A. J. SCAIFE.

CARBURETER.

APPLICATION FILED DEC. 12, 1910.

998,123.

Patented July 18, 1911.

3 SHEETS—SHEET 1.

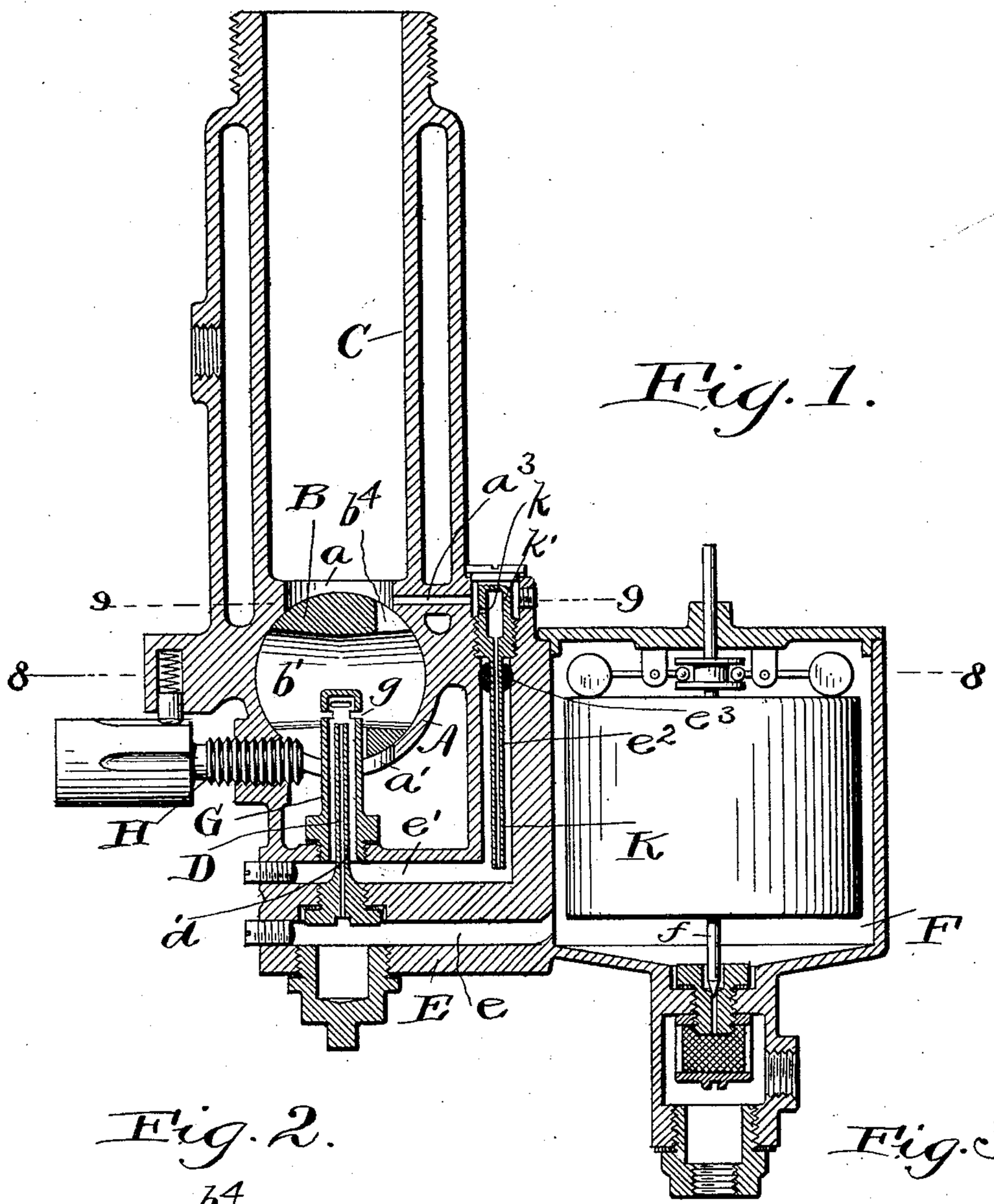


Fig. 1.

Fig. 2.

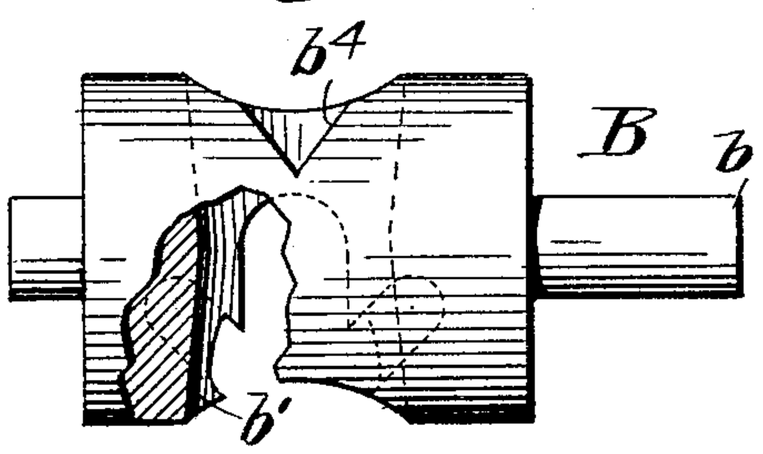
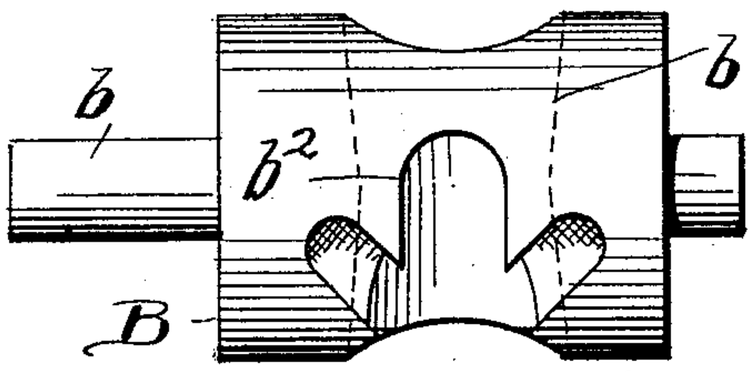


Fig. 3.



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3 SHEETS—SHEET 2.

Fig. 4.

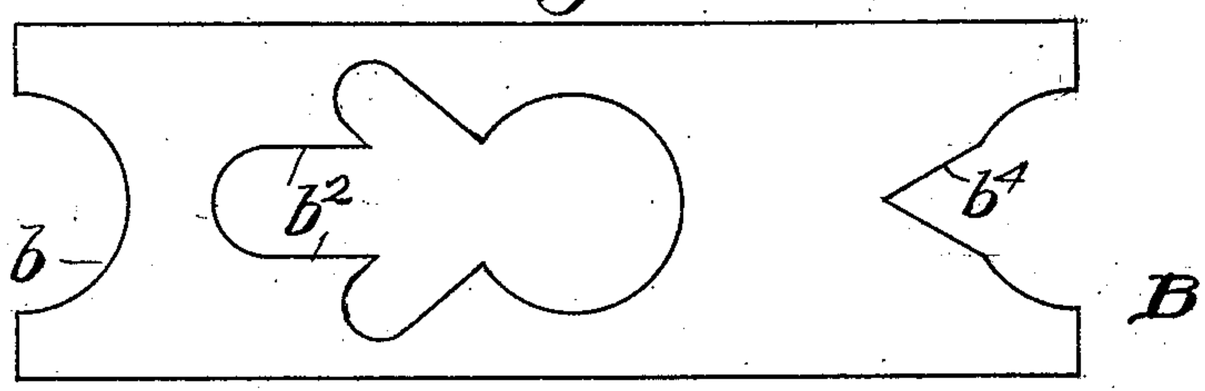


Fig. 5.

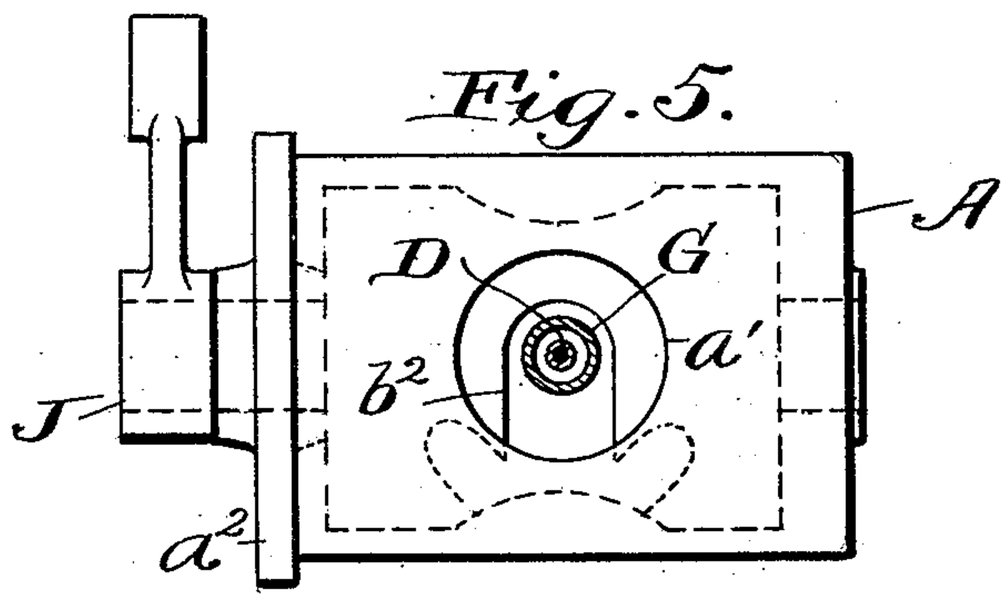


Fig. 6.

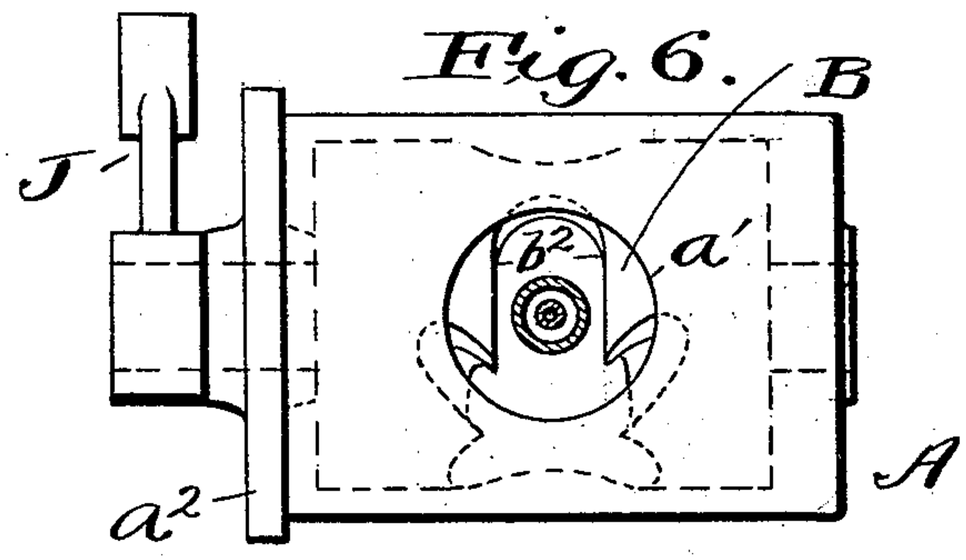
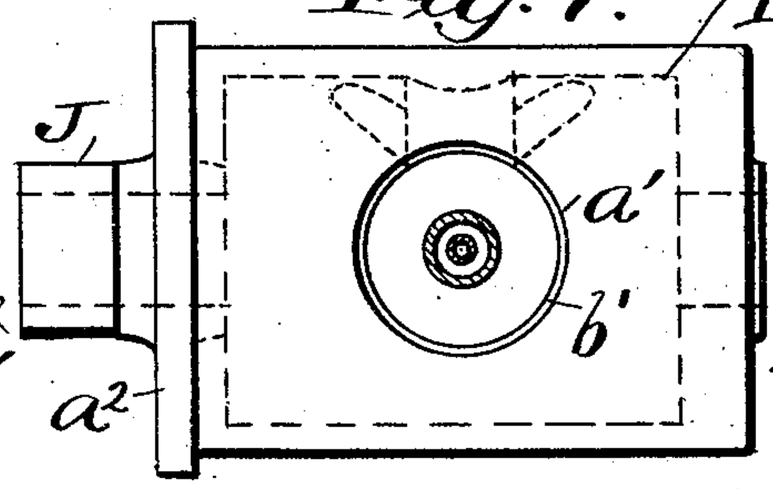


Fig. 7.



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3 SHEETS—SHEET 3.

Fig. 8.

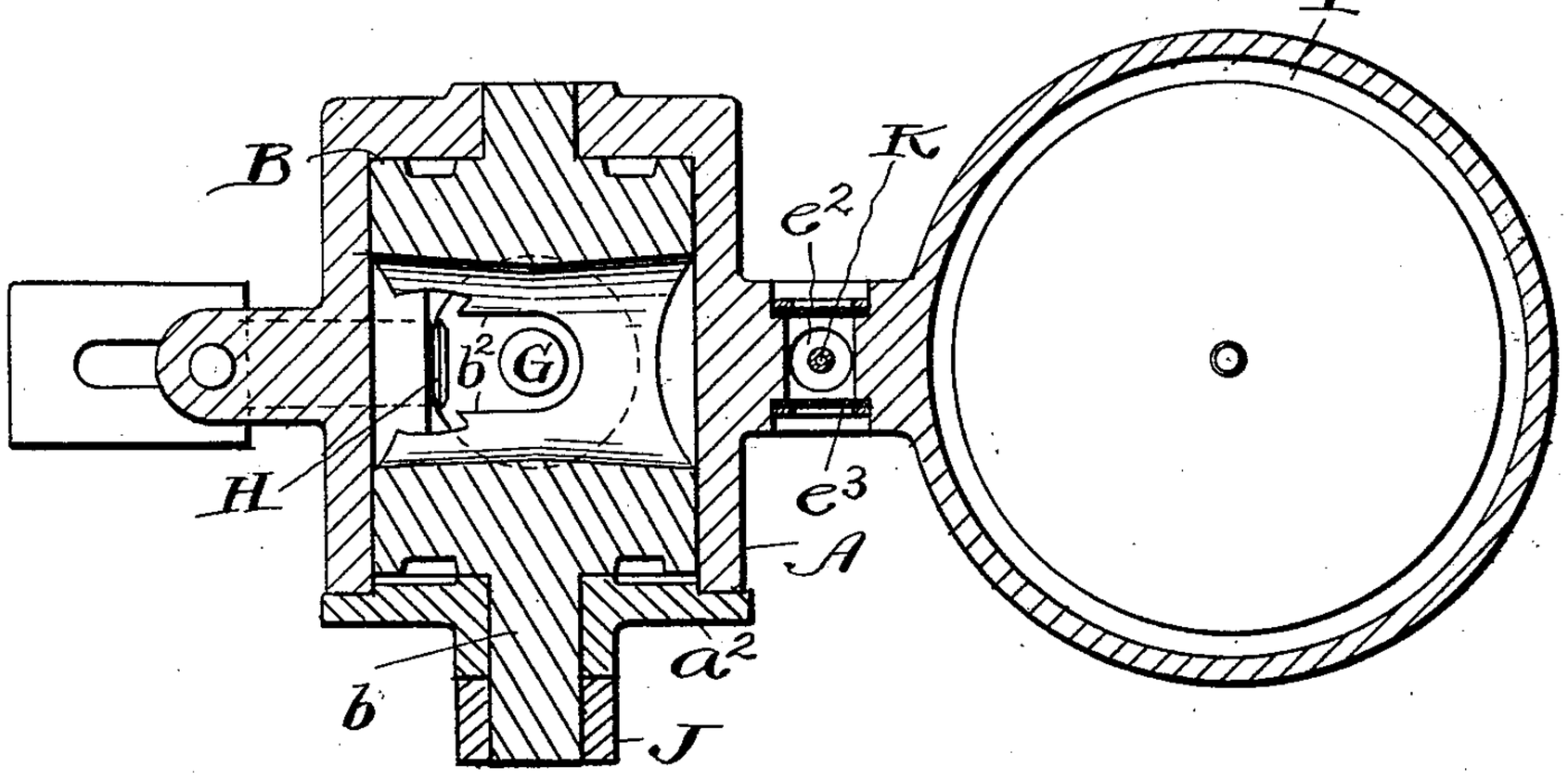
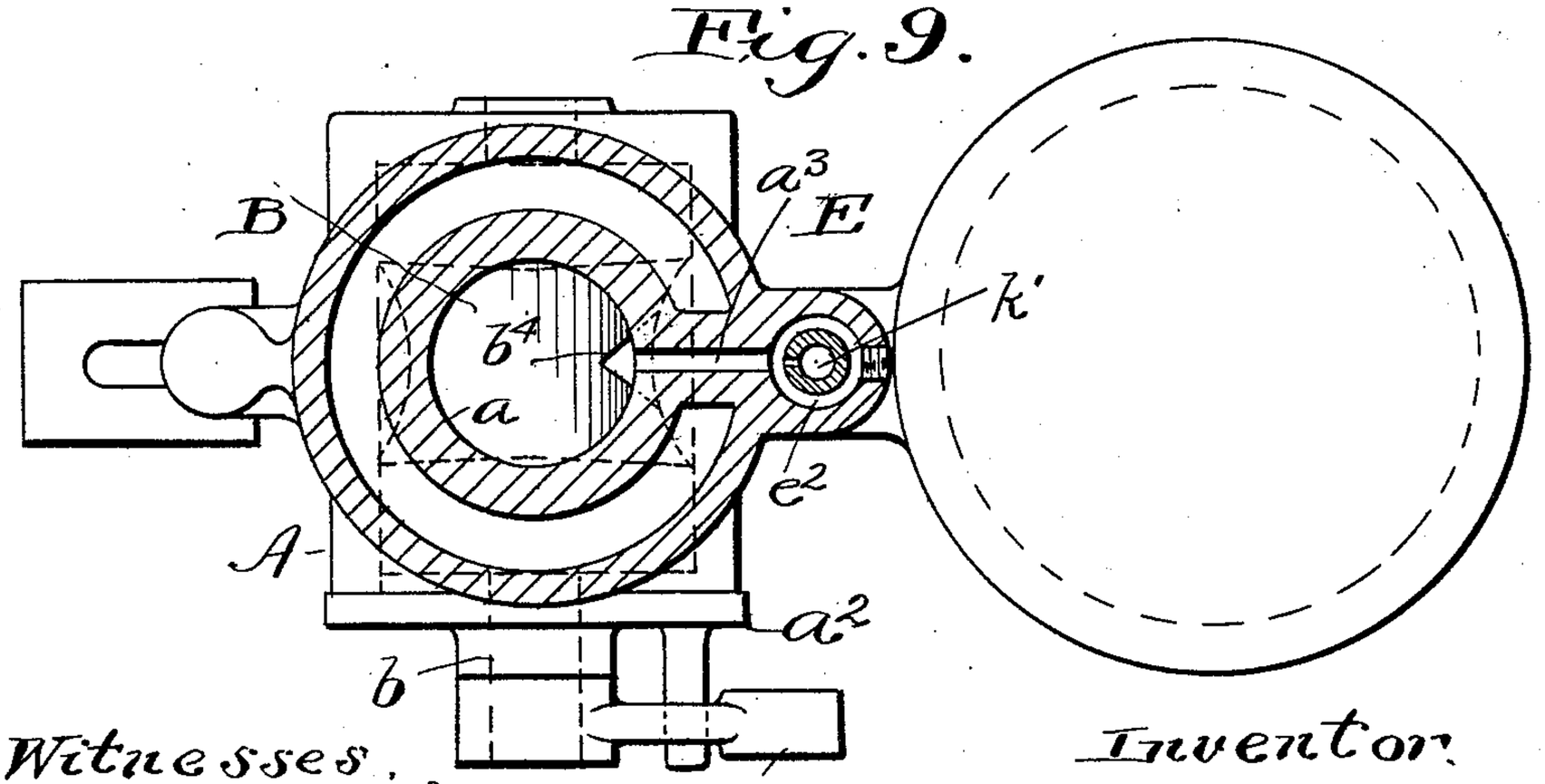


Fig. 9.



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UNITED STATES PATENT OFFICE.

ARTHUR J. SCAIFE, OF CLEVELAND, OHIO, ASSIGNOR TO THE WHITE COMPANY, OF CLEVELAND, OHIO, A CORPORATION OF OHIO.

CARBURETER.

998,123. Specification of Letters Patent. **Patented July 18, 1911.**

Application filed December 12, 1910. Serial No. 596,758.

To all whom it may concern:

Be it known that I, ARTHUR J. SCAIFE, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented a certain new and useful Improvement in Carbureters, of which the following is a full, clear, and exact description.

This invention relates to the kind of a carbureter which is especially adapted for forming, out of liquid hydro-carbon (especially gasolene) and air, the explosive charges to be immediately used in an internal combustion engine.

One object of the invention is to provide a carbureter with which, by the mere operation of an air throttling valve, the explosive charges will be varied quantitatively as required without any substantial variation in quality; or in other words will produce charges substantially uniform as to richness of the mixture at all speeds of the engine.

Another object is to provide a carbureter which may be easily and quickly adjusted for different temperature conditions.

Another object is to provide a carbureter of simple construction having few parts, and those so formed that they may be easily put together or taken apart.

The invention consists in the construction and combination of parts which are shown in the drawings and hereinafter described and definitely defined by the appended claims.

In the drawing, Figure 1 is a sectional side elevation of a carbureter embodying the invention. Fig. 2 is a detached side view of the air throttling valve partly broken away, and Fig. 3 a view of the same from the opposite side. Fig. 4 is a development of said valve. Fig. 5 is a bottom view of the valve casing when the valve is closed. Fig. 6 is a similar view of the valve casing when the valve is partly opened. Fig. 7 is a similar view of the valve casing when the valve is entirely opened. Fig. 8 is a horizontal sectional view of the carbureter in the plane of line 8—8 on Fig. 1. Fig. 9 is a sectional plan view of the carbureter, the section being in the plane indicated by line 9—9 on Fig. 1.

In the construction shown the fuel chamber F, the throttle-valve casing A, the mixing tube C, and the horizontal member E are all parts of the same casting, although this is not an essential. The fuel chamber is of common construction, such that when connected with a fuel supply tank, a float controlled valve will preserve a constant level of the fuel in said chamber F.

The vertical jet nozzle D screws into the member E; and in this member is a fuel conduit *e* leading from chamber F to said nozzle. In the member E is also another conduit having the horizontal part *e'* and a vertical part e^2, the latter being open to the atmosphere through screened apertures e^3 in its wall. A tubular sheath somewhat larger in diameter than the nozzle surrounds the nozzle and screws into the member E, so that at its lower end it is in communication with the conduit *e'*. This sheath extends over and lies fairly close to the discharge end of the nozzle D, but said sheath has a plurality of horizontal slits *g* through the wall near its upper end.

A horizontal cylindrical air throttling valve B is rotatably mounted in the valve casing A, said valve having reduced concentric ends, and one end *b* projects out of the valve casing through a removable cap plate a^2 which is secured across the end of said valve casing. The valve operating lever J is fixed to this projecting stem.

There is a diametrical hole *b'* through the vale; and in the lower and upper walls of the valve chamber are the circular inlet and outlet openings *a* and *a'* respectively. This hole *b'*, except for certain important peculiarities of construction at the ends thereof, to be presently described, is circular in cross section and of gradual decreasing diameter from both ends to the middle. This hole, in fact, has the shape and serves the purpose of the so-called Venturi tube which is employed in several well known carbureters.

The mixing tube C is above the valve casing and directly over the outlet opening *a*. This mixing tube is to be connected with a pipe which supplies the explosive charges to the several cylinders of an internal combustion engine.

When the engine is in operation, air will be drawn into the opening *a* and through the valve and out into the mixing tube, and thence to the engine on every suction stroke of the piston, the rate of flow of this air stream being dependent upon the position of the air throttling valve which in turn regulates the speed of the engine. While

the air is so flowing, it will suck from the nozzle a spray of the fuel. This spray will be discharged directly up against the upper end of the sheath, will be deflected thereby, and then, fairly well mixed with the air flowing through said sheath, which passes out through the slits into the hole through the valve. It so flows out of said slits in a direction transverse to the in-flowing stream of air passing through the valve, the result being the very complete vaporization of the fuel spray, and the very complete commingling of the vapor produced with air to form the explosive mixture. Again, referring to the valve, it will be seen by reference to Figs. 2 to 7, inclusive, that at the inlet end of the hole b' through it, there is a slot b^2 extending circumferentially in the wall of the valve. This circumferentially extended slot is only a trifle wider than the diameter of the sheath, and it is provided to receive the sheath when the valve is turned to the closed position. It is evident, therefore, that even when the valve is in the closed position there will still be an opening between the sheath and the left wall of the valve casing through which air may flow into the hole b' in the valve. A screw H screws horizontally through the wall of the valve casing toward the sheath. Its diameter is a trifle less than the width of the said slot b^2, and it is so placed that it occupies a position to partly close this slot when the valve is closed. By screwing this screw in or out the size of the opening through this slot when the valve is closed may be decreased or increased at will. Moreover when the valve is open this screw extends a greater or less distance across the inlet opening a, and therefore to a greater or less extent reduces the size of the opening and restricts the flow of air through it. This screw is useful because thereby the device may be adapted for use in cold weather, as by screwing the screw in and so restricting the opening; or to adapt the device for use in warm weather by screwing it out and thus enlarging said opening. In addition to this slot b' there are two obliquely set auxiliary air slots formed through the walls of this valve on opposite sides of the slot b^2, and appear as branches thereof. When the valve is closed these auxiliary air slots are covered by the valve casing, as shown in Fig. 5. When the valve is wide open they are likewise covered, as shown in Fig. 7. But when one begins to open the valve these slots are slowly brought into alinement with the opening a, and thereby the area of the space through which air must flow into the valve is enlarged much more rapidly than would be the case if these oblique air slots were not provided. These air slots placed as shown play a very important part in so controlling the flow of air at all speeds of the engine that the explosive charges are of substantially uniform character. The drawing is made to scale from a practical operative device. In fact, Figs. 2 to 7, inclusive, are full size, and these slots are therein shown in that size, shape and location in which a vast amount of practical experience has shown them to be most effective. It is thought that any departure from the precise construction shown will, by so much, reduce the efficiency of the device; although even if changed in shape, size and angularity, they will have some modifying effect and will be of some value.

The carbureter shown embodies certain features of construction which will now be explained which are of greatest functional value in connection with starting the engine, and while the throttle valve is only partly open and the engine is running so slowly that the resulting flow of air through the throttle valve is too slow to draw an adequate supply of gasolene from the nozzle D. In the nozzle D is a very fine drip hole d'. In practice this hole is about .025 of an inch in diameter. A small tube K screws into the open upper end of the conduit e^2 and extends down to near the bottom thereof. The head k' of this tube screws down on top of the casting in which the conduit e^2 is formed. There is a horizontal jet opening a^3 through the wall of valve casing just above the valve B, and in a position where it can never be covered by the valve. There is a small hole k preferably about .03 of an inch in diameter, through the wall of the tube K just above the screw threads thereof, this part of the tube being of slightly smaller diameter than the threaded part. In the valve B near the upper end of the hole thereof there is a V-shaped notch b^4 placed so as to be in vertical alinement with the jet opening. When the engine is not running, fuel will slowly drip from this hole into the conduit e', and this will continue until the fuel therein and in the sheath G and in the vertical conduit e^2 rises to the level of the fuel in the fuel chamber F.

When it is now desired to start the engine the throttle valve is not opened much. If the engine be turned over, air will flow into the valve through the space between the sheath and the screw H, and will flow out of the valve through this V-shaped opening b^4 directly across the discharge end of this jet opening a^3 and will flow very rapidly through this restricted V-shaped opening with the result that the liquid fuel which has accumulated in the conduits e', e^2 will be drawn up through tube K and through said jet opening a^3 in the form of a spray, which spray will be vaporized by and mixed with the air which flows through said V-shaped opening and carried on to

the engine; so that, generally speaking, the engine will thereby be provided with a suitable explosive charge, the first or second time it is turned over. After a few turns of the engine shaft most of this accumulated fuel will have been withdrawn from the conduits e', e^2. But as long as the engine is running so slowly that the suction cannot draw an adequate supply of fuel from the nozzle D, fuel will continue to drip through the hole d into conduit e'. Under these conditions some of the air drawn into the valve opening b', will flow through the slots g and the sheath and thence into the conduits e', e^2, and will vaporize the fuel in said conduit; and the mixture of this vapor and air supplemented by other air drawn through the screened openings will flow through tube K and the jet opening a^3 into the mixing tube C. This action will continue until the throttle valve is opened farther, and the engine increases its speed and consequently its suction action sufficiently to draw fuel from nozzle D in considerable volume. After this the flow of vapor through nozzle a^3 will cease; and the explosive mixture supplied to the engine will include the mixture of fuel drawn through nozzle D and air drawn through the inlet opening a', and additionally a mixture of vapor derived from the fuel which drips through the opening d, and air drawn in through the screened openings e^3.

Having described my invention, I claim:

1. In a carbureter, the combination with a fuel chamber, a spray nozzle, a conduit connecting said chamber and nozzle, an air conduit open to the atmosphere, and a tubular sheath which surrounds the nozzle and is in communication with said air conduit, and has lateral discharge orifices near its upper end, of a valve casing having alined inlet and outlet openings in its lower and upper walls, a cylindrical air throttling valve mounted in said casing and having through it a hole in the shape of a Venturi tube, said valve being so placed that the sheath and nozzle project into the hole in the valve, and said valve having in its wall a circumferentially extended slot to accommodate said sheath when the valve is closed.

2. In a carbureter, the combination with a fuel chamber, a spray nozzle, and a conduit connecting said chamber and nozzle, of a valve casing having inlet and outlet openings in its lower and upper walls, a cylindrical air throttling valve rotatably mounted in said casing and having through it a hole in the shape of a Venturi tube, said valve being so placed that the nozzle projects into the hole in the valve, and said valve having in its wall a circumferentially extended slot, and a screw screwing through the valve casing toward said nozzle and lying adjacent to said laterally extended slot when the valve is closed so as to partly close said slot.

3. In a carbureter, the combination with a fuel chamber, a spray nozzle, a conduit connecting said chamber and nozzle, an air conduit open to the atmosphere, and a tubular sheath which surrounds the nozzle and is in communication with said air conduit and has lateral discharge orifices near its upper end, of a valve casing, a cylindrical air throttling valve mounted therein and having a diametrical hole through it, an auxiliary jet nozzle in the form of a hole through the wall of the valve casing above the valve, means for temporarily supplying a limited amount of fuel to be drawn through its auxiliary jet nozzle, said valve having a notch which communicates with the hole therethrough and which when the valve is closed lies directly beneath this supplemental nozzle, the parts being arranged substantially as shown with the principal nozzle and its sheath projecting into the hole in the valve, and said valve having a circumferentially extended branch which will receive the sheath when the valve is closed.

4. In a carbureter, the combination with a fuel chamber, a spray nozzle having through its wall a fine drip hole, a conduit connecting said chamber and nozzle, an air conduit comprising a horizontal member and a vertical member, a tubular sheath which surrounds the nozzle and is in communication with the horizontal member of said air conduit, said sheath having lateral discharge orifices near its upper end, and a tube extending down the vertical member of said air conduit to a point near the bottom thereof, of a rotatable cylindrical air throttling valve having a diametrical hole through it, a valve casing in which said valve is rotatively mounted, said valve casing having through its lower and upper walls respectively inlet and outlet openings which register with the ends of the hole in the valve when the latter is fully opened, and having also above the valve a jet hole which is in communication with said tube and the valve having near the discharge end of the hole a laterally extended notch which, when the valve is in the closed position, is directly beneath the jet hole in the wall of the valve casing.

5. In a carbureter, the combination with the fuel chamber, a spray nozzle, a conduit connecting said nozzle and chamber, a valve casing having a cylindrical recess and alined circular holes through the upper and lower walls of said recess, a cylindrical valve rotatably mounted in said recess and having through it a diametrical hole which when the valve is open will register with the two holes in the valve casing, said nozzle being extended through the inlet hole of the valve casing and into the hole through the valve,

and the valve having in communication with the hole through it a circumferentially extended slot for the reception of the nozzle when the valve is closed, and said slot having obliquely extended air slots extending from both sides thereof, which air slots are located so as to be covered by the valve casing when the valve is either open or closed, but to be uncovered gradually as the valve is opening.

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

ARTHUR J. SCAIFE.

Witnesses:
H. R. SULLIVAN,
E. L. THURSTON.