

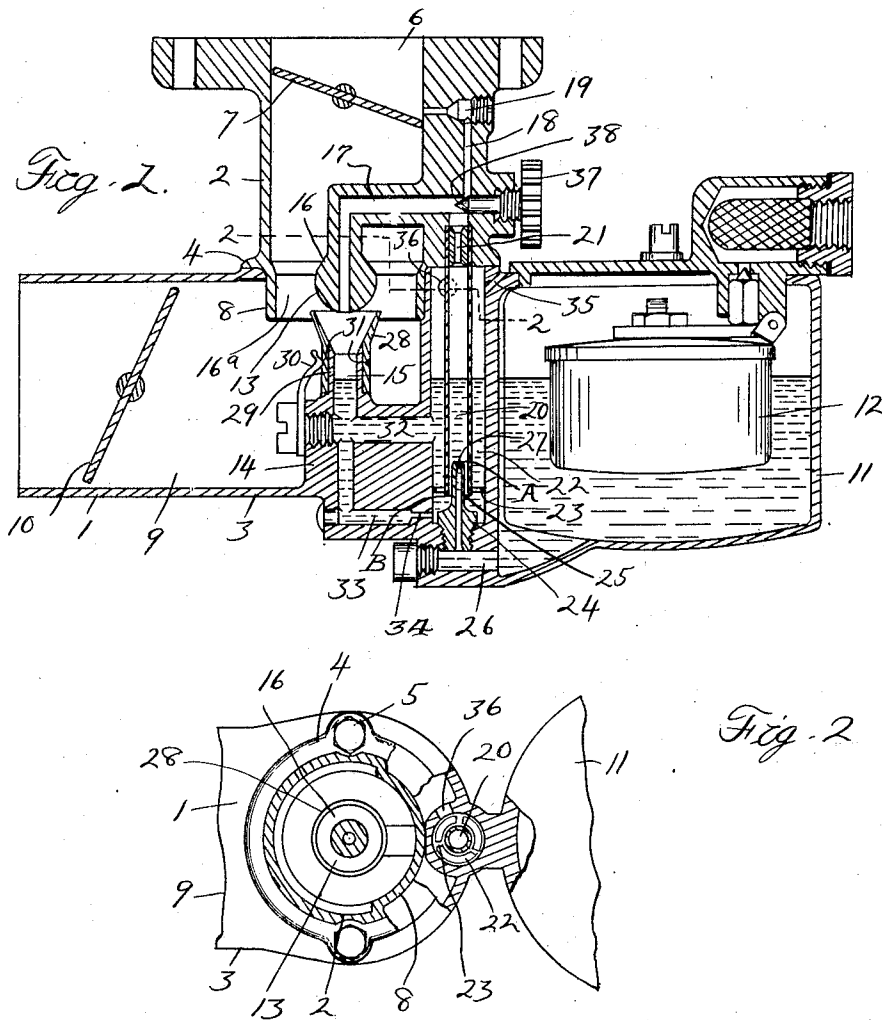
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CARBURETOR

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UNITED STATES PATENT OFFICE.

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CARBURETOR.

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The invention relates to carburetors, particularly of the plain tube type, wherein the proportioning of the fuel mixture for various speeds and for acceleration purposes is accomplished without the use of moving parts. This application forms a continuation in part of my copending application Serial No. 460,183, filed April 11, 1921.

It is one of the objects of the invention to provide a construction which will include an accelerating well; a filling orifice which can be calibrated primarily for filling this well promptly, and elements for controlling this well-filling orifice at various loads, inclinations and speeds of the engine, in a manner which will not alter its primary function.

A further object is to include in the construction compensating elements for all speeds, loads and inclinations which may occur in the propulsion of a vehicle, which elements, functioning jointly with the well-filler, will provide such a mixture of liquid fuel and air as will produce a smooth, economical performance of the engine and the vehicle propelled by it.

These objects are obtained by certain novel features of construction which are herein-after fully described and illustrated in the accompanying drawings, wherein:

Figure 1 is a vertical section on the line 1—1 of Figure 2;

Figure 2 is a horizontal section on the line 2—2 of Figure 1.

The carburetor comprising a casing 1 preferably formed of two castings 2 and 3, the former being provided with annular shoulders 4 engageable with the casting 3 and secured thereto by suitable means 5. The upper casting 2 contains the outlet 6 having the butterfly throttle 7 mounted therein and is also provided with the depending annular flange 8, preferably of slightly smaller internal diameter than the passage 6, forming the restricted air passage. The lower casting 3 has a horizontal air inlet passageway 9 containing a choke valve 10 and is also provided with an integral float chamber 11 containing a float mechanism 12. The upper casting 2 has a downwardly extending main nozzle 16 extending axially of the intake conduit 6 and preferably integral with the casting 2, while the lower casting has the web 14 extending into the air passage and provided with an upturned conduit 15 in axial alignment with the nozzle 13.

The main nozzle 16 when directed downward as shown is enlarged at its outlet end to form a rounding surface 13 adjacent the outlet of the upturned conduit 15. A horizontal passage 17 connects the downturned nozzle 16 with a main conduit 20. A vertical branch passage 18 extends upwardly from passage 17 communicating through the passage 19 with the induction conduit at a point above the throttle 7. The main conduit 20 communicating with the passage 17 through a restriction 21 is secured to the upper casting 2 and extends downward within a cylindrical well 22 in the lower casting and being centered within said well by the spider 23. 24 is a nipple screwed into the lower casting in axial alignment with the well 22 and extending within the main conduit 20. The nipple is of slightly smaller diameter than the conduit 20, thereby forming the calibrated passage 25 and placing the main conduit in communication with the surrounding well. The bore of the nipple 24 communicates with the float chamber 11 by means of the passage 26 and its upper end 27 is calibrated. The position of the orifice 27 with respect to the level of the fuel in the float chamber may be varied by inserting plugs of different lengths in order to place the desired hydrostatic pressure upon the fluid at the said orifice, and the latter is calibrated for the well filling requirements of the engine.

The upwardly extending conduit 15 is preferably provided with a conical mouth 28 extending adjacent to the downturned nozzle 16, preferably sleeved upon a cylindrical portion 29 of the web 14 and removably secured thereto by a spring detent bearing in a groove 31. With this arrangement the conical mouth may be replaced by another member of different size in order to vary the position of the same with respect to the nozzle 16 and annular flange 8. This provides a means for varying the size of the restricted air passage 16^a which is formed between the conical mouth 28 and the annular flange 8 to adapt a carburetor of a standard size to slight variations in the requirements of different engines. The conduit 15 is connected to the well 22 by means of an unrestricted horizontal passage 32 preferably arranged at a height below the normal float level but above the restricted orifice 25. A second horizontal passage 33 also connects the well and the conduit 15, and

this passage preferably communicates with the bottom of the well below the restricted orifice 25 and is provided with a restriction 34 adjacent the well. The well is placed
 5 under atmospheric pressure by the passage 35 through the wall of the casting 3 and is also in communication with the main air passage by virtue of the aperture 36 in the upper portion of the well which leads to the
 10 annular chamber surrounding the depending flange 8. The aperture 36 is provided in order to introduce warm air into the well when the carburetor is provided with an arrangement for preheating the air introduced through the air inlet 9.

The amount of fuel passing through the idling passage 18 is regulated by the valve 38, which has a knurled head 37.

In the operation of the carburetor as described, fuel from the float chamber 11 enters through the plug 24 and calibrated orifice 27 into the main conduit 20 and also fills the well 22, the lateral passages 32 and 33 and the upwardly extending conduit 15
 25 to the level of the fuel in the float chamber by passing through the annular restriction 25. When the throttle is closed or nearly closed the suction from the engine creates in the horizontal passage 17 a depression
 30 sufficient to raise the liquid in the main conduit 20 to the height of the needle valve 38, this depression also being affected by the opening through the downturned nozzle 16. By properly adjusting the needle valve 38
 35 fuel passing upwardly through the main conduit 20 will be emulsified by air passing upward through the downturned nozzle 16, and this emulsion is carried through the idling passages 18 and 19 to the induction
 40 passage 6 above the throttle.

When the throttle is opened slightly from its idling position, the pressure within the calibrated air entrance 16^a is reduced, as well as that at all orifices between this orifice
 45 and the source of suction. Consequently less air passes into main nozzle 16 and more liquid is delivered through the idling orifice 19, which increase in the flow of liquid through 19, conduit 20 and restriction 21
 50 causes the liquid in the well 22 to fall to a point where air will pass through passages 32 and 15 to nozzle 28. Main nozzle 16, being so located, relatively to nozzle 28, that there is a greater reduction of pressure at
 55 its orifice than at the orifice of nozzle 28, will receive air from the latter, which air, having passed through passage 32, is laden with vapor and, when taken into main nozzle 16, passages 18 and 19, further enriches
 60 the idling mixture delivered between the throttle and the engine through 19 and air passage 6.

It will be noted that during a certain portion of the movement of the throttle, air,
 65 with or without a mixture of fuel and fuel

vapor, flows through the nozzle 16, passage 18, into the passage 19, while during the rest of the throttle movement, fuel flows in the opposite direction, through the passage 18 and nozzle 16, into the mixing passage. At
 70 the time when the flow through this passage and the nozzle reverses, the feed of fuel might be insufficient to maintain the mixture at proper proportions, if the nozzle 16 and the passage 19 were the only sources of fuel,
 75 but the fuel which the nozzle 28 is now discharging maintains the mixture at proper proportions.

If the throttle is now suddenly opened a depression is created in the conical mouth
 80 28 of the upwardly extending conduit 15 with the result that the fuel in the accelerating well 22 under atmospheric pressure is discharged through the horizontal passage 32 into the main choke tube 16^a, thus provid-
 85 ing a rich mixture during acceleration. On the other hand, if the throttle is opened gradually the level of the fuel is lowered below the horizontal passage 32 by discharging the same into the main conduit through
 90 the restricted orifice 25. At this point in the operation of the carburetor air will be introduced through the upwardly extending conduit 15 by way of the passage 35, well 22, and horizontal passage 32.

From the above description it will be noted that fuel is introduced into the carburetor in three different ways, namely, through the idling passage, the downturned nozzle, and the upwardly extending conduit.
 100 During acceleration the fuel in said passages will be discharged upwardly through the conical mouth 28, but as soon as sufficient fuel is discharged to lower the level in the well below the height of the horizon-
 105 tal passage 32 air is permitted to pass through the upward conduit 15, and this reduces the amount of fuel delivered, leaving a certain amount below the level of the passage 32. With a greater suction, however,
 110 all of this fuel below the passage 32 will be removed from the well either through the upwardly extending conduit 15 or the annular restriction 25.

One of the features of this construction is
 115 the arrangement of the plug 24 within the main conduit 20 to form an annular restriction 25 below the level of the discharge orifice 27. The advantage of this arrangement is that when the suction is such as to
 120 reduce the level of the fuel in the well to the point A there is still no air introduced into the main conduit 20, since this conduit extends downward below the height of the orifice 27 to a point B. This construction
 125 has been found to prevent a certain "spot" in the operation of the engine.

Another feature is the provision of the passage 32 intermediate the bottom and the
 130 top of the well 22. This prevents complete

exhaustion of the available fuel in the well at the first sudden opening of the throttle, since as soon as the level of the fuel drops to the height of said passage air may be introduced therethrough, which will reduce the rate at which the remainder of the fuel in the well may be introduced into the carbureting passage.

The economy of operation at touring speeds is due to the fact that at such speeds all the fuel passes through the calibrated orifice 21 and is delivered to the air passage through the main conduit. In some cases air may be introduced through the annular orifice 25 from the well 22 to the main conduit 20, but under other conditions,—that is, when the carburetor is adapted for use with other motors—the various ports may be so constructed that no air is introduced through the annular orifice 25, but a balance of pressures is obtained within and without the tube 20. With this balanced pressure no fuel or air flows through the annular orifice 25 either into the tube 20 or from the tube 20 into the well 22. At higher engine speed there will always be a greater reduction of pressure in the well 22 than at the touring speeds and the change in the differential pressures within and without the tube 20 will result either in less air being admitted into the tube 20 through annular orifice 25 in the first case mentioned above, or in the withdrawal of fuel from the tube 20 into the well in the second case mentioned above. In the latter case the fuel which issues from the annular orifice 25 is carried by the air current in the well 22 through the passage 33 and is discharged through the upwardly turned nozzle 28.

One of the important features of the carburetor construction is the means employed to fill the well 22. The plug 24 with its calibrated orifice 27 is not designed primarily to limit the amount of fuel delivered through the main conduit 20 and the downturned nozzle 16 for the calibrated orifice 21 serves this function; but the plug 24 is designed primarily to function as a means for filling the well 22 whenever it is desirable that the additional fuel be available for acceleration or extra power. Thus whenever the throttle is closed entirely, fuel from the orifice 27 can pass downwardly through the annular orifice 25 and fill the well and associated passages. As the throttle is opened the suction within the main tube 20 is increased and at the touring speeds under normal load the fuel from the orifice 27 no longer is admitted to the well 22 because of the balanced pressure conditions above described. However, if the load on the engine increases while the throttle still remains in open position, the speed of the motor consequently decreases and the suction on the main conduit also decreases,

thereby destroying the balance of pressures within and without the tube 20 and permitting fuel from the orifice 27 to flow by gravity through the annular orifice 25 into the well and the excess fuel supplied in this manner is delivered to the choke tube through the upwardly extending conduit 28. Therefore, in my carburetor while the provision of the calibrated plug 21 results in an economical mixture normally being supplied to the engine, nevertheless there is provision for delivering additional fuel if abnormal conditions of heavy load are encountered.

What I claim as my invention is:—

1. In a carburetor, a casing having an air passage restricted to form a choke tube, a throttle in said air passage, a constant level chamber, a main fuel conduit, a well open to the atmosphere, a well-discharging conduit communicating with said air passage in the restricted portion thereof, a main fuel conduit having a main discharge orifice in said choke tube arranged in proximity to the discharge end of said well-discharging conduit so as to receive fuel discharged therefrom, said main fuel conduit having a well-filling orifice communicating with said well and said main fuel conduit having a branch extending above said throttle.

2. A carburetor comprising a casing having an air passage restricted to form a choke tube, a nozzle discharging in the direction of the air flow through said passage and having its discharging orifice substantially at the point of greatest restriction of said tube, a second nozzle discharging in the opposite direction to the first named nozzle having an enlarged head at its discharge end and arranged in said choke tube in substantial alignment with said first named nozzle, and means for supplying fuel to said nozzles.

3. In a carburetor, the combination of a casing having an air passage restricted to form a choke tube, a nozzle discharging at substantially the point of greatest restriction of said tube, a second nozzle discharging in a direction opposite to the discharge of said first nozzle and arranged in said choke tube in substantial alignment with said first named nozzle, a constant level chamber, a passage including a restriction connecting said constant level chamber with said second named nozzle, a well open to the atmosphere and connected to said passage through a restricted port, and a connection from said well to said first named nozzle.

4. In a carburetor, a casing having an air passage restricted to form a choke tube, a nozzle discharging in the direction of the air flow through said carburetor and having its discharge orifice at substantially the point of greatest restriction of said tube, a second nozzle discharging in a direction opposite to the discharge of said first nozzle and ar-

- ranged in said choke tube in substantial alignment with said first named nozzle, a constant level chamber, a passage including a restriction connecting said constant level chamber with said second named nozzle, a well open to the atmosphere and connected to said passage through a restricted port, and a connection from said well to said first named nozzle.
- 10 5. In a carburetor, a casing having an air passage restricted to form a choke tube, a nozzle discharging into the restricted portion of said tube, a second nozzle discharging in a direction opposite to the discharge of said first nozzle, having an enlarged head at its discharge end placed in said tube in substantial alignment with said first named nozzle, a constant level chamber, a passage including a restriction connecting said constant level chamber with said second named nozzle, a well open to the atmosphere and connected to said passage through a restricted port, and a connection from said well to said first named nozzle.
- 25 6. In a carburetor, a casing having an air passage restricted to form a choke tube, a nozzle discharging in the direction of the air flow through said carburetor and having its discharge orifice at substantially the point of greatest restriction of said tube, a second nozzle discharging fuel in a direction opposite to the discharge of said first nozzle, having an enlarged head at its discharge end and placed in said choke tube in substantial alignment with said first named nozzle, a constant level chamber, a passage including a restriction connecting said constant level chamber with said second named nozzle, a well open to the atmosphere and connected to said passage through a restricted port, and a connection from said well to said first named nozzle.
- 40 7. In a carburetor, a casing having an air passage restricted to form a choke tube, a nozzle discharging at substantially the point of greatest restriction of said tube, a second nozzle discharging fuel in a direction opposite to the discharge of said first nozzle, placed in said choke tube in substantial alignment with said first named nozzle, a constant level chamber, a passage including a restriction connecting said constant level chamber with said second named nozzle, a well open to the atmosphere and connected to said fuel passage through a restricted port, and a plurality of horizontal passages connecting said well to said first named nozzle.
- 50 8. In a carburetor, a casing having an air passage restricted to form a choke tube, a nozzle discharging at substantially the point of greatest restriction of said tube, a second nozzle discharging fuel in a direction opposite to the discharge of said first nozzle, placed in said choke tube in substantial alignment with said first named nozzle, a constant level chamber, a passage including a restriction connecting said constant level chamber with said second named nozzle, a well open to the atmosphere and connected to said fuel passage through a restricted port, and a plurality of horizontal passages connecting said constant level chamber with said second named nozzle, a well open to the atmosphere and connected to said fuel passage, a connection from said well to said first named nozzle, a passage leading from said first named fuel passage to an orifice in said outlet above said throttle.
- 90 9. In a carburetor, a casing having an air passage restricted to form a choke tube, a throttle valve in the outlet of said air passage, a nozzle discharging at substantially the point of greatest restriction of said tube, a second nozzle discharging in a direction opposite to the discharge of said first nozzle, placed in said choke tube in substantial alignment with said first named nozzle, a constant level chamber, a passage connecting said constant level chamber with said second named nozzle, a well open to the atmosphere and connected to said fuel passage, a connection from said well to said first named nozzle, a passage leading from said first named fuel passage to an orifice in said outlet above said throttle.
- 100 10. In a carburetor, a casing having an air passage restricted to form a choke tube, a throttle valve in the outlet of said air passage, a nozzle having a flaring mouth discharging at substantially the point of greatest restriction of said tube, a second nozzle having an enlarged head discharging fuel in a direction opposite to the discharge of said first nozzle and arranged in said choke tube in substantial alignment with said first named nozzle, the orifices of said nozzles being in such proximity as to afford communication between the same, a constant level chamber, a passage connecting said constant level chamber with said second named nozzle, a well open to the atmosphere, a connection from said well to said first named nozzle, and a passage leading from said first named fuel passage to an orifice in said outlet beyond the throttle.
- 110 11. In a carburetor, the combination of a casing having an air passage therein, a calibrated restriction in said air passage, a throttle valve adapted to control the flow through said air passage, a liquid fuel and air discharge nozzle extending into said restriction and adapted to discharge in the direction of the air current through said air passage, a second liquid discharge nozzle discharging in a direction opposite to the discharge of the first named nozzle, said nozzles being in substantial alignment with each other, and means for regulating the flow of air and fuel through said nozzles.
- 125 12. In a carburetor, the combination of a casing having an air passage therein provided with a calibrated restriction, a throttle
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valve in said air passage between said restriction and the outlet of said air passage, a fuel conduit having a plurality of discharge orifices, one of said orifices discharging into said air passage between the outlet thereof and the throttle when in closed position, the second of said discharge orifices discharging into said air passage between said calibrated restriction and said throttle, said second discharge orifice being adapted to discharge fuel into said air passage when said throttle is open and being adapted to function as an air inlet for said first named orifice when said throttle is closed, and means for supplying fuel adjacent said second named discharge orifice to mix with such air and increase the amount of fuel delivered through said first named discharge orifice.

13. In a carburetor, the combination of a casing having an air passage, a portion of which passage has a calibrated restriction therein: a throttle valve in said air passage: a fuel supply means: a main fuel conduit leading from said fuel supply to said air passage and having a calibrated restriction therein: a well communicating with said fuel conduit between said calibrated restriction and said fuel supply means: an auxiliary conduit leading from said well through a calibrated restriction to a discharge orifice on the air inlet side of said throttle: said main fuel conduit having a discharge orifice in said air passage adjacent the orifice of the auxiliary conduit and a second discharge orifice on the outlet side of said throttle.

14. In a carburetor, the combination of a casing having an air passage therein provided with a calibrated restriction, a throttle valve in said air passage, a fuel conduit having two branch passageways extending above the normal fuel level, one of said passageways having a discharge orifice in said air passage between the outlet thereof and said throttle, the second of said branch passageways having a discharge orifice in said air passage on the inlet side of said throttle, a well in communication with said main fuel conduit, a third fuel passageway extending from said well to said air passage adjacent said second discharge orifice from which passageway fuel may flow into said second discharge orifice when said throttle is in a relatively closed position.

15. In a carburetor, the combination of a casing having an air passage constricted to form a choke tube, a nozzle discharging at the point of greatest constriction of said choke tube, a second nozzle discharging in a direction opposite to the discharge of the first mentioned nozzle and arranged in said choke tube in substantial alignment with said first named nozzle, a constant level chamber, a well offset from said nozzles and open to the atmosphere, a tube extending into said well to a point below the normal

fuel level, said tube connecting said well and said second named nozzle, a passage including a nipple of calibrated bore and of calibrated exterior diameter extending within said tube and connecting said constant level chamber and said well, and a connection from said well to said first named nozzle.

16. In a carburetor, the combination of a casing having an air passage constricted to form a choke tube, a nozzle discharging at the point of greatest constriction of said choke tube, a second nozzle also discharging into said choke tube, a constant level chamber, a well offset from said nozzle and open to the atmosphere, a tubular conduit extending from a point below the normal fuel level in said well to said second named nozzle, a passage including a nipple of calibrated bore and of calibrated exterior diameter extending within said tube and connecting said constant level chamber and said well and a plurality of horizontal passages at different levels connecting said well to said first named nozzle.

17. In a carburetor, the combination of a casing having an air passage constricted to form a choke tube, a nozzle discharging at the point of greatest constriction of said choke tube, a second nozzle also discharging into said choke tube, a constant level chamber, a well offset from said nozzle and open to the atmosphere, a tubular conduit extending from a point below the normal fuel level in said well to said second named nozzle, a passage including a nipple of calibrated bore and of calibrated exterior diameter extending within said tube and connecting said constant level chamber and said well and a plurality of horizontal passages at different levels connecting said well to said first named nozzle, the uppermost of said horizontal passages being of substantial size and the lowermost being restricted.

18. In a carburetor having a fuel supply chamber and a mixing passage having an air inlet, a mixture outlet and a throttle in the mixture outlet: a branched passage leading from the fuel supply chamber to the mixing passage, one branch opening into the mixture outlet between the throttle when the latter is in a closed position and the discharge end of said outlet and discharging fuel for idling and the second branch opening into the mixing chamber between the throttle and the air inlet and permitting the flow of air into the idling branch in some positions of the throttle and the flow of fuel in the opposite direction into the mixing passage in other positions of the throttle; and additional means for discharging fuel into the mixing passage at the time when the direction of flow in the second-named branch reverses.

19. In a carburetor having a fuel supply

chamber and a mixing passage having an air inlet, a mixture outlet and a throttle in the mixture outlet: a branDED passage leading from the fuel supply chamber to the mixing passage, one branch opening into the mixture outlet between the throttle when the latter is in a closed position and the discharge end of said outlet and discharging fuel for idling and the second branch opening into the mixing chamber between the throttle and the air inlet and permitting the flow of air into the idling branch in some positions of the throttle and the flow of fuel in the opposite direction into the mixing passage in other positions of the throttle; and additional means communicating with said branched passage for discharging fuel into the mixing passage at the time when the direction of flow in the second-named branch reverses.

In testimony whereof I affix my signature.
WILFRED O. CHASE.

CERTIFICATE OF CORRECTION.

Patent No. 1,716,619.

Granted June 11, 1929, to

WILFRED O. CHASE.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 6, line 3, claim 19, for the word "branded" read "branched"; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 13th day of August, A. D. 1929.

(Seal)

M. J. Moore,
Acting Commissioner of Patents.