No. 871,320. PATENTED NOV. 19, 1907.

L. BOLLÉE.

CARBURETER.

APPLICATION FILED AUG. 3, 1903.

2 SHEETS—SHEET 1.

Fig 1.

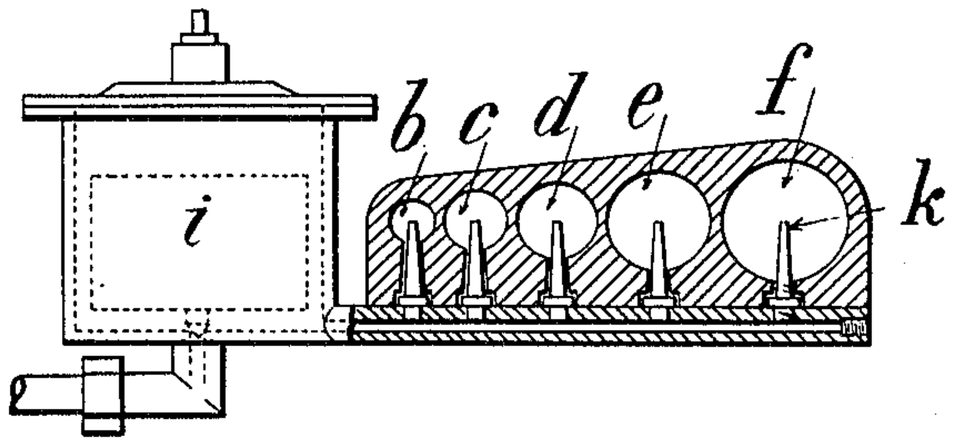
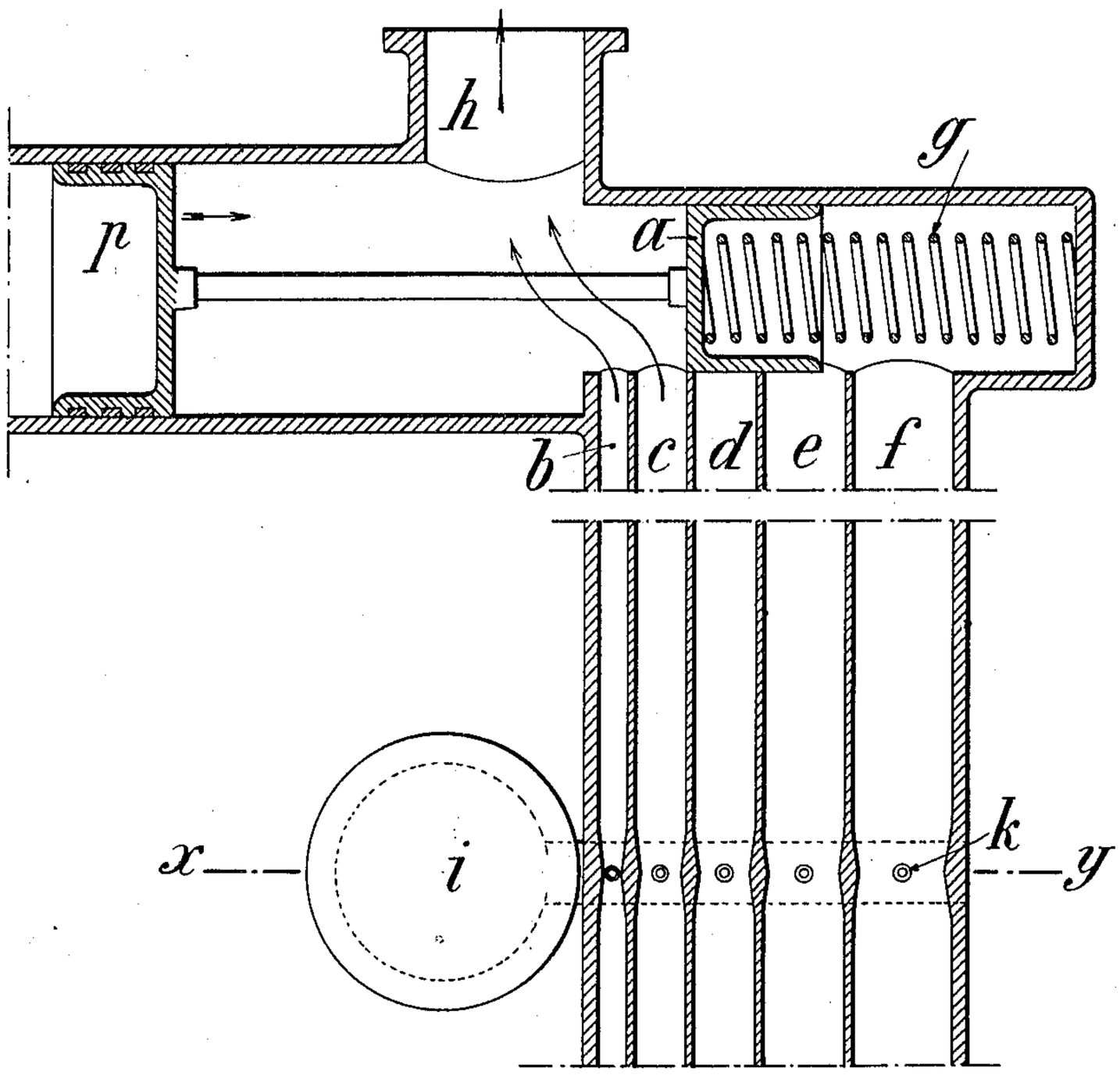


Fig 2.



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2 SHEETS—SHEET 2.

FIG. 3.

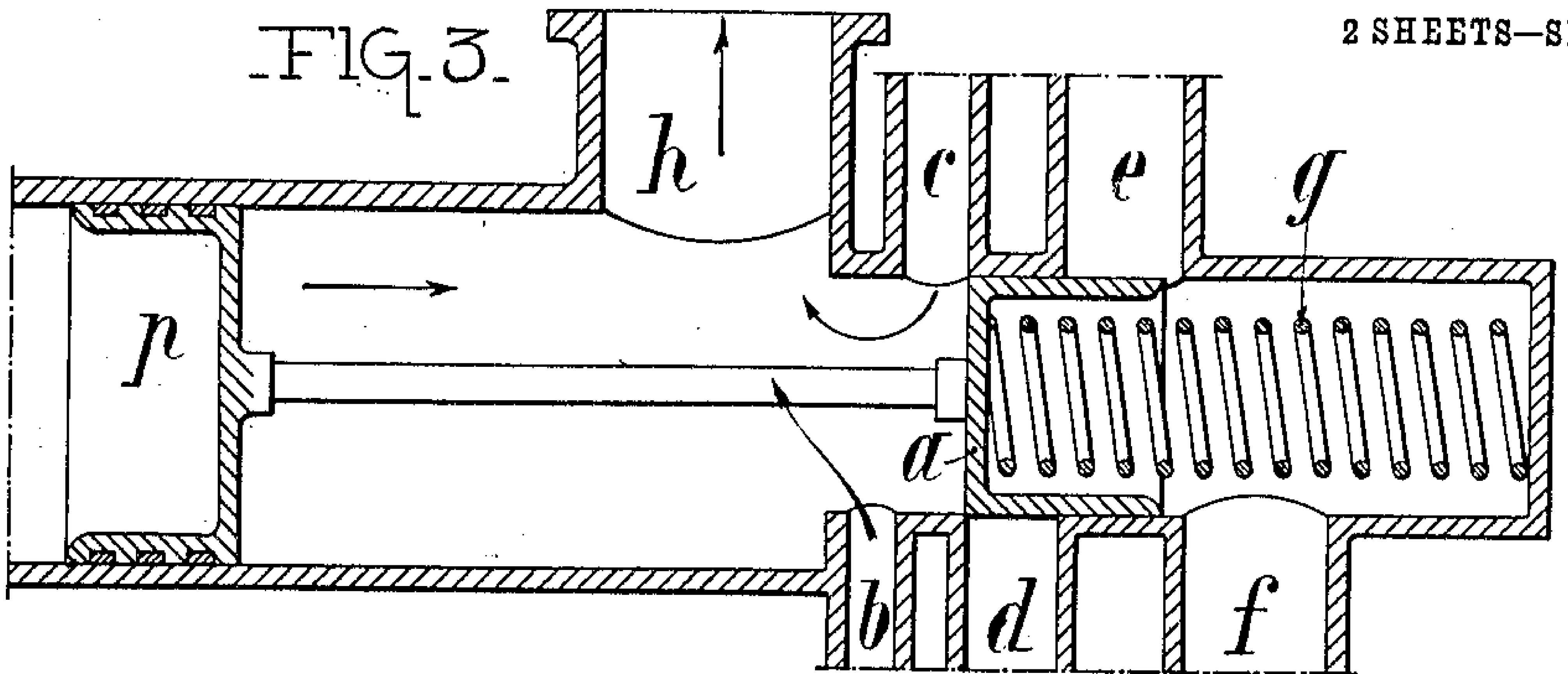


FIG. 4.

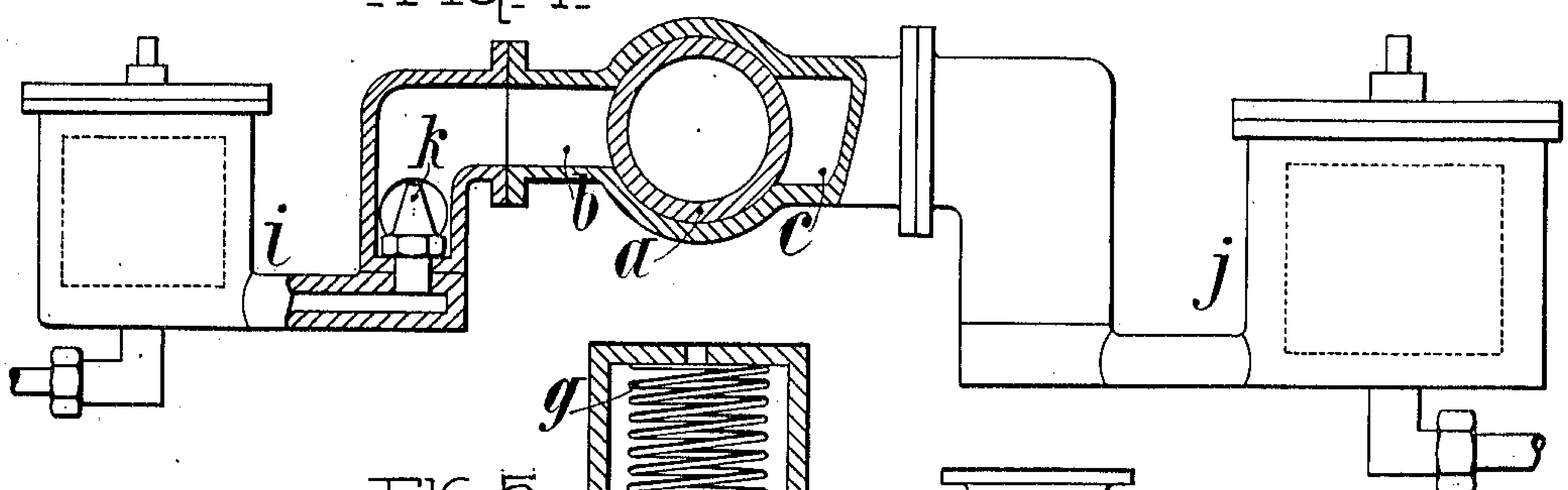


FIG. 5.

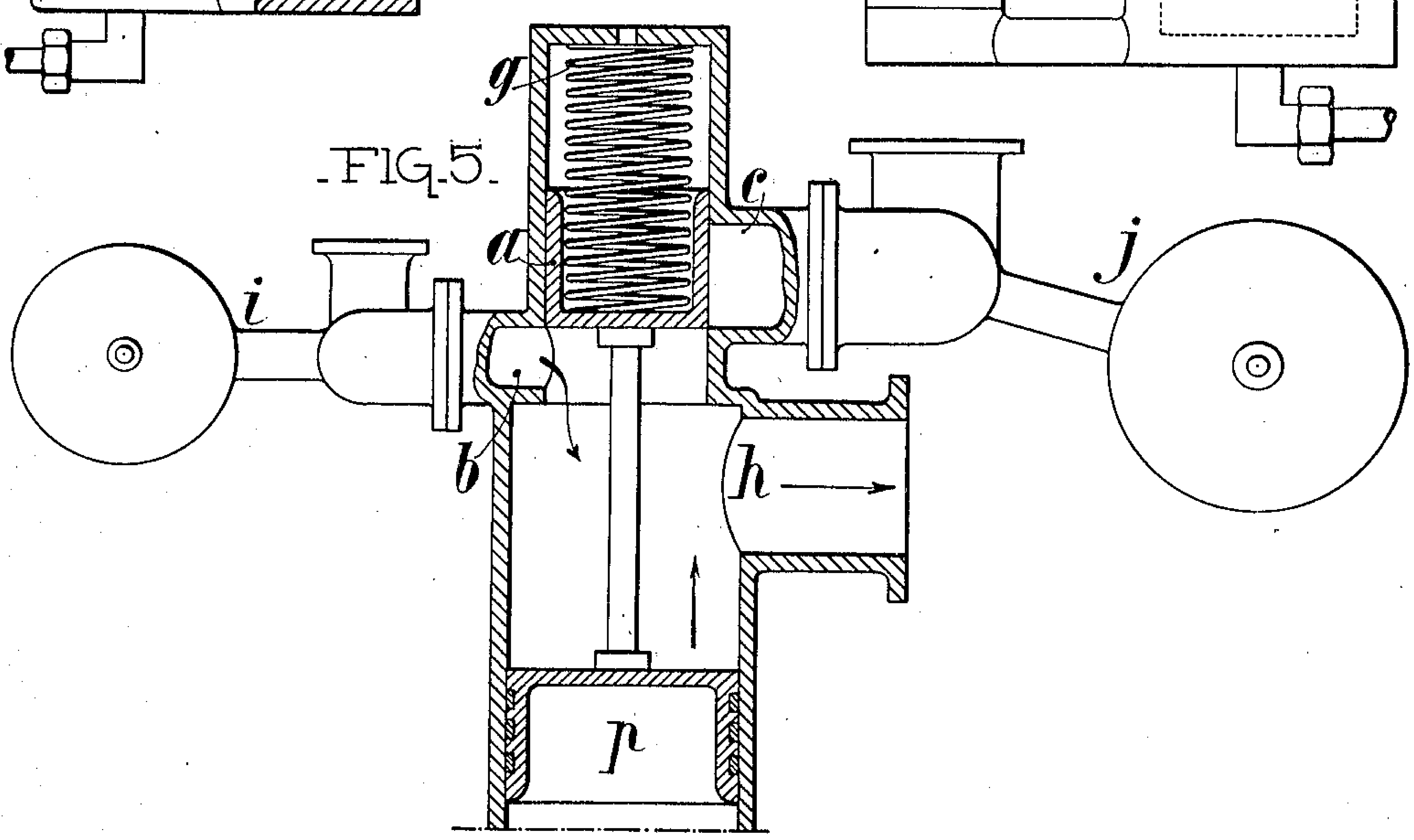
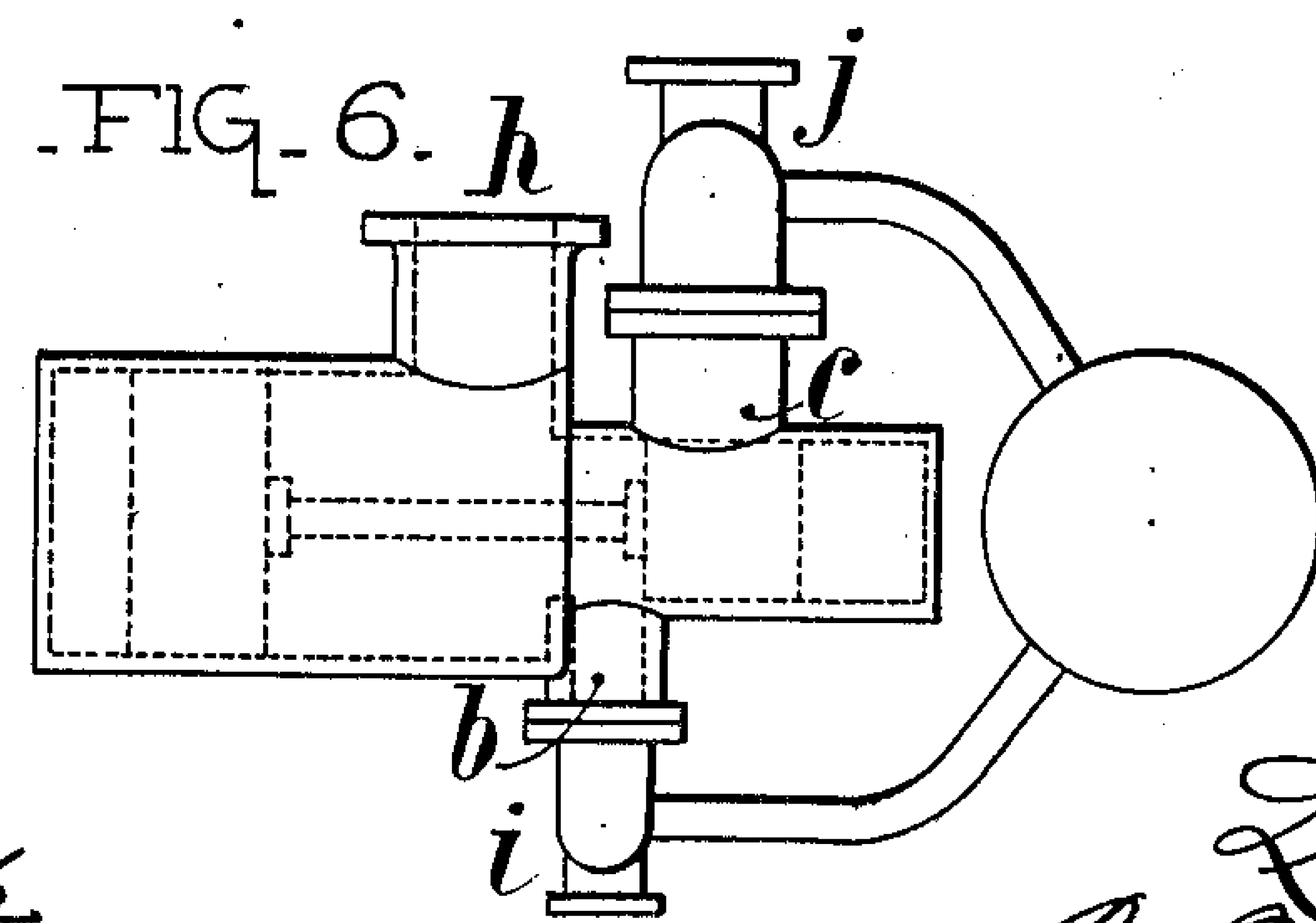


FIG. 6.



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CARBURETER.

No. 871,320. Specification of Letters Patent. Patented Nov. 19, 1907.

Application filed August 3, 1903. Serial No. 168,007.

To all whom it may concern:

Be it known that I, LÉON BOLLÉE, a citizen of the Republic of France, residing at Le Mans, France, have invented certain new and useful Improvements in or Relating to Carbureters, of which the following is a specification.

This invention relates to apparatus for regulating the supply and proportions of the explosive mixture to an internal combustion engine in accordance with requirements; and has for its object to provide an improved construction and arrangements whereby the explosive mixture of air and fuel is always perfectly proportioned to the needs of the moment.

In certain cases, such as for instance in motor car engines, the power developed by the engine, either when running slowly and without doing any work, or when running at high speed under full load, varies often as much as 1 to 20 and sometimes even more. The quantity of explosive mixture to be supplied to the engine should vary practically in the same proportion.

Assuming that the apparatus has passages, the size of which does not vary, this would mean that the suction at the point of discharge of the fuel would have to vary as the square of the quantities handled, that is to say as 1 to 400, and consequently the suction for small outputs would be too weak to insure reliable working, and for large outputs too large to give a full cylinder charge. Moreover, experience has shown that in an ordinary carbureter with small suction the mixture is much poorer than when the suction is great, this being due to the resistance the fuel meets with as it is sprayed in, which resistance is due to several causes, such as difference of level, capillarity, etc.

The invention consists essentially in supplying the explosive mixture to the engine supply pipe by menas of a series of passages each communicating with the carbureter or with one of a set of carbureters and a regulating device operated by the engine or under the influence of a governor or by hand being provided whereby the working mixture is caused to be supplied from one only, or from several or all of the supply passages according to the work to be done by the engine, the dimensions of the supply passages being also such that according to circumstances an almost perfectly proportioned mixture is supplied. This system enables an almost perfectly proportioned mixture, whatever its quantity, to be supplied to the engine at all speeds, and under all conditions of work.

In the following description the expression carbureter will be used as indicating the separate chambers in which the mixture of air and fuel is effected, while the common passage or chamber with which the carbureters communicate will be called the engine supply chamber.

Devices whereby the above mentioned drawbacks are obviated and the required regulation of the explosive mixture is obtained according to this invention, are illustrated, by way of example, in the accompanying drawings.

Figure 1 is an elevation of a form of the apparatus, partly in section on the line x—y of Fig. 2. Fig. 2 is a longitudinal section of the form of apparatus seen in Fig. 1, the fuel-supply reservoir being shown in plan. Fig. 3 is a longitudinal section of a slightly modified device according to this invention in which there is a series of five "stepped" carbureters connected with the single supply chamber to the engine. Figs. 4 and 5 are respectively an elevation and a plan, partly in section, of another arrangement according to this invention, comprising the combination of only two carbureters. Fig. 6 shows in plan a modified construction of the arrangement illustrated in Figs. 4 and 5, in which two carbureters are combined with a single fuel supply reservoir, so that there is a single constant level supply through two passages.

In carrying out my invention according to Figs. 1 and 2 a series (in this case five) of jets k are arranged in line and fed from a constant-level fuel supply reservoir i of any suitable description and communicate with a common casing or engine supply chamber.

The five carbureters are arranged in parallel lines and are slightly contracted at the points where the jets project into them in order to facilitate the spraying of the liquid fuel.

Between the jets and the engine supply chamber with which they communicate these passages are of such a length as to insure that the sprayed liquid shall be intimately mixed with the air, these passages

thus form carbureting chambers and their length will be varied in accordance with the liquid fuel employed, which need not necessarily be a hydrocarbon, but could be alcohol etc.

It would not be advisable for the jets to issue immediately into ths large engine supply chamber, particularly when they are employed singly, since the particles of fuel discharged into a large tube or chamber would not mix intimately with the air.

According to this invention, an already intimate mixture is discharged into the engine supply chamber or collected as it may be called.

According to the arrangement shown in Fig. 3, a number of distinct fuel supply reservoirs of any suitable construction and each preferably adapted to supply a differently proportioned explosive mixture, are connected by means of five carbureters *b c d e* and *f* to the casing, suction conduit, or engine supply chamber, the carbureters being arranged in stepped relation on either side of the supply chamber. In both constructions a sliding valve *a* in the engine supply chamber in its movements covers or uncovers the ends of one or all of the carbureters, so that the explosive mixture is supplied from the carbureter *b*, or from the carbureters *b* and *c*, *b c* and *d*, *b c d* and *e*, or *b c d e f*, to the engine supply pipe *h*, according to the position occupied by the valve *a* at any moment.

The sliding valve *a*, as shown, is connected to the piston *p*, a spring *g* causing its return movements, and the suction action of the engine which varies according to variations in the work to be done, speed, etc., draws the piston *p* as great distance as is necessary to place the valve *a* in the position at which the required quality and quantity of the explosive mixture will be supplied. Or, the valve *a* can be operated by a governor, or by hand-mechanism when hand regulation is employed.

By suitably proportioning the areas of the carbureters *b c d e* and *f* and the quality of the carbureted mixture supplied through each, the respective areas of the valve *a* and the piston *p*, and the strength of the spring *g*, an apparatus constructed as illustrated and described will be found to supply an almost perfectly proportioned mixture under all circumstances.

The carbureters may be governed by separate spring valves instead of by the one valve *a*, the carbureters being brought into operative connection with the engine according as the suction action of the engine or the governor or hand gear, causes the movements of one or several or all of the said spring valves.

In practice unless very powerful engines are used two carbureters as shown by way of example in Figs. 2, 3 and 4 are sufficient to insure a uniform working. One of the carbureters *i* is in this case of small size and enables the engine to rotate very slowly while maintaining a comparatively high suction action. The second carbureter *j* is, on the contrary, of sufficient size to enable its capacity combined with that of the small carbureter *i* to provide the requisite motive fluid when the engine is working hard. As soon as the suction in the small carbureter *i* becomes too great the automatic valve *a* uncovers the orifice *c* of the large carbureter, so that both carbureters are brought into use.

Even in the simple case of the use of two carbureters *i j* only, practically perfect carbureting is insured. The sizes of the two carbureters *i j* are calculated so as to insure exact mixture at low speeds by the small carbureter *i* alone, and at high speed by the two carbureters acting together, the carburization in the small carbureter becoming too rich, while in the large one it is a little too poor. It must be besides pointed out that not only the suction does not vary much but that it never drops so low as to be more or less unable to overcome the resistance offered to the liquid fuel in escaping from the nozzle *k* of the sprayer of the carbureter, as often happens in engines with a single carbureter, unless the engine runs at a great speed, with enormous suction, otherwise it becomes necessary to be satisfied, at small speeds, with a suction of a few millimeters of water which is often, at starting, insufficient to overcome the resistance to the dischage of the fuel at the spray nozzle. It must be remembered also that in order to obtain proper carbureting there must be sufficient speed of suction for effecting spraying of the liquid fuel, and that consequently the carbureting chamber must not be too large relatively to the quantities of air and fuel used in the motor.

In the modified arrangement shown in Fig. 4 only one fuel supply chamber is provided, but there are two carbureters *b c* with the spraying nozzles arranged in these passages at *i* and *j*. The action and arrangement is otherwise similar, to that already described.

It is to be observed that there is no advantage beyond simplicity in feeding the jets from one fuel supply reservoir, or in forming the passages parallel and in one piece instead of arranging them at distances apart.

The various passages may be of any diameter and not necessarily of increasing sizes. The arrangement of increasing diameters however has two advantages. First a smaller number of carbureters can be used, the differences of good carburization becoming less noticeable as full suction is approached, and consequently, allowing at this moment more marked change in the cross sectional area of the passages to be made; the second advantage consists in being able to have, if desired, fewer carbureters in operation at one time,

since it is possible with a suitable piston to close if desired the smaller carbureters in proportion as one opens a sufficient number or section of the larger ones.

What I claim as my invention and desire to secure by Letters Patent is,

1. A vaporizer for liquid hydrocarbons, comprising a number of hydrocarbon-inlets, a separate air-inlet to each hydrocarbon-inlet, a common outlet-pipe and means for cutting off one or more of the pairs of hydrocarbon-inlets and air-inlets simultaneously, as described.

2. A vaporizer for liquid hydrocarbons, comprising a number of inlets for hydrocarbon and means at all times to supply a constant flow to each inlet, an air supply to each said inlet, an outlet for the vaporized mixture and a throttle valve between the individual inlets and the outlet adapted to cut off or open more or fewer of the combined air and hydrocarbon inlets, substantially, as described.

3. A vaporizer for liquid hydrocarbons, comprising an outlet pipe, a throttle valve opening thereto, a body part containing a plurality of chambers, a separate passage from each chamber to the throttle valve and an air suppln and a hydrocarbon supply to each chamber, the throttle valve being adapted to cut off more or fewer of the chambers from the outlet pipe, substantially as described.

4. A carbureting apparatus comprising a casing, a combustible mixture outlet therefrom, a plurality or carbureters communicating with the casing, and means in said casing adapted to progressively uncover the outlets from the carbureters, substantially as set forth.

5. A carbureting apparatus comprising a casing, a combustible mixture outlet therefrom, a plurality of carbureters communicating with the casing, and a valve in said casing adapted to progressively uncover the outlets from the carbureters, substantially as set forth.

6. A carbureting apparatus comprising a casing, a combustible mixture outlet therefrom, a plurality of carbureters communicating with the casing and a valve in said casing operated by the suction of the engine and adapted to progressively uncover the outlets from the carbureters substantially as set forth.

7. A carbureting apparatus comprising a casing, a combustible mixture outlet therefrom, a plurality of carbureters communicating with the casing, a suction piston in said casing, and a valve operated by said piston and adapted to progressively uncover the outlets from the carbureters substantially as set forth.

8. A carbureting apparatus comprising a casing, a combustible mixture outlet therefrom, a plurality of carbureters communicating with the casing, corresponding passages of progressively varying cross-sectional area, intermediate the carbureters and casing, a suction piston in said casing, and a piston operated valve adapted to uncover the outlets from the carbureter passages, substantially as set forth.

9. A carbureting apparatus comprising a casing, a combustible mixture outlet therefrom, a plurality of carbureters communicating with the casing on either side thereof in stepped relation, corresponding passages of progressively varying cross-sectional area, intermediate the carbureters and casing, a suction piston in said casing, and a piston operated valve adapted to uncover the outlets from the carbureter passages, substantially as set forth.

10. A carbureting apparatus comprising a casing, a combustible mixture outlet therefrom, a large carbureter and a small carbureter communicating with the casing, and means adapted to uncover the outlets from the carbureters successively, substantially as set forth.

11. A carbureting apparatus comprising a casing, a combustible mixture outlet therefrom, a plurality of carbureters, a common fuel reservoir and a valve in said casing adapted to progressively uncover the passages from the mixing chambers, substantially as set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

LÉON BOLLÉE.

Witnesses:
JEAN ROBELET,
AUGUSTUS E. INGRAM.