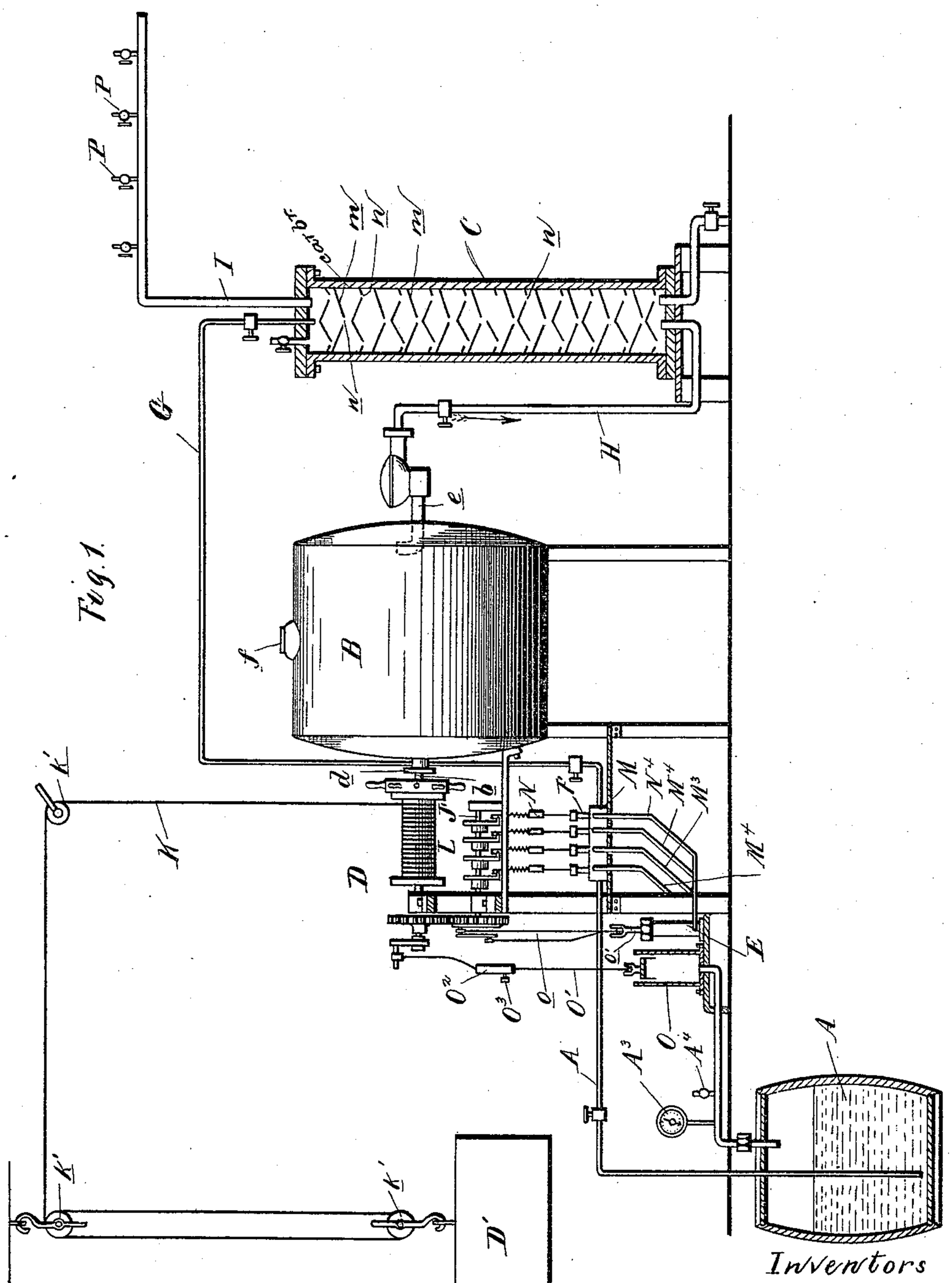
(No Model.) 3 Sheets—Sheet 1.

G. HARGREAVES, J. P. SCRANTON & E. W. PORTER.

CARBURETOR.

No. 459,579. Patented Sept. 15, 1891.

Fig. 1.



Witnesses
P. M. Hulbert
A. L. Hobbie

Inventors
James P. Scranton
Edwards W. Porter
George Hargreaves
By Thos. S. Sprague & Son
Atty.

(No Model.) 3 Sheets—Sheet 2.

G. HARGREAVES, J. P. SCRANTON & E. W. PORTER.

CARBURETOR.

No. 459,579. Patented Sept. 15, 1891.

Fig. 3.

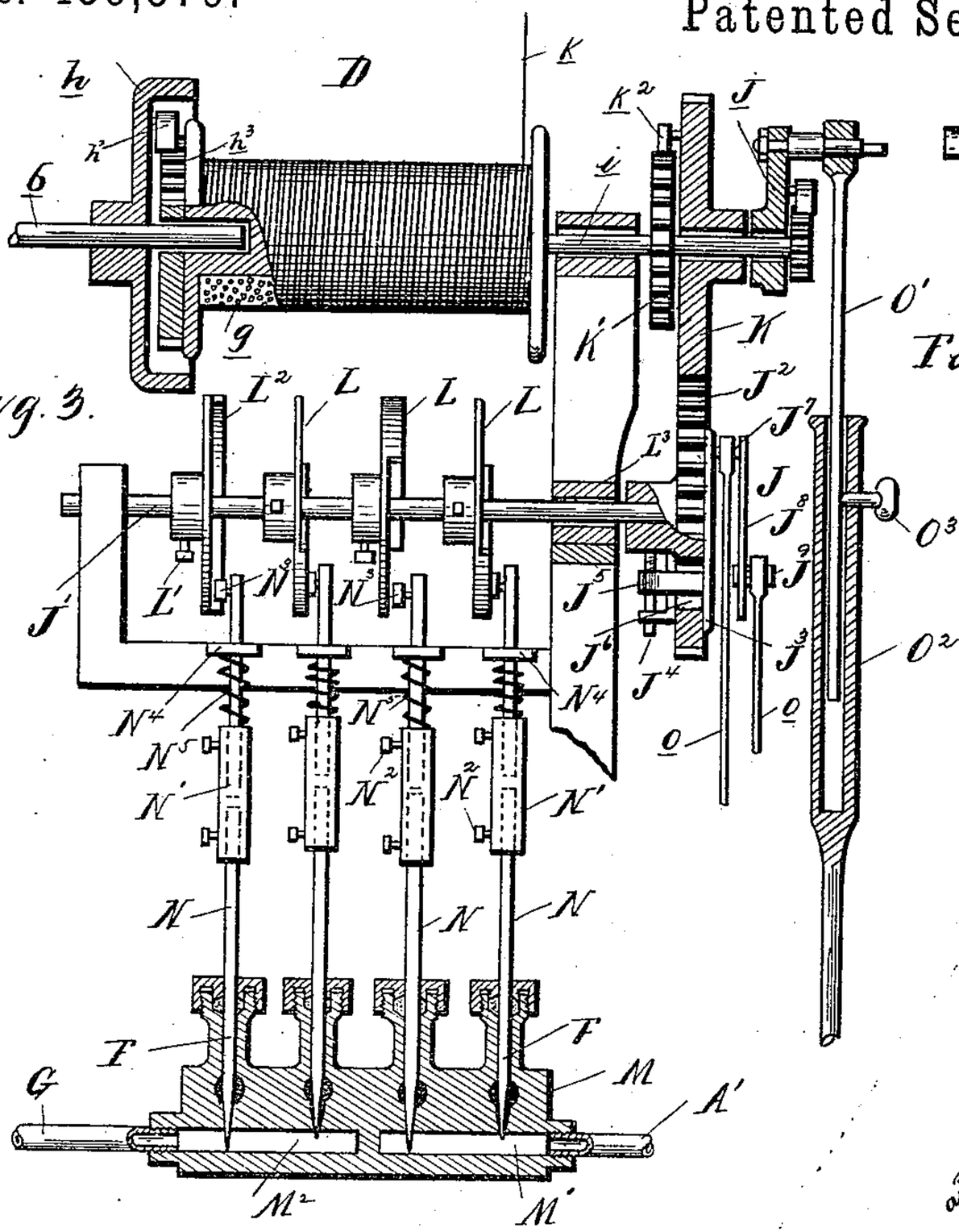


Fig. 5.

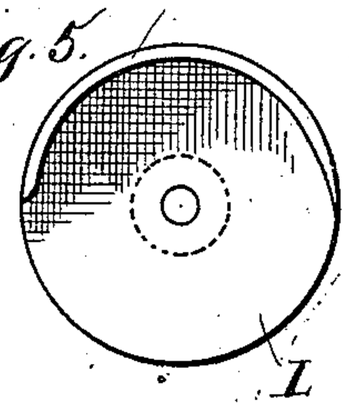


Fig. 4.

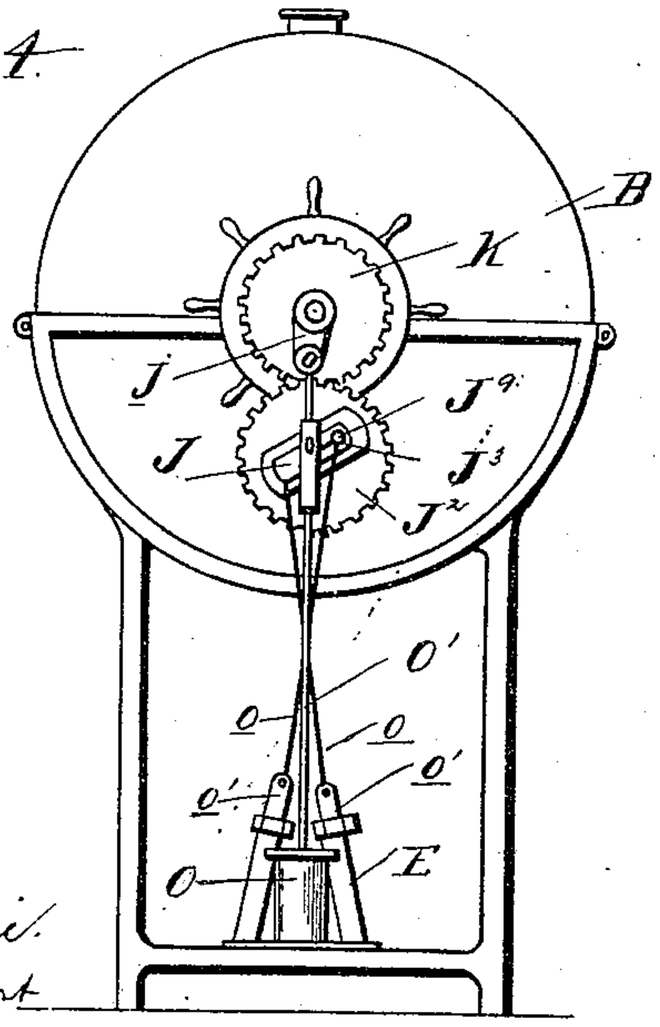
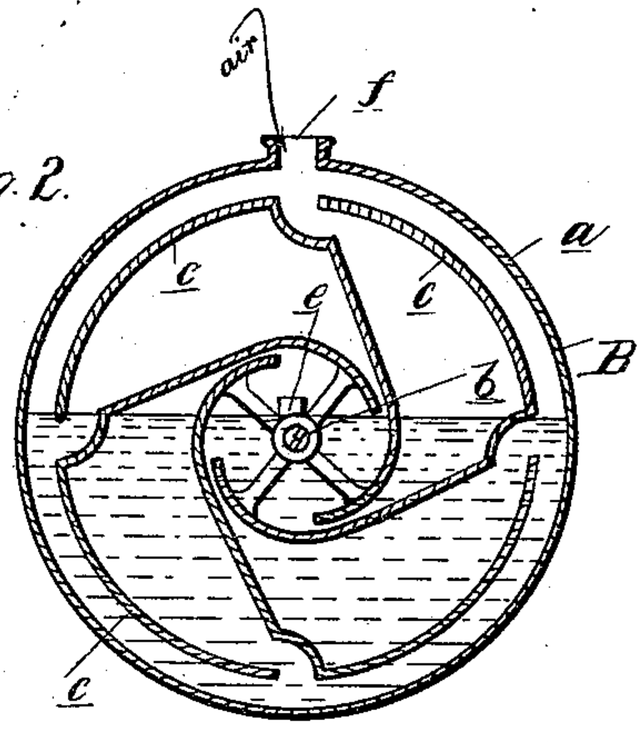


Fig. 2.



Witnesses
W. L. Hobbie.
P. M. Hulbert

Inventors
James P. Scranton
Edwards W. Porter
George Hargreaves
By Thos. S. Sprague & Son
Att'y.

(No Model.) 3 Sheets—Sheet 3.

G. HARGREAVES, J. P. SCRANTON & E. W. PORTER.

CARBURETOR.

No. 459,579. Patented Sept. 15, 1891.

Fig. 6

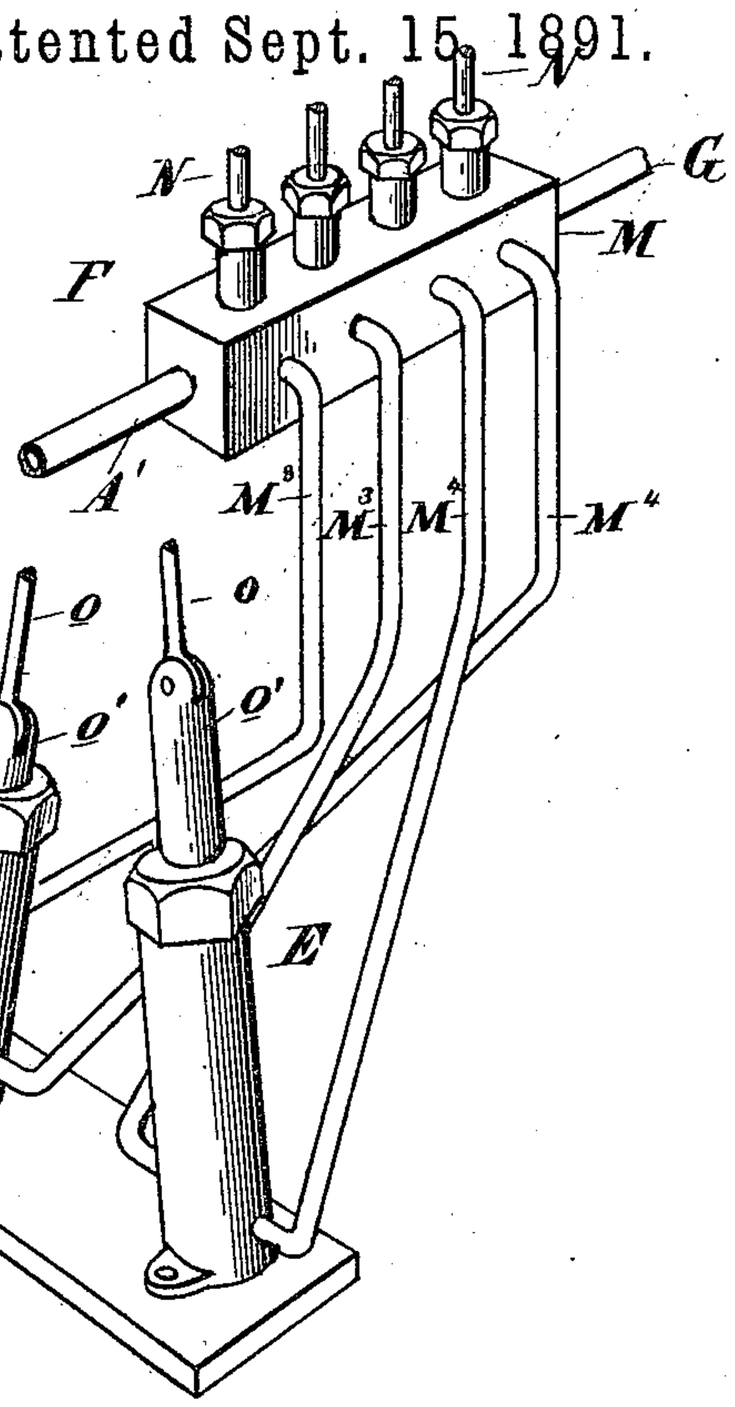


Fig. 7

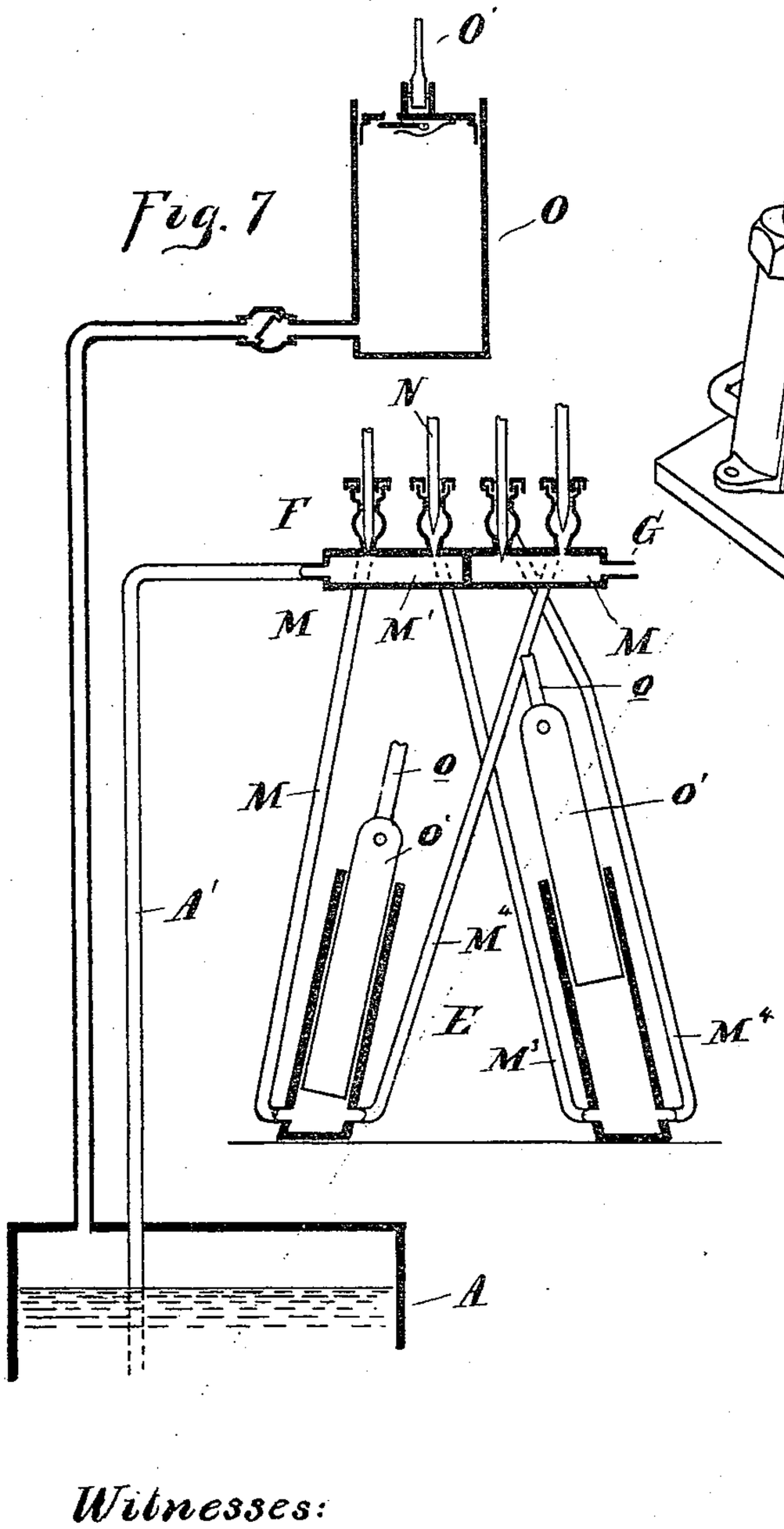
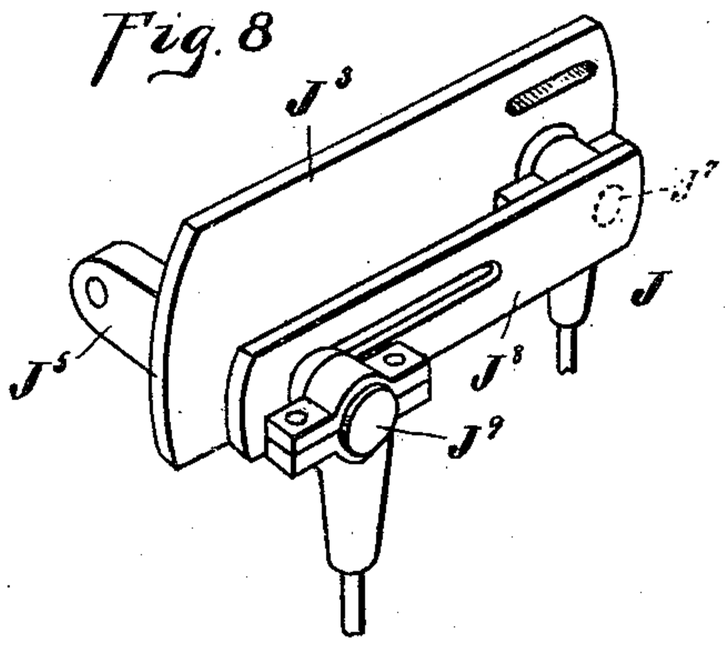


Fig. 8



Witnesses:

J. M. Dougherty.

W. M. Hulbert

Inventors:

James P. Scranton

Edwards W. Porter

George Hargreaves.

By Munn & Sprague & Co, Atty.

UNITED STATES PATENT OFFICE.

GEORGE HARGREAVES, JAMES P. SCRANTON, AND EDWARDS W. PORTER,
OF DETROIT, MICHIGAN.

CARBURETOR.

SPECIFICATION forming part of Letters Patent No. 459,579, dated September 15, 1891

Application filed December 18, 1890. Serial No. 375,151. (No model.)

To all whom it may concern:

Be it known that we, GEORGE HARGREAVES, JAMES P. SCRANTON, and EDWARDS W. PORTER, citizens of the United States, residing at Detroit, in the county of Wayne and State of Michigan, have invented certain new and useful Improvements in Carburetors, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to new and useful improvements in apparatus for carbureting air; and the object of the invention is to produce carbureted air in which the proportion of hydrocarbon is so nicely adjusted to the amount of air used that the vapor produced is neither so heavily carbureted as to smoke in burning or so lightly as not to produce a pure white flame.

Furthermore, it is the object of our invention to automatically regulate the quantity of vapor produced to the amount consumed. Thus if one burner is in use the machine produces vapor sufficient for one burner only. If ten burners are lighted, the proportion of vapor is increased to supply them all, while if all lights are turned out no vapor is produced. Thus up to a certain limit the apparatus is intended to automatically adjust itself to furnish the requisite amount of vapor.

Our improved apparatus comprises an air-pump for forcing the air, a feeding device for supplying oil in regulated quantities to the carburetor, and a carburetor in which the vapor is formed, the parts being so constructed, arranged, and combined that the operation of the air-pump is directly controlled by the quantity of vapor consumed in burning, that the feeding device is directly controlled by the operation of the air-pump, and that the feed device has proper adjustments for regulating the quantity of oil necessary to carburet a certain quantity of air.

In the drawings, Figure 1 is a diagram side elevation, partly in section, of my apparatus complete. Fig. 2 is a cross-section through the air-pump. Fig. 3 is an enlarged sectional elevation of the motor and feeding device. Fig. 4 is a diagram front elevation of the machine, and Fig. 5 is a detail of one of the cam-wheels for controlling the feed-valves. Fig. 6 is a detail perspective view of the feed-pumps. Fig. 7 is a detail sectional elevation of the force and feed pumps, and Fig. 8 is a detail perspective view of the double crank.

A is an oil-tank, which is preferably placed outside the building below the ground.

B is an air-pump for furnishing the air to the carburetor C, and D is a motor device therefor.

E is a feeding device or pump for regulating the supply of oil to the carburetor, and F are mechanically-controlled valves in the discharge and supply connections of the pump.

The air-pump B may be of any construction which will give a uniform pressure of air. We preferably use the construction shown in the drawings, of which *a* is a cylindrical casing partly filled with water. *b* is a shaft passing centrally through said casing and carrying the buckets *c*, one end of said shaft passing through the stuffing-boxes *d* and out of the casing, the other being suitably journaled to the opposite head of the cylinder.

e is an exit-pipe centrally leading out from the casing opposite the shaft *b*, and *f* is an inlet-aperture at the top of the casing, the parts being similar in construction to the well-known gas-meter, but so arranged as to force air by the rotation of the shaft *b* (and consequent depression of the buckets into the water) through the exit-pipe *e*. The motor device D may also be of any kind which will drive the pump against a certain fixed resistance or air-pressure only.

In the drawings, *g* is a winding-drum journaled in line with the shaft *b* of the air-pump, the projecting end of said shaft forming one of the bearings for one end of the drum. A hand-wheel *h* is fast upon the shaft *b* and engages with the adjacent end of the drum through the medium of a pawl-and-ratchet device h^2 and h^3, respectively, all so arranged that the revolution of the drum will transmit motion to the shaft of the air-pump. The shaft *i* of the drum projects beyond its bearing and is provided with a winding-crank *j* and gear-wheel K.

k is a cord or wire cable wound upon the drum, one end of which, after passing over suitable pulleys *k'*, is attached to the weight D'. By using a sufficient number of pulleys

and heavy enough weight a single winding will store power to last for several days.

The carburetor is constructed as follows: Within the casing I place a series of conical disks *m*, one above the other and having their apices alternately turned up and down. Each disk has a series of perforations at or near the lowest point of its surface, all so arranged that the oil which is introduced through the pipe G into the top of the carburetor will run down the inclined surfaces of the disks *m*, dropping through the perforations *n*, which are alternately at the base or apex of each plate, onto the plate immediately below. At the same time the air which is admitted through the air-pipe H into the bottom of the carburetor in passing up in contact with the surfaces of the disks *m* and through the perforations *n* is brought into such intimate relation with the oil that the latter is completely absorbed before it reaches the bottom of the carburetor.

I is a gas-pipe leading out from the top of the casing.

E is a pump, preferably consisting of two single-acting pump-cylinders, each having a pitman *o* pivotally connected at its lower end to the plunger *o'* and at its upper end to the double crank J, which is adjustably secured on the gear J^2, mounted on the end of a shaft J', journaled in suitable bearings L^3 to the frame of the machine underneath the shaft *i*.

J^2 is a gear-wheel upon the shaft J', meshing with the gear-wheel K, sleeved upon the shaft *i* and adapted to be driven by the same through the medium of the ratchet-wheel K', secured to said shaft and pawl K^2 upon the gear-wheel K.

The double crank J is formed of the plate J^3, adjustably secured to the face of the gear-wheel J^2 by means of the adjusting-screw J^4, located on the opposite side of the wheel J^2, engaging with the lug J^5 on the rear side of the plate J^3, said lug passing through the slot J^6 in the gear-wheel J^2.

J^7 is a crank-pin secured to the plate J^3, and J^8 is a slotted arm secured to the said pin, carrying the adjustable crank-pin J^9, all so arranged that by the means described the length of the cranks can be adjusted to insure greater accuracy in such adjustment. The plate J^3 and arm J^8 are each provided with a scale-marking by which they may be set equidistant from the center of the shaft.

L are cam-wheels adjustably secured to the shaft J' by means of the set-screw L'. Each of these wheels is provided with a cam-flange L^2, extending a little less than half-way around its periphery.

F are valves operated by the cams L, two of said valves forming the admission-valves and the other two the discharge-valves of the pump-cylinder, allowing the oil from the pumps to pass into the carburetor. We preferably use the so-called "needle-valves" and arrange them in a common casing M, containing the chambers M' and M^2, connected with the pipes A' and G, leading, respectively, to the oil-tank A and carburetor C.

N are stems of the valves F, preferably made adjustable as to length by means of the coupling N' and set-screws N^2. Their upper ends are provided with anti-friction rollers N^3, adapted to engage with the cam-flanges L^2.

N^4 is a guide for each of the valve-stems N, and N^5 are springs sleeved upon the valve-stems and adapted to hold the valves to their seats except when lifted by the cams L.

M^3 and M^4 are induction and eduction pipes connecting the chambers M' and M^2, respectively, with the pump-cylinders E whenever their valves F are open.

O is a supplementary air-pump for compressing air in the tank A above the oil to elevate the latter to the chamber M'. O' is a pitman connecting the plunger of said pump with the crank *j*, which is preferably sleeved upon the shaft *i*, having the ratchet-and-pawl connection therewith, admitting of its being turned one way without moving the shaft *i*. The pitman O' is made in two parts, having a slip-coupling O^2, which may be tightened by the set-screw O^3, thus making a dissoluble driving connection between the motor and the pump O.

In practice the apparatus is intended to operate as follows: The motor is wound up by turning the crank *j*, which at the same time by its connection with the supplementary air-pump O compresses the air in the tank A above the oil sufficiently to force the same through the pipe A' to the chamber M'. If the requisite air-pressure, as indicated by the gage A^3, is reached before the motor is completely wound, an escape-valve A^4 will allow the escape of air; or the operator may unloosen the connection O^2 and thus allow the pitman O' to slide loosely in its socket without working the pump. When the motor is wound, the machine is ready for operation; but if no escape for vapor is afforded the pump stops when a certain pressure is reached, and this pressure can be regulated by increasing or diminishing the weight. As soon, however, as one or more of the gas-jets P are opened and the pressure thereby relieved, the motor will begin to operate, and by actuating the air and feed pumps will force air into the bottom of the carburetor and oil in the top, which in running down over the disks *m* is completely absorbed by the air before reaching the bottom and produces carbureted air in the usual manner. Thus the operation of the apparatus is automatically controlled by the pressure of the vapor. It will be seen that the office of the feed-pumps E and the mechanically-controlled valves is not to force oil into the carburetor, (which might readily be accomplished by the pressure of the air above the tank A,) but to so control the flow of oil that a measured quantity is allowed to pass into the carburetor for a certain volume of air; and to this end the cams L are so set that the admission-valves are always closed

before the discharge-valves are opened, and to vary the proportions of oil to the air the stroke of the pump E is made adjustable by lengthening or shortening the cranks. The object of our mechanically-controlled valves is to insure their positive action, no matter how slow the operation of the pump is, and thus the quantity of oil fed into the carburetor (after the adjustment is once made) never varies. By employing the two pumps we acquire a more rapid distribution of the oil, and the use of the two valves in the respective chambers M M′ is to prevent back-pressure, the pumps being single-acting. Were the oil to be supplied directly from the tank to the carburetor, the supply would be too great; but by the use of the feed-pumps and the valve mechanism the supply is regulated according to the consumption of gas. By maintaining a fixed pressure on the oil within the tank we prevent the separation of the lighter from the heavier products. Thus the last drop is just the same in quality as the first.

In conclusion, the advantages of our construction may be briefly summed up as follows: first, that the machine is perfectly automatic in its operation; second, that the gas is only made as needed for consumption and is not stored in a gasometer at the risk of deterioration in quality; third, the quality of the vapor may always be maintained uniform, neither being too heavily nor too lightly carbureted; fourth, all the oil or hydrocarbon may be used, as no separation of the lighter from the heavier products can take place, as is the common difficulty in other machines where a residuum is left which is of no value.

What we claim as our invention is—

1. In apparatus for carbureting air, the combination, with an oil-tank and carburetor, of an air pump and motor, connections whereby the same are automatically controlled in their operation by the pressure of the air, a feed device driven through a suitable connection by the air-pump, connections between the tank, carburetor, and feeding device, valves for said feed device, and connections between the valves and the air-pump for controlling the valves, substantially as described.

2. In apparatus for carbureting air, the combination, with the oil-tank, of an air pump and motor, means for automatically controlling the pressure of the air, the carburetor into which the air is delivered from the air-pump; a feed-pipe connected to said carburetor to feed oil into it, a valve in said feed-pipe adapted to control the delivery of oil into said carburetor, and mechanical means for controlling the feed-valves, substantially as described.

3. In apparatus for carbureting air, the combination, with the oil-tank, of an air pump and motor, means whereby the same is automatically controlled by the pressure of the air in the carburetor, a carburetor into which the air is delivered by said air-pump, a feed-pump for feeding oil into said carburetor, feed-valves, mechanical connection between the air-compressor and valves for controlling the valves, and pipe connections between the oil-tank, carburetor, and feed-pump, substantially as described.

4. In a carburetor, the combination, with the carbureting-chamber and oil-tank, of an air-pump, a motor, means for automatically controlling the pump and motor by the air-pressure in the carbureting-chamber, two single-acting pumps for feeding oil into the carbureting-chamber, inlet and outlet valves for the pumps, mechanical means for controlling the valves and connecting the same with the air-pump, and pipes connecting the pumps, tank, and carburetor-chamber, substantially as described.

5. In apparatus for carbureting air, the combination, with the air pump and motor, connections whereby the same are automatically controlled by the pressure of air in the carburetor, a carburetor into which air is delivered from said air-pump, two single-acting feed-pumps for feeding oil alternately into said carburetor and provided with valves, mechanical connections with the valves and air-pump, an oil-reservoir connected to the feed-pumps, a supplementary air-pump connected to the top of said reservoir, and a dissoluble drive connection between said pump and the winding mechanism of the motor, substantially as described.

6. In apparatus for carbureting air, the combination of an air-pump and actuating-motor, connections whereby the same is automatically controlled by the pressure of the air in the carburetor, a carburetor from which the carbureted air is directly supplied to the burners, an oil-feeding device consisting of a suitable pump actuated by the motor under the control of the air-pump, inlet and outlet connections from said pump communicating, respectively, with a supply-tank and with the carburetor, induction and eduction valves in said pump, connections also actuated by the motor under the control of the air-pump, and a supply-tank from which the oil is automatically supplied to the feed-pump by compressed air on top of the oil in the supply-tank, substantially as described.

7. In apparatus for carbureting air, the combination, with a carburetor, of compressed air and oil feeding devices connecting into the bottom and top of said carburetor, respectively, of a motor adapted to intermittently operate said device under the control of the pressure of air in the carburetor, and a supply-tank for such feeding device in which the oil is maintained under an air-pressure by an independent air-compressing device, an oil-tank, and pipes connecting the several parts, substantially as described.

8. In apparatus for carbureting air, the combination, with the carburetor and an oil-tank, of the rotary air-compressor and its mo-

tor, the winding-drum of said motor journaled in line with the shaft of said air-compressor and having a ratchet-and-pawl connection therewith, the winding-crank on the shaft of the winding-drum, the two single-acting pumps, an induction and an eduction chamber communicating with a supply-tank and with the carburetor, respectively, and also communicating with the induction and eduction ports of the pumps through intermediate connections controlled by induction and eduction valves, a shaft driven by intermediate gearing with the shaft of the winding-drum and provided with two adjustable cranks for actuating the pumps and with cams for actuating the valves of said pumps, and a supply-tank provided with an independent air-compressor for forcing air into the top of the tank, all arranged to operate substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

GEORGE HARGREAVES.
JAMES P. SCRANTON.
EDWARDS W. PORTER.

Witnesses:
M. B. O'DOGHERTY,
P. M. HULBERT.