No. 775,103. PATENTED NOV. 15, 1904.

J. F. DURYEA.

INTERNAL COMBUSTION ENGINE.

APPLICATION FILED DEC. 22, 1902.

NO MODEL. 2 SHEETS—SHEET 1.

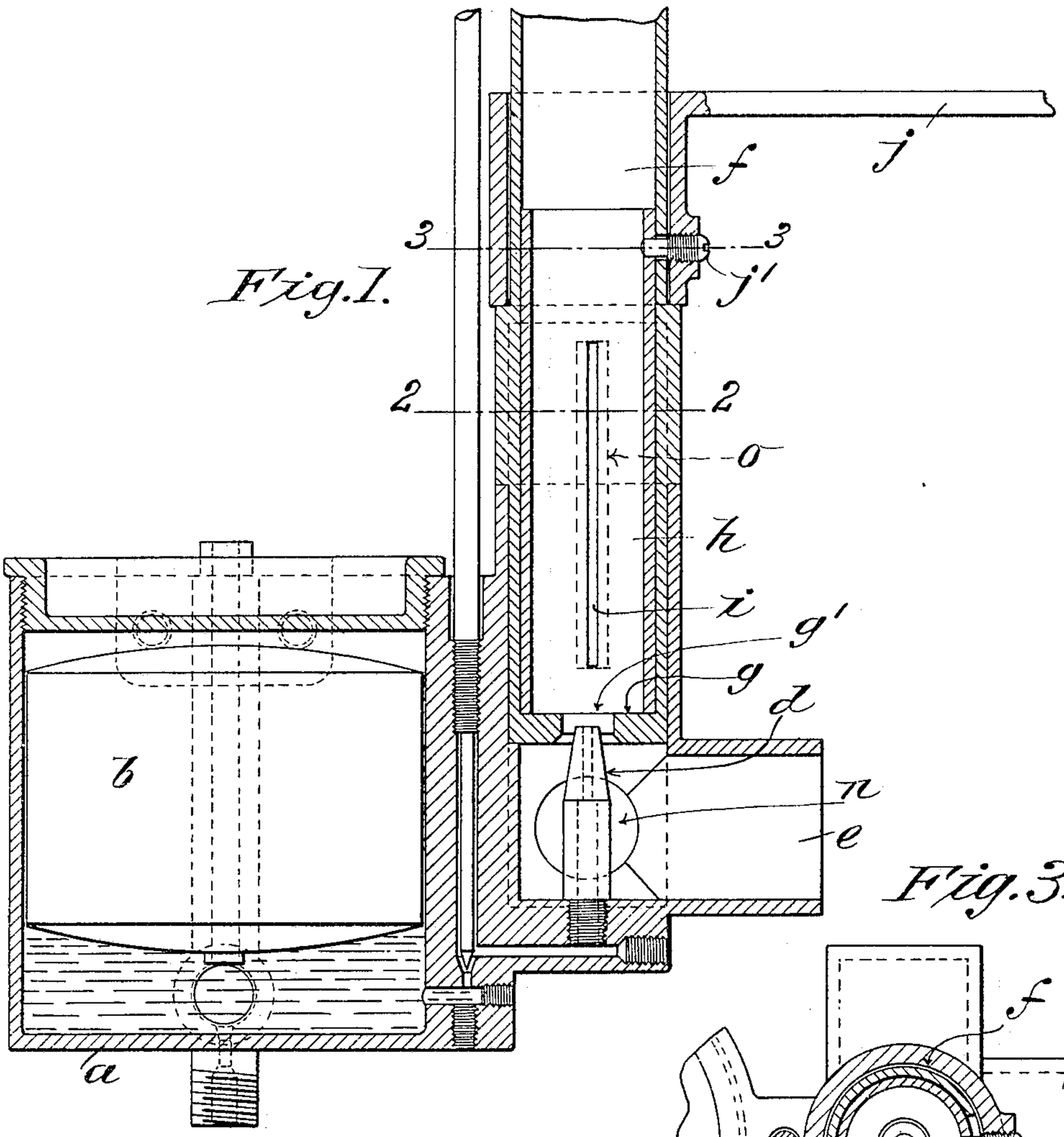

Fig. 1.

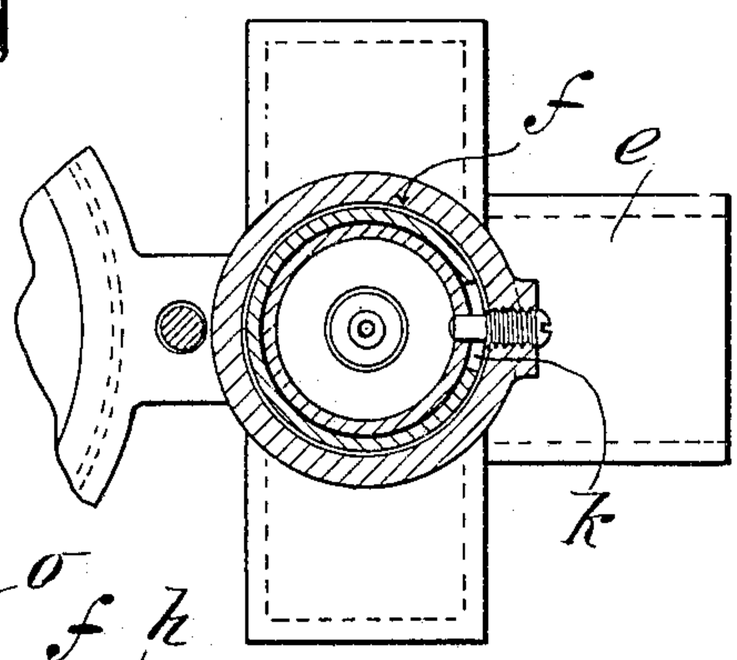

Fig. 3.

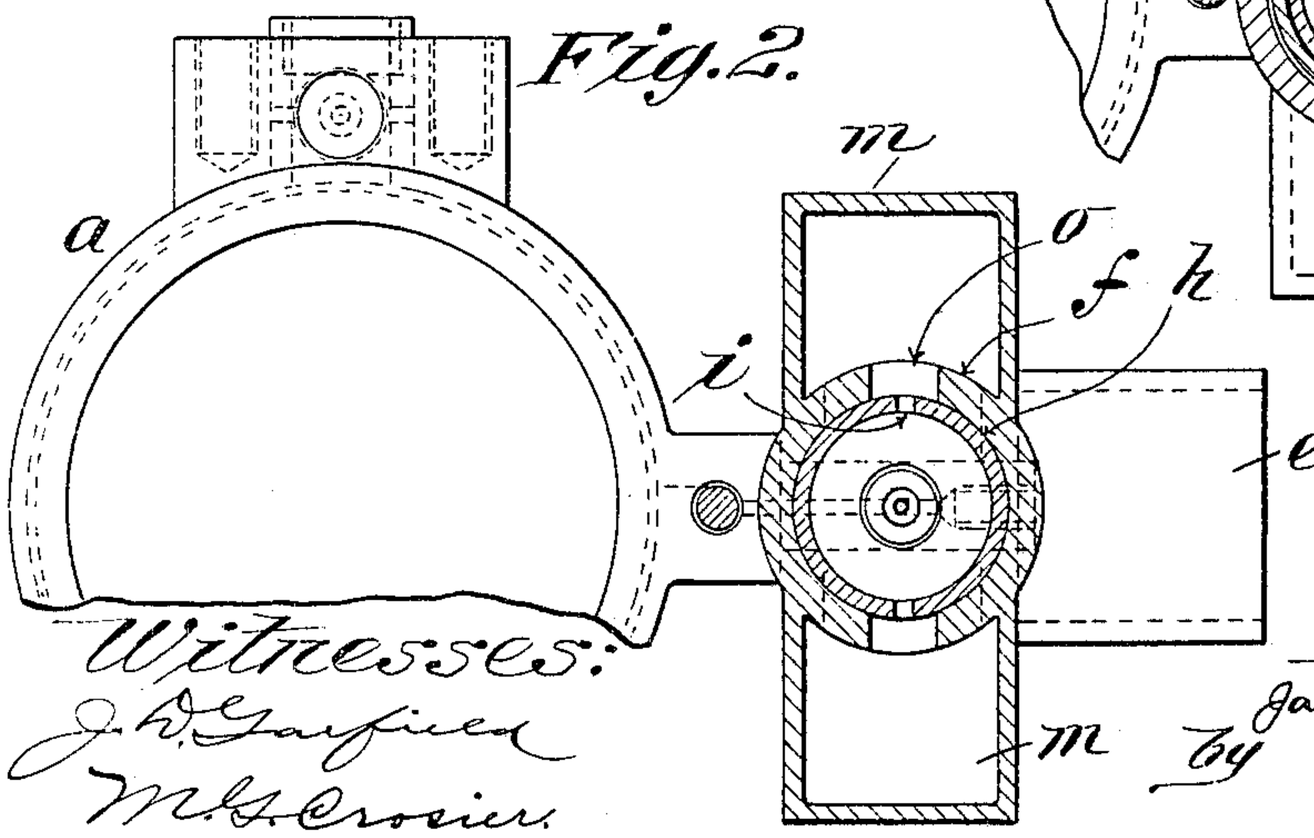

Fig. 2.

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NO MODEL. 2 SHEETS—SHEET 2.

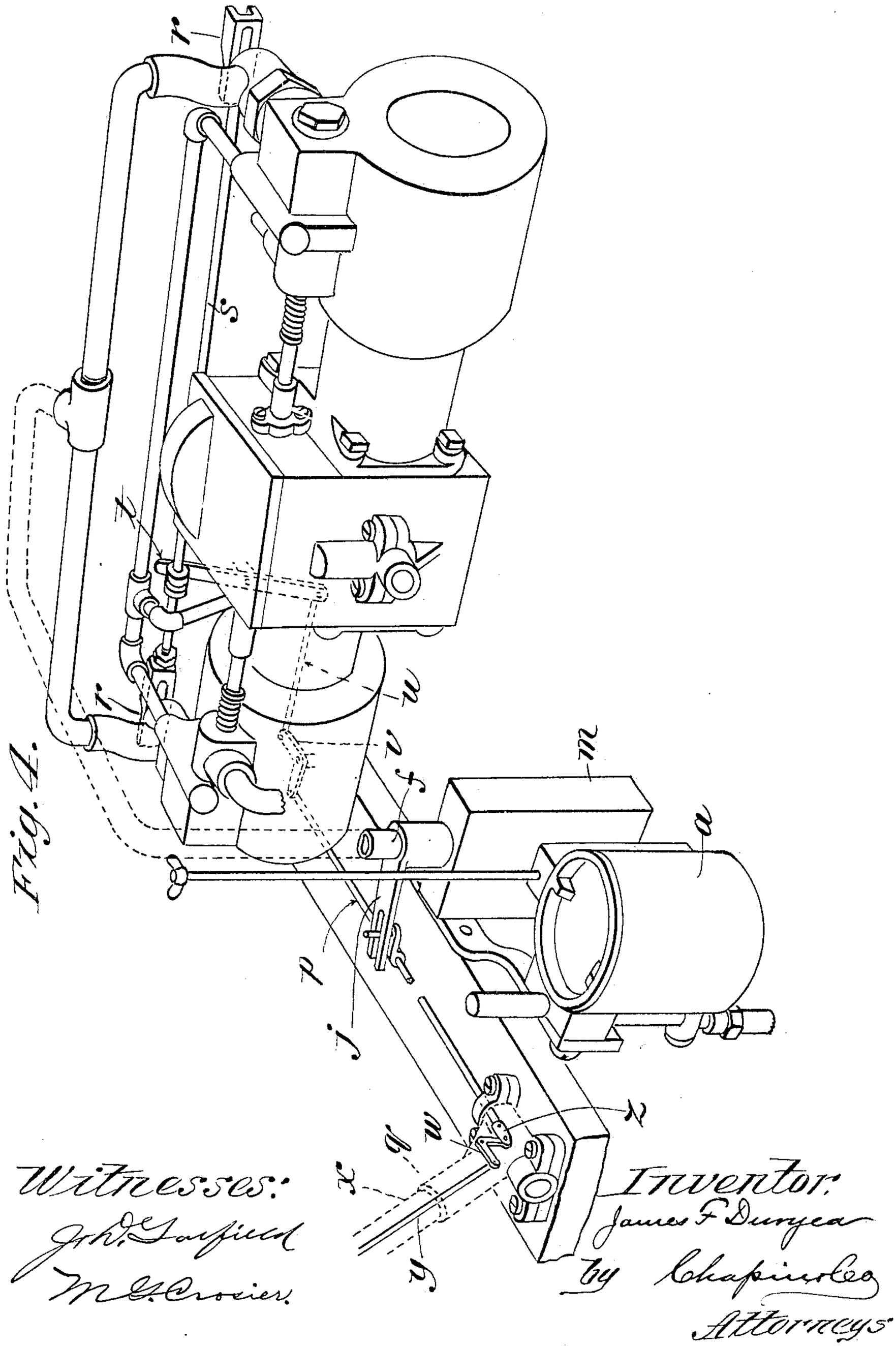

Fig. 4.

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No. 775,103. Patented November 15, 1904.

UNITED STATES PATENT OFFICE.

JAMES FRANK DURYEA, OF SPRINGFIELD, MASSACHUSETTS.

INTERNAL-COMBUSTION ENGINE.

SPECIFICATION forming part of Letters Patent No. 775,103, dated November 15, 1904.

Application filed December 22, 1902. Serial No. 136,168. (No model.)

To all whom it may concern:

Be it known that I, JAMES FRANK DURYEA, a citizen of the United States, residing at Springfield, in the county of Hampden and State of Massachusetts, have invented new and useful Improvements in Internal-Combustion Engines, of which the following is a specification.

This invention relates to improvements in the construction of internal-combustion engines, and it has special reference to improvements in the construction of the carbureter and in the manner of connecting the same with the motor-controlling devices, whereby when the latter are operated to throttle the engine the quantity of the combustible may be automatically regulated, to the end that on high speeds the quantity of combustible may be increased in proportion to the increased demands made on the motor, the construction and arrangement of the devices being such, however, that the motor-controlling device may be moved within certain limits without affecting the normal supply of combustible to the motor.

In the drawings forming part of this application, Figure 1 is a sectional elevation of a carbureter constructed according to this invention. Fig. 2 is a top plan view of Fig. 1, a portion of the carbureter being shown in section on line 2 2, Fig. 1. Fig. 3 is a transverse section in the plane of line 3 3, Fig. 1; and Fig. 4 is a perspective view of a motor provided with a suitable throttling mechanism and showing the manner of connecting the carbureter-regulating device with the throttling mechanism.

The carbureter shown herein is of that type in which a certain level of liquid combustible is maintained in a reservoir with which the atomizing-tube is connected; but the illustration of the invention in connection with this particular type of carbureter is a matter of convenience only, as the invention resides in the construction of these devices whereby the amount of combustible drawn through the atomizer-tube may be regulated coincidently with the operation of the devices which adapt the motor to develop more than its normal power.

Referring now to the drawings, *a* may indicate the reservoir for the combustible; *b*, the float therein, which operates to cut off the supply of combustible when the latter attains a certain level within the reservoir. This reservoir is connected by a passage *c* with an atomizer-tube *d*, located within a tubular air-passage, the intake end of which is indicated by *e*. The opposite end thereof, which is indicated by *f*, is located at right angles to the intake end and is connected, as shown in Fig. 4, with the motor in such manner that upon the suction-stroke of the piston air may be drawn through the intake end *e* of this passage. Within the vertical portion *f* of this air-passage is the usual partition *g*, having a central aperture *g'* therein somewhat larger than and surrounding the upper end of the atomizing-tube *d*. All of the foregoing construction is old. Within the vertical portion *f* of the air-passage there is fitted a sleeve *h*, which fits closely said passage and is rotatable therein, and there is cut through the side thereof, as shown clearly in Figs. 1 and 2, a long narrow slot *i*. This sleeve is rotated by means of a lever *j*, whose hub fits loosely the upper end of said air-passage, there being a screw *j'* in the hub of said lever extending through an elongated horizontal slot *k* in the wall of *f* and into the wall of said sleeve. The length of the slot *k* determines the throw of the lever *j* in either direction, and consequently the degree of rotation of the sleeve *h*. Located on opposite sides of the vertical portion *f* of the air-passage through the carbureter is a box-like structure constituting two parallel passages or by-pass conduits (indicated by *m*) extending from the plane of the bottom of the intake end *e* of the air-passage up to a point somewhat above the upper end of the slot *i*. Through the wall of the air-passage at some point below the partition *g* an opening *n* is made through each side of said passage into the lower end of the passages *m*, and a slot *o* is made through the wall of the vertical portion *f* of the air-passage in that part thereof opposite to the slot *i*, the slot *o*, however, being wider than the slot *i*, but having the same length as the latter. As shown in Fig. 2, the slots *i* and *o* are provided on opposite sides of the air-passage, and the position in which they

are shown in Fig. 2 is their normal relative position when the motor is running under average conditions, and this being the case it is apparent that owing to the greater width of the slots *o* the sleeve *h* when it is rotated to such a degree as will keep the slots *i* within the limits of the slots *o* will not by reason of said rotation affect the operation of the carbureter.

It is clear from the foregoing that upon the suction-stroke of the piston when air is drawn through the intake *e* a certain proportion of the amount taken in at *e* will pass up through the aperture in the partition *g* in the air-passage and that a certain other proportion thereof will be diverted through the openings *n* into the by-pass conduits *m*, and from thence it will enter the air-passage *f* through the slots *i*, if these be open—that is to say, if the sleeve *h* has not been rotated far enough to cover them up.

As stated above, the rotation of the sleeve *h* is effected by the swinging movements of the lever *j* when the latter is moved in either direction far enough to cause the screw *j'* to bring up against one end or the other of the slot *k*, and the lever *j* is, as shown in Fig. 1, connected with a rod *p*, which is one of the moving parts of the throttling mechanism of the motor. This throttling mechanism is the same in principle as is shown in United States Letters Patent issued to me on March 27, 1900, No. 646,399, and it consists in a wedge movable under a shoulder on the stem of the inlet-valve, the wedge being operated in my said prior patent by means of a rod located axially of the controlling-lever of a vehicle and operated by the thumb. In the present application the devices located between the controlling-lever, the latter being shown only in Fig. 1 and indicated by *q*, consist of rigid connections instead of the flexible connection shown in my said prior patent. In the present construction the wedges, one for the inlet-valve of each cylinder operating to limit the throw of said inlet-valves, are indicated by *r* and are connected together by the rod *s*. A lever *t* is connected with this rod at some convenient point between its ends and is mounted to swing in a direction to impart endwise movement to the rod, and this lever is, by means of the rod *u* and the elbow-lever *v*, (shown only in dotted lines in said Fig. 1,) connected with one end of the rod *p*, whose opposite end is connected to an elbow-lever *w*, hung in the controlling-lever *x*, and from this elbow-lever *w* another rod *y*, axially located in the controlling-lever *x*, is carried up through the latter to a point therein from which it can be easily manipulated by the operator, as in my said prior patent.

At some point on the rod *p* or, if more convenient, on one of the other moving parts of the throttling mechanism connection is made with the lever *j* of the carbureter, as shown in Fig. 4. This connection is in the form of a pin mounted on the rod *p* and entering a slot in the end of the lever *j*, whereby endwise movement of the rod *p* will impart swinging movements to the lever *j*, and consequently when these movements exceed a certain degree the slot *i* in the rotatable sleeve *h* within the passage *f* will be covered, and when this occurs the full effect of the suction-stroke of the piston will be exerted to draw the air from the intake *e* through the aperture *g'*, within which is located the nozzle of the atomizer-tube, and thus a larger proportion of combustible will be drawn through said tube, although the quantity of air will not be varied. If the lever *j* be swung only far enough to partially cover the slot *i*, the suction effect on the atomizer will be increased only in proportion to the reduction of the area of the slot *i*.

The rod *p*, through which connection is made from the controlling-lever to the wedge-carrying rod *s*, enters the controlling-lever through the axis on which the latter swings, and the elbow-lever *w* may be connected with said rod *p* by means of a sleeve *z*, (shown in Fig. 4,) adapted to rotate on said rod, whereby no torsional strain will be imparted to the rod when the controlling-lever is swung on its axis. Obviously this is only one method of making this connection, and any other more convenient one will be substituted therefor, if desired. Furthermore, a different connection from that shown may be located between the controlling-lever and the throttling mechanism of the motor, and this throttling mechanism may be of some other type than that shown, if desired, without departing from the spirit of the invention, which resides particularly in the combination of the regulating devices of the carbureter with a coupling mechanism for the motor and in the construction of the carbureter, whereby within certain limits the throttling of the engine may take place without effecting the adjustment of the carbureter; but when these limits are exceeded then the carbureter is automatically adjusted to provide for the necessities of the engine resulting from the abnormal movement imparted to the throttling mechanism.

From the foregoing description it is evident that the engine may be throttled down to slow speed without changing the relative proportions of the air and the combustible, and in the other direction the throttling mechanism may be manipulated to permit the motor to attain a relatively high speed without affecting the relative proportions of the combustible mixture; but if an extraordinary duty be required of the engine the supply of the combustible to a given quantity of of air may be varied to increase to the maximum the amount of combustible which the maximum quantity of air which can be drawn

through the aperture g' will consume properly.

Obviously it is quite immaterial whether the throttling devices be operated, as shown herein, by the extension of the rod y up through the controlling-lever or whether said mechanism be operated independently.

Having thus described my invention, what I claim is—

The combination with an internal-combustion engine, having an adjustable inlet-valve and a carbureter operatively connected with the engine through said valve, of means for adjusting said valve, and connections between said valve-adjusting means, and a part of said carbureter, whereby the adjustment of the valve may be effected independently within certain limits, and whereby beyond these limits, the valve adjustment, and the adjustment of the carbureter may be effected coincidently.

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