A. HOWARTH.

CARBURETER.

APPLICATION FILED SEPT. 28, 1908.

958,128. **Patented May 17, 1910.**

2 SHEETS—SHEET 1.

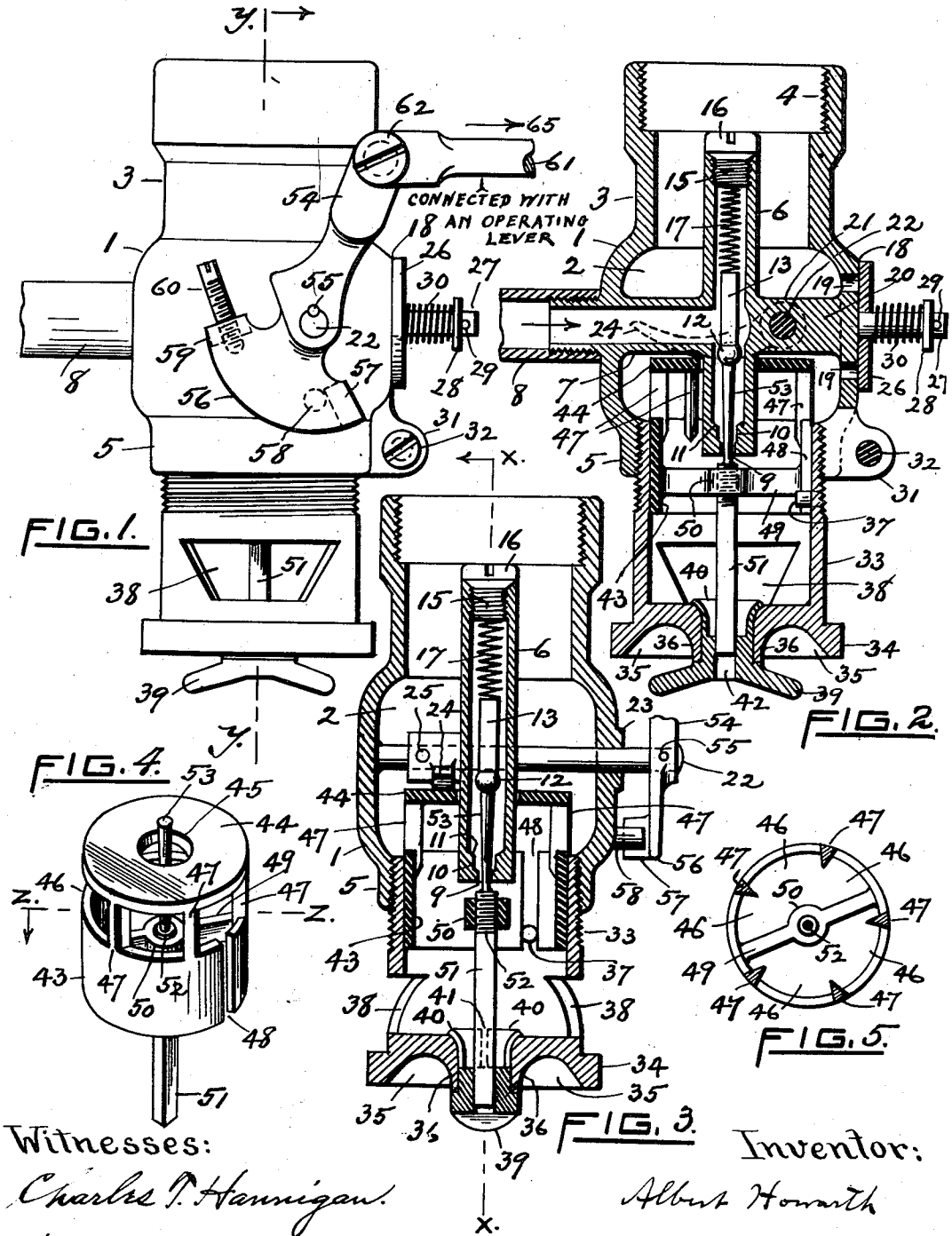

FIG. 1.

FIG. 2.

FIG. 4.

FIG. 5.

FIG. 3.

Witnesses:

Charles P. Hannigan.

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2 SHEETS—SHEET 2.

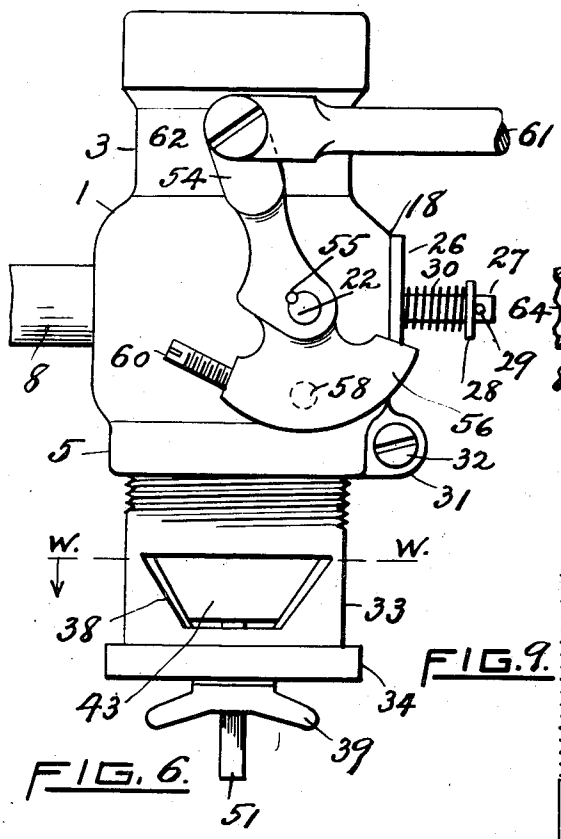

FIG. 6.

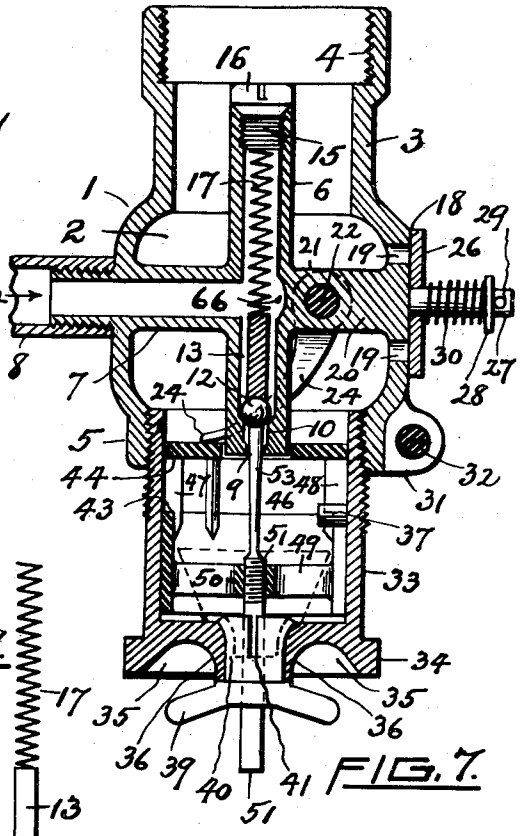

FIG. 7.

FIG. 9.

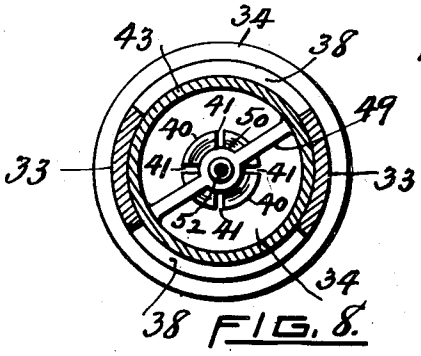

FIG. 8.

FIG. 10.

Witnesses:

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UNITED STATES PATENT OFFICE.

ALBERT HOWARTH, OF PROVIDENCE, RHODE ISLAND, ASSIGNOR, BY MESNE ASSIGNMENTS, TO STAR CARBURETOR AND SUPPLY COMPANY, OF PROVIDENCE, RHODE ISLAND, A CORPORATION OF RHODE ISLAND.

CARBURETER.

958,128. Specification of Letters Patent. Patented May 17, 1910.

Application filed September 23, 1908. Serial No. 455,194.

To all whom it may concern:

Be it known that I, ALBERT HOWARTH, a citizen of the United States, residing at Providence, in the county of Providence and State of Rhode Island, have invented certain new and useful Improvements in Carbureters, of which the following is a specification, reference being had therein to the accompanying drawings.

Like reference numerals indicate like parts.

Figure 1 is a side elevation of my improved carbureter. Fig. 2 is a view of the same in central longitudinal section as seen on line *x x* of Fig. 3, the several valves being shown as fully open. Fig. 3 is a view of the same in central longitudinal section as seen on line *y y* of Fig. 1, said valves being shown as fully open. Fig. 4 is a perspective view of the combined throttle valve and gasolene feeding valve. Fig. 5 is a sectional view of the same as seen on line *z z* of Fig. 4. Fig. 6 is a side elevation of said carbureter when the valves are nearly closed. Fig. 7 is a central longitudinal section of the same as seen on line *x x* of Fig. 3. Fig. 8 is a sectional view as seen on line *w w* of Fig. 6. Fig. 9 is a side elevation of the presser bar and operating spring therefor constituting an element of my said invention. Fig. 10 is a side elevation of the gasolene feeding valve constituting another element of said invention.

My invention relates to the class of carbureters and consists of the novel construction and combination of the several parts as hereinafter described and specifically set forth in the claims.

In the drawings the reference numeral 1 represents the central or body portion of the carbureter comprising a case or shell, and the inner space within the same is the central chamber, designated as 2. An integral tube 3, of smaller diameter opens at its bottom into the chamber 2 and extends upwardly from the case 1. Its upper portion has the interior screw-thread 4. The tube 3 conducts the gasolene vapor from the carbureter to the engine.

The case or body 1 has an annular flange 5 integral therewith and extending downwardly. This annular flange 5 has an interior screw-thread, shown in Figs. 2, 3 and 7.

In the chamber 2 is a central vertical gasolene chamber or receptacle 6, of tubular shape. An integral feed pipe 7 opens into the gasolene chamber or tube 6, just below the center thereof and extends at right angles therewith on one side. The pipe 7 projects out from the case 1 and the projecting portion is screw-threaded on its exterior, as shown in Figs. 2 and 7. A supply pipe 8 has an interior screw-thread by which it fits upon and is engaged with the projecting end of the feed pipe 7.

The gasolene receptacle or tube 6 has its bore countersunk at its upper portion, and adjacent thereto has an interior screw-thread. The lower end of said bore has a small circular opening or orifice 9, which is slightly enlarged concentrically, as represented at 10, and just above said enlargement 10, the bore has the annular shoulder 11, which forms a valve seat for a ball valve 12.

A pressure bar 13 is mounted vertically in the gasolene receptacle or tube 6, and has at its lower end a convex seat 14, by which it fits upon the ball 12. A screw 15 having a head 16, tapered on its under side to fit the countersink of the gasolene tube or chamber 6, is in threaded engagement with the bore of said tube and has a squared-off end. A spiral spring 17 has a bearing at its upper end against the said squared-off end and also a bearing at its lower end against the plain end of the bar 13. Thus, by the pressure of the spring 17 the ball valve 12 is forcibly held to its seat 11, when the parts of the device are in the positions illustrated in Fig. 7, as also whenever the engine is not in operation.

The case 1 of the carbureter on the side opposite to the threaded end of the pipe 7 has a plain face indicated by the vertical line 18 and is there perforated with a plurality of ports 19, 19. A cross bar 20 extends from the interior surface of the case 1 in a position between the ports 19, 19, to the gasolene chamber or tube 6, and is preferably integral both with said case and tube. The bar 20 provides a bearing 21, within which a shaft 22 is loosely mounted. The shaft 22 at one end abuts loosely the inner surface of the case 1, as shown in Fig. 3.

The shaft 22 within the chamber 2 carries a cam or curved arm 24, which is adjustably

secured to the shaft by a pin 25, or otherwise. A circular disk serves as a relief valve 26 and is loosely and slidably mounted upon a cylindrical stem 27. The stem 27 may be either integral and cast with the cross bar 20, or it may be inserted in the cross bar 20 and project therefrom. A collar 28 is mounted loosely on the stem 27, and is held from detachment therefrom by the cotter pin 29, or in any other preferred manner. A spiral spring 30 surrounds the valve stem 27 loosely and has one end bearing against said collar 28 and the opposite end bearing against the outer plain surface of the disk 26.

The case 1 is slitted and at the slit, on opposite sides thereof, has two ears 31, extending in proximity with each other and tightened into forcible contact together by a screw 32. The slit in the case is thus narrowed and the tube 33, hereinafter described, is clamped by said screw action.

A tubular body 33 is provided with an exterior screw-thread on its upper portion, by which it fits within and engages the flange 5 of the case 1. The bottom of the tube 33 is shown at 34 and constitutes with the tubular part 33 a cup. The outer surface of the bottom 34 of said cup is dished or concaved as shown at 35, but leaving a central boss 36, which is centrally bored. The upper end of the bore is countersunk. There is a guide pin 37 on one side of the tube 33, extending inwardly. One or more air-admission openings or ports 38 are cut through the tube 33, preferably in approximately the shape illustrated in the drawings, or in any other suitable form.

A thumb piece 39 is mounted rotatably in the perforation through the boss 36 of the bottom 34 of the tube 33. This thumb piece 39 has a tubular extension 40, which passes up through said perforation. This tube 40 is cut longitudinally, before insertion, to form four (or any preferred number of) sections, as seen at 41. These sections are flared by a suitable tool to spread outwardly in a radial direction to fit the countersunk portion of the bore and to lie in snug contact therewith, as illustrated in Figs. 2, 3 and 7, and thereby have a spring-pressure in such contact. The thumb piece has an axial opening, which is square transversely, as best shown at 42.

In my construction there is a combined throttle valve and air valve which is described as follows: A tube 43 has a circular disk 44 at its upper end, which disk has a central circular aperture 45. The tubular part 43 is cut to form rectangular openings or apertures 46, separated by the posts 47. The tube 43 also has a longitudinal slot 48, through which the guide pin 37 presses loosely. The tube 43 is slidable loosely within and along the tubular body 33 of the air inlet. The space within the tube 43 below the disk 44 constitutes the primary mixing chamber. A cross bar 49 extends diametrically across the tube 43 and has a central circular bearing 50. This bearing 50 is tapped with a screw-thread. A valve rod comprises a square stem 51, which fits slidingly in the square aperture 42 of the thumb piece 39, but in the part passing through the tapped hole of the bearing 50 of the cross bar 49, said stem 51 is reduced to a cylindrical form, as seen at 52, and furnished with a screw-thread, as best seen in Fig. 3. The valve rod, above said screw-threaded portion, has the form of an elongated truncated cone, as shown at 53. The upper end of the conical portion of the valve rod extends axially through the aperture 45 of the disk 44, up through the lower end of the gasolene receptacle or tube 6, and at its upper or large end it is in contact loosely with the ball valve 12. The action of this combined throttle valve and air valve is hereinafter explained.

An operating lever 54 is mounted on the shaft 22 and fastened thereto by a key pin 55, or otherwise. The lower end of the lever 54 is enlarged into a sector shape, as represented at 56. The sector 56 at one corner has an inwardly bent lip 57, which is in contact with a stop pin 58, when the parts are in the position shown in Figs. 1 and 3, said stop pin projecting from the case 1 outwardly, as best seen in Fig. 3. At the opposite corner of the sector 56 there is an inwardly bent lip 59, through which a set screw 60 passes. This screw, when in contact with the stop pin 58 limits the oscillation of the lever 54 and shaft 22, to close simultaneously the gasolene feed valve, the throttle valve and the air valve, as represented in Fig. 7.

A link bar 61 is pivotally mounted on the upper end of the lever 54 by the screw 62. The link bar 61 is moved by the chauffeur, as desired, by means of a lever (not shown).

The portion of the bore of the gasolene tube or receptacle 6, which is directly opposite to the inner end of the feed pipe 7 is concaved as represented at 66 in Figs. 2 and 7.

The operation of my improved carbureter hereinbefore described is explained as follows: When the engine (not shown) is not operating, the parts of the carbureter are in the positions shown in Fig. 7. The gasolene flows from a tank (not shown) through the pipe 8, in the direction indicated by the arrow 64 in Fig. 7, and fills the pipe 7 and the gasolene chamber or receptacle 6 up to the screw or plug 15, or to the height of the level of the gasolene in said tank, if such level is below the bottom of said screw or plug. At this time the ball valve 12 is firmly seated on the annular shoulder 11 near the bottom of said gasolene chamber or receptacle 6 by means of the pressure of the

spring 17 downward against the presser bar 13, in whose socket 14 the ball 12 is seated above. At this time also the combined air valve and throttle valve is closed, and the air supply is cut off by the tube 43 which as a sliding shutter closes the air openings 38, as shown in Fig. 7.

As seen in Fig. 7, the disk 44, extending across the tube 33 within the same but slidable therein, constitutes the throttle valve. In its closed position there shown, it prevents all flow of the carbureted air to the engine; but in the open position illustrated in Fig. 2, it permits said flow. The tube 43 which extends down from and is carried by the disk 44 constitutes the air valve, the lower portion of which tube, when the parts are in the position represented in Fig. 7, acting as a shutter to close the air-admission openings or ports 38, but, when the parts are in the position seen in Fig. 2, rising wholly above said ports 38, and so permitting atmospheric air to enter through the ports. As already stated, the space in the tube 43 beneath the disk 44 is the primary mixing chamber, as will be hereinafter more fully explained.

When the chauffeur draws the link bar 61 in the direction indicated by the arrow 65 in Fig. 1, the lever 54 is moved and causes a partial oscillation of the shaft 22 and connected parts from the positions shown in Figs. 6 and 7 to the positions shown in Figs. 1, 2 and 3. The limits of said oscillation are fixed by the stop pin 58. The extent of the throw of the lever 54 is varied as desired, to increase or diminish the supply of the gasolene and air and so to change the rate of speed. When the parts are in the position shown in Fig. 6, the inner end of the screw 60 is in contact with the stop pin 58, but when the parts are in the position shown in Fig. 1, the lip 57 of the sector plate 56 is in contact with said stop pin. The extent of the movement of the link bar 61 and lever 54 is regulated by adjustment of the screw 60.

The oscillation of the shaft 22 caused by the movement of the link bar 61, as just described, carries the cam or curved arm 24 from the position shown in Fig. 7 to the position shown in Fig. 2, because said cam or arm is fastened upon said shaft and therefore turns with it. The suction of the engine then draws the combined throttle valve and air valve (Fig. 4) upward to the open position shown in Figs. 2 and 3. As the said valve has the cross bar 49, with which the valve rod 51 is engaged by the screw-threads, as shown at 52 in the bearing 50 of said cross bar, the whole valve rod 51, 52, 53, is carried upwardly by the rise of said valve (Fig. 4). The valve and connected parts continue to rise until the disk 44 comes into contact with the curved arm or cam 24, then in the position shown in Fig. 2, and is there stopped. By means of the adjustment of the screw 60, as already explained, the extent of the throw of the lever 54 and the consequent oscillation of the shaft 22 are pre-determined, and so the extent of the rise or opening of the valve are regulated as may be desired. The rise of the valve rod 53, so caused, lifts the ball 12, thus unseating the ball from the annular shoulder 11 and lifting also the presser bar 13 and increasing the tension of the spring 17. Thus, the discharging orifices 9 and 10 at the bottom of the gasolene chamber or tube 6 are opened, and the gasolene drops by gravity from said chamber or tube, aided by the suction of the engine, which sucks out the gasolene from said discharge openings. The rise of the valve (Fig. 4) above described, also causes the tube 43 thereof to move up along the inner surface of the tube 33, and so the ports 38, 38, are uncovered. The suction of the engine draws in the atmospheric air through these ports into the valve. The air current, so formed, is deflected by the under surface of the disk 44 and is there spread radially outward into a plurality of air currents (six, as shown in Fig. 5), and discharged from the valve through the apertures 46, 46, into the chamber 2 of the case 1. The air which has been sucked in by the engine through the ports 38 moves with great force up through the valve, and instantly takes up the gasolene discharged from the nozzle or orifice 9 of the gasolene chamber or tube 6, and dissipates it into vapor in passing, so that what is discharged through the apertures 46, 46, is gasolene vapor, or carbureted air, the gasolene having been finely divided, torn apart and thoroughly mixed with atmospheric air by the radially-spreading, forcible currents, streaming out through said apertures of the valve. The carbureted air then passes out through the chamber 2 and tube 3 to the engine. The tube 43 beneath the disk 44 thus forms the first or primary mixing chamber, in which the gasolene discharged from the nozzle 9 first comes in contact with the air currents which stream in through the ports 38. The mingled gasolene vapor and air so discharged through the apertures 46, pass into the chamber 2, which constitutes the secondary mixing chamber, whereby the convergence of the wall to the outlet tube 3, which is of less diameter, said vapor and air are still more mingled before passing to the engine.

When the carbureter is not in operation and the parts are in the position shown in Fig. 7, the lower portion of the valve rod 51 projects out below the thumb piece 39 to some extent, as illustrated in Figs. 6 and 7; but when the carbureter is in operation, the rise of the valve, already described, moves the valve rod 51 up so that its lower end is within the square axial opening 42 of the

thumb piece 39, as plainly represented in Figs. 2 and 3. The rod 51, being square in cross section and loose in the square axial opening 42 of the thumb piece, can move longitudinally without restraint, but cannot turn. The pressure of the spring 17 keeps the concaved end of the presser bar 13 constantly in forcible contact with the ball 12, and also keeps the ball 12 in forcible contact with the large upper end of the valve rod 53. The resistance to this spring-pressure is afforded by the threaded engagement of the part 52 of the valve rod in the threaded bearing 50 of the cross bar of the valve.

For fine adjustment of the valve rod 51, 52, 53, to determine to a nicety the exact amount of discharge of gasolene from the gasolene chamber or tube 6, the valve rod 51 is capable of an independent movement on its threads 52 along the threaded bearing 50 of the cross bar 49. To make this adjustment the piece or knob 39 is seized by the thumb and forefinger and turned. The rotatory movement gives to the thumb piece 39 a corresponding movement to the valve rod 51, 52, 53, through the bearing 50. The guide pin 37 allows at all times by the vertical slot 48, the vertical movements of the valve and connected parts, but prevents rotation of the same.

To stop entirely the operation of the carbureter, the chauffeur draws the link bar 61 from the position shown in Fig. 1 to the position shown in Fig. 6. This results in an oscillation of the shaft 22 and the movement of the cam or curved arm 24 from the position shown in Fig. 1 to the position shown in Fig. 6. This cam movement presses or crowds down the valve. As the curved arm or cam 24 is adjustable on the shaft 22 by means of the set screw 25, as already stated, it is in practice advisable to adjust the arm or cam 24 so that in its extreme lowest position it will not entirely close the combined throttle valve and air valve, but will nearly do so. In such a case, the bottom edge of the tube 43 does not quite close or cover the air ports 38 of the tube 33, but leaves a small space there open, as illustrated in Fig. 6. The extent of such opening depends upon and is regulated by the adjustment of the curved arm or cam 24 upon the shaft 22. In such a position of the parts, a minimum quantity of air and of gasolene is supplied and the throttle valve remains slightly open. The engine will therefore continue to run, but at its minimum speed. This cam action to depress the combined throttle and air valve enables a quick reduction of speed to the minimum degree.

When it is desired to stop the operation of the carbureter entirely, the sparking apparatus is thrown out of circuit, and the combined throttle and air valve then descends automatically by gravity to the position shown in Fig. 7, by which movement the tube 43 wholly closes and covers the air ports 38 of the tube 33. The descent of the valve carries down the valve rod 51, 52, 53, and the ball valve 12 is forced to the annular seat 11 by the force of the spring 17 and the presser bar 13. Thus, the supply of air and of gasolene to the carbureter is cut off and the supply of carbureted air to the engine is stopped. As shown in Fig. 7, however, the ball valve 12 is fully seated on the annular shoulder 11, before the valve tube 43 has entirely closed the air inlet ports 38, and thus the discharge of gasolene from the nozzle of the tube 6 is shut off. The valve then descends automatically by its own gravity along the tube 33, and by said movement withdraws the valve rod 53 from contact with the ball valve 12. When, the engine is started again, the suction raises the valve and brings the valve rod 53 into contact with the ball valve 12, and thereafter lifts the valve and connected parts to the position shown in Fig. 2, as already explained.

Whenever, by any improper working or condition of the engine, there may occur an undue pressure of the gas or carbureted air in the chamber, or other tendencies or liabilities to an explosion, the relief valve illustrated in the drawings is useful. If the pressure of the aeriform contents of the chamber 2 exceeds the pressure of the spring 30 on the stem 27 of the valve 26, such internal pressure exerted through the openings 19, 19, forces the valve disk 26 outwardly and overcomes the resisting pressure of the spring 30, thus affording the necessary relief. When the internal pressure in the chamber 2 is less in degree than the pressure of the spring 30, said spring automatically closes the valve 26 into forcible contact with the plain face 18 of the case 1.

The splitting of the case 1 and the screw-clamping together of the ears 31 by the screw 32 tends to lock the flange 5 and tube 33 together.

The radial splits 41 of the annular flange 40 of the thumb piece 39 and the radial spreading of the sections of said flange, as illustrated in Figs. 2, 3, 7 and 8, give a spring-pressure to said flange sections sufficient to insure a proper frictional connection between the thumb piece 39 and the bottom 34 of the tube 33 to prevent accidental displacement and to hold the valve rod 50, 51, 53 set in its adjusted position.

The tube or gasolene chamber 6 may be recessed or concaved as at 66 (Fig. 6) to enable a better flow of gasolene from the tube or chamber down behind the ball valve 12 into the lower part or nozzle of said tube or chamber.

It is evident that by the construction

shown I produce a very simple and effective carbureter and greatly reduce the number of parts heretofore commonly employed.

The size of the carbureter is considerably lessened and the cost of manufacture reduced.

There is no float valve or mechanism therefor to supply the carbureter with gasolene. The gasolene flows unobstructed under the gravity pressure of its own head directly to the gasolene chamber or tube nozzle 6.

It is an important feature of my invention that whereas in other carbureters the nozzle or discharging orifice, whereby the gasolene is supplied to the carbureting chamber or carbureting means, is directed upwardly, in my said construction the discharging end or nozzle of the gasolene tube or chamber 6 is directed vertically downward, thus facilitating the discharge, and especially enabling the exit of dirt and other foreign matter which may be contained in the gasolene as said liquid flows from the gasolene tank. When the nozzle discharges a stream or jet of gasolene upwardly, such dirt and foreign substances are forced up into the nozzle and are packed close therein and soon form a clog to diminish and ultimately to prevent the discharge of the liquid therefrom. In my construction such substances flow out from the nozzle in a downward direction and drop out entirely by gravity, assisted by the suction of the engine.

Another advantage, realized in my device as described, is that all the valves are operated simultaneously and automatically. The combined air valve and throttle valve opens wholly by the suction of the engine; the rise of the valve, so caused, uncovers the air ports and admits the atmopsheric air; and said rise of the said valve opens the nozzle valve 12, all at the same time. The opening of these valves is caused entirely by the suction of the engine. The closure of these valves is caused simultaneously simply by an oscillation of the shaft 22, which causes the cam or curved arm 24 to press downward to its normal position the disk 44 of said valve and thereby to close the air ports 38 and the ball or nozzle valve 12. These valve movements result from the operation of the link bar 61. The cam or curved arm 24 does not mechanically cause the opening of these valves, but simply permits them and limits their extent, the motive power being simply and only the suction of the engine. The closing movements of the valves, however, are mechanically caused by cam pressure of the curved arm 24 in pressing down upon the disk 44 of the valve.

I claim as a novel and useful improvement and desire to secure by Letters Patent:—

1. In a carbureter for an engine, the combination of a carbureter case; a shaft mounted transversely in the case and capable of oscillatory movement; means for oscillating said shaft at will to limited extents; a fixed air inlet tube opening into the carbureter case and extending from said case in an axial direction, which air inlet tube has ports through the sides thereof, located and arranged to deliver atmospheric air into the carbureter case; an outlet pipe communicating with the interior of the carbureter case and extending therefrom to the engine; a gasolene-supply pipe extending in the axial line of the carbureter case and of the air inlet tube and discharging into the air inlet tube; a tubular valve fitting slidably in the air inlet tube and adapted alternately to cover or uncover the ports of said tube and having at its top a disk provided with a central aperture for the passage therethrough of said gasolene-supply tube, which disk has the same diameter as the tubular body of the valve and is adapted to be moved with said valve by the suction of the engine, said tubular body being provided with side openings adjacent to but beneath the disk, which openings are covered by the air inlet tube when the tubular body of said valve is wholly contained in the air inlet tube in contact therewith, but are open to the interior of the carbureter case when the valve has been moved up beyond the top of the air inlet tube by the suction of the engine; and a curved arm mounted fast at its inner end on the shaft and in contact at its outer end with the disk and adapted to move the tubular body of the valve into the air inlet tube and also to limit the extent of the upward movement of the tubular body of the valve when said valve is subjected to the suction of the engine.

2. In a carbureter for an engine, the combination of a carbureter case; a shaft mounted transversely in the case and capable of oscillatory movement; means for oscillating said shaft at will to limited extents; a fixed air inlet tube opening into the carbureter case and extending from said case in an axial direction, which air inlet tube has ports through the sides thereof located and arranged to deliver atmospheric air into the carbureter case; an outlet pipe communicating with the interior of the carbureter case and extending therefrom to the engine; a gasolene-supply pipe extending in the axial line of the carbureter case and of the air inlet tube and discharging into the air inlet tube; a tubular valve fitting slidably in the air inlet tube and adapted alternately to cover or uncover the ports of said tube; a throttling disk having a central aperture for the passage therethrough of said gasolene-supply pipe, which disk is concentric with the tubular body of the valve and having the same diameter as it and supported paral-

lel to the upper edge of the tubular body by posts extending longitudinally therefrom and so arranged as to provide side apertures beneath said disk and between said posts for the discharge of carbureted air from the tubular body of said valve into the carbureter case at will, when the valve is extended up beyond the inner end of the air inlet tube, but said side apertures being covered by the air inlet tube when the valve and disk are seated therein; and a cam mounted fast on the shaft with its working surface adapted to contact at will with the throttling disk to force the valve into the air inlet tube and also adapted to limit the movement of the valve along the air inlet tube when said valve is partially withdrawn therefrom by the suction of the engine.

3. In a carbureter for an engine, the combination of a carbureter case; a shaft mounted transversely in the case and capable of oscillatory movement; means for oscillating said shaft at will to limited extents; a fixed air inlet tube opening into the carbureter case and extending therefrom in an axial direction, which air inlet tube has ports through the sides thereof, located and arranged to deliver atmospheric air to the carbureter case; an outlet pipe communicating with the interior of the carbureter case and extending therefrom to the engine; a gasolene-supply pipe extending in the axial line of the carbureter case and of the air inlet tube and discharging into the air inlet tube; a tubular valve fitting slidably in the air inlet tube and adapted alternately to cover and uncover the ports of the air inlet tube, and provided with side apertures; a throttling disk having a central opening for the passage therethrough of said gasolene-supply pipe, which disk is fastened upon the top of the tubular valve and concentric with the tubular body of the valve, having the same diameter and adapted to be moved with the valve by the suction of the engine; and a cam mounted on said shaft and movable therewith and adapted to close the valve by pressure upon said disk, said valve apertures being arranged so as to be covered by the air inlet tube when the valve is closed.

4. In a carbureter for an engine, the combination of a carbureter case; a shaft mounted transversely in the case and capable of an oscillatory movement; means for oscillating said shaft at will to limited extents; a fixed air inlet tube opening into the carbureter case and extending therefrom in an axial direction, which air inlet tube has ports through the sides thereof, located and arranged to deliver atmospheric air to the carbureter case; an outlet pipe communicating with the interior of the carbureter case and extending therefrom to the engine; a gasolene-supply pipe extending in the axial line of the carbureter case and of the air inlet tube and discharging into the air inlet tube; a tubular valve fitting slidably in the air inlet tube and adapted alternately to cover and uncover the ports of the air inlet tube and provided with side apertures; a throttling disk having a central opening for the passage therethrough of said gasolene-supply pipe, which disk is mounted upon the top of the tubular valve; and a cam mounted on and movable with the shaft and in operative contact with the upper surface of the throttling disk.

5. In a carbureter, the combination of a carbureter case; an air inlet tube extending into said case; a gasolene-supply tube supported in the case and extending into the air inlet tube; a discharging nozzle at the end of the gasolene-supply tube, provided with a valve seat; a ball valve normally supported by the valve seat; a slidably mounted valve within the air inlet tube, having lateral apertures, which, when the slidable valve is wholly contained in the air inlet tube, are covered thereby, but which open into the carbureter case, when the slidable valve projects beyond the upper end of the air inlet tube; a valve rod mounted in and movable with said slidable valve, and whose upper end is in constant contact with the ball valve and is adapted to unseat the ball valve in the nozzle, whenever the slidable valve moves up along the air inlet tube; an outlet tube from the carbureter case adapted to discharge into an engine; and a cover fastened on the slidable valve adapted to be lifted in the air inlet tube by the suction of the engine.

6. In a carbureter, the combination of a carbureter case; an air inlet tube extending into said case; a gasolene-supply tube supported in the case and extending into the air inlet tube; a discharging nozzle at the end of the gasolene-supply tube, provided with a valve seat; a ball valve adapted to fit in said seat; a spring normally pressing the ball valve into contact with said seat; a slidable valve mounted within the air inlet tube and having lateral apertures, which, when the slidable valve is wholly contained in the air inlet tube, are covered thereby, but which open into the carbureter case, when the slidable valve projects beyond the upper end of the air inlet tube; a valve rod mounted in and movable with the slidable valve and whose upper end is in constant contact with the ball valve and is adapted to unseat the ball valve in the nozzle, whenever the slidable valve rises in the air inlet tube; an outlet tube from the carbureter case adapted to discharge into an engine; and a cover fastened on the upper end of the slidable valve and adapted to be lifted in the air inlet tube by the suction of the engine.

7. In a carbureter, the combination of a

carbureter case; a gasolene-supply tube supported in the case and extending into the air inlet tube; a discharging nozzle at the end of the gasolene-supply tube, provided with a valve seat; a ball valve adapted to fit in said seat; a presser bar mounted in the gasolene-supply tube and having its lower end in contact with the ball; a spring in the gasolene-supply tube having its upper end bearing against the upper end of the gasolene-supply tube and its lower end bearing against the presser bar; an air inlet tube extending into the carbureter case; a slidable valve having lateral apertures and mounted in the air inlet tube, which apertures, when the slidable valve is wholly contained in the air inlet tube, are covered thereby, but which open into the carbureter case, when the slidable valve projects beyond the upper end of the air inlet tube; a valve rod mounted in and movable with the slidable valve and whose upper end is in constant contact with the ball and is adapted to unseat the ball in the nozzle against the pressure of said spring, whenever the slidable valve rises in the air inlet tube; an outlet tube from the carbureter case to the engine; and a cover fastened on the upper end of the slidable valve adapted to be lifted in the air inlet tube by the suction of the engine.

8. In a carbureter, the combination of a carbureter case; an air inlet tube extending into said case; a gasolene-supply tube supported in the case and extending into the air inlet tube, a discharging nozzle at the end of the gasolene-supply tube, provided with a valve seat; a spring-pressed ball adapted to fit in said seat; a slidable valve mounted within the air inlet tube and having lateral apertures, which, when the slidable valve is wholly contained in the air inlet tube, are covered thereby, but which open into the carbureter case, when the slidable valve projects beyond the upper end of the air inlet tube; a valve rod mounted in and movable with the slidable valve and whose upper end is in constant contact with the ball and is adapted to unseat the ball in the nozzle whenever the slidable valve rises in the air inlet tube; an outlet tube from the carbureter case and adapted to discharge into an engine; and a cover fastened on the upper end of the slidable valve adapted to be lifted in the air inlet tube by the suction of the engine.

9. In a carbureter connected with an engine, the combination of a carbureter case; an air inlet tube extending into said case; a gasolene-supply tube supported in the case and extending into the air inlet tube; a discharging nozzle at the end of the gasolene-supply tube, provided with a valve seat; a spring-pressed ball adapted to fit in said seat; a slidable valve mounted within the air inlet tube and provided with a cover whereby it is adapted to be opened by suction of the engine; and a valve rod operable by the sliding valve to move the ball from said seat.

10. In a carbureter, the combination of a carbureter case; means for supplying air thereto, comprising an air inlet tube extending into said case; a gasolene-supply tube supported in the case; a discharging nozzle at the end of the gasolene-supplying tube; a valve seat in the nozzle; a spring-pressed ball adapted to fit in said seat, a slidable valve mounted in the air inlet tube and having a cover and also lateral apertures, which when the slidable valve projects beyond the upper end of the air inlet tube, communicate with the interior of the carbureter case, but which, when the slidable valve is wholly contained in the air inlet tube, are covered thereby; an outlet pipe from the carbureter case adapted to discharge into an engine; a valve rod carried by the slidable valve and at its upper end in contact with the lower surface of the ball and adapted to unseat the ball in the nozzle; an oscillatory shaft mounted in the carbureter case; means to give an oscillatory movement to the shaft; and a cam fastened on the shaft capable of moving the slidable valve downward into the air inlet tube and also of limiting the rise of the slidable valve when said valve is lifted in the air inlet tube by the suction of the engine.

11. In a carbureter, the combination of a carbureter case; a gasolene tube having a discharging nozzle; a ball valve seated in the nozzle; means for supplying gasolene to the tube; a valve rod in contact with said valve; and means adapted to move the valve rod to unseat said ball valve.

12. In a carbureter, the combination of a carbureter case; a gasolene tube within the carbureter case; a gasolene supply pipe entering said tube midway its ends; a downwardly directed nozzle within the carbureter case adapted to discharge gasolene from said tube by gravity and provided with a valve seat; a ball in said nozzle for a valve normally resting upon said seat; and means for lifting and lowering said ball valve at will, said gasolene tube being provided with a recess in its side opposite to the discharging end of said pipe for the purpose of supplying gasolene to the nozzle in the rear of said ball.

13. In a carbureter, the combination of a carbureter case; a gasolene-supply tube having a nozzle within the case; means for supplying gasolene to the tube; a ball in said nozzle for a valve; a valve rod in contact with the ball and adapted to move the ball to allow a discharge of gasolene from the tube through the nozzle; an air inlet tube open-

ing into the case and having lateral ports near the bottom thereof; a valve having a tubular body and an open bottom and mounted slidably in the air inlet tube, which tubular body has near its top air-discharging ports through its sides; a disk for a cover of said slidable valve; means for supporting the valve rod upon the slidable valve; and means for giving to said slidable valve movements in alternately opposite directions, said slidable valve being so arranged and movable in the air inlet tube that when the upper end of said slidable valve projects beyond the upper end of the air inlet tube the air-discharging ports of the slidable valve open into the carbureter case.

14. In a carbureter for an engine, the combination of a carbureter case; an air admission tube opening into the case and provided with lateral air ports; a tubular valve slidably mounted in the air admission tube and having a centrally perforated cover and an open bottom, said tubular valve being provided with a plurality of air apertures just beneath the cover; a gasolene-feed tube having a nozzle which extends through the perforation of said cover into the tubular valve; a valve in the nozzle; a cross bar in the tubular valve extending diametrically thereof; a valve rod supported by the cross bar and projecting into the nozzle to operate the nozzle valve; an oscillatory shaft mounted in the carbureter case; an operating rod for oscillating the shaft; a cam on the shaft in contact with the cover of the tubular valve adapted to depress the tubular valve when the shaft is oscillated in one direction but to limit the rise of the tubular valve in the opposite direction; and an outlet pipe from the carbureter case to the engine, said tubular valve being movable upwardly by the suction of the engine, and said tubular valve and air admission tube coöperating to close the air apertures of the tubular valve and to close the lateral air ports of the admission tube when the tubular valve is wholly contained in the air admission tube, but to uncover the lateral air ports of the air admission tube and to open the air apertures of the tubular valve when the tubular valve projects up beyond the top of the air admission tube.

15. In a carbureter, the combination of a carbureter case; an air admission tube opening into the case and rotatably connected therewith and provided with lateral air ports; a tubular valve having an open bottom and a centrally perforated cover, which tubular valve is slidably mounted in the air admission tube, and has one longitudinal slot and a plurality of air apertures just beneath the cover; a pin extending from the air admission tube inwardly through said slot; a gasolene-feed tube in the carbureter case and having a nozzle which projects loosely through the aperture of the valve cover; a valve in said nozzle; a cross bar extending diametrically in the tubular valve; a valve rod supported on the cross bar and projecting into the nozzle to operate the nozzle valve; an oscillatory shaft mounted in the case; and a cam on the shaft in contact with said cover to limit the movements of the tubular valve in the air admission tube, the air admission tube serving to close the air apertures of the tubular valve when the tubular valve is wholly contained in the admission tube and the air ports of the air admission tube being covered when the tubular valve is wholly contained in the air admission tube, but the air apertures being capable of discharging into the carbureter case when the tubular valve projects up beyond the top of the air admission tube.

16. In a carbureter connected with an engine, and having a carbureter case, the combination therewith of the combined throttle valve and air valve herein described comprising a centrally perforated circular disk; a tube longitudinally slotted; a plurality of posts connecting the top of the tube to the lower side of the disk leaving a plurality of intermediate apertures; a cross bar extending diametrically in the tube and having a central threaded bearing; a valve rod having a central cylindrical threaded portion engageable in said bearing and also a long tapered conical portion extending from said central portion up through the aperture of the disk and a stem square in cross section extending from said central portion in the opposite direction; an air inlet tube within which said combined throttle valve and air valve is slidable and which extends into said case and is provided with lateral air ports and also with a pin which projects loosely through the slot of the first named tube and also having a bottom in which is a central threaded hole; a thumb piece in threaded engagement with said threaded hole, which thumb piece has a central square aperture wherein the square stem of the valve rod is slidable but not rotatable; an oscillatory shaft mounted in the case; an outlet pipe from the case to the engine; a cam on the shaft adapted to depress the combined throttle valve and air valve when the shaft is oscillated in one direction and to limit the rise of said combined valve when the shaft is oscillated in the opposite direction; a gasolene-feed tube having a downwardly extending nozzle in the vertical axial line of the carbureter case and passing through a central aperture of said disk into the first named tube; a valve seat in said nozzle; and a ball normally resting on the valve seat in loose contact with the upper end of the valve rod, said intermediate apertures open-

ing into the carbureter case when the tubular body of the air valve projects up beyond the top of the air inlet tube but closed by the inlet tube when said tubular body of the valve is wholly contained in the air inlet tube, at which time also the said tubular body of the air valve closes the lateral ports of the air inlet tube.

17. In a carbureter, the combination of a gasolene tube having a nozzle; a ball seated in the nozzle for a valve; a valve rod comprising three integral portions,—a truncated cone-shaped upper portion extending into the nozzle and having its large end adapted to contact with said ball, a central cylindrical threaded portion and a lower portion square in cross section; a support vertically movable and provided with a central threaded bearing with which said central threaded portion of the valve rod is engageable; and a thumb screw mounted loosely by a square central aperture on the lower portion of the valve rod and adapted to adjust the position of the valve rod longitudinally.

18. In a carbureter connected with an engine, the combination of a carbureter case; an air admission tube opening into the case and having lateral ports and a closed bottom with a centrally perforated boss; a thumb piece mounted rotatably in the perforation of the boss and having an axial bore which is square transversely; a valve rod which at its lower end is square in cross section extending slidingly in the axial bore of the thumb piece, but which is round and threaded at its center and at its upper end is shaped like a truncated cone with its large end uppermost; a support having a central threaded bearing to receive rotatably the threaded portion of the valve rod; a slidable valve mounted in the air admission tube and capable of partial withdrawal therefrom by the suction of the engine, which valve has lateral ports and is adapted to cover the lateral ports of said tube when fully seated therein and to uncover the lateral ports of said tube when partially withdrawn therefrom, said lateral ports of said valve being covered by said tube when said valve is fully seated in said tube but uncovered to communicate with the carbureter case when said valve is partially withdrawn from said tube as aforesaid; a gasolene-feed tube discharging into the sliding valve and having a nozzle into which the inner end of said valve rod enters loosely; a ball in the nozzle for a valve to control the delivery of the gasolene and movable by said valve rod; an outlet tube from the carbureter case to the engine; an oscillatory shaft mounted in said case; and a cam fastened on the shaft capable of loose working contact with the top of the slidable valve.

19. In a carbureter connected with an engine, the combination of a carbureter case; an air admission tube opening into the case and having a closed bottom with a centrally perforated boss; a thumb piece mounted rotatably in the perforation of said boss and having an axial bore which is square transversely and provided with longitudinally split flanges capable of being bent or flared to lie in the bore of said boss with a spring-pressure; a valve rod which at its lower end is square in cross section and extends loosely in the axial bore of the thumb piece but is rotatable with the thumb piece, and which is round and threaded at its center and which at its upper end is shaped like a truncated cone with its large end uppermost; a support having a central threaded bearing to receive rotatably the threaded portion of the valve rod; a gasolene-feed tube having a nozzle into which the upper end of the valve rod enters loosely; a ball in the nozzle for a valve to control the delivery of the gasolene and movable by said rod; a slidable air valve vertically movable in the air admission tube by the suction of the engine, an outlet pipe from the carbureter case to the engine; an oscillatory shaft mounted in the case; and a cam on the shaft in contact with the top of the slidable valve.

20. In a carbureter, the combination of a carbureter case; an outlet pipe from the case adapted to conduct carbureted air to an engine; a suction-operated combined throttle valve and air valve in the carbureter case provided with means for receiving atmospheric air; a suction-operated gasolene feed valve capable of discharging into said combined throttle valve and air valve; a gasolene-supply chamber in which said gasolene feed valve is movable; a shaft mounted in the case; means to oscillate the shaft; and means operated by the shaft for limiting the movements of all of said valves.

21. In a carbureter, the combination of a carbureter case; an outlet pipe from the case adapted to conduct carbureted air to an engine; an air inlet tube opening into the case; a longitudinally-movable suction-operated throttle valve in the case; a longitudinally-movable suction-operated air valve mounted in the air inlet tube; a longitudinally-movable suction-operated gasolene-feed valve; a gasolene-supply chamber within the case; a shaft mounted in the case; means for oscillating said shaft; and means operated by the shaft and adapted to close all said valves at will.

22. In a carbureter, the combination of a carbureter case; an outlet pipe therefrom; an air inlet tube opening into said case; means for supplying gasolene to the car-

bureter for mixing the vapor of said gasolene with the air delivered to the carbureter by the air inlet tube; means for discharging the carbureted air when produced and a cam in the case for closing at will said gasolene-supplying means and said means for discharging carbureted air or for simultaneously permitting and limiting at will the opening of said gasolene-supplying means and said means of discharging carbureted air.

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

ALBERT HOWARTH.

Witnesses:
WARREN R. PERCE,
HOWARD A. LAMPREY.