United States Patent

Cunning et al.

[15] **3,640,128**

[45] **Feb. 8, 1972**

[54] THROTTLE VALVE GAUGE

[72] Inventors: **Alfred C. Cunning**, Indianapolis; **Harry D. Wolverton**, Brownsburg, both of Ind.

[73] Assignee: **General Motors Corporation**, Detroit, Mich.

[22] Filed: **Oct. 10, 1969**

[21] Appl. No.: **875,280**

[52] U.S. Cl. ..... **73/118**, 33/181 AT

[51] **Int. Cl.** **G01m 13/02**

[58] **Field of Search** ..... 73/118, 119; 116/136.5; 33/180 AT, 181 AT

[56] **References Cited**

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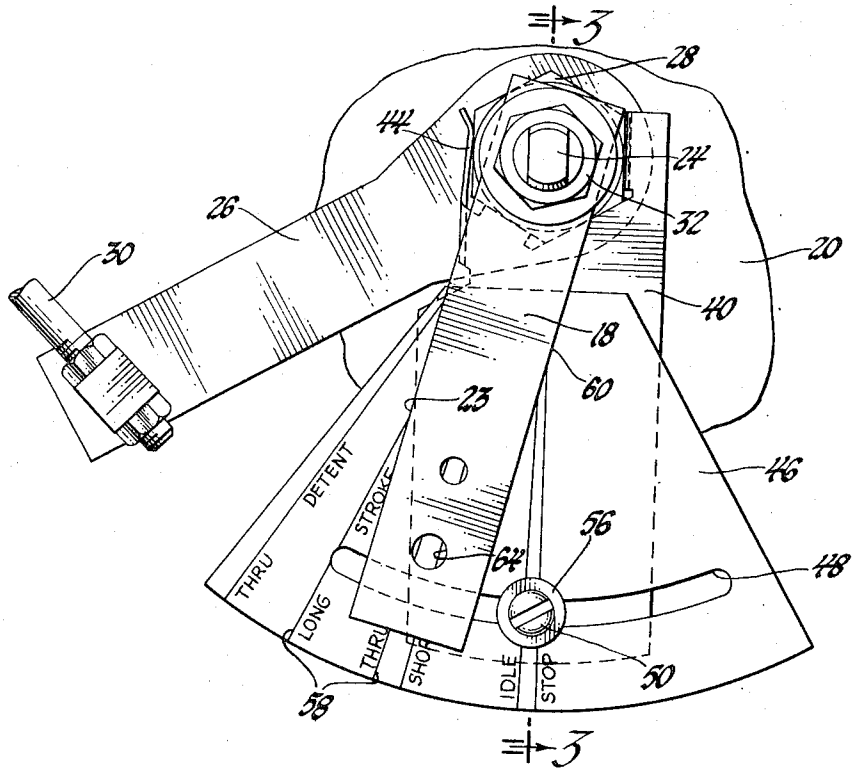
Primary Examiner—Jerry W. Myracle

Attorney—W. E. Finken, A. M. Heiter and Charles R. White

[57] **ABSTRACT**

This gauge has a base member with a jaw which clamps to the selector lever nut of a transmission control to hold the gauge on the transmission housing. There is a gauging plate having spaced indicia thereon which indicates proper positions of the throttle valve lever from a fixed station when actuated by throttle pedal through the throttle valve linkage. The gauging plate is adjustably mounted on the base so that particular indicia on the plate can be aligned with the throttle valve lever when the lever is at a predetermined position to serve as a starting point in determining whether the linkage will accurately move the lever to other predetermined positions.

5 Claims, 5 Drawing Figures



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SHEET 1 OF 2

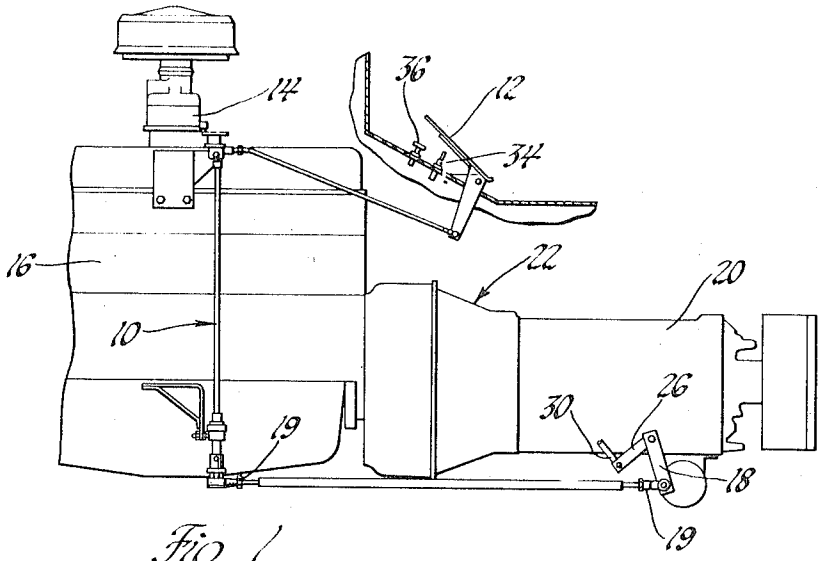


Fig. 1

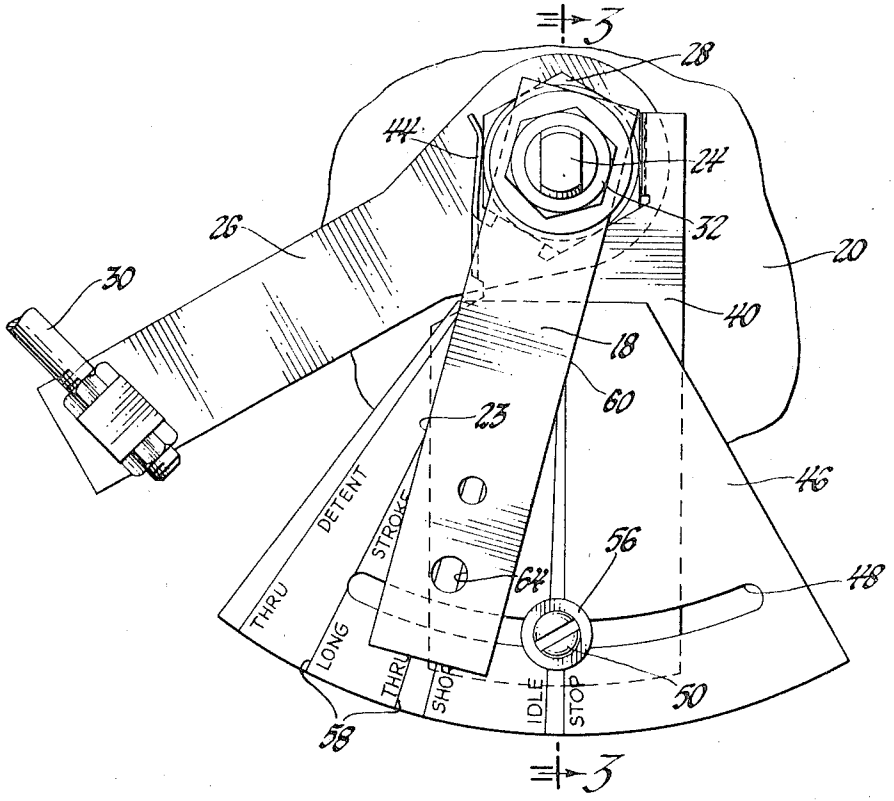


Fig. 2

INVENTORS.
Alfred C. Cumming &
BY Harry D. Wolverton
Charles L. White
ATTORNEY

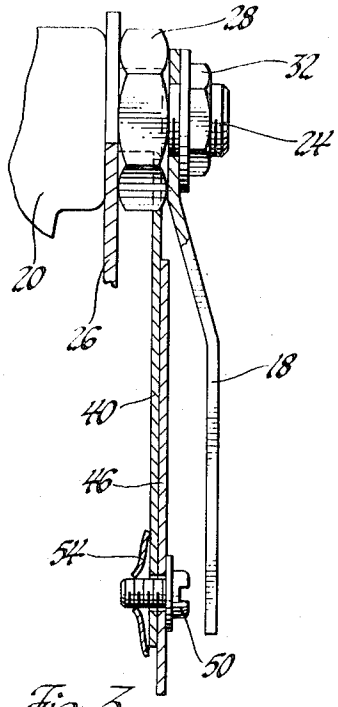


Fig. 3

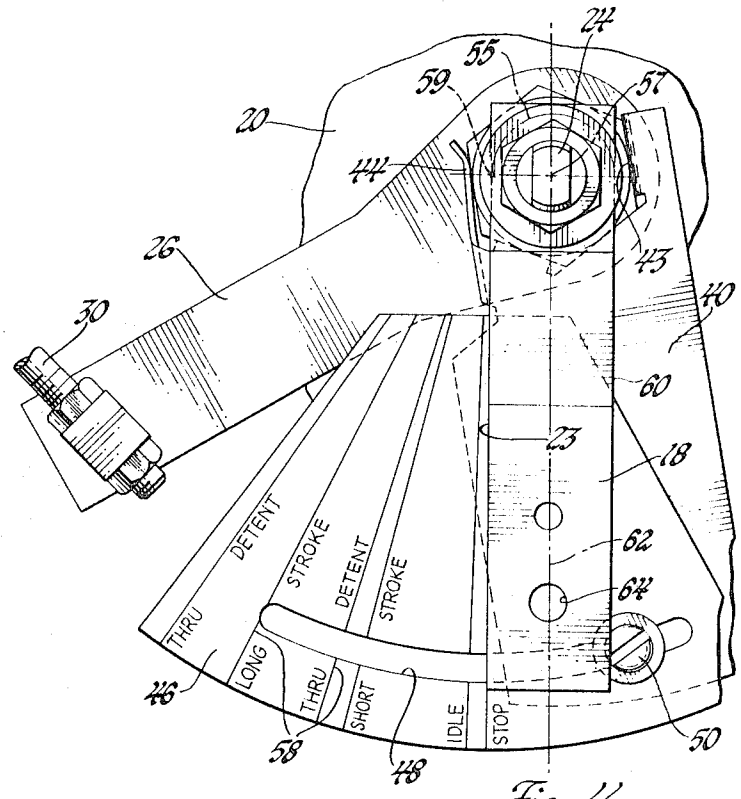


Fig. 4

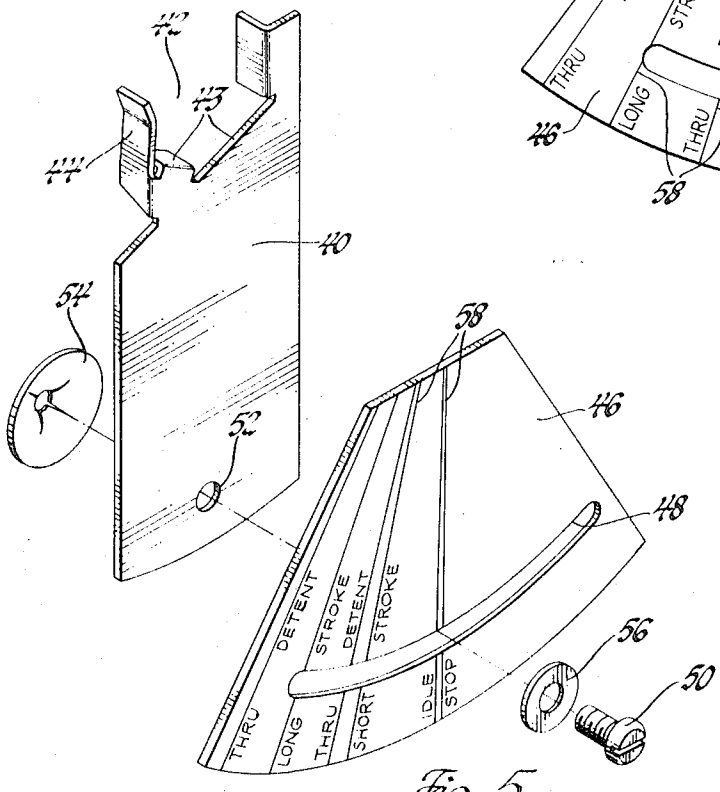


Fig. 5

INVENTORS.
Alfred C. Cunning &
BY Harry D. Wolverton
Charles R. White
ATTORNEY

THROTTLE VALVE GAUGE

This invention relates to gauges for setting and checking controls and more particularly to a throttle valve gauge for checking the adjustment of the throttle valve linkage in an automatic transmission so that throttle valve means of transmission controls precisely reflects torque demand signals.

Accurate adjustment of the throttle valve or TV linkage of transmission controls is necessary so that the throttle valve means in the automatic transmission controls accurately provides torque demand signals in the controls in response to movement of the throttle pedal. If the TV linkage is not properly adjusted the throttle valve pressures of the transmission controls will be inaccurate and the transmission will not perform at its highest efficiency.

With this invention the TV valve linkage connecting the throttle control and the TV lever can be quickly checked and adjusted so that the transmission operation is fully responsive to vehicle operating signals. This invention comprises a gauge which is easy to use and does not require any particular special skills to operate and is substantially foolproof. With this gauge, field adjustments can be readily made thereby reducing downtime for repair and adjustment.

In this invention a gauge is provided which has a base member that can be readily anchored to the selector nut on the transmission. Adjustably mounted on the base member is gauging plate having indicia thereon representative of proper throttle lever positions when moved by throttle control linkage. The plate can be positioned so that particular indicia is aligned with the edge of the TV lever when that lever is moved to a predetermined first station. The adjustable member is then locked to the base member and the gauge can be used as a sight gauge to adjust the linkage by determining if the linkage, moves the lever to a full throttle position, a through detent position or to idle position.

It is an object of this invention to provide a new and improved gauging mechanism for checking and adjusting throttle valve linkages operatively connecting a manual control, a fuel control and a TV lever.

Another object of this invention is to provide a new and improved gauge for adjusting the throttle valve linkage operatively connected to an automatic transmission which gauge includes a base member that can be easily attached to the selector lever nut mounted on the transmission; the gauge has a movable plate thereon with indicia which represents various positions of the TV lever from a predetermined station and indicates whether or not the linkage is moving the TV lever to proper stations when actuated by the foot pedal or other control.

These and other objects of the invention will become more apparent from the following detailed description and drawings in which:

FIG. 1 is a side view partly in section of a portion of a vehicle body, an engine, a transmission and transmission throttle valve controls.

FIg. 2 is a side view of a gauge which is used for adjusting transmission throttle valve controls.

FIG. 3 is a view taken along lines 3—3 of FIG. 2.

FIG. 4 is a view similar to FIG. 2 illustrating adjustment of the gauge.

FIG. 5 is a perspective view of the throttle valve gauge of this invention.

Turning now to details of the preferred embodiment of the invention there is shown in FIG. 1 a conventional throttle valve linkage **10** operatively connecting throttle or accelerator pedal **12** to the carburetor **14** of engine **16** and to the throttle valve or TV lever **18**. The linkage has adjusting nuts **19** which can be turned to change and adjust the dimensions of the linkage. As shown, the linkage is connected to one end of the TV lever **18** which is mounted for limited pivotal movement on the outside of the housing **20** of transmission **22**. The transmission is automatic and may have six forward drive gear ratios. As shown, the TV lever has a straight side edge **23** which can be used as a sight edge for gauging purposes as will appear below.

The TV lever **18** is keyed or otherwise fixed to a shaft **24** that extends to the inside of the transmission housing and this shaft has an internal throttle valve lever similar to lever **54** of U.S. Pat. No. 3,180,173 to M. E. Fisher et al. As disclosed in that patent, the internal lever is in contact against one end of the throttle valve element **51** to exert a force on that valve element to adjust its position in accordance with different accelerator positions such as light throttle, part throttle or full throttle. With the throttle valve properly positioned the throttle valve and throttle regulator valve generate appropriate torque demand signals for accurate transmission control.

The throttle valve shaft extends through a selector valve shaft assembly that is mounted for limited rotational movement in the transmission housing **20**. The selector valve shaft assembly has an external selector valve lever **26** keyed thereto which is held on the shaft by a nut **28**. The selector valve lever is operatively connected to a manual selector lever, not shown, by linkage **30**. As shown best by FIGS. **2**, **3** and **4** the TV lever is spaced outwardly from the selector lever and is held on shaft **24** by nut **32**.

By depressing the accelerator pedal the linkage **10** will be actuated to rock the TV lever **18** clockwise and thereby exert a force on the TV valve in accordance with torque demanded by the vehicle operator. It will be appreciated that the number of degrees which the TV lever is turned affects the position of the TV valve and the throttle regulator valve and their control pressures. It is accordingly necessary to ensure that the linkage is properly adjusted so that the TV valve and TV regulator valve will properly register torque demand.

When the pedal is depressed into initial contact with the floor-mounted detent **34** the throttle valve in the carburetor or other fuel control is at full fuel control opening. At this point, positive resistance to further pedal movement is experienced by the vehicle operator. The pedal can be moved through detent by pushing through the pedal resistance to move the throttle valve to a downshift position so that it effects a forced downshift of the transmission. Pedal travel is limited by the adjustable stop **36** contacting the pedal. When the pedal is released, spring means, not shown, force the pedal to the engine idle position shown.

FIGS. **2** through **5** illustrate the preferred embodiment of the gauge of this invention for accurately and precisely adjusting the TV lever and the TV linkage. The gauge has an elongated base **40** preferably of metal which has a jaw **42** formed at one end. The jaw is open ended and has angularly related faces **43** which contact the faces of a nut such as the hex nut **28** of the shifter lever assembly. As illustrated, the jaw has a springlike jaw member **44** which yields to allow easy installation of the base on the nut and which exerts a clamping force on the nut to securely retain the base thereon.

A special gauging plate is slidably and pivotally mounted on the base. This is preferably accomplished by forming the plate with an arcuate slot **48** and securing the plate to the base by a retaining bolt **50** which extends through the slot **48** and through an opening **52** in the base both being slightly larger than the shank of the bolt. The bolt is retained on the base by a suitable nut **54** and a washer **56** may be employed between head of the bolt and the gauge plate.

As illustrated in FIG. **4**, the gauge plate has a series of spaced radial lines formed thereon which radiate from points on an arcuate locus **55**. This locus has a center **57** coinciding with the axis of shaft **24** and has a radius normal to edge **23** which is equal to the distance from center **57** to point **59** on the edge **23** of the TV lever. With this construction the radial lines can be employed with high precision with the edge **23** of the TV lever serving as an indicator edge. Thus, as the lever **18** is turned the edge **23** can be aligned with any of the radial lines **58**. As shown best in FIGS. **2**, **4** and **5** these lines are marked—THRU DETENT, LONG STROKE, THRU DETENT, SHORT STROKE, IDLE and STOP.

Before the gauge is employed in adjusting the TV linkage it is highly desirable to adjust the foot pedal linkage to allow full fuel control opening at detent or the full throttle position.

Also, with the pedal and fuel control linkage properly adjusted, the engine speed is set for idle and for proper governed speed as indicated by engine section of users manual and set with selector in neutral and accelerator at full throttle. After the engine and foot pedal linkage are adjusted to allow full fuel control opening, the invention is used to check transmission TV lever travel when moved by pedal **12** and the TV linkage **10**.

First the base of the gauge is installed by clamping the jaw on the selector lever nut **28** and the linkage **10** is disconnected at the TV lever. The TV lever is then moved counterclockwise to a positive stop position where it is against a positive stop, not shown, inside of the transmission housing. The gauge plate is adjusted to align the line **58** marked stop with the forward edge **23** of the TV lever as shown by FIG. **4**. Bolt **50** is tightened to fix the gauge plate **46** in this position on base **40**. Then the TV lever is moved clockwise with the edge **23** turning with respect to gauge plate **46** to the full throttle position. This determines whether the valve stroke is long or short by observing alignment of edge **23** with either the long or short stroke line. Then the lever is released. Afterwards, with the engine off and accelerator foot pedal at the idle position, linkage **10** is adjusted and connected to the TV lever with the forward edge **23** aligned with the idle line on the gauge plate. After this, the accelerator pedal is depressed to full throttle and to thru detent. The TV lever should travel to long or short stroke "full throttle" or "thru detent" lines respectively as determined above. Any over or under travel indicates further adjustment or replacement of the linkage is necessary. The vehicle is then road tested.

Full throttle fifth to sixth gear upshift should occur approximately 50 r.p.m. below loaded governed speed or maximum r.p.m. If adjustment is necessary, the linkage is adjusted at the TV lever. To raise shift point r.p.m. the linkage is adjusted to allow more TV travel clockwise. To lower shift point r.p.m., the linkage is adjusted to allow less TV lever travel clockwise.

If the TV lever does not return to the idle line after road testing, it is necessary to reset the internal stop setscrew which contacts the internal TV lever. The transmission oil and oil pan are removed for access to the internal stop. With the engine off and the pedal **12** at detent, the proper "long stroke" or "short stroke" line **58** is aligned with the leading edge of the TV lever and then the pedal **12** is released. Linkage **10** is disconnected and the TV lever is turned counterclockwise until forward edge of TV lever is aligned with stop line on the gauge plate. After this, the stop screw is set to contact the inner lever at this position and then it is fixed at this point. After this the linkage can be reconnected and the pan reinstalled.

To adjust the TV linkage from the full throttle position the base of the gauge is installed on the nut **28**. The TV lever **18** is turned full counterclockwise against the positive stop setscrew described above. The gauge plate is then adjusted to align the stop line with the edge **23** of the TV lever. The Tv lever is then turned clockwise to determine whether the TV valve stroke is long or short. After the stroke is determined, the lever is moved clockwise to the thru detent position. The gauge plate is then adjusted and locked on the base so that the proper "thru detent" line **58** is aligned with the leading edge **23** of the TV lever. The lever is turned counterclockwise to the full throttle position which is the appropriate long or short stroke line. With the TV lever in this position and pedal **12** at the full throttle position, the linkage **10** is adjusted and hooked up to the TV lever and the gauge is removed. The linkage will be properly adjusted and ready for road testing.

Assuming that the linkage has been adjusted to provide the desired full throttle shift point in shifting between the fifth and sixth gear ratio and it is desired to check the linkage, the following steps are taken:

First the pedal **12** is depressed to the full throttle position and the gauge is reinstalled with the gauge plate adjusted so that the appropriate full stroke indicator line is aligned with the edge **23** of the TV lever. The pedal is released to idle position and if the linkage is proper, the TV lever returns to the idle setting line. If the lever is not aligned with this line, there is linkage error and readjustment is needed.

Although this gauge has been described as working with a particular portion of the TV lever such as front edge **23** it can be readily employed with the straight rear edge **60** since both of these edges are parallel to the centerline **62** of the TV lever. As shown in FIG. **4**, this centerline extends through the rotational axis **57** of the TV lever and the center of the openings **64** for the trunnion pivotally connecting the TV linkage and the TV lever. When the gauge plate is properly adjusted for the rear edge, the radial indicia lines will radiate from separate points on the arcuate locus **55** to the right side centerline **62**. In the event that the TV lever has no straight edges to serve as indicator edges, a suitable indicator with straight edges corresponding to those of lever **18** can be affixed to the TV lever and used as described above.

The gauge can be seated or positioned on the nut **28** without regard to the orientation of the nut or the position of selector lever **26** because the gauge plate is adjustably mounted on the base **40**. After the TV lever is rotated to the stop position the gauge plate is adjusted to indicate and fix this position externally of the transmission.

It will be appreciated that the invention is not limited by these details of construction and operation shown and described but only by the following claims.

What is claimed is:

1. A gauging device for checking the adjustment and operation of an adjustable throttle valve linkage operatively connecting a manual control to an automatic transmission throttle valve lever mounted on a pivot shaft extending into a housing for the transmission, comprising a support member, anchoring means carried by said support member and adapted to be disposed about the pivot shaft for rigidly securing said support member with respect to the transmission housing adjacent to the throttle valve lever, a gauging plate operatively mounted on said support member and disposed in a plane parallel to the plane of said support member, a plurality of separate indicia means disposed on said gauging plate to indicate the different stations to which the throttle valve lever is to be moved relative to a fixed station by the manual control through the throttle valve linkage, fastener means for mounting said gauging plate for turning and sliding movement on said support member to predetermined fixed positions relative to said support member so that a first of said indicia means can be aligned with a predetermined portion of the lever when the lever is in a predetermined position and so that a second of said indicia means indicates the position to which said throttle valve lever is to be moved from said first indicia means by the throttle valve linkage in response to movement of the manual control to a predetermined position.

2. A gauge for checking and determining the proper adjustment of an adjustable control linkage operatively connecting an engine fuel feed control with a rockable throttle valve lever operatively connected with the throttle valve of an automatic transmission, comprising, a planar base member, said base member having clamping means formed in one end thereof for rigidly securing said base member to a transmission, a gauging plate operatively disposed on said base member in a plane parallel to the plane of said base member, said gauging plate having a plurality of radially disposed indications thereon which indicate different positions taken by the throttle lever as determined by the engine fuel feed control position, and securing means for slidably and pivotally mounting said gauging plate on said base member to a fixed station whereby the base member can be adjusted and secured so that a first of said indications is aligned with said throttle valve lever when the throttle valve lever is rocked to a first position and whereby a second of said indications on said fixed base member is aligned with said throttle valve lever when the throttle valve lever is turned in an opposite direction to an extreme position corresponding to a full throttle position and whereby a third of said indications on said fixed base member can be aligned with

the throttle valve lever so that the linkage can be accurately adjusted and connected to the throttle valve lever.

3. A gauge for checking the adjustment of a throttle valve linkage for an automatic transmission comprising an elongated base member having an open end portion with angularly related sides for engaging predetermined sides of a retaining nut, clamping means disposed on one side of said base for engaging the retaining nut, a gauge plate having indicia representative of predetermined stations of a throttle valve lever with respect to a fixed station, and fastener means movably mounting said gauge plate on said base so that predetermined indicia can be aligned with said lever when said lever is in a predetermined position.

4. The gauge of claim 3 wherein said fastener means comprises an elongated slot in said plate and a retaining bolt secured to said base and extending through said slot to slidably and pivotally mount said plate to said base, and wherein said indicia means comprises a family of radial lines radiating from a point remote from said plate.

5. A gauge for checking the adjustment of a throttle valve linkage operatively connecting a movable accelerator pedal and a throttle valve lever having a linear edge portion mounted for limited rotation on a transmission housing having a selector lever and a selector lever nut, comprising, an elongated base member having a planar upper surface and having an open end jaw shaped to accommodate said base on said nut, said jaw having a fixed first face formed by a portion of said base deformed inwardly at right angles to said planar surface and having a yieldable second face spaced and directly opposing said first face formed by a spring finger integral with said base and spaced from the first face for clamping the selector lever nut therebetween, said jaw further having third and fourth angularly related nut engaging faces disposed between said first and second faces to guide and securely seat said base on said nut, a sector-shaped gauging plate having an arcuate slot formed therein adjacent to and concentric with the arc of said sector plate and extending substantially across the face of said plate, bolt means extending through said slot and fixed to said base for adjustably securing said plate to said base, said plate having a family of radial lines formed thereon which are alignable with the edge portion of said lever to correspond to different positions of the throttle valve lever when moved by the linkage to control the transmission, a first of said lines being a radial line indicative of a maximum limit of movement of the lever in one direction when disconnected from the linkage, a second of said lines being indicative of the engine idle position of said linkage and said lever, a third of said lines being indicative of the full throttle position of said pedal and said lever and a fourth of said lines being indicative of a forced downshift position of said pedal and lever and disposed beyond said full throttle position.

* * * * *