April 27, 1965 D. ROSENSTON 3,180,949

ADAPTER FOR LIMIT SWITCH OR THE LIKE

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Fig. 2.

Fig. 1.

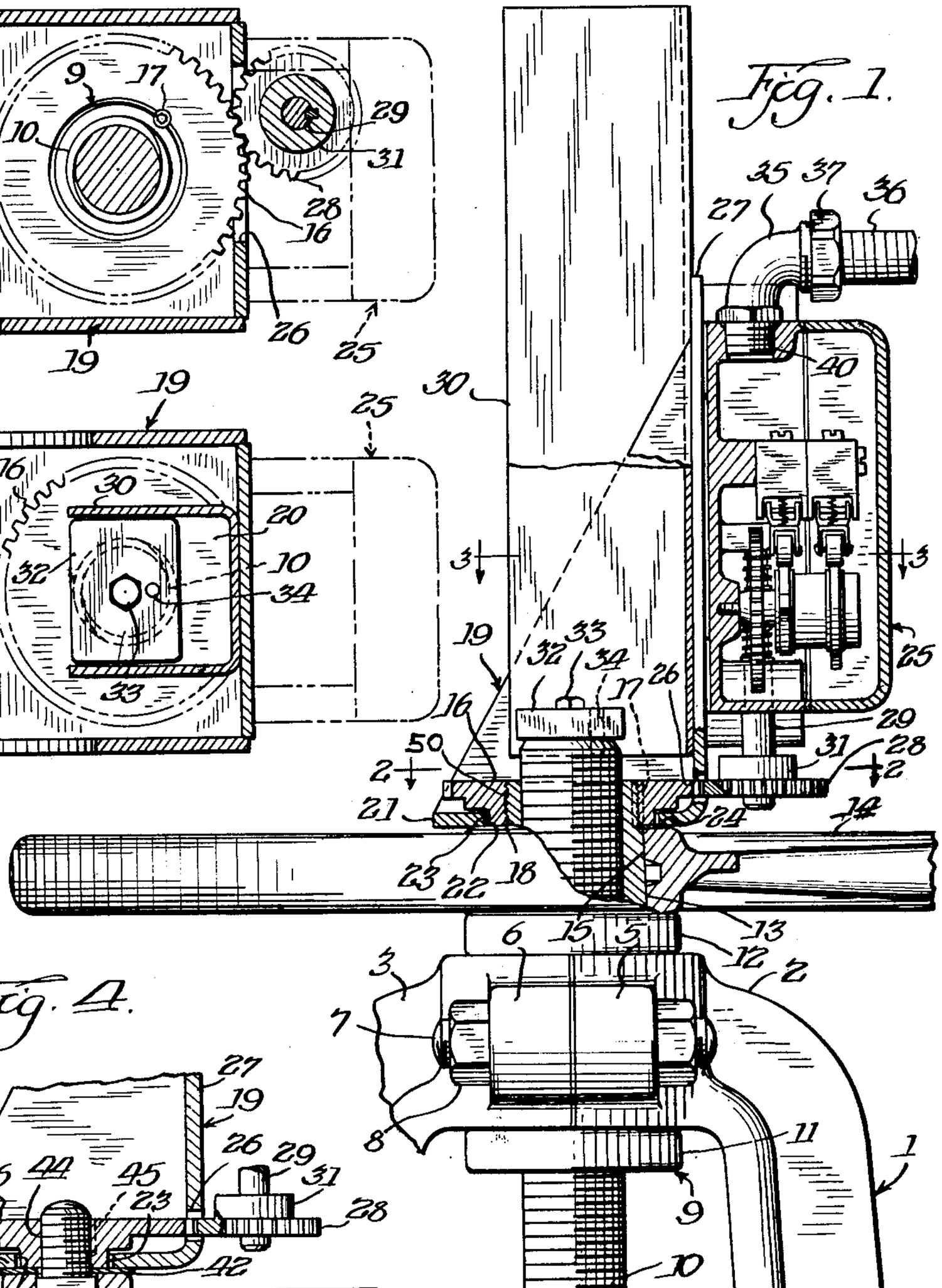

Fig. 3.

Fig. 4.

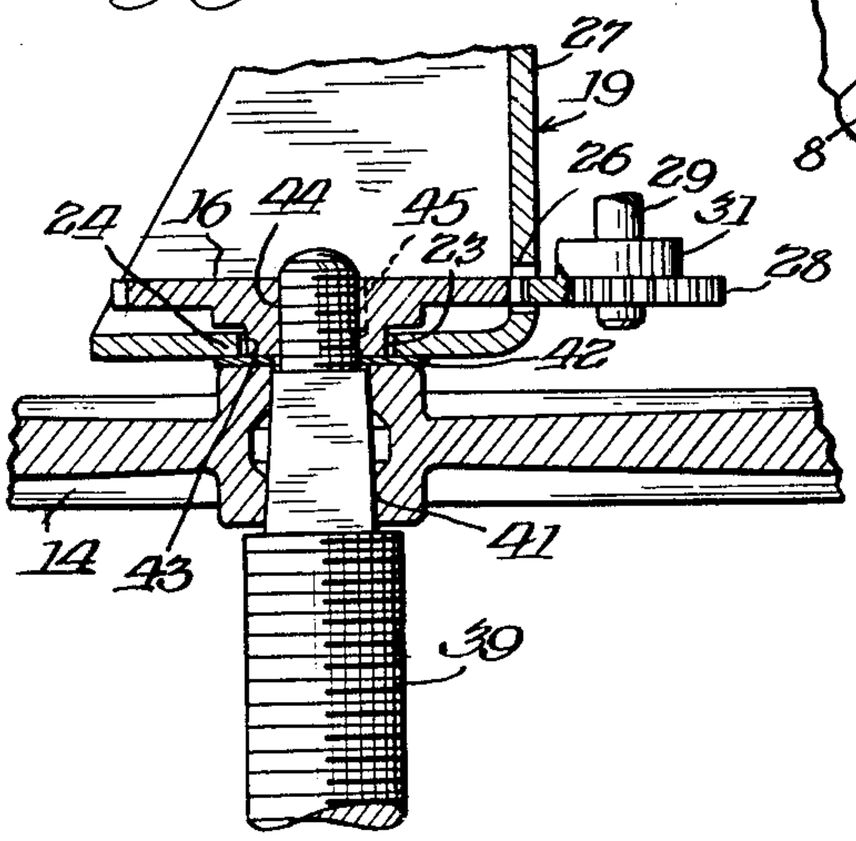

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Fig. 5.

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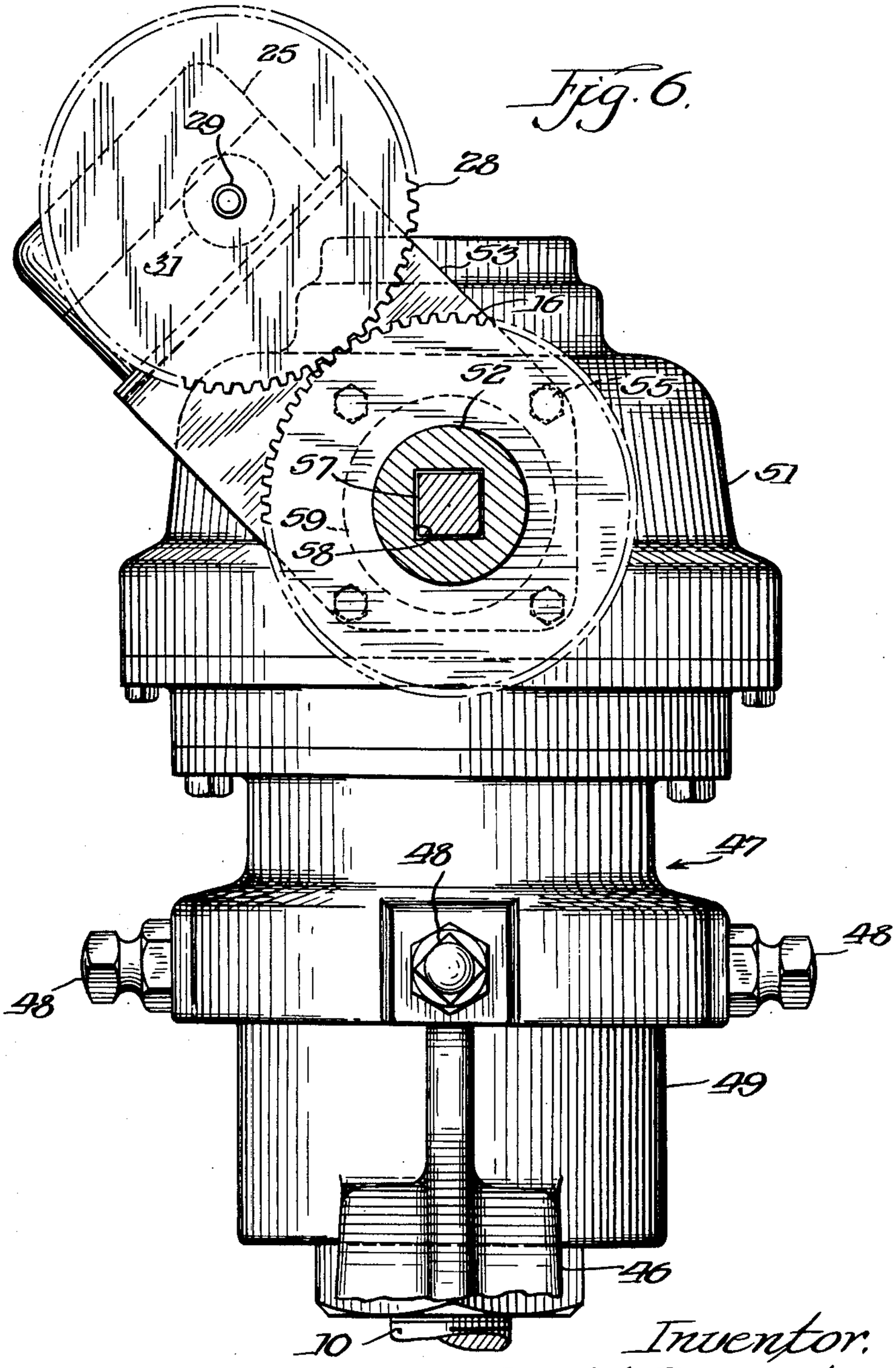
Fig. 6.



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United States Patent Office

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ADAPTER FOR LIMIT SWITCH OR THE LIKE

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Filed June 25, 1962, Ser. No. 204,839
5 Claims. (Cl. 200—47)

This invention relates generally to an indicator mechanism and, more particularly, it is concerned with a novel adapter for limit switch or other suitable switch useful for indicating the position remotely for, say, manually operated valves on an indicator panel in a central station, powerhouse, or the like.

As will hereinafter become apparent, these switches also may function as electrical interlocks without departure from the inventive scope.

In order to obtain a better understanding of the merits of this invention, it should be understood at the outset that it has long been a problem in connection with valve operation to provide indicator means capable of easy, convenient and economical adaptation to such valves generally manually operated by providing an indication of their position, say, open, closed, or throttled, to an operator or maintenance people in, say, power or manufacturing processes in the field.

Therefore it is one of the more important objects of this invention to provide a switch adapter particularly suitable for manually operated valves in which the adapter can easily and cheaply be applied without substantial effort or expense to valves already installed in which the benefits above referred to becomes desirable.

Another object is to provide for a limit switch adapter in which the mounting is not only simple, but is relatively foolproof and is capable of being applied to a wide variety of valves, such as gates, globes, angles, stop checks, and the like, whether employing rising or non-rising, rotatable or non-rotatable stems.

Another important object is to provide for an indicator adapter construction hereinafter described in which said adapter is assembled with the valve by the simple expedient of removing a handwheel nut or the other conventional means of attachment for the handwheel and replacing said original means of attachment by a special adapter for attaching the indicating means such as the limit switch application of this invention.

Other objects and advantages will become more readily apparent upon proceeding with the following description read in light of the accompanying drawings, in which:

FIG. 1 is a fragmentary sectional assembly view of a valve portion having a rising, non-rotatable stem embodying my invention;

FIGS. 2 and 3 are fragmentary sectional assembly views taken on the lines 2—2 and 3—3 respectively of FIG. 1;

FIG. 4 is a modified form of a manual operated valve adaptation applied to a rising rotatable stem valve;

FIG. 5 is a fragmentary sectional assembly view of the invention applied to a gear operated manual valve; and

FIG. 6 is a sectional view taken on the line 6—6 of FIG. 5.

Similar reference numerals refer to similar parts throughout the several views.

Referring now to FIG. 1, the complete valve to which this invention is applied is not shown, but it is a conventional rising stem, non-rotatable stem operated valve which may be either gate, globe, or stop check valve. It is supplied with the usual yoke, generally designated 1, which in this case is of the split type, being provided with the yoke arms 2 and 3 joined at a central hollow upper portion thereof as at 5 and 6 with through bolts or studs 7 and retained in assembled position illustration by means of the nuts 8.

Within the hollow portion of the said arms 2 and 3, a rotatable yoke sleeve generally designated 9 is mounted, having the upper and lower flanges 11 and 12 for said rotatable actuation within said yoke. At an upper portion thereof, as at 13, the yoke sleeve 9 is provided with a hexagonal or other suitable polygonal portion for receiving the handwheel 14 provided with the polygonal recess or aperture 15. Ordinarily, at the end outer limit of the yoke sleeve 9, the threads 50 are provided, the latter ordinarily being used to receive a handwheel retaining nut (not shown). However, in this case, the yoke sleeve shank threadedly receives the driving spur gear 16, the spur gear being locked to the threads 50 upon assembly therewith by means of the pin 17. Clamped between the upper surface 18 of the handwheel and the gear 16 in relatively loose fitting relationship is the bracket generally designated 19 which is provided with an apertured flange 21, apertured as at 22 to receive the hub 23 of the said spur gear 16. The hub is preferably made of such thickness or length as to allow for the flange portion 24 of the bracket 19 to be received therebetween as illustrated, thereby allowing for said relative looseness and the consequent ease of mounting in flexible attachment thereto of the bracket 19 and supported on said upper surface 18 of the handwheel 14.

Attached to an angular extension of the bracket 19, a rotary limit switch generally designated 25 is fixedly mounted to said bracket by means of bolts or cap screws (not shown). The driving gear 16 has an annular arcuate portion thereof projecting through the aperture 26 of the limit switch extension and support 27 of bracket 19 as indicated. By such extension through the said latter aperture, the said gear meshes with the driven pinion gear 28, the said pinion gear being non-rotatably mounted on the limit switch depending shaft 29 attached at the shoulder enlarged portion 31 to the said pinion gear as illustrated.

Suffice to say, the rotating gear shaft 29 actuates the limit switch mechanism gears and switches to control movement thereof and give indication at a light panel of the valve position. This indication depends upon the initial setting and the amount of rotation of the gears 16 and 28 in response to the movement of the valve as determined by the axial movement of the valve stem 10 and rotation of the handwheel 14.

It is deemed unnecessary to go into any lengthy explanation as to the detailed structure specifically involved in the limit switch 25 per se, since this device is a conventional or stock item and is readily available in the open market, as, for example, of the type manufactured by the Gemco Electric Co., Detroit, Michigan, or by the General Electric Co. at Schenectady, New York, or by the Cutler-Hammer Co. at Milwaukee, Wisconsin.

Referring again to the stem construction, as previously mentioned, the threaded stem 10 in locating the axial position of the main valve closure member (not shown) moves reciprocally in its response to the rotation of the yoke sleeve 9 as actuated by the handwheel 14. It has been found that in order that the bracket 19 may be suitably restrained against any substantial rotation in response to the rotation of the yoke sleeve 9, it is desirable to attach at the upper limit of the stem the rotation preventing block member 32, which as more clearly shown in FIG. 3, is slidably but snugly received within the relieved section or space 20 of the bracket portion 30. The said block member, as indicated, is of generally U-configuration in cross-section and is retained firmly at the end of the stem by means of the retaining nut 33 and held against rotation by means of the pin 34 as better shown in FIG. 1. It will of course be appreciated that the tendency to rotate on the part of the bracket 19 is somewhat

minimized frictionally by the latter fact, not withstanding that there is the clearance as previously mentioned between the mounting of the driving gear 16 and the top of the handwheel 14. Further, the rotation tendency is further minimized by the mountings of said block member 32 as stated. In addition, it has been found that the relatively rigid attachment as at 35 for the flexible conduit 36 at threads 40 aids materially in reducing the tendency for the switch assembly to rotate with the attaching coupling 37 made with the elbow member 35. As a matter of fact, it has actually been found that the latter use and mounting of the electrical wiring conduit to the limit switch 25 as shown at 40 is frequently sufficient to restrain the limit switch 25 and the bracket 19 against relative rotation with respect to the handwheel when the latter member is being rotated in the normal operation of the valve manually. Thus, the block member 32 may be dispensed with under such circumstances.

It should now be apparent that all that is necessary in the field in order to apply the indicator of this invention to a valve already installed is to remove the handwheel nut threadedly attached to the yoke sleeve and replace the said nut by means of the combined limit switch and bracket in the manner hereinabove described in detail. It will also be apparent that a cheap, convenient, and durable indicator and limit switch mounting has been accomplished.

The construction of this invention is also capable of being applied to a rotating rising stem valve construction as will hereinafter become apparent by referring to the fragmentary sectional assembly shown in FIG. 4 as an example, in which a threaded valve stem 39 has a handwheel 14 attached to it, the stem being polygonally formed as at 41 to receive the said wheel in non-rotatable relation thereto. Here, similarly, for purpose of applying the invention, the usual handwheel nut (not shown) applied to the washer 42 is replaced by the limit switch bracket 19 with its support extension 27, the said bracket being suitably apertured at 43 as previously described in connection with FIG. 1, as at 43, to receive the driving spur gear 16 mounted upon the threaded portion 44 of the stem 39. The gear is pinned as at 45 for non-rotatable relationship on said stem. As in the same manner described in connection with FIG. 1, the driving gear 16 is provided with the depending hub 23, the latter having a length sufficient to allow for the portion 24 to be loosely received in the aperture 43 between the gear 16 and the upper surface of the washer 42 as shown. Also in the same manner as previously described in connection with FIG. 1, the bracket 19 is apertured as at 26 to allow for the meshing engagement of the driving gear 16 with the driven pinion gear 28. Here, in the same manner as previously described, the electrical conduit connection in FIG. 1 at 35 and 40 is generally sufficient to keep the bracket 19 and the attached limit switch 25 from rotating when the handwheel 14 is being rotated in the normal course of operating the valve from open to closed or to intermediate positions. In this construction, it will be understood, that the U-form of retainer cooperating with the block rotation preventing member 32 does not apply, since the latter member is dispensable in the rotatable stem construction. While the description of the modification in FIG. 4 has been directed to a rotatable rising stem, it will of course be appreciated that under certain types of valve constructions, the stem may be made non-rising and non-rotatable with equal flexibility in the mounting as above described. Thus, the invention has application broadly to a wide variety of valve types in varied installations.

Referring to a still further modified form shown in FIGS. 5 and 6, the application of my invention is made to a gear operated by manually actuated type of valve operator, such as that identified by the trademark "Converto-Gear" manufactured and sold by Crane Co., Chicago, Illinois, and covered by U.S. Patent No. 3,034,371,

granted May 15, 1962. In this modification, the valve (not shown) is provided with the usual valve yoke 46 and is arranged by a suitable adapter to receive the valve operator generally designated 47, the operator being attached in any one of a number of different ways, as, for example, by means of the annularly spaced apart set screws 48 engaging the yoke hub 49 as indicated. A valve stem 10 which is the non-rotatable, rising stem type is connected in the usual manner in the valve yoke sleeve generally designated 9. Rotation of the gearing in the housing 51 provides for the rotation of the yoke sleeve 9 in a manner similar to that described as accomplished by the handwheel 13 in FIG. 1. Because of the wide varieties of ways in which the mounting by suitable adapters may be accomplished, it is deemed unnecessary to go into any detailed explanation concerning the specific manner in which the gear operator 47 is mounted in relation to the yoke in the instant modification. The housing 51 in this case is provided with the horizontally disposed shaft 52, the limit switch 25 being attached thereto as more clearly shown in FIG. 6 by means of an integral plate 53 apertured to allow for the projection therethrough as at 54 as shown. The attachment of the plate is accomplished by means of the usual cap screws 55.

Upon the shaft 52 at a portion immediately emerging from the bracket hollow hub 56, the shaft is polygonally formed as at 57 to receive thereon the spur gear 16, the latter being apertured polygonally as at 58 to receive in non-rotatable relation the said spur gear. The gear 16 in the same manner as described in connection with the previous figures, meshes with the driven pinion gear 28, the latter being attached in non-rotatable relationship to the shaft 29 also in the same manner as described in connection with the previous figures. A retaining hollow substantially cylindrical housing 59 serves as a spacer to receive the polygonal extension of the reduced shaft portion 57. At its outer end portion, it also serves to receive the handwheel 61, the latter member being non-rotatably attached to the shaft 52 as indicated at 62 and held thereto by means of the threaded shank 63, the wheel washer 64 and retaining nut 65 in the usual manner and as more completely described in connection with the said patent. It will be apparent that for a rigid type of mounting, such as that presented in a valve operator of the "Converto-Gear" type, the combined bracket and indicator mounting for valve positioning indication is easily applied without substantial modifications being necessary in the existing structures, thus, making it economical to apply the invention in the field wherever deemed necessary.

While a plurality of embodiments have been shown and described, it will of course be appreciated that this has been done merely in an effort to give a demonstration of the versatility of this invention in its application to a wide variety of valves, regardless of whether a rising or non-rising stem is used, or whether a split yoke or a ball bearing yoke sleeve construction is employed. Thus it should be clear that this invention is capable of application to many other forms not herein described, and the scope of the invention therefore should be measured by the scope of the appended claims, considered in light of the art to which it is related.

I claim:

1. In a valve position indicator for hand operated valves or the like, the combination of an actuated stem therefor, rotatable means for actuating said stem, a driving gear and driven pinion gear cooperating with the said stem, said stem having means for supporting said driving gear, an indicating switch with a housing having a protruding shaft extending therefrom, the said protruding shaft carrying said driven pinion gear for cooperation with said driving gear, a bracket for mounting the housing of said switch around the upper limits of said stem, the said bracket having an angular transverse apertured portion for mounting said bracket swivelably around said stem upper limits and driving gear, the said bracket being

non-rotatably mounted relative to the rotation of said rotatable means and having a side disposed apertured wall portion to allow for the protrusion therethrough and the meshing engagement of the said driving gear with the said driven pinion gear and means on said switch housing for restraining bracket against substantial rotation relative to said rotatable stem actuating means.

2. The subject matter of claim 1, the said apertured side wall portion of the bracket having means for carrying said indicating switch and cooperating with said actuating means to restrain said bracket against rotation.

3. The subject matter of claim 1, the said switch having flexible conduit means for restraining said bracket against rotation.

4. The subject matter of claim 3, the said restraining

flexible conduit means comprising means for supplying electrical energy to said switch.

5. The subject matter of claim 1, the said restraining means comprising flexible means connected with said housing of the indicating switch to restrain against substantial rotatability of the said latter member.

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