

Sept. 9, 1947.

C. W. NORWOOD

2,427,019

INDICATOR OPERATING MECHANISM

Filed April 6, 1946

2 Sheets-Sheet 1

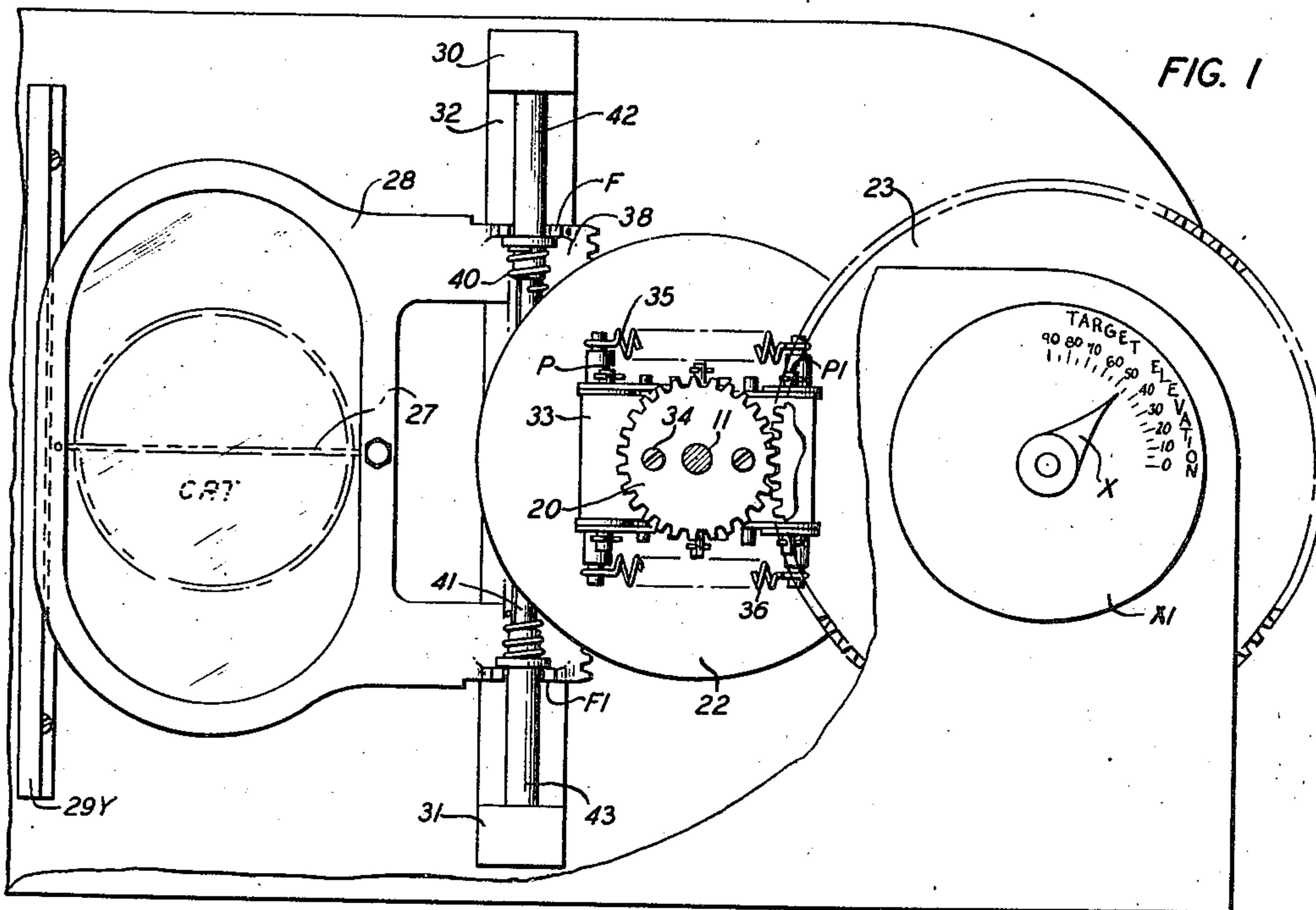
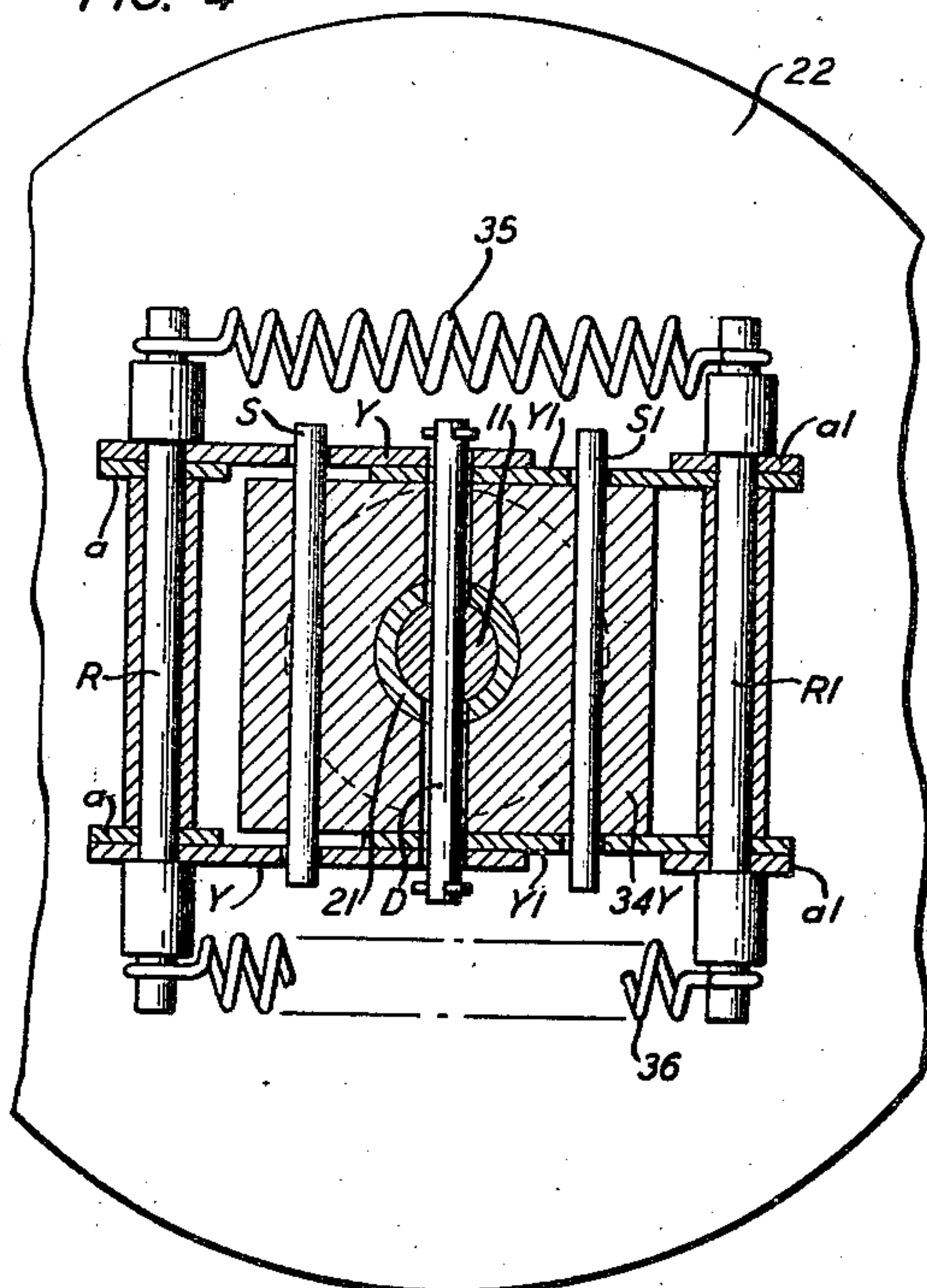


FIG. 4



Sept. 9, 1947.

C. W. NORWOOD

2,427,019

INDICATOR OPERATING MECHANISM.

Filed April 6, 1946

2 Sheets-Sheet 2

FIG. 2

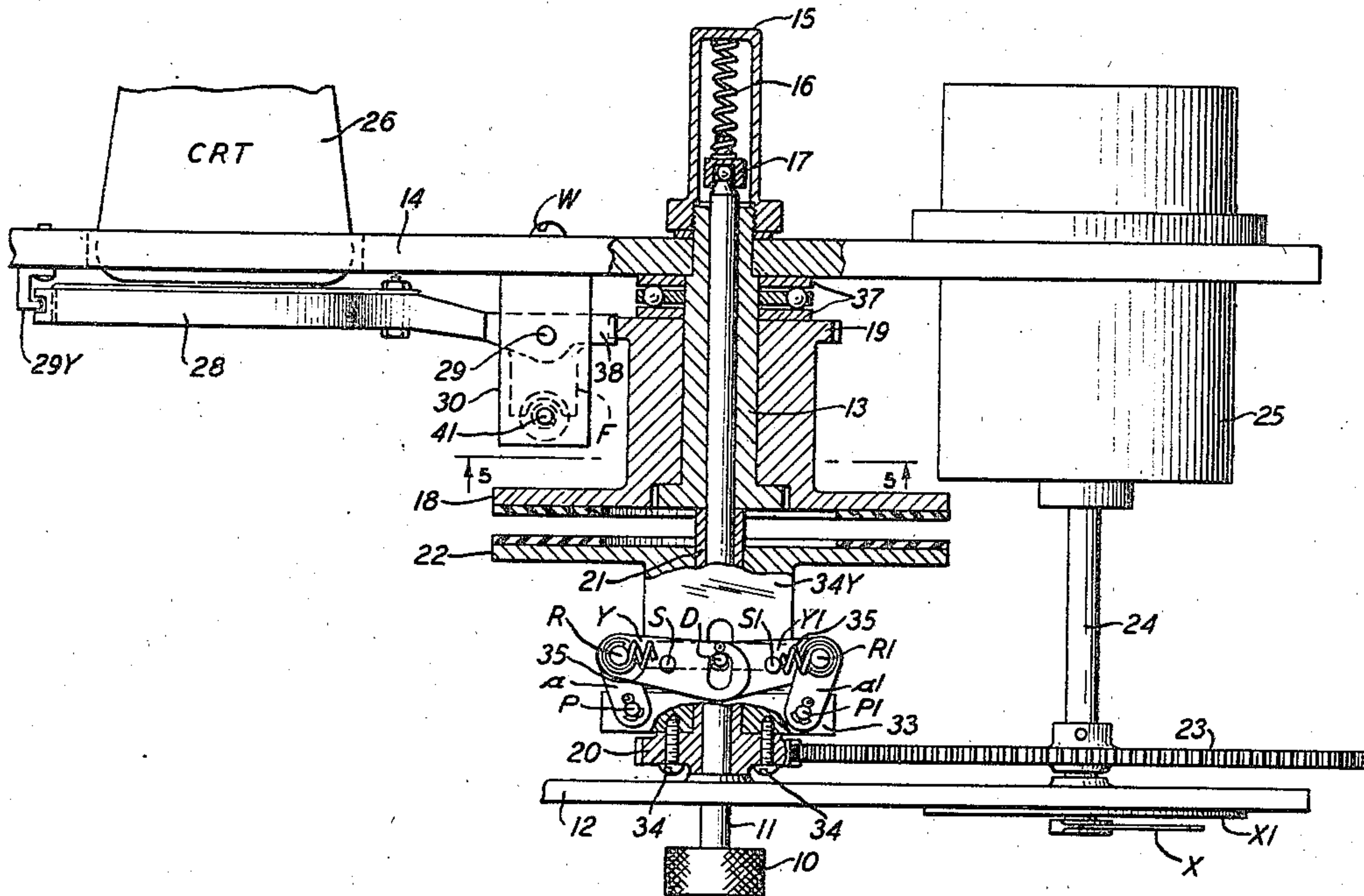
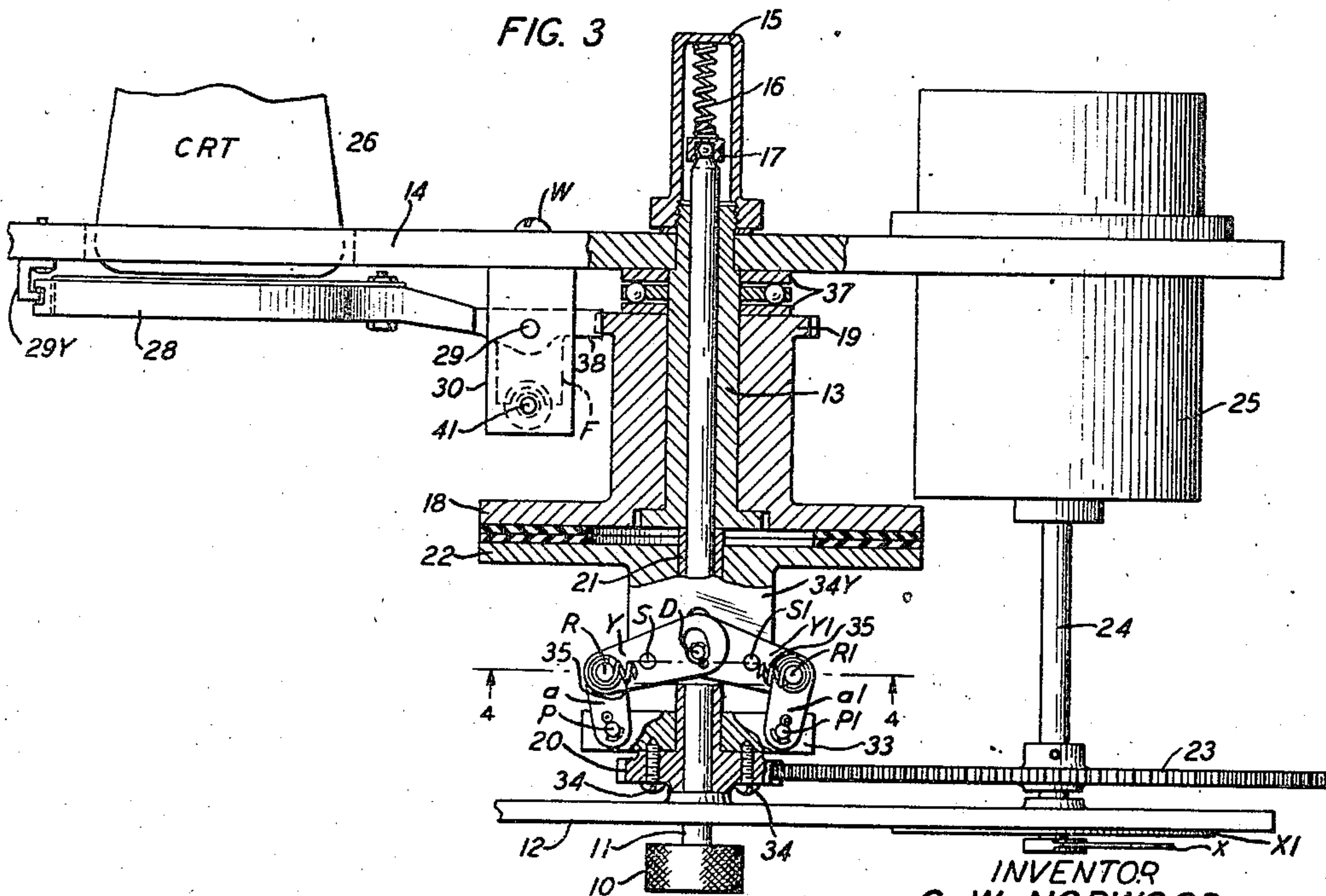


FIG. 3



INVENTOR
C. W. NORWOOD
BY J. Mac Donald
ATTORNEY

UNITED STATES PATENT OFFICE

2,427,019

INDICATOR OPERATING MECHANISM

Charles W. Norwood, Caldwell, N. J., assignor to
Bell Telephone Laboratories, Incorporated,
New York, N. Y., a corporation of New York

Application April 6, 1946, Serial No. 660,264

6 Claims. (Cl. 177—380)

1

This invention relates to signaling apparatus and more specifically to a manually operated indicating mechanism for use in so-called target acquisition apparatus.

The object of this invention is the provision of a mechanism of the type above referred to which will be simple, convenient to use and accurate in operation.

In the drawing,

Fig. 1 is a front elevation view shown with a number of operating parts in vertical section;

Fig. 2 is a top assembly view shown with a number of operating parts in horizontal longitudinal section and in non-operated position;

Fig. 3 is a view similar to that of Fig. 2 but showing the operating parts in the operated position;

Fig. 4 is a vertical sectional view taken on line 4—4 of Fig. 3; and

Fig. 5 is a detailed view shown with a number of operating parts in vertical section taken on line 5—5 of Fig. 2.

In the indicating mechanism of this invention as best seen in Figs. 2 and 3, a manually operable shaft 11 is mounted for rotational and longitudinal movement in a bearing formed with a mounting plate 12 and in a bushing 13 which is held securely on another mounting plate 14 by a sleeve 15 closed at one end and having its open end screw-threaded for engaging a similarly screw-threaded portion at the end of bushing 13 so as to effect a clamping action between the shoulder portion of bushing 13 and the sleeve 15, while a spring 16 housed in the sleeve 15 is tensioned against an end thrust bearing 17 abutting against this end of shaft 11 for yieldably holding the latter in non-operated or retracted position as shown in Fig. 2.

On the bushing 13 is mounted for free rotation thereon a clutch element in the form of a disc 18 formed with a hub portion and a gear 19 provided for a purpose which will be hereinafter described in detail. On the opposite end of shaft 11 is mounted a knob 10 and a gear 20, the latter having a hub portion 21 on which a clutch element in the form of a disc 22 is mounted for longitudinal sliding movement under control of a toggle mechanism in frictional engagement with the clutch element 18 for rotating the latter and the gear 19 carried thereby upon the operation of shaft 11 in a manner which will be hereinafter described in detail.

The toggle mechanism consists of two pairs of arms *a—a* and *a1—a1* pivoted at one of their ends on the opposite ends of pins *P* and *P1* best

2

seen in Figs. 1, 2 and 3 extending through drilled holes in a square-shaped piece 33 fitted over the sleeve 21 and secured to the gear 20 by a number of screws 34. Two pairs of yokes *y—y* and *y1—y1* best seen in Fig. 4 are pivoted at their middle length portions on rods *S* and *S1* extending through drilled holes in a square-shaped portion 34 formed with the hub portion of disc 22, the yokes *y—y* and *y1—y1* at one of their ends engage the rods *R* and *R1* which also serve as pivots for the arms *a—a* and *a1—a1* respectively.

The opposite ends of yokes *y—y* and *y1—y1* are provided with elongated-shaped openings engaging a common rod *D* extending through an elongated opening in the square-shaped portion 34 which as above mentioned is formed with the hub of clutch disc 22 and through a slot in the sleeve 21 of gear 20 in press fit engagement in a drilled hole in the shaft 11 while two springs 35 and 36 are hooked to the opposite ends of rods *R* and *R1* to yieldably hold the clutch element 22 engaged or disengaged with its cooperating clutch element 18 depending upon the longitudinal position of shaft 11, and end thrust bearing 37 being disposed between the end of the hub of clutch disc 18 adjacent the gear 19 and the mounting plate 14 for reducing the friction therebetween following the engagement of clutch element 22 with clutch element 18 by the tension of springs 35 and 36 following the longitudinal movement of shaft 11 preparatory to rotating these elements.

The rotation of clutch element 18 is effective to actuate a support 28 against the tension of a two-way effective retractile 40 through the engagement of gear 19 with a gear rack 38 formed with such support depending upon the direction of rotation of shaft 11 for moving a hair line 27 carried by support 28 in juxtaposition to the screen of a cathode ray tube CRT, this spring being coiled on a guiding rod 41 having its opposite ends fitted with a press fit adjustment into drilled holes in the arms 30 and 31 of a support 32 best seen in Fig. 1 secured to the mounting plate 14 by a number of screws, while bushings as 42 and 43 mounted on guiding rod 41 are each provided with an enlarged portion cooperating with the prongs *F* and *F1* formed with the hair-line support 28 to serve as stops for the support for normally positioning the hair line 27 at the center of the cathode-ray tube.

Rotation of gear 20 is effective to rotate a gear 23 keyed on the armature shaft 24 of a Selsyn generator 25. When shaft 11 is operated longitudinally, rotation of gear 20 is effective to rotate shaft 24 according to the position of the signals

3

appearing in the cathode ray tube as indicated by the hair line 27 in relation to the position of these signals on the screen of the cathode ray tube. Support 28 is mounted for sliding movement on a vertically disposed guiding rod 29 secured at both ends to the arms 30 and 31 of the support 32 and is guided at its free end by a bar 29Y secured to the plate 14 as shown in Figs. 1, 2 and 3.

In a typical example of operation of the indicating mechanism of this invention a manual rotational movement of the shaft 11 and gear 20 keyed thereon by the pin D is effective to rotate the gear 23 keyed to the shaft 24 of a Selsyn generator 25 for transmitting a signal to other apparatus, not shown, as indicated by the operation of the pointer x on its cooperating scale $x1$ best seen in Fig. 1. A manual longitudinal movement of the shaft 11 in the hub 21 of gear 20 and in its supporting bushing 13 against the tension of retractile spring 16 from the position shown in Fig. 2 to the position shown in Fig. 3 causes the pivotal movement of yoke members $y-y$ and $y1-y1$ to a point wherein their pivotal center on rods S and S1, pass beyond the center of rods R and R1 as to permit the tension of springs 35 and 36 to continue the movement of the clutch 22 for frictionally engaging the latter with its cooperating clutch element 18 independently of the manual continued longitudinal movement of shaft 11 and that of the pin D carried thereby within the limits defined by the length of the groove formed in the hub portion of clutch 22 which is thus held in frictional engagement with the disc 18 with a pressure determined by the tension of springs 35 and 36.

The turning operation of shaft 11 by the manually operable knob 10 following the operation of this shaft from the position shown in Fig. 2 to the position shown in Fig. 3 is effective to rotate the disc clutch element 18 and thereby the gear 19 meshing with the rack portion 38 of support 28 for slidably moving the latter along the guiding rod 29 and bar 29Y for positioning the hair line 27 carried by the support in registry with the signals appearing on the cathode ray tube above or below its center line as the case may be and is simultaneously effective to rotate the gear 23 keyed on the shaft 24 of the Selsyn generator 25 thereby transmitting a correction in the signal originally transmitted as indicated by the operation of the pointer x on its cooperating stationary dial $x1$ in relation to the hair line movement from the center line of the cathode ray tube to a position on its screen corresponding to the signal appearing thereon.

What is claimed is:

1. In an indicating device for a target acquisition apparatus, said device comprising a pair of supports, a shaft mounted for longitudinal and rotatable movement on said supports, a Selsyn generator operated by the rotary movement of said shaft, a cathode ray tube, a hair line, a mechanism for moving said hair line in juxtaposition to the screen of said cathode ray tube, said mechanism comprising a normally disengaged clutch, means operable upon the longitudinal movement of said shaft for engaging said clutch, and means actuated by the rotary movement of said shaft following the engaging movement of said clutch for moving said hair line on said screen for indicating the position of the signal appearing on said cathode ray tube in relation to the operation of said generator.

4

2. In an indicating device for a target acquisition apparatus, said device having a cathode ray tube, a movable hair line associated with the screen of said cathode ray tube, a Selsyn generator, a gear keyed on the armature shaft of said Selsyn generator, a scale for said generator, a pointer carried by said armature shaft cooperating with the scale for indicating the operation of said generator in relation to the position of said hair line on the screen of said cathode ray tube, a mechanism for moving said hair line in juxtaposition to said screen and at right angles thereto, said mechanism comprising a shaft mounted for rotational and longitudinal movement, a pair of normally disengaged clutch elements, a gear keyed on said shaft for actuating the armature shaft of said generator, said gear having a hub portion for mounting one of said clutch elements, a support for said hair line having a gear rack portion, a gear carried by the other of said clutch elements engaging said gear rack for moving said hair line in juxtaposition to the screen of said cathode ray tube following the longitudinal movement of said shaft for engaging said clutch elements.

3. In an indicating device for a target acquisition apparatus, said device comprising a manually operable shaft, a pair of supporting plates, a bushing secured to one of said plates serving as a bearing for said shaft, a clutch element mounted for free rotation on said bushing, an end thrust bearing disposed between said plates and the hub portion of said clutch element, a gear carried by the hub portion of said clutch element, a cathode ray tube in the apparatus having a hair line, a support for said hair line, a mechanism for actuating said support, said mechanism comprising a gear rack carried by said support engaging the gear carried by the hub portion of said clutch element, a gear having a hub portion mounted for rotation with said shaft, a clutch element mounted for longitudinal movement on the hub portion of said gear, a toggle mechanism operable upon the longitudinal movement of said shaft for engaging the second-mentioned clutch element with the first-mentioned clutch element for operating said hair-line support simultaneously with the operation of the second-mentioned gear by the rotation of said rotatable and longitudinally movable shaft, and a Selsyn generator actuated by the rotation of the last-mentioned gear.

4. In an indicating mechanism for a target acquisition apparatus, the apparatus having a cathode ray tube and a Selsyn generator, a support, a hair line mounted on said support for movement relative to the screen of said cathode ray tube, a scale for the generator, a pointer mounted on the generator shaft for movement on the scale, a shaft arranged for movement in two directions, a mechanism movable in one direction of said shaft for actuating said pointer but ineffective relative to said hair-line support, and means for operating said shaft in the other direction to render said mechanism effective to operate said hair-line support simultaneously with the operation of said pointer for indicating the position of the signal appearing on said cathode ray tube in relation to the operation of said generator.

5. In an indicating mechanism for a target acquisition apparatus, said apparatus having a cathode ray tube and a Selsyn generator, a hair line movable in juxtaposition to the screen of said cathode ray tube at right angles thereto, a

5

scale for the generator arranged in an arcuate row, a pointer mounted on the generator shaft for movement in juxtaposition to the scale, and a manually operable mechanism for actuating said pointer and said generator independently of said hair line and in conjunction therewith following a movement of said mechanism ineffective relative to said hair line and said pointer.

6. In an indicating mechanism for a target acquisition apparatus having a cathode ray tube and a Selsyn generator, a hair line mounted for indicating the position of the signal appearing on the cathode ray tube, a pointer mounted on the armature shaft of the generator, a scale cooperating with said pointer for indicating the angular position of said shaft relative to the position of said hair line on the cathode ray tube, a mechanism for actuating said hair line and said armature shaft, said mechanism comprising a mounting plate, a bushing secured at one of its ends to said plate, a shaft having one end journaled in said bushing, another plate having means for supporting the other end of said shaft, a gear mounted on said shaft having a hub portion extending from the second-mentioned plate to the free end of said bushing, a manually operable knob keyed on said shaft for imparting rotational and longitudinal movement to said shaft, a retractile spring for normally yieldably

6

holding the second-mentioned shaft in non-operated position, a clutch element mounted for rotation on said bushing having a gear, a support for said hair line having a gear rack portion meshing with said gear, a clutch element mounted for sliding movement on the hub of the first-mentioned gear, a spring actuated toggle mechanism controlled by the longitudinal movement of said shaft operable for engaging said clutch elements, means actuated by the rotation of the gear carried by said clutch element for moving said hair line for indicating the signal received on the cathode ray tube, and a gearing actuated by the rotation of said manually operable shaft for actuating said Selsyn generator and said pointer in juxtaposition to its respectively associated scale, said retractile spring operating said toggle mechanism for disengaging said clutch elements following the release of the manually operable knob by the operator.

CHARLES W. NORWOOD.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
2,383,365	Beers	Aug. 21, 1945