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Gas-Carbureter.

No. 226,820. Patented April 20, 1880.

FIG. 2.

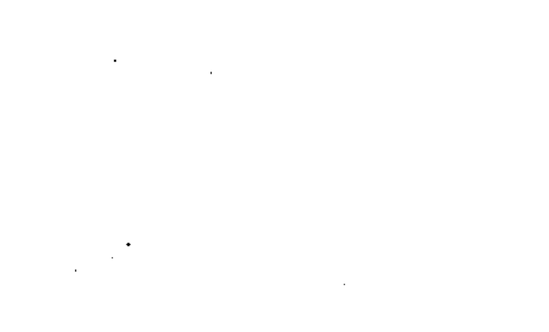

FIG. 3.

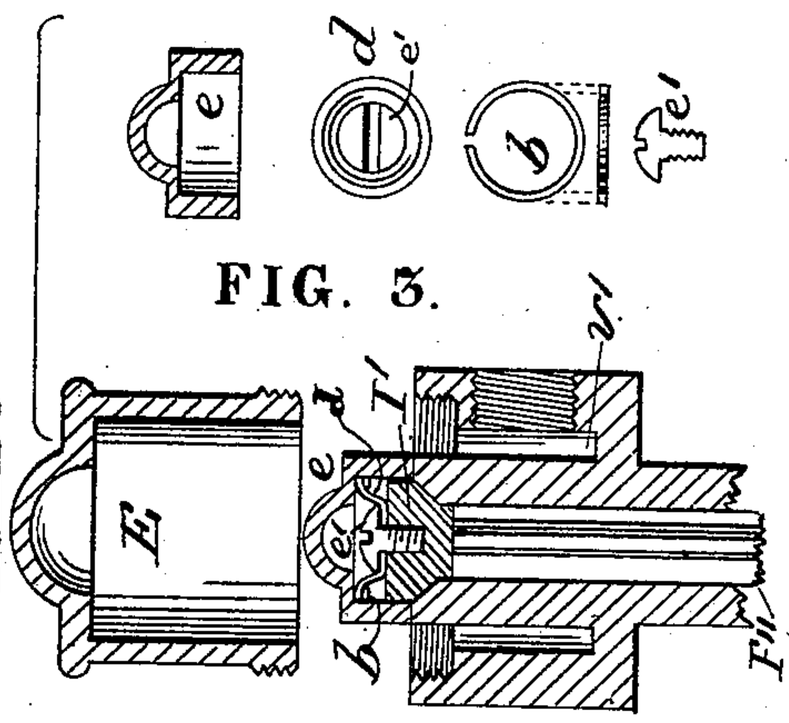

FIG. 1.

FIG. 4.

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FIG. 5.

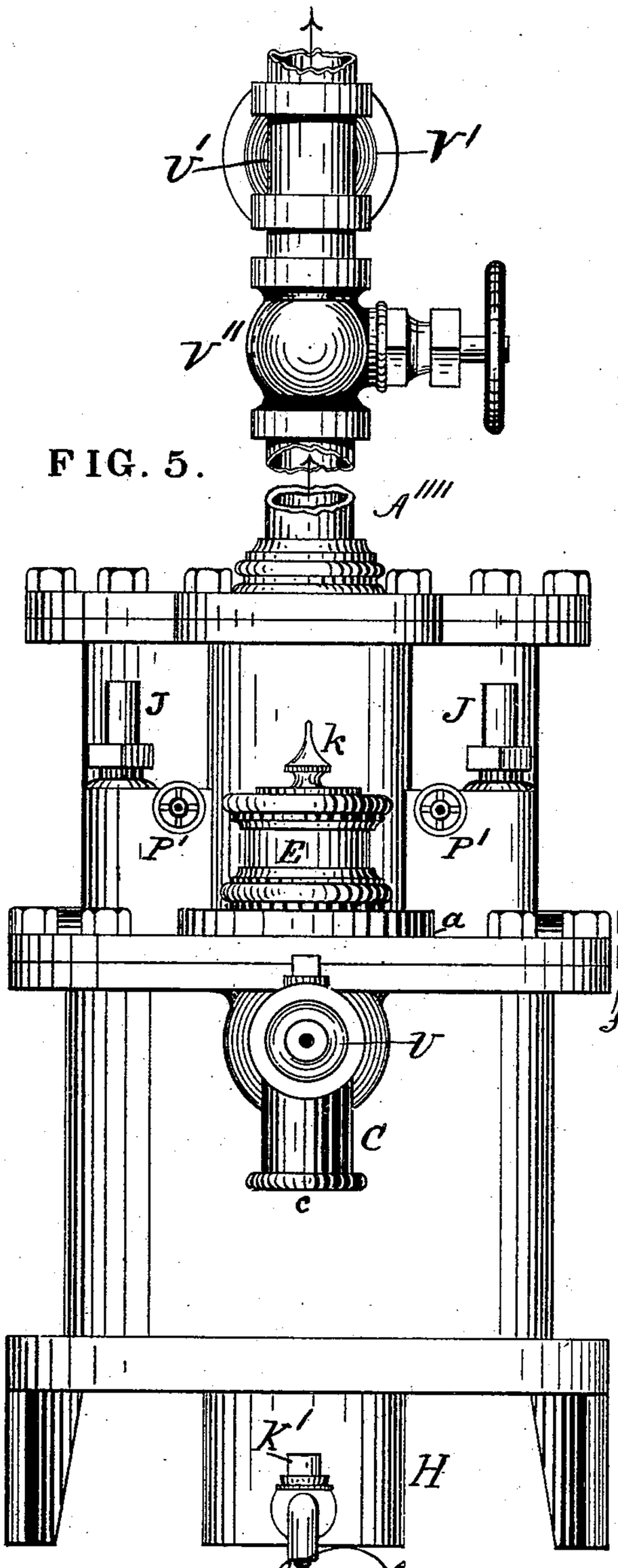
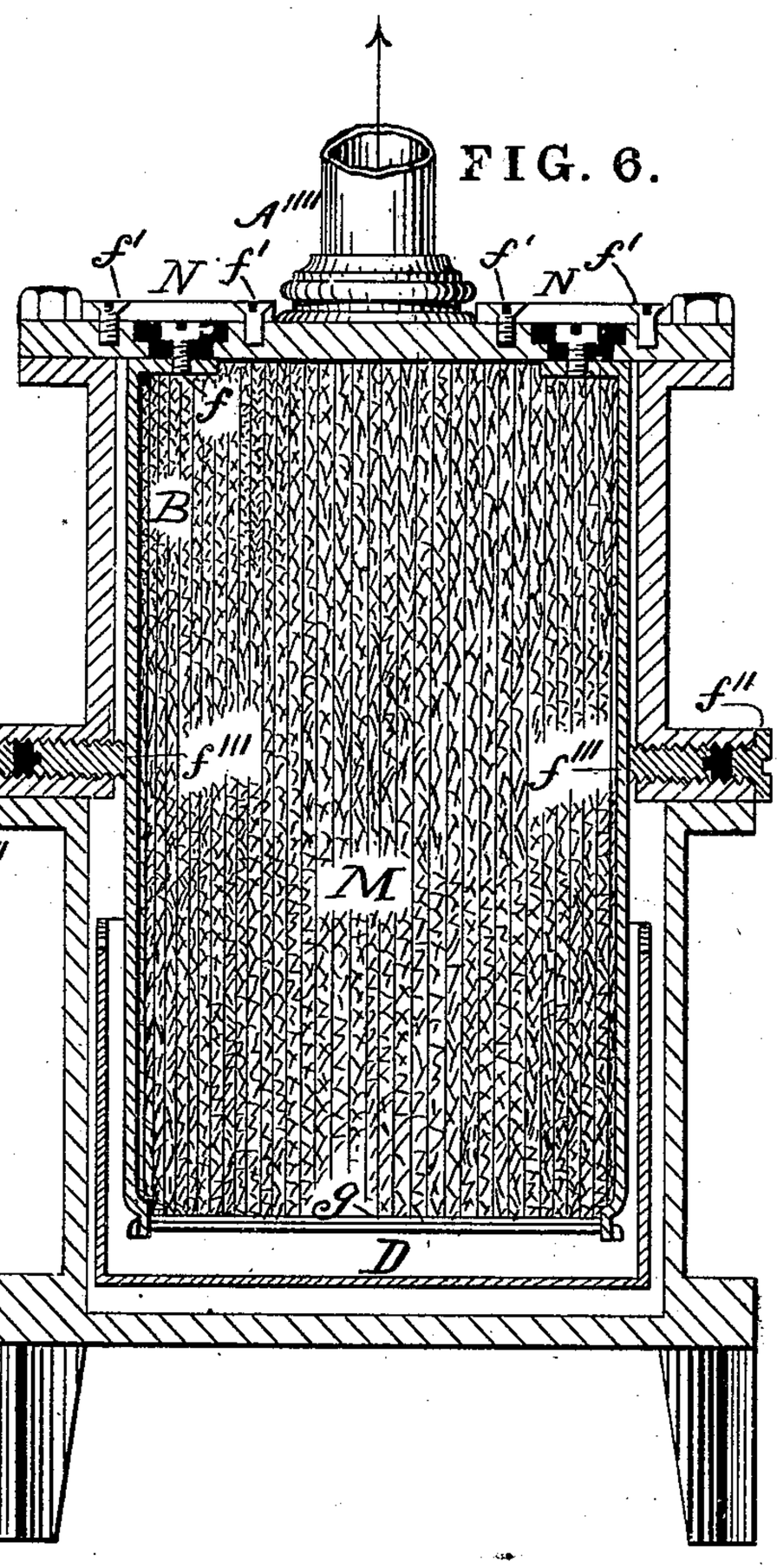


FIG. 6.



Witnesses. Wm. Dixon. Thos Houghton.

INVENTOR. Henry. J. Ferguson.

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H. J. FERGUSON.

Gas-Carbureter.

No. 226,820. **Patented April 20, 1880.**

FIG. 7.

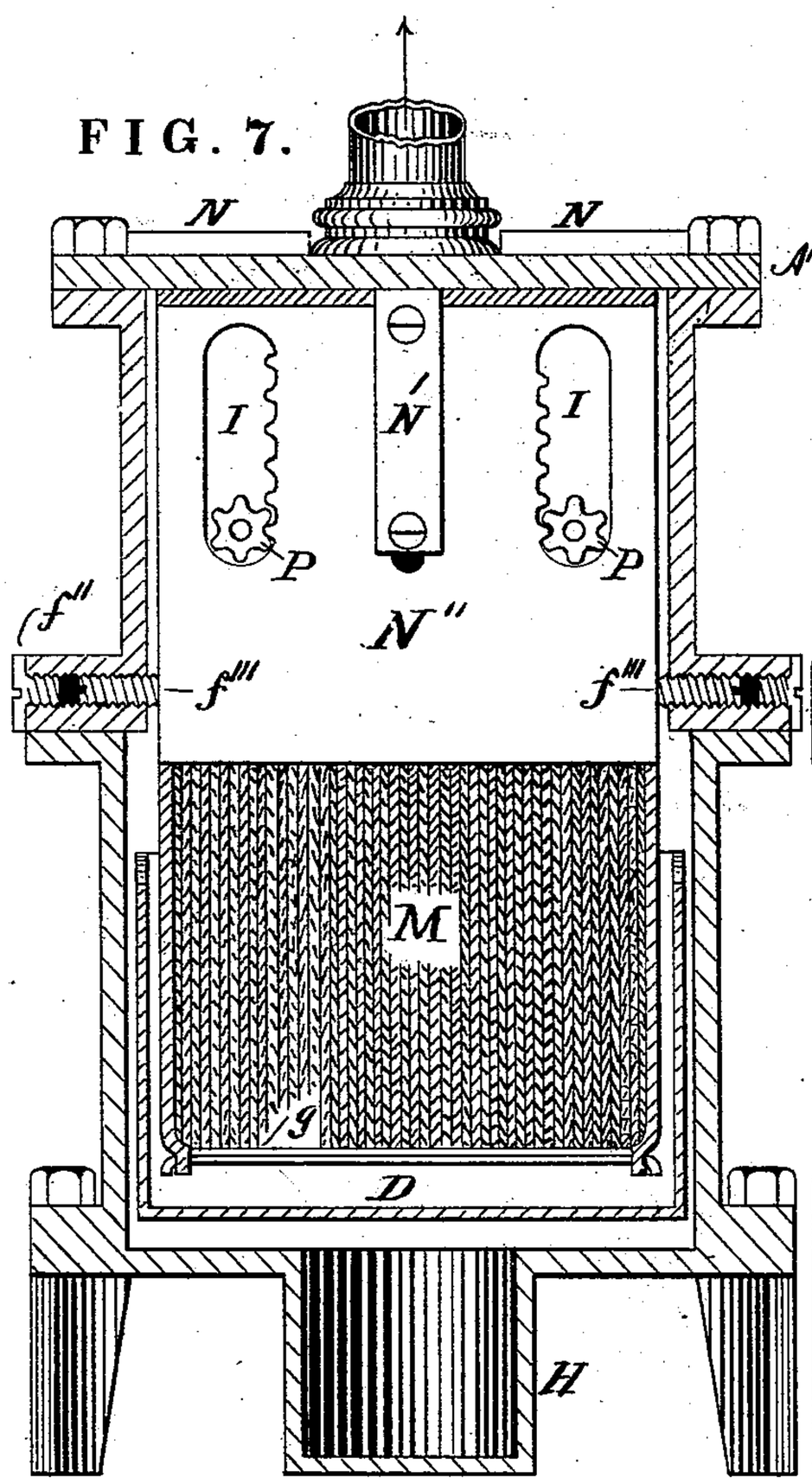
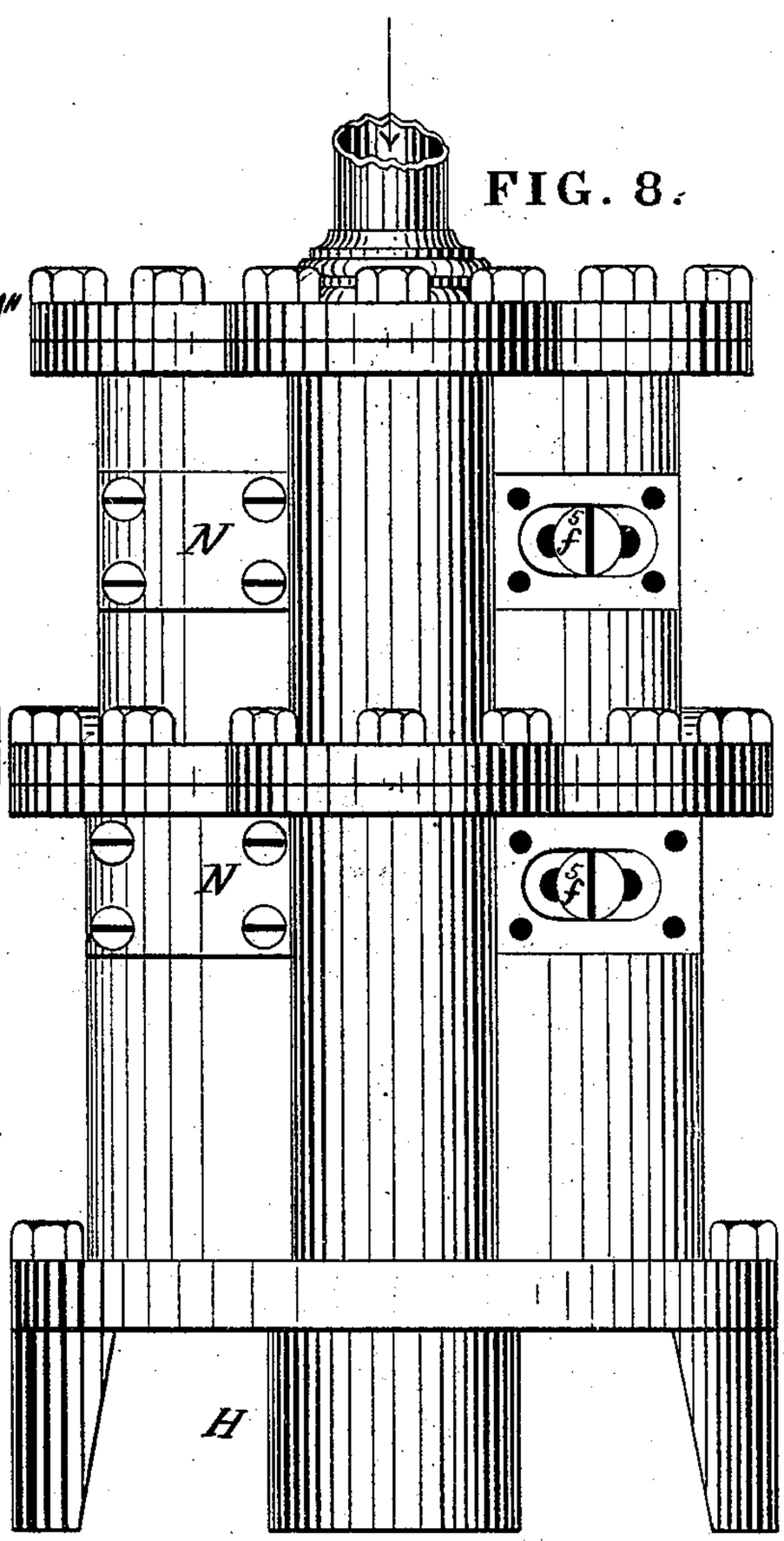


FIG. 8.



Witnesses, { Wm. Dixon, Thos. Houghton.

INVENTOR. Henry J. Ferguson.

5 Sheets—Sheet 4

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Gas-Carbureter.

No. 226,820. **Patented April 20, 1880.**

FIG. 9.

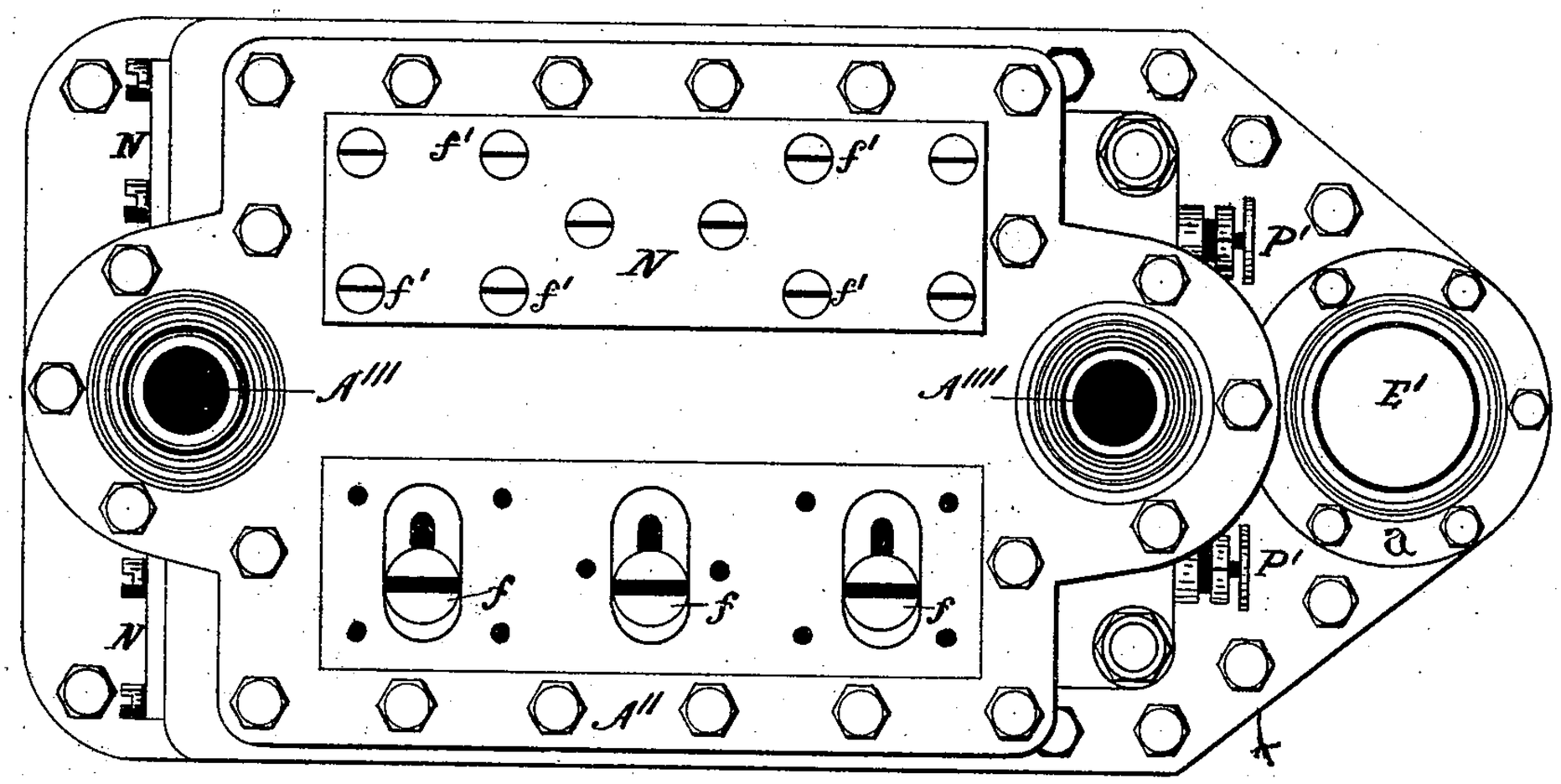
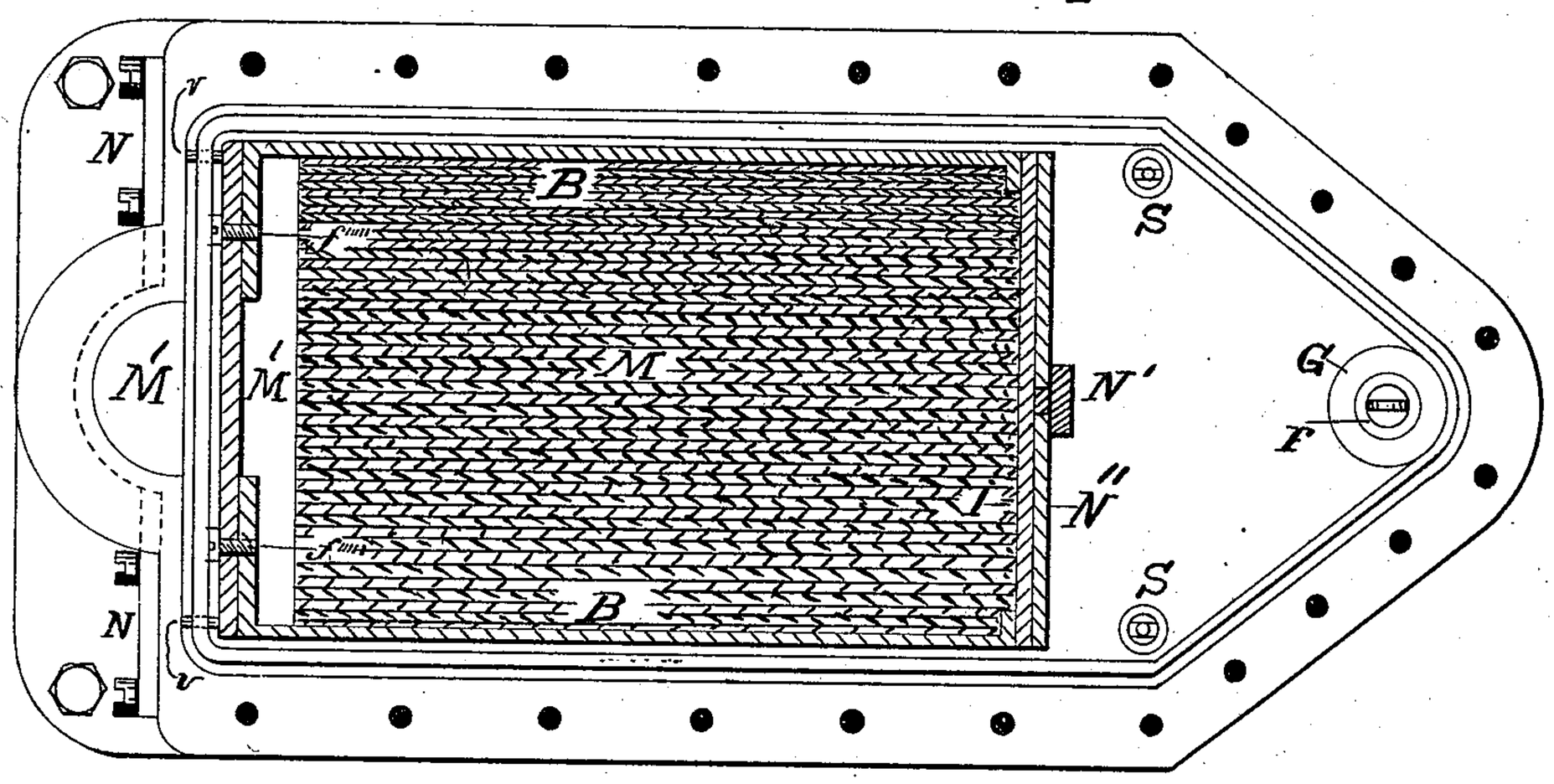


FIG. 10.



Witnesses: Wm. Dixon, Thos. Houghton.

INVENTOR. Henry J. Ferguson.

5 Sheets—Sheet 5.

H. J. FERGUSON.

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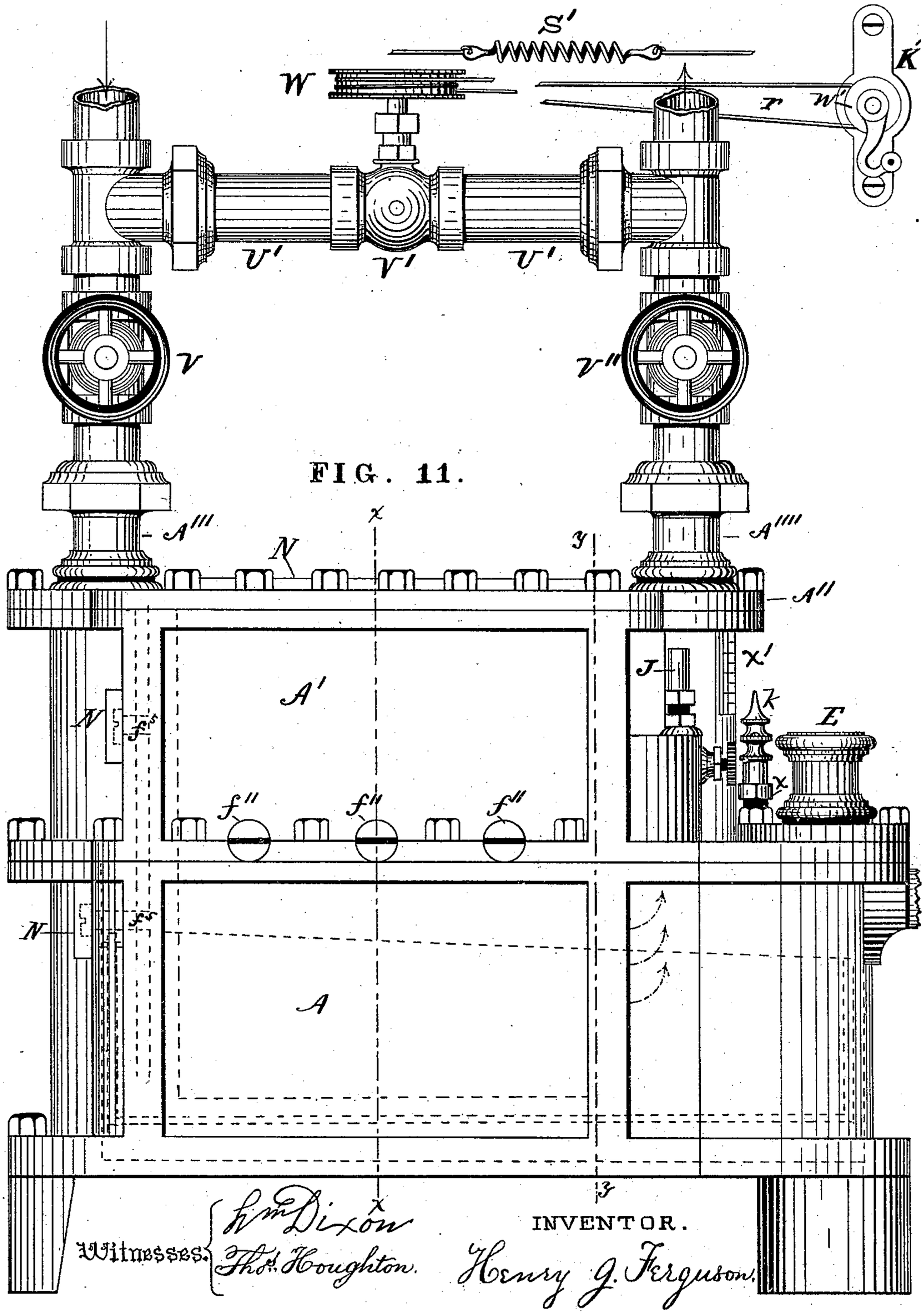

FIG. 11.

UNITED STATES PATENT OFFICE.

HENRY J. FERGUSON, OF NEW YORK, N. Y.

GAS-CARBURETER.

SPECIFICATION forming part of Letters Patent No. 226,820, dated April 20, 1880.

Application filed August 30, 1877.

To all whom it may concern:

Be it known that I, HENRY J. FERGUSON, of the city, county, and State of New York, have invented certain new and useful Improvements in Apparatus for Carbureting or Enriching Common Illuminating-Gas; and I hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming part of this specification, in which similar letters of reference indicate like parts in all the figures.

Figure 1 is a longitudinal vertical section of my invention. Figs. 2, 3, and 4 are enlarged details of the same. Fig. 5 is an elevation of the right-hand end of Fig. 1. Fig. 6 is a transverse vertical section of the same through side set-screws, *f'' f''*, on dotted line *x x*, Fig. 11. Fig. 7 is a transverse vertical section with a view of two plates, one, I, fixed, and the other, N'', adjustable with its racks and pinions for operating the same. Fig. 8 is an elevation of the left-hand end of Fig. 1. Fig. 9 is a top view of the carbureter with one gas-check plate, N, removed. Fig. 10 is a horizontal section and view through the plane of dotted line Q in Fig. 1. Fig. 11 is a side view of Fig. 1.

The object of my invention is to provide an apparatus of novel construction, by means of which common illuminating-gases may be enriched to a degree and in a manner perfectly uniform and as the consumer may choose, and also by means of which common air or any suitable gaseous carrier may be likewise employed, the apparatus being kept supplied uniformly with any of the hydrocarbons now so well known by means of an automatic device, which will be hereinafter fully described.

In many of the carbureters heretofore constructed there has been a very unequal diffusion of the enriching agent with the common gas, causing at first a large smoky flame, and as the more volatile constituents of the hydrocarbon were exhausted the flame at the gas-burner would dwindle down to a small blue light, having scarcely any illuminating power.

By means of my invention I am enabled to avoid such unsatisfactory results and to insure an equal and uniform flow of the hydrocarbon through the vaporizer and the continuous maximum effect produced by mingling the vapors of hydrocarbons with common illuminating-gas, thus producing a uniform light of great brilliancy and at the minimum cost.

The casing of my improved carbureter is of cast-iron, and is made in two parts, and may be of the form shown in Figs. 1 to 11. It is divided horizontally about midway down its side, and is provided with flanges at its junction, and bolted or screwed together in the usual manner, as shown in the accompanying drawings.

A is the lower section of the carbureter, and A' its upper section.

My invention consists of a hydrocarbon-vaporizer, M, constructed of perpendicular layers of fibrous or other suitable absorbent material, preferably of Canton flannel, (having a nap on both sides,) which is made by cutting out a series of rectangular pieces of cloth of the required size, or by doubling the cloth upon itself until the required thickness of material is obtained.

Figs. 1 and 10 show the thickness of the cloth cube when compressed and secured in its place within the casing.

B B are side plates of the vaporizer, between which the sheets of flannel are held in place. Said plates B B are not perforated, their office being to hold the sheets of absorbent material in close contact with each other while in the machine, so as to prevent the common gas or air from passing too rapidly through the machine; also, to shut off the passage of the common carrier through the machine in any way except between the sheets of the vaporizer M.

The cloths of the vaporizer, after having been put in place to form the required cube, are tightly pressed together and secured by the two side plates, B B, which are flanged at their upper ends to be screwed to the under side of the top plate, A'', by screws *f*, the heads of which are movable in slotted recesses cast in the top plate, A'', the slots permitting screws *f* to be moved toward the center of the machine, so as to compress the folds or pieces of cloth M when in place to an equal degree with the bottom part of the vaporizer, which

is rigidly held together by the cross-rods which pass through the bottom edges of side plates, B B, which is further facilitated by set-screws *f'''*, as shown in Fig. 6. The vaporizer rests upon a sheet of wire-cloth, *g g*, which, in turn, rests upon cross-rods, the ends of which pass through holes *o o* of side plates, B B.

N N are plates to cover set-screws, to prevent leakage of gas from the slotted spaces.

Side plates, B B, extend around the rear angle about one-third the distance across the width of the machine, and to a distance of about half an inch beyond the ends of the cloth, leaving a clear passage for the entering gas from the top to the bottom of the vaporizer M, as shown in Figs. 1 and 10.

The upper half of the right-hand end of the vaporizer M is covered by a fixed plate, I, and upon said plate I is another plate, N'', which is made to have a vertical sliding motion, and is guided upon a guide, N', a cross-section of which is shown between Figs. 9 and 10. Plate N'' is operated by means of pinions P P and racks, as shown in Fig. 7. Pinions P, having their shafts extended through the outer casing of the front of the machine, are rotated by milled heads P'.

The lower end of the vaporizer M extends downward nearly to the bottom of the hydrocarbon-containing vessel D, as seen in Figs. 1, 6, and 7, and in dotted lines, Fig. 11.

The vessel D, in which the hydrocarbon is placed, is suspended at the left-hand end of Fig. 1 upon two pins or pivots, *v*, so as to permit its opposite end to be lowered or raised automatically, as will be hereinafter more fully described.

At S S, Figs. 1 and 10, are spiral springs, one end of which is attached to the bottom of the vessel D, and the other end to a vertical rod, R, the upper end of which is threaded and provided with an adjusting-nut, *m*, whose lower elongated part fits loosely into recess *m'*. The upper end of rod R is covered by a screw-cap, J. These parts are shown in enlarged detail views in Fig. 2.

The hydrocarbon fluid is fed into vessel D by a tube passing from any suitable tank or reservoir. Stop-cock *k* in the conducting-tube admits or shuts off the supply of hydrocarbon fluid.

When the machine is in action the supply of the hydrocarbon is regulated automatically by the combined operation of springs S S and valves I' and *e*, as follows: The springs S S are first adjusted to sustain the required amount of fluid to be contained in the vessel D. Then when the hydrocarbon fluid is absorbed by the vaporizer M the vessel D becomes, in consequence, lighter. This causes the springs S S to contract and raise the forward end of vessel D, to which is attached the valve-stem F'' of valve I', and consequently opens valve I', thereby admitting a fresh supply of fluid into vessel D. This operation continues until the springs S S are again extended, thus closing valve I' and shutting off the supply of hydrocarbon fluid.

The inner end of the fluid-feed tube communicates with an annular chamber, *v'*, surrounding valve I'.

Valve I' has two independently-acting seats—one conical, the other annular and horizontal. The conical portion is upon the upper end of the valve-rod F'' in the usual well-known manner. The horizontal seat is just above the conical one, and is covered and engaged by a cap, *e*.

On the top of valve I' is secured, by a central screw, *c'*, a cup-like diaphragm, *d*, of corresponding diameter to the inside diameter of cap *e*, and to which the diaphragm is attached at the inside flange of *e* by compression-ring *b*, acting from under and against diaphragm *d*.

The space described between the line of the upper surface of valve I' and the under line of *b* is a space of freedom for an intermittent or alternate valvular action, designed to meet and remedy either of two possible contingencies—that of some particle-like obstruction between either the conical or horizontal surfaces when approaching for final checking, &c., and of an imperfect fitting of one or the other surfaces. In either case the difficulty, if it occurs, is likely to be limited to one set of surfaces. Therefore the other will be presumed to be perfectly fitting and checking.

It is of great importance that the automatic action of valves I' and *e* be perfect; for, were it not so, there would be an overflowing of the vessel D, and the interior of the carbureter, below the bottom edge of plate I, would be filled with the hydrocarbon fluid, cutting off the gas and putting out the lights.

When the vessel D becomes sufficiently exhausted to be raised by the released and contracting influence of springs S S, F and I' are caused to rise too; but as I' continues to rise until its upper surface engages the under line of *b*, as before stated, then follows the rising of cap *e*, and so both I' and *e*, the passage for the liquid hydrocarbon is open, and it flows on, filling vessel D, and when it becomes recharged, and therefore reweighted, it overcomes the tension of springs S S, and D again descends, carrying I' and *e* along; but the valve surface of *e* comes in contact first, and if it is in perfect apposition with its seat then check work is complete, even though the surfaces of I' also come into perfect apposition; but should some particle lodge on the surface of *e*, forming an obstruction, and so causing an imperfect apposition of its surface and seat, the perfect check in all probability will then belong to I', for its function is to continue descent by the distance, as before stated, and after *e* has come into contact with its seat. Thus, in brief, it may be stated that the valvular action is consecutive and in duplicate, instead of being single, as ordinarily.

The successful operation of this combination-valve is further assured by the use of a circu-

lar diaphragm, Z, of fine wire-cloth, placed in front of shouldered interior of C and inlet-passage to valves I′ and *e*, the use of said wire-cloth Z being to sift the liquid hydrocarbon in its passage to vessel D of all foreign particles.

T is a vertically-sliding tube passing through a stuffing-box, *x*, and provided at its upper end with a stop-cock and gas-tip *k*, for testing the height of the hydrocarbon in vessel D. If in turning stop-cock *k* gas escapes, then the liquid contained in vessel D is below the mouth of tube T, and vessel D is nearly or quite empty; but if gas does not issue, *k* and also T must be drawn up until gas does issue, but there to be rested, and index *x′*, Fig. 11, noted. That point read off from the starting-point indicates the depth of liquid in vessel D, and thus its quantity in D can readily be ascertained at any stage of the operation of the device.

F′ is a link connecting foot-loop F with valve-rod F″. H is a drip or sink provided with stop-cock *k*, for the purpose of collecting and drawing off accidental overflow from vessel D. At C is a pendent branch of a T-connection, having at its lower end a perfectly-fitting thumb-cap or closer, *c*, by which the residuum or collection from the passing hydrocarbon collected there by the action of wire disk Z may be removed.

U is a union for connecting the hydrocarbon-feed pipe to the apparatus. In Fig. 4 G is a circular and recessed bossed disk, perforated centrally, and having a flanged expansion of the rim of recess to enable the piece to be attached to the bottom of vessel D. In the recess and perforation of G foot-loop F fits very loosely, or has a considerable lateral and horizontal freedom of motion, for the purpose of permitting foot-loop F to take a central position relative to the axis of F″ and irrespective of such relation of the axis of G, for in securing G to vessel D it might not be in exact axial relation to F, and therefore if it were not an undue transverse strain and friction would occur to F″, and therefore would impair the function of springs S S, the tension of which should freely conform to the varying quantity of fluid which vessel D may be containing.

About two feet above the machine the ingress and egress gas-pipes are connected by a cross-pipe having a valve, V′. On the stem of globe-valve V′ is a grooved or toothed pulley, W, for the purpose of being operated by an endless cord or wire, *r*, which extends from pulley W to any convenient or chosen point—the office of an establishment, for instance—and there joins another pulley, *w′*, having a winch, and both supported on the wall of the room by a suitable bracket, K′.

Embraced in one line of the endless cord is a spiral spring, S′, the use of which is to keep the cord at an equal degree of tension.

The stop-cock V′ has two functional uses, one of which is to permit the passage of gas to burners by opening it wide in case there is any derangement of the carbureting device; the other is to modify the degree of enrichment as may be desired. This is performed by slightly opening valve V′ by the aid of winch and pulley *w′* and the cord *r* and pulley W. The point of observation is in the office which contains the test-burner. In moving the winch and pulley *w′*, and so cord *r*, valve V′ may be slightly opened, admitting a little uncarbureted gas or air, as the case may be, and which mingles with the enriched body in its egress passage.

It will be seen that any proportion of the passing volume of gas may thus be diverted from entering and passing through the carbureting device, and consequently it is seen to be perfectly easy to adopt any desirable proportion of mixture, or, in other words, any desired degree of carbureting, as already stated.

It will also be noted that whatever effect is witnessed on the test-burner at the office, the same is produced simultaneously upon all the burners throughout the establishment, and that by this arrangement I have complete control of all the burners in a simultaneous manner, and by means of one valve, V″, as well as of the desired degree of enrichment, as hereinbefore stated.

It may be remarked, as a matter of common notoriety among observers of carbureter improvements, that however meritorious the devices may be for evolving the enriching vapor or gas, they fail in a practical respect chiefly because their action is not uniform nor suitably controllable in respect to degree of enrichment. These two essential desiderata are herein claimed clearly accomplished as described, even to a shade of a degree.

It will be seen from the above that when ready for use the mode of operation of my invention will be as follows: Stop-cock *k* will be opened to admit the hydrocarbon fluid to vessel D, which will, when nearly full, close valve I′, as before explained.

The vaporizing arrangement M, reaching nearly to the bottom of vessel D, will absorb the hydrocarbon fluid and carry it upward and diffuse it through the whole compact mass of cloth M. In this attenuated condition it is ready to receive the gas to be enriched. We now open stop-cock V of the ingress-pipe. The gas now enters the chamber M′ and passes downward to plate Z′, and thence toward the bottom of vessel D, between plates Z′ and B B and the uncovered end of the vaporizer M. The inlet gas-duct is clearly shown in Figs. 1 and 10. It is indicated in the former by arrows.

The gas will now pass through the vaporizing arrangement M, coming into most intimate contact therein with the hydrocarbon vapor, which is spread out upon the very large amount of evaporating-surface of the vaporizer. The lighter constituents of the hydrocarbon, naturally rising to the upper part of the vaporizer, would be carried off with the gas first were they not intercepted by the fixed plate I in the upper half of the outlet end of the

vaporizer. If plate I does not direct the gas low enough to absorb all the constituents of the hydrocarbon fluid it is sent farther downward by lowering plate N″.

By this means I am enabled to cause the gas to take the lowest possible course, and so take up and absorb all the hydrocarbon constituents, its heavier as well as its lighter and more volatile ones, and I obtain thereby from the beginning the maximum and uniform effect of the entire body of hydrocarbon, which effect is continued without any deterioration to the end, giving a steady, uniform brilliancy of flame at the burner, free from smoke or smell, and at a minimum cost of production.

These results have not been heretofore obtained by the use of any carbureting device with which I am acquainted.

It has been clearly established by experiment that the proportion of the illuminating value of a grain of naphtha depends upon the relation which it bears to the volume of gas with which it is burned. Therefore, to mingle the gas with the proper portion of hydrocarbon, so as to suit the size of the burner used, I employ the adjustable plate N″, which may be lowered nearly to the bottom of the vaporizer, if required, thus regulating within the machine the volume of hydrocarbon vapor to be mingled with the gas. I also employ the diluting or regulating valve V′ in such a manner as to admit precisely the required amount of uncarbureted gas to that which is highly enriched or carbureted.

Having clearly and fully described my improvements, what I claim as new, and desire to secure by Letters Patent, is—

1. In gas-carbureters, the vaporizer M, constructed of compact perpendicular sheets of fibrous material, inclosed between solid or imperforated plates B B and I, arranged as herein set forth.

2. The vaporizer M, plates B B and I, and plate Z′, constructed as herein shown, in combination with a liquid-hydrocarbon vessel.

3. The solid adjustable plate N″, in combination with permanent solid plate I, for the purpose of regulating within the carbureter the flow of carbureted gas to the outlet-pipe, as herein set forth.

4. The hydrocarbon-vessel D, pivoted or hinged at one end and provided with suspensory springs S S, and connected to fluid-inlet valve I′, as and for the purpose herein shown.

5. The hydrocarbon-vessel D, pivoted or hinged at one end and provided with suspensory springs S S, and connected to fluid-inlet valve I′, in combination with a vaporizer, M, substantially as herein set forth.

6. The hydrocarbon-indicator consisting of a sliding tube, T, stuffing-box *x*, and gas-tip *k*, provided with a stop-cock, in combination with index *x′*, as herein described.

7. The fluid-inlet valve I′, constructed with two independently-acting seats, one conical the other annular, both at the same end of the valve-rod, the one surrounding and inclosing the other, as herein shown.

8. The combination of the hydrocarbon-vaporizer M, fluid-vessel D, hinged and provided with springs S S, and inlet fluid-valve I′, all inclosed in a gas-tight vessel provided with ingress and egress pipes A‴ A⁗ for the gas, as herein shown and described.

HENRY J. FERGUSON.

Witnesses:
WM. DIXON,
THOS. HOUGHTON.