Feb. 28, 1928. 1,660,731

C. F. TAYLOR

AUTOMATIC THROTTLE STOP

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Fig. 1.

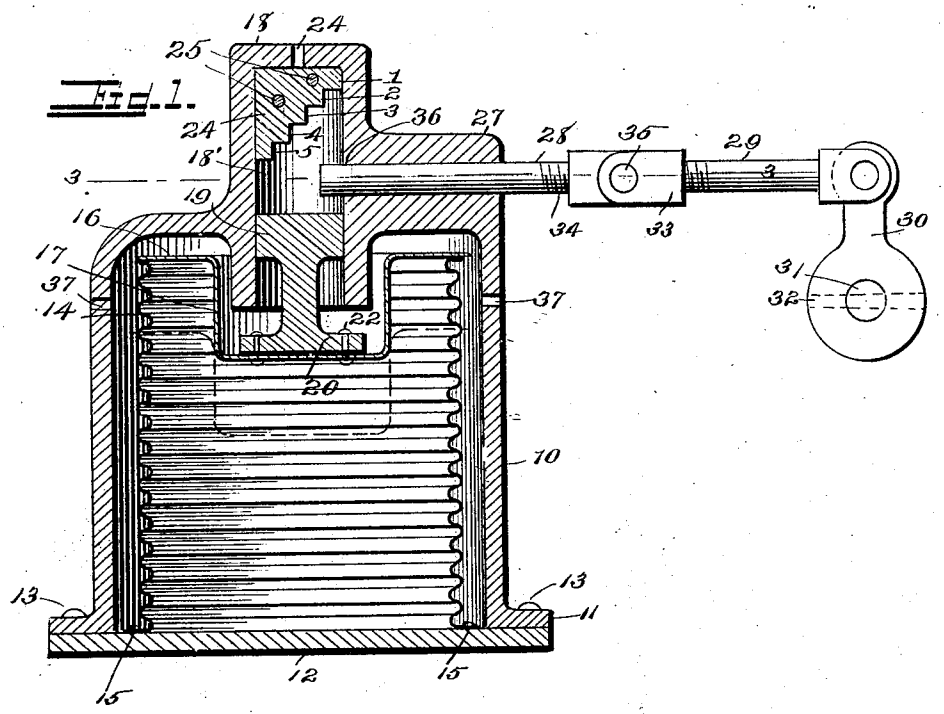
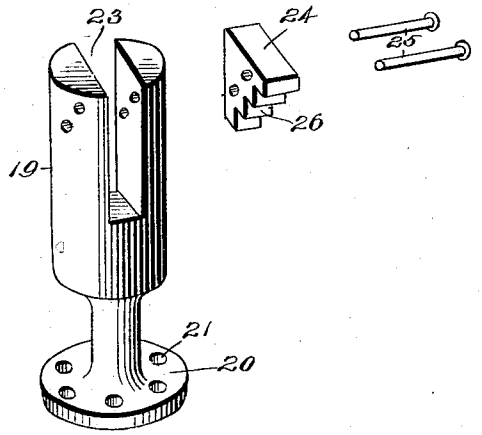


Fig. 2.



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Fig. 4.

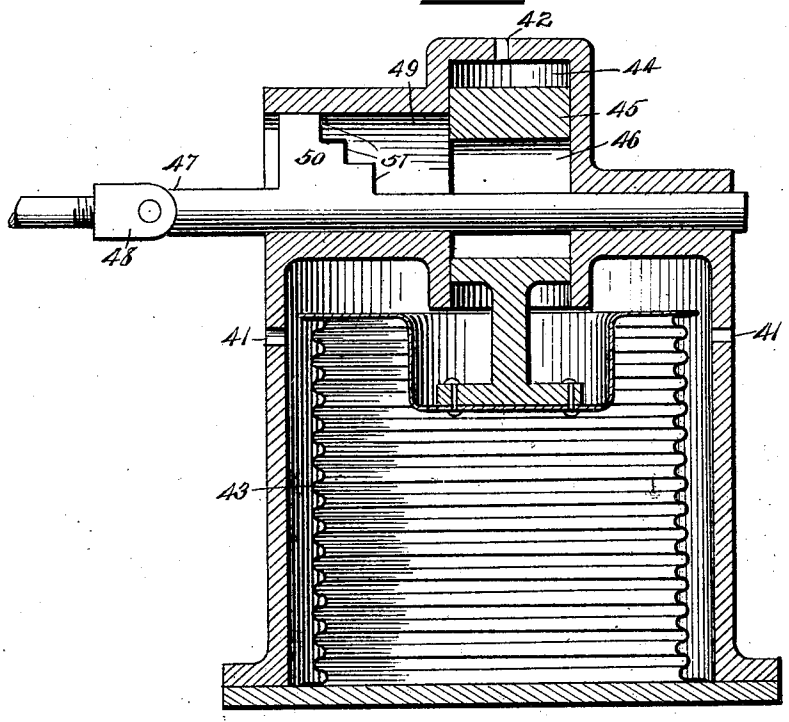
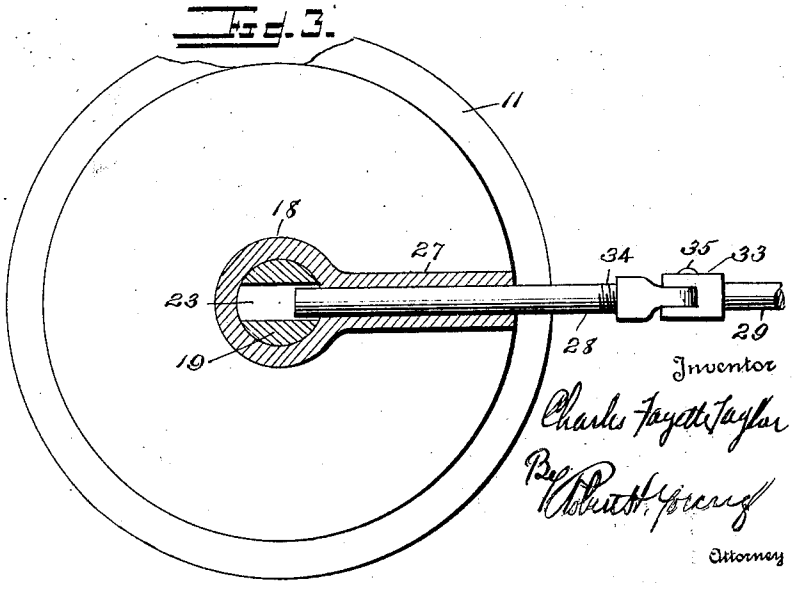


Fig. 3.



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UNITED STATES PATENT OFFICE.

CHARLES F. TAYLOR, OF DAYTON, OHIO.

AUTOMATIC THROTTLE STOP.

Application filed August 1, 1921. Serial No. 488,999.

This invention relates to an automatic throttle stop and is particularly adapted to be used in connection with the internal combustion engines of aircraft.

According to my invention a device responsive to differences in atmospheric pressure, such as a sylphon, is utilized to vary the position of a stop device in accordance with the atmospheric pressure at the altitude at which the aircraft is flying. The stop device is provided with a series of stepped surfaces which are adapted to be placed in alignment with a rod connected to the throttle shaft of the engine so as to limit the movements of the throttle valve in accordance with the position of the particular surface thus presented to the rod. The various parts of the mechanism are arranged so that the motion of the throttle is restricted without imposing any strain on the sylphon.

The nature of the invention will become apparent on reference to the following specification which describes the invention in connection with the accompanying drawings.

In the drawings, similar reference characters designate corresponding parts throughout the several views, which may be identified as follows:

Figure 1 is a central vertical section through the casing of the mechanism;

Figure 2 is a detail perspective view of the plunger, stepped block and rivets in disassembled relation;

Figure 3 is a sectional view on the line 3—3 of Figure 1; and

Figure 4 is a central vertical section of a modified form of the invention.

The numeral 10 designates a hollow, rigid casing which is preferably of cylindrical form and provided with a bottom flange 11, which is secured to a base plate 12 by means of suitable fastening devices 13. A sylphon 14 is attached at its lower end to the base plate 12 by means of rivets 15, and the upper end of the sylphon is closed by means of a sheet metal cap 16 which is bent inwardly so as to form the central depression 17. The sylphon is preferably filled with dry air under desired pressure and hermetically sealed. The top of the casing is elongated at 18 and this portion is bored or otherwise suitably formed to provide a cylindrical chamber 18′ in which a plunger 19 is adapted to reciprocate. The plunger is formed with a lower flange 20 provided with apertures 21 for receiving rivets 22 which secure the flange to the sheet metal cap 16 at the central depression 17. The plunger 19 is longitudinally slotted at its upper end as indicated at 23 and a case hardened steel block 24 is inserted in the slot 23 and retained therein by means of rivets 25 which pass through aligning apertures formed through the bifurcated portions of the plunger and the block 24, repectively. The block 24, as illustrated, has substantially the section of a right triangle and the hypotenuse or lower side in this case is provided with a series of stepped surfaces, herein given the general designation 26 but designated successively in Figure 1 as 1, 2, 3, 4, 5.

Adjacent the elongated portion or boss 18 of the casing an offset portion 27 is provided, and this offset portion is formed with a lateral opening which intersects the cylindrical chamber 18′ at a point within the range of the entire movement of the stepped block. A hardened steel rod 28 is inserted through the lateral opening of the offset portion and this rod is pivotally connected with a link 29, which in turn is pivotally connected to an arm 30 secured to shaft 31 of the throttle valve by means of a tapered pin 32. The connection between the rod 28 and link 29 is preferably of the type which will permit longitudinal adjustment and for this purpose a coupling 33 is used, having a threaded socket, for engaging the threads 34 formed on the outer end of the rod 28. The coupling 33 is formed with a suitable aperture and is adapted to engage in the bifurcated end of the link 29 and is pivotally connected thereto by a pivot pin 35.

This apparatus is intended especially for use with engines which are intended for full throttle operation at high altitudes only, and which must not be operated at full power below a certain specified altitude. When the engine is at sea level the normal position of the upper end 16 of the sylphon is shown by the dotted lines in Figure 1. This brings the plunger 19 and the stepped block into such position that the topmost step 1 of the block is placed opposite the lateral opening in which the rod 28 operates, thereby limiting the inward travel of the rod to a point which is practically flush with the side walls of the cylinder 18′ as indicated by the numeral 36 in Figure 1. As the airplane ascends to higher altitudes, the decreased atmospheric pressure is transmitted to the interior of the casing through the vents 37 which pierce

the side walls thereof. This reduction of pressure within the casing allows the air in the sylphon to expand and gradually increase the length of the sylphon and thereby move the plunger 19 upwardly. This action of the plunger is communicated to the stepped block and, as the steps of the block are positioned successively opposite the rod 28, the latter is allowed a correspondingly increased travel and when the altitude is reached at which the engine may be operated with the throttle wide open, the block 24 is entirely out of the path of the rod 28 whereby the latter is granted a free movement and may move to the other side of the cylindrical portion 18. In this last position of the block 24, the engine throttle may be opened as wide as desired.

The sylphon 14 and the block 24 may be so designed as to limit the travel of the throttle below any specified altitude, depending, of course, upon the size and stiffness of the sylphon and the height and number of steps in the block, and it will be understood that these arrangements can be varied to suit any type of engine. It is desired to call particular attention to the fact that the restriction of the motion of the throttle by the stepped block does not impose any strain on the sylphon or the connection between the sylphon and the plunger as the impact is taken up by the side walls of the cylindrical chamber 18'. In order to provide freedom of movement for the plunger 19, the top of the cylindrical chamber is preferably formed with a vent 38 which permits air to escape from the chamber during the upward movement of the plunger.

Figure 4 illustrates a modified form of my invention in which a casing 40 provided with vents 41 and 42 encloses a sylphon 43. This casing is also formed with a longitudinal chamber 44 in which a plunger 45, secured to the sylphon 43, is adapted to reciprocate. The plunger 45 has a transverse bore 46 which provides a clearance for a rod 47. The rod 47 is connected to the throttle valve of the engine by means of a link 48. The top of the casing 40 is formed with an enlarged transverse chamber 49 placed substantially at right angles to the chamber 44. A lug or block 50 projecting from the rod 47 has sliding engagement with the walls of the chamber 49 and is provided with stepped surfaces 51 adapted to engage against the adjacent side of the plunger 45 in accordance with the position of said plunger as determined by the sylphon 43. The rod 47 is provided with an extension 52 which is guided in a lateral opening in the top of the casing formed on the side of the chamber 44 opposite from the chamber 49.

The operation of this modified form of my invention is similar to that described above in connection with the embodiment thereof illustrated in Figures 1, 2 and 3. The stepped surfaces, however, are carried by the slidable rod 47 and abut against the adjustable plunger 45 to limit the opening of the throttle valve to various extents depending upon the altitude of the aircraft.

It is obvious that modifications in the structure herein illustrated and described may be made by those skilled in the art to which this invention appertains without departing from the spirit and scope of the invention as defined in the appended claims.

I claim:

1. In a device of the class described, the combination with the throttle valve of an internal combustion engine, and devices connected to the throttle valve and movable therewith, of a block adjustable in position adapted to coact with said devices for limiting the extent of the opening movements of said valve, and mechanism responsive to changes in atmospheric pressure for adjusting the position of said block.

2. The combination with the throttle valve of an internal combustion engine of an aircraft, and a rod connected to the throttle valve and movable therewith, of a casing having a chamber formed therein, a plunger adapted to reciprocate in said chamber, a device responsive to changes in atmospheric pressure for actuating said plunger, and a stop block connected to said plunger for limiting the movement of said rod in one direction whereby impact between said rod and block is communicated by the plunger to the walls of said chamber without imposing undue strain on said device.

3. In combination with the throttle valve of an internal combustion engine, a pressure responsive device, an element operatively connected to the throttle valve, an element operatively connected to the pressure responsive element, one of said elements having stepped surfaces engageable with the other element for limiting the movement of the throttle valve in accordance with the atmospheric pressure.

4. The combination with the throttle valve of an internal combustion engine of an aircraft, and devices connected to the throttle valve and movable therewith, of a casing having vents communicating with the atmosphere and a chamber formed therein, barometric means within said casing, and a plunger connected to said means and adapted to reciprocate in said chamber in accordance with the movements of said means, said devices including stepped surfaces adapted to coact with said plunger for limiting the movement of the throttle valve to various extents depending upon the altitude of the aircraft.

In testimony whereof I have affixed my signature.

CHARLES F. TAYLOR.