

United States Patent

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2,941,788 6/1960 Braun..... 261/52X
 3,006,618 10/1961 Carlson et al..... 261/52X
 3,043,572 7/1962 Ott et al..... 261/52X

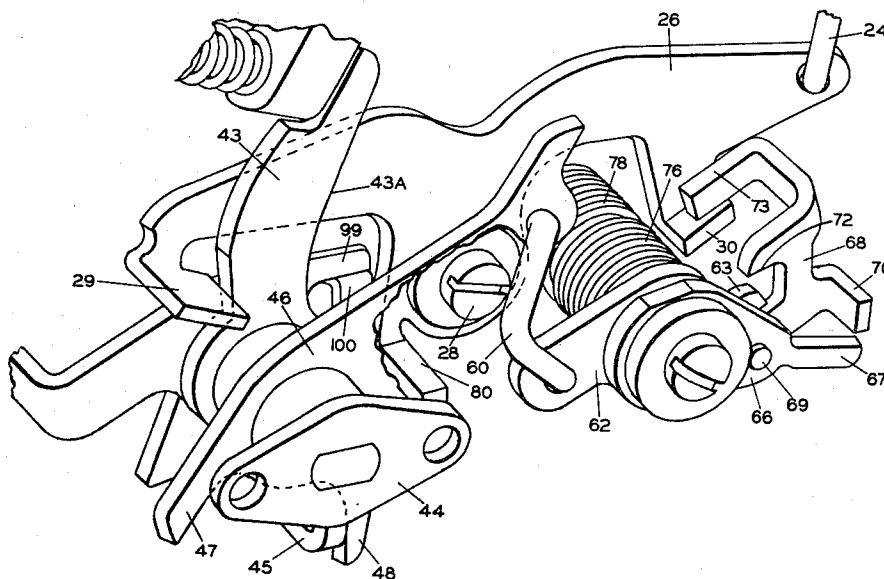
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[54] **THROTTLE LINKAGE MECHANISM FOR A
 MULTI-STAGE CARBURETOR**
4 Claims, 8 Drawing Figs.

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 261/52, 261/39, 261/34
 [51] Int. Cl..... **F02m 11/02**
 [50] Field of Search..... 201/23.1,
 39.1, 39.2, 52, 34.1

[56] **References Cited**
UNITED STATES PATENTS
 2,715,522 8/1955 Carlson et al..... 261/52X

ABSTRACT: Lever and linkage mechanism are disclosed for the sequential operation of the throttle of a two stage carburetor. When the engine is cold and the choke is in operation, only the primary throttle is operative. When the choke is fully opened, a latch or dog on the secondary side is released by the choke mechanism whereby the latch engages a loose lever driven by the primary throttle to complete the connection between the primary throttle and the secondary throttle, thereby causing the secondary throttle to open on demand.



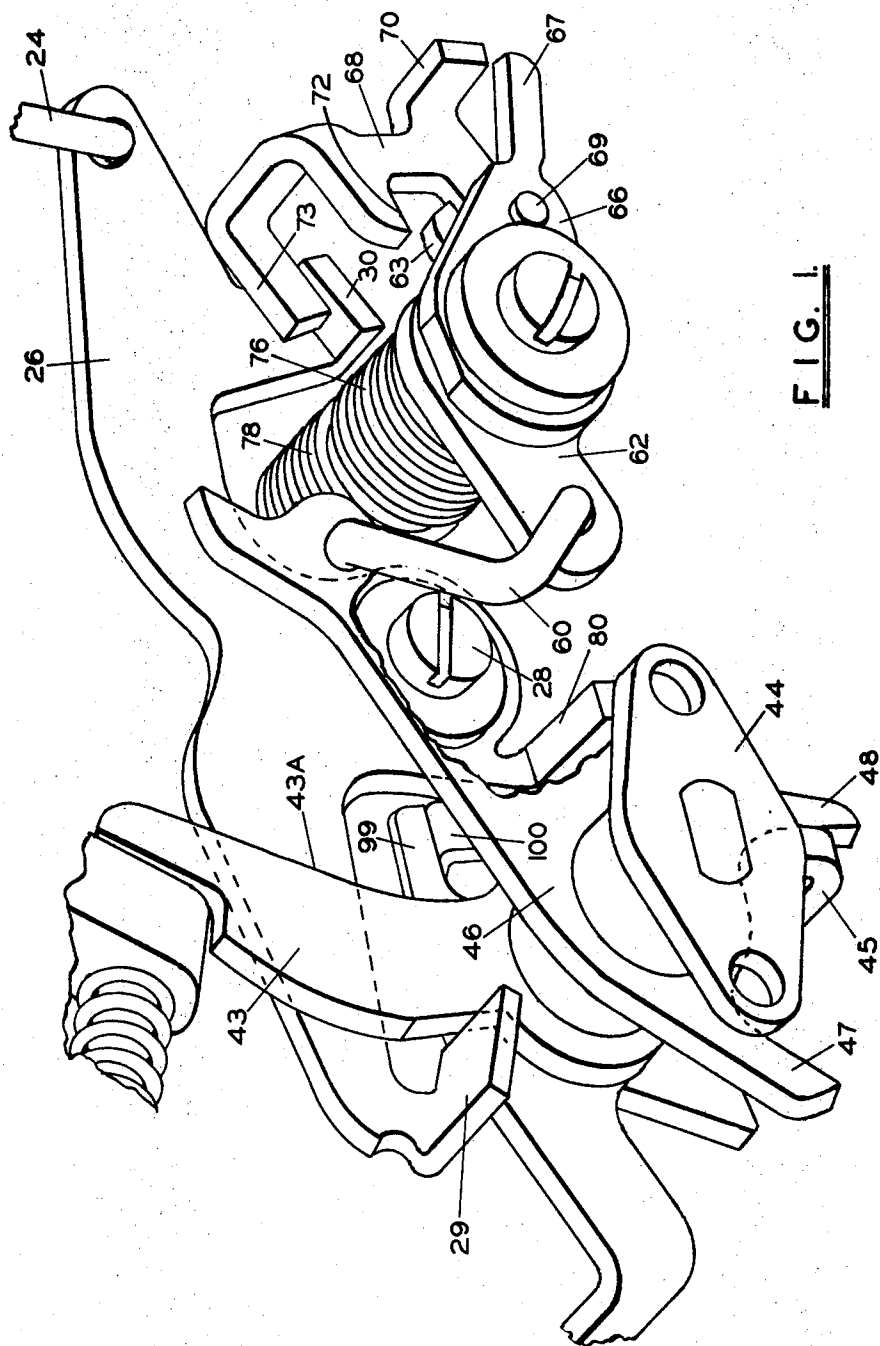
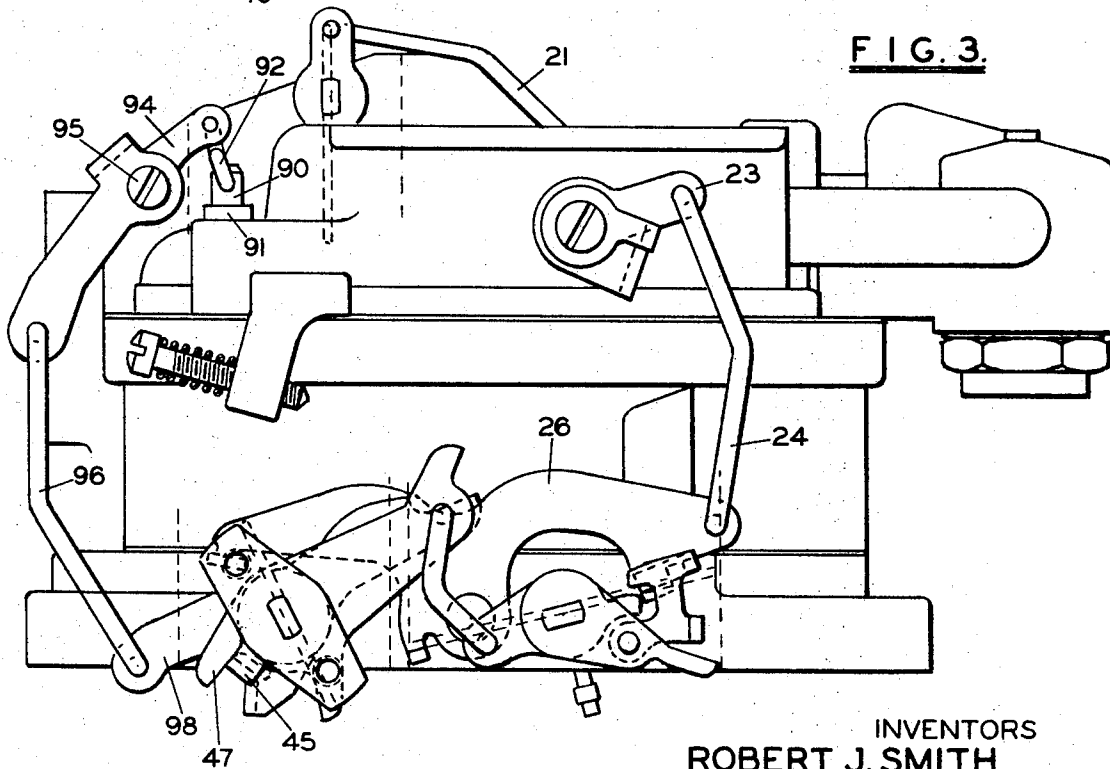
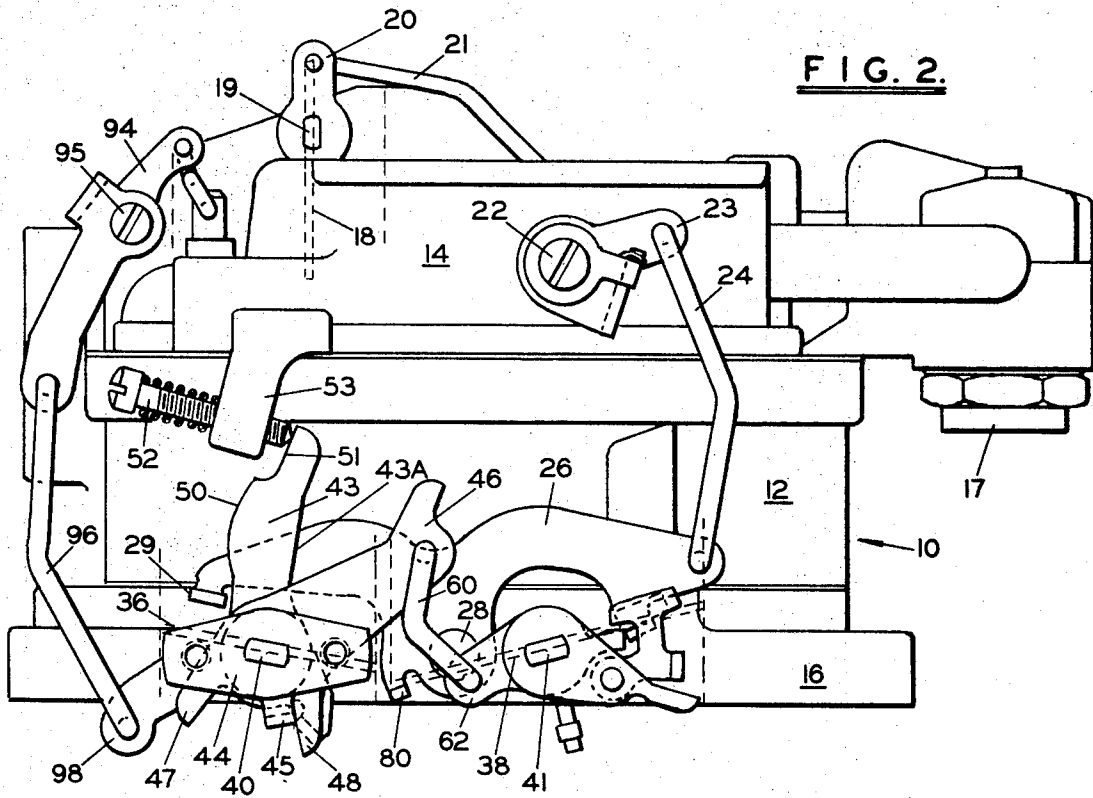
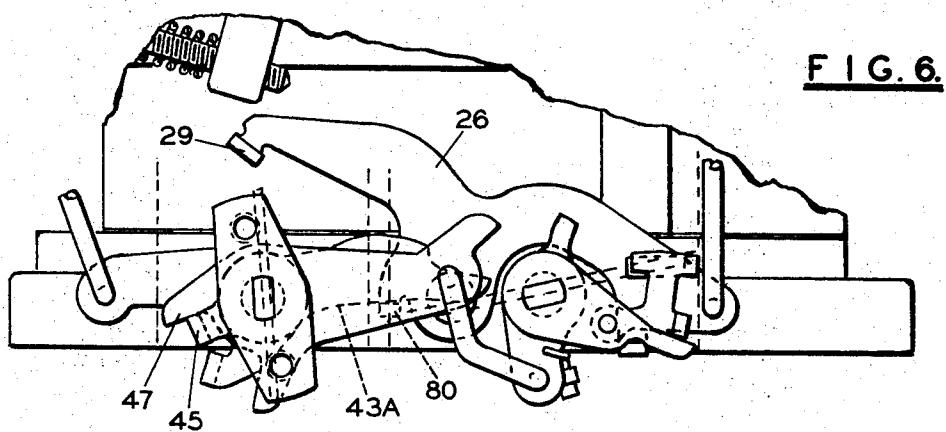
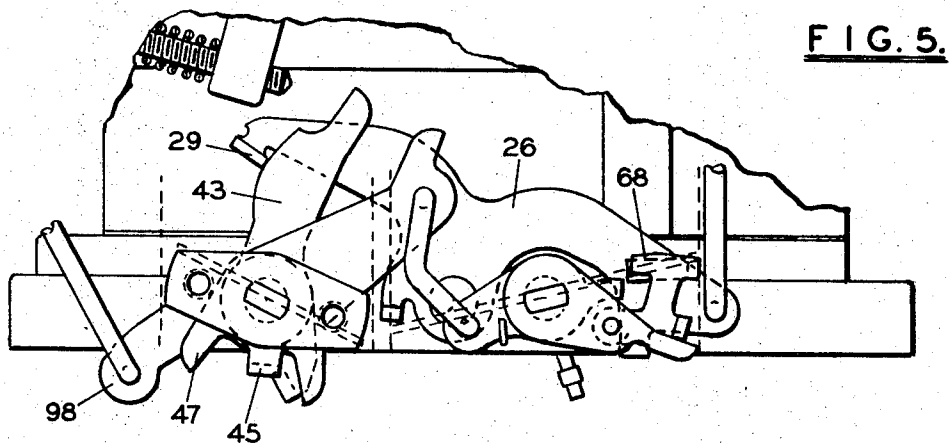
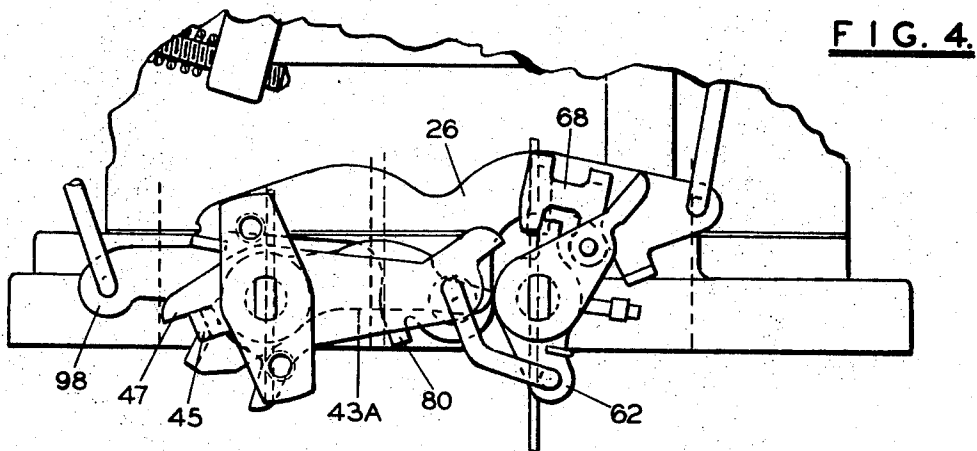


FIG. 1

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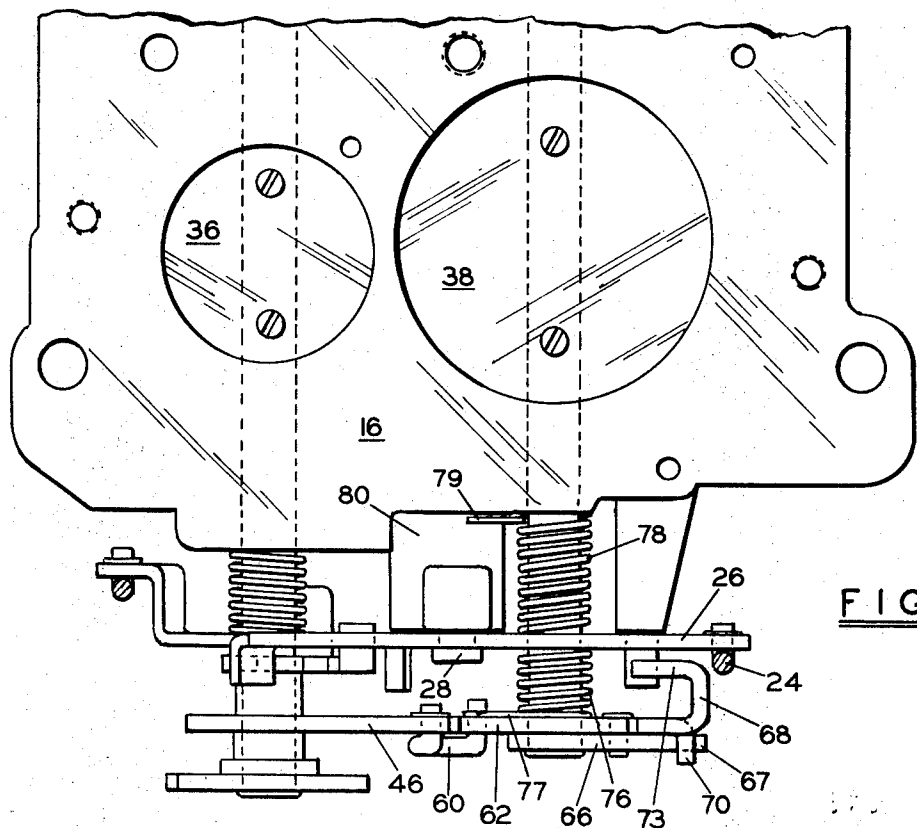


FIG. 7.

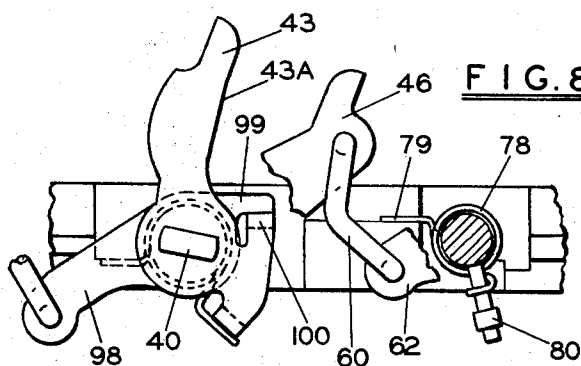


FIG. 8.

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THROTTLE LINKAGE MECHANISM FOR A MULTI-STAGE CARBURETOR

BACKGROUND OF THE INVENTION

Two stage carburetors are well known in the prior art and typically are exemplified in the United States by the well known four-barrel carburetor. Such a carburetor has a pair of primary throttles and a pair of secondary throttles which by way of suitable linkages are caused to open in a sequential manner. When both throttles are fully opened the engine is enabled to deliver maximum performance. In a typical carburetor of the four-barrel variety, cold start and warmup is conducted in such a fashion that the secondary throttles cannot be opened until the engine has warmed up. The conventional practice, in many instances, has been to utilize lever and linkage mechanism that locks the secondary throttle in the closed position until after the engine has reached normal operating temperatures. Usually this involves a rocker arm which is moved by the choke itself and the rocker arm engages a tab on a lever fixed to the secondary throttle shaft to lock it in the closed position. When the choke has opened fully, indicating a normal operating temperature, the rocker arm moves out of the way thus allowing the tab to clear the rocker arm and this in turn allows the secondary throttles to open. When the engine is cold the normal sequential lever and linkage mechanism attempts to open the secondary throttle and as pointed out earlier is prevented from doing so by the rocker arm and tab. However, the linkages make the normal movement required for the normal opening of the secondary throttle and since the throttle is prevented from opening the additional movement is taken care of by way of overcoming the bias of a spring. This results in an objectionable back pressure on the throttle pedal.

Carburetors of the type just described are exemplified by the patent to Ott et al., No. 3,043,572 dated Jul. 10, 1962.

It is an object of the invention to provide a carburetor having primary and secondary linkages that do not present the objectionable feature of overcoming the bias of a spring when the engine is cold and an attempt is made to open the secondary throttle.

BRIEF DESCRIPTION OF THE INVENTION

In the carburetor of this invention there is provided on the primary throttle shaft a lever which is fixed to the shaft and a second lever which is loose on the shaft. After a predetermined amount of opening of the primary throttle, the fixed lever picks up the loose lever. The loose lever is connected by way of a link to a loose lever on the secondary throttle shaft. The secondary throttle loose lever is provided with a tang on one side of the lever. Also mounted on the secondary throttle shaft, and in fixed relation thereto, is a second lever arm which is the operating lever for the secondary throttle. Pivoted upon the operating lever is a latch which can rotate into and out of engagement with the tang on the loose lever. Through suitable linkages the choke valve of the carburetor is connected to a rocker arm which moves in accordance with the position of the choke. When the choke is fully opened the rocker arm by way of a tab moves the latch into engagement with the tang on the secondary throttle loose lever. Once the latch is engaged with the tang, movement of the loose lever then causes the fixed lever to move and the secondary throttles to open.

There is also provided on the primary throttle shaft a loose lever which actuates the accelerating pump of the carburetor. This pump-operating lever is so arranged that it provides for overtravel whenever the accelerating pump bottoms out before the primary throttles are fully opened.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of the principal portion of the levers and linkages of the invention.

FIG. 2 is a side view of a carburetor in warmed-up condition with choke off and throttles closed.

FIG. 3 is a side view similar to FIG. 2 but showing the primary throttle in the partly opened position.

FIG. 4 is a view of a carburetor with the choke open and with primary and secondary throttle valves in the fully opened position.

FIG. 5 is a side view of a carburetor with the choke closed or partially closed and with the primary throttle in a partially open position.

FIG. 6 is a side view of a carburetor similar to FIG. 5 showing that when the choke is closed or partially closed the primary throttles can be moved to fully open position without moving the secondary throttles.

FIG. 7 is a plan view of a throttle flange showing the relationship of the levers and linkages of the invention, and

FIG. 8 is a breakaway view of a portion of the throttle flange showing springs used as throttle return springs.

DETAILED DESCRIPTION OF THE INVENTION

The carburetor of the invention is of the staged variety in which there is one or a plurality of primary throttles and one or a plurality of secondary throttles. Although not shown or described, it will be appreciated that the carburetor is provided with a fuel supply, the usual fuel circuits and an air-fuel mixing chamber.

Carburetor 10 is provided with a central body 12, an air horn 14 and a throttle flange 16. The throttle flange may be separate from the body 12 as shown or may be integrally formed therewith. Fuel is supplied to an inlet fitting 17 of the carburetor and is regulated by a fuel control valve of conventional nature. The primary side of the carburetor air horn is provided with a choke valve 18 mounted on a shaft 19. The choke valve control mechanism is not shown but can be manual or automatic as is well known in the art. A lever arm 20 on the choke shaft is connected by way of a link 21 to a countershaft 22. Thus countershaft 22 rotates as a function of rotation of the choke shaft 19. A lever 23 on countershaft 22 is connected by link 24 with fast idle arm 26. Fast idle arm 26 is rotatably mounted on a pivot pin 28 fastened to the throttle flange 16. Arm 26 is provided with a bent over portion or tab 29 which coacts with a fast idle cam to speed up the engine during cold starting and warmup. As shown tab 29 is at the opposite end of fast idle arm 26 from the end which is connected to the choke countershaft. Arm 26 is further provided with a secondary throttle engagement tab 30 located at the end of arm 26 which also receives connecting link 24.

The carburetor is provided with a primary throttle shaft 40 and a secondary throttle shaft 41 which are respectively provided with a primary throttle 36 and a secondary throttle 38. Mounted on primary throttle shaft 40 is a fast idle cam 43 and a throttle lever 44. Throttle lever 44 is driven by way of a rod through the customary foot pedal on the interior of the vehicle. Fast idle cam 43 and throttle lever 44 are both fixed on the shaft 40. Loosely mounted on shaft 40 is a primary throttle shaft arm 46. Arm 46 has pickup ear 47 and a return ear 48. Throttle lever 44 is provided with a rearwardly turned ear engagement tab 45 which coacts with ears 47 and 48 as hereinafter described. Fast idle cam 43 is provided with a cam surface 50 for increasing the speed of the engine when the engine is cold and is further provided with an idle speed adjustment surface 51 which by way of screw 52 adjusts the speed of the engine when the engine is warm. Screw 52 is threadably engaged with a boss 53 which is a part of air horn 14.

Primary throttle shaft arm 46 is connected by way of a link 60 to an operating lever 62 loosely mounted on secondary shaft 41. Loose lever 62 has an operating tang 63. (See FIG. 1) Mounted on shaft 41 and in fixed relation thereto is a secondary throttle actuating lever 66 having a tang 67. A latching lever 68 is mounted on lever 62 by way of a pivot pin 69. Latch 68 is so arranged that its own weight normally causes the latch to fall into a downward position in which a tab 70 rests on the tang 67. This prevents the latch from dropping completely out of position. Lever 68 is provided with a

latching surface or dog 72 which cooperates with the tang 63 in a manner to be hereafter described. Lever 68 is further provided with a tab 73 which engages the tab 30 on fast idle arm 26 when the fast idle arm is in certain positions. A coil spring 76 urges loose lever 62 into a normal throttle closed position and a coil spring 78 urges throttle shaft 41 into a normally throttle closed position. Each of coils 76 and 78 have one end of the coil encircling a pin 80 which is fastened to the shaft 41. Spring 76 has its other end 77 resting upon an end of link 60 to thereby complete the biasing force necessary to move operating lever 62. The other end 79 of spring 78 rests upon a boss 80 on carburetor flange 16.

The operation of the carburetor as thus far described will now be given. Reference is made in particular to FIGS. 1, 5 and 6 for the cold phase operation. With the choke closed or partly closed rod 24 moves the fast idle arm to a low position. This low position causes the tab 29 on arm 26 to rise into engagement with the fast idle surface 50 thus propping the throttle open a small amount as shown in FIG. 5.

Upon additional opening movement of the primary throttle tab 45 on throttle lever 44 moves into engagement with pickup gear 47 thus causing lever 46 to move. Movement of lever 46 causes loose lever 62 to move by way of link 60. Because rod 24 is holding idle arm 26 in a low position, latch 68 is in a nonengageable position and movement of lever 62 results in a condition where the tang 63 does not engage latching surface 72 (See FIG. 6) and the primary throttle moves to a fully open position without movement of the secondary throttle.

As shown in FIGS. 3 and 4 a different result is obtained when the choke is fully opened indicating a warmed-up engine. When the engine is warm, rod 24 pulls idle arm 26 upwardly and this in turn causes tab 29 at the other end of arm 26 to move into a low position away from the fast idle surface 50 and at the same time pulls tab 30 upwardly to raise latch 68 into a position where it can and will engage the tab 63 of loose lever 62. Thus opening the primary throttle will result in tab 45 contacting pickup gear 47 thus causing loose lever 46 to drive loose lever 62 through link 60. Movement of lever 62 will cause tab 63 to engage latching surface 72 of latch 68 to drive lever 66 by way of pivot pin 69 and since lever 66 is fast on secondary throttle shaft 41 the secondary throttle 38 will open. When the primary throttle is returned to a closed position, biasing spring 78 will normally urge the secondary throttle into a closed position. However, to insure positive movement of the secondary throttle, tab 45 moves into engagement with return ear 48 and this in turn drives loose lever 46 and hence lever 62 into a throttle closed position. At that time the tang 63 contacts latch 68 and this also forces the secondary throttles into a closed position.

Additional features are to be found in the linkages described thus far to perform still further useful functions. One of these is the unloader function which opens the choke a small amount upon wide open throttle position of the primary throttles so that flooding that might have occurred during cranking can be purged. Recalling that rod 24 moves in an upwardly direction as the choke moves toward the fully open position, it will be apparent that any action aimed at moving the rod 24 in an upwardly direction will serve the purpose of the unloading function. This is accomplished by a tab 80 on fast idle arm 26 and the back surface 43a of the fast idle cam 43. If the choke is fully closed rod 24 will be in its lowest possible position. Then if the primary throttle is moved to its wide open position surface 43a will contact tab 80 causing arm 26 to rotate about the pivot 28 thus forcing rod 24 upwardly which in turn will open the choke a slight amount. The additional air permitted to pass the choke valve will then purge the manifold and cylinders of any excess gasoline that may have caused a flooding condition.

Another important feature of the invention resides in the accelerator pump-actuating control. This can best be understood by reference to FIGS. 1, 3 and 8. The carburetor is provided with an accelerating pump (not shown) which is of

the type that is biased in the pumping direction by a spring inside the pumping chamber. A stem 90 holds the pump piston in an uppermost position when the throttle is closed and when the stem 90 is released the internal spring forces the piston downwardly to cause the pump to discharge a metered amount of fuel. A link 92 connects the stem 90 to a pivoted lever 94. When the stem 90 moves downwardly link 92 strikes a boss 91 to limit the travel of the pump. This amount of travel represents only a few degrees of throttle movement.

Lever 94 is pivoted at 95. A link 96 connects an end of lever 94 with a loose lever 98 which is rotatably mounted on the primary throttle shaft 40. Lever 98 has a tab 99, and fast idle cam 43, which is fast on shaft 40 has a tab 100.

From the description just given it will be apparent that stem 90 is urged in a downwardly direction at all times. This results in a biasing force on link 96 which attempts to raise one end of lever 98 and simultaneously urge tab 99 in a downward direction. When the throttle is closed tab 100 on fast idle cam 43 prevents the stem 90 from dropping. As the throttle moves toward an open direction tab 100 moves downwardly and tab 99 follows it until the link 92 strikes boss 91. At this time additional movement of the primary throttle will cause the tab 100 to move away from tab 99 and thus compensate for what otherwise would have been an overtravel condition.

We claim:

1. In a multistage carburetor having a choke valve, a primary throttle moveable by a primary throttle shaft and a secondary throttle moveable by a secondary throttle shaft, lever and linkage mechanism for the sequential operation of said shafts as a function of engine temperature comprising:

- A. an idle arm pivoted at its center and having a first end linked with a lever indicative of choke position,
- B. a primary throttle lever fixed to said primary throttle shaft and having a pickup tab struck out from said lever,
- C. a primary loose lever on said primary throttle shaft and having pickup and return means engageable by said pickup tab,
- D. a secondary loose lever on said secondary shaft and having an operating tang at one side thereof,
- E. connecting means for connecting said primary loose lever with said secondary loose lever,
- F. a secondary throttle lever fixed to said secondary throttle shaft, said secondary lever having a latching means pivoted thereon, said latching means being engageable with said operating tang, and
- G. engagement means on said idle arm for moving said latching means into engagement with said operating tang when said choke is fully open and for preventing such engagement when the said choke is partially closed whereby the said secondary throttle can be opened when said choke is open but will not be opened when said choke is at least partially closed.

2. A carburetor according to claim 1 including a fast idle cam fixed to said primary throttle shaft, a fast idle cam surface on said cam, an engagement surface opposite said cam surface, and a tab on a second end of said idle arm, said tab contacting said fast idle surface when said choke is not fully open whereby to partially open said primary throttle.

3. A carburetor according to claim 2 including an unloading tab on said idle arm, said unloading tab being located on said idle arm on the same side of the pivot as the said second end, said unloading tab being engageable by said unloading surface when said primary throttle is in a fully open position to thereby open said choke at least a small amount.

4. A carburetor according to claim 2 including an accelerating pump operating lever loosely mounted on said primary throttle shaft, said operating lever being connected at one end to an accelerating pump of the said carburetor, said operating lever having a tab at its other end, said fast idle cam having a pump control surface engageable with said operating lever tab, said control surface acting to move said pump in a direction to fill said pump when the said primary throttle is closed and to move away from said operating lever tab when said primary throttle is opened.