1895. Serial No. 545,196. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM EDWARD GIBBON, a subject of the Queen of Great Britain, residing at Colchester, England, have invented new and useful Improvements in Petroleum or Hydrocarbon Engines, of which the following is a specification.

My invention relates to explosive engines.

According to my invention the combustion-chamber, which is preferably of small diameter and circular in section, is provided with a jacket through which the air for mixing with the hydrocarbon vapor to form the explosive charge is drawn in order to prevent the said chamber from becoming overheated, and at the same time to heat the air.

The vaporizer and igniter is in the form of a chamber, which is partly within the combustion-chamber and partly without, the part of the igniter within the combustion-chamber being surrounded by a shield or casing for preventing the air entering the combustion-chamber from coming into direct contact with the igniter and so cooling it. The part of the igniter projecting outside the combustion-chamber serves for the application of a lamp for initially heating the igniter when starting, and is also advantageously provided with internal ribs or vanes for collecting the heat of the lamp as much as possible. The liquid hydrocarbon is injected into this vaporizer by any suitable means—for instance, by a pump. In connection with the combustion-chamber I arrange a valve-box containing a valve or valves serving for controlling the admission of air into and the escape of the products of combustion from the combustion-chamber.

To enable my invention to be fully understood, I will describe the same by reference to the accompanying drawings, in which—

Figure 1 is a plan of an explosive engine having my improvements applied thereto; and Fig. 2 is a section of the same on the line 2 2, Fig. 1. Fig. 3 is a sectional elevation of the valve-box detached from the engine; and Fig. 4 is a vertical section of the valve-box, drawn to a larger scale than Fig. 3. Fig. 5 is a sectional view, also drawn to a larger scale, showing the arrangement of the oil-injecting pump in connection with the vaporizer. Fig. 6 is an enlarged view of a portion of the plunger and pump-barrel of the said oil-injecting pump.

a is the framing of the engine, and *b* is the power-cylinder, which is provided with a water-jacket *c* in the usual manner.

d is the combustion-chamber, which is connected to the cylinder *b* by a short neck or passage *e*, and which is preferably of much smaller diameter than the cylinder and placed parallel thereto, as shown in Fig. 2. With this arrangement the passage *e* can be formed in a cover which is common to both the cylinder and the combustion-chamber, so that by removing the said cover access is readily afforded to the interior of the said cylinder and of the combustion-chamber.

f is the jacket, surrounding the combustion-chamber. *g* is the valve-box, and *h* is the valve working therein and serving both as an air-inlet valve and as an exhaust-valve, the space *i* above the valve communicating by the passage *i'* directly with the interior of the combustion-chamber *d*, while the space beneath the valve is in communication through the ports *j j* and the pipe *k* with the jacket *f* and by the ports *l l* with the atmosphere, according to the position of the valve *h*.

m m are holes formed in the jacket *f* for admitting air thereinto for the formation of the explosive charges.

The valve *h*, which, as shown, is a miter-valve, is provided on its under side with a hollow cylindrical extension, which fits within the valve-box *g*, and is provided with a series of circumferential apertures or openings $n\,n'$ $n^2\,n^3\,n^4$, leaving the solid rings $o\;o'\;o^2\;o^3\;o^4$, which serve to control the ports $j\,j\,l\,l$. Any suitable means may be employed for operating the said valve; but in the drawings I have represented the valve *h* as being operated by a cam *p*, mounted on a shaft making one revolution to two of the crank-shaft, the said cam being provided with a concentric portion p' and with the two lifts $p^2\,p^3$ and operating against a roller *q* on a lever q', arranged to impinge against the end of the stem *r* of the valve *h*, a spring *s* being provided for normally retaining the valve upon its seat. The operation of this valve is as follows: During the compression and combustion stroke of the piston the valve *i* is in the position shown in Fig. 4, the roller *q* running upon the concentric part p' of the cam *p*. When the exhaust stroke of the piston commences, the lift p^2 of the cam lifts the valve *h* from its seat and places the apertures $n^3\,n^4$ of the cylin-

drical extension opposite to the ports *l l*, so that the gases from the cylinder *b* can pass under the valve *h* into the cylindrical extension, and thence escape through the apertures n^3 n^4 and the ports *l l* to the atmosphere. During the time that the ports *l l* are open the air-inlet ports *j j* are closed by the rings *o o'*. On the completion of the exhaust stroke the lift p^8 of the cam raises the valve still further, whereby the ports *l l* are closed by the rings o^3 o^4 and the apertures *n' n²* are brought opposite to the ports *j j*, whereby on the induction stroke of the engine air will be drawn through the holes *m m* into the jacket *f*, and thence through the pipe *k* and the ports *j j* into the valve-box, whence they pass into the cylinder *b* through the aperture *i'* in the said valve-box. On the completion of the induction stroke the cam *p* has moved to allow the roller *q* to run on the concentric part *p'* of the cam, the valve being suddenly moved down under the action of the spring *s*. In order to prevent noise and undue wear of the valve owing to its sudden closing upon its seat, the lower end of the cylindrical extension of the said valve is made solid, so that the air compressed in the space *t* beneath the said extension will serve as a cushion, a small hole or aperture being formed in a well-known manner to allow the air to escape.

u is the vaporizing chamber and igniter, which is arranged partly within the combustion-chamber *d* and partly without the same, the part without being, as shown in the drawings, provided with internal ribs *u' u'* and being heated for starting the engine by the flame of a lamp arranged in any suitable manner. After the engine has been running for a short time the part of the chamber *u* within the combustion-chamber *d* will be sufficiently heated to serve as the igniter.

v is the shield, which I place around the portion of the vaporizing-chamber and igniter *u* within the combustion-chamber *d* for the purpose of preventing the air entering the combustion-chamber from impinging against the walls of the chamber *u* and so cooling the same. The said shield *v* is placed at a slight distance from the chamber *u* in order to afford a space into which the gases can penetrate.

w w' indicate, respectively, the barrel and plunger of the pump, which I employ for injecting the liquid hydrocarbon into the vaporizing-chamber *u*, the said pump being fixed upon the outwardly-extending portion of the said vaporizer and delivering directly into the end of the same in the direction of its axis. This pump is not provided with a valve, but is constructed as follows and as shown in Fig. 5—that is to say: in the end of the plunger is formed for a short distance a passage *x*, which terminates in a cross-passage *x'*, as shown most clearly in Fig. 6. Around the barrel *w* of the pump is formed a chamber *y*, and around a portion of the plunger of the pump is formed a space *y'*, which communicates with the chamber *y* through a passage y^2, the said space being kept constantly filled with oil under a slight head or pressure.

When using light petroleum or paraffine oil, the chamber *y* may be used as a water-jacket, the oil entertng the passage y^2 from an outside reservoir. With this arrangement when the plunger is in its lowest position the cross-passage *x'* is in the space *y'*, so that the oil can flow from the latter into the passage *x* and fill the space above the plunger. Immediately the upward movement of the plunger commences the passage *x'* is moved into the part of the pump-barrel which the plunger fits, so that the return of oil through the passage *x'* is prevented, the result being that the oil above the plunger is injected into the vaporizer *u*. The plunger may be operated by any suitable means. As shown, it is arranged to be operated by the impingement of a lever *z*, carrying a roller *z'*, acted upon by an eccentric or cam z^2, a spring being arranged to move the plunger in the reverse direction, as shown.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is—

1. In an explosive engine the combination with the combustion chamber, of a vaporizing device communicating interiorly with a supply of liquid, an air inlet adjacent to the exterior of said vaporizing device, and a shield surrounding said vaporizing device and located between it and the air inlet, substantially as described.

2. In an explosive engine, the combination with the combustion chamber, of an air heating chamber separate therefrom and surrounding said combustion chamber, an air inlet for said air heating chamber communicating with the atmosphere, an air passage connecting said air chamber and said combustion chamber, a vaporizing device extending into the combustion chamber and communicating interiorly with a supply of liquid, and a shield surrounding said vaporizing device between it and said air passage, substantially as described.

3. In an explosive engine the combination with the combustion chamber and the vaporizing chamber, of a liquid supplying device comprising the liquid supply passage, a plunger located therein having a longitudinal aperture in its end and a cross passage communicating therewith at a distance from its end, substantially as described.

In witness whereof I, the said WILLIAM EDWARD GIBBON, have hereunto set my hand this 26th day of March, 1895.

WILLIAM EDWARD GIBBON.

Witnesses:
JOSEPH LEE,
EDMD. WADE.