

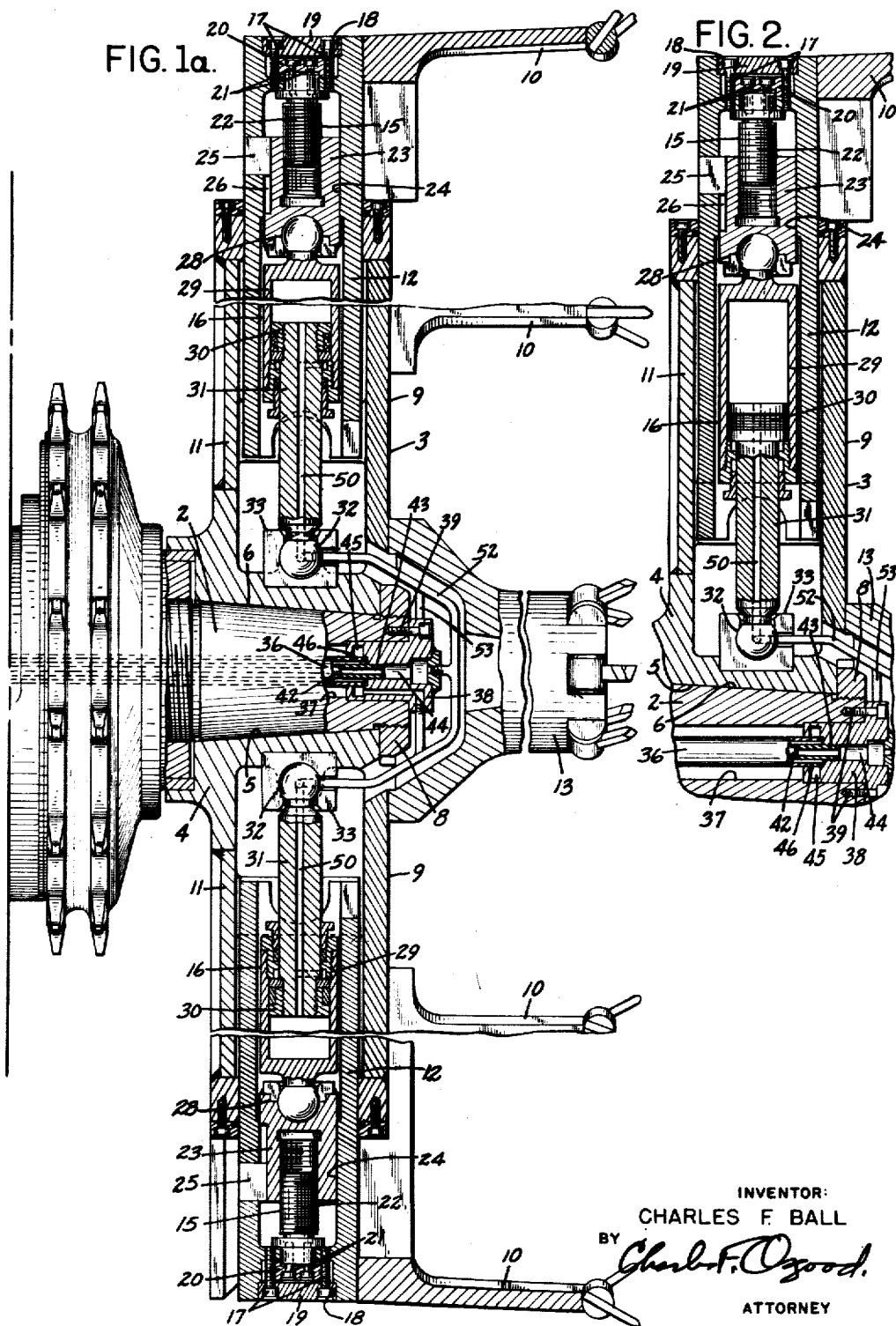
July 30, 1957

C. F. BALL
ADJUSTING MECHANISM FOR BORING ARMS OF A
ROTARY BORING HEAD

2,801,094

Filed July 30, 1954

3 Sheets-Sheet 1



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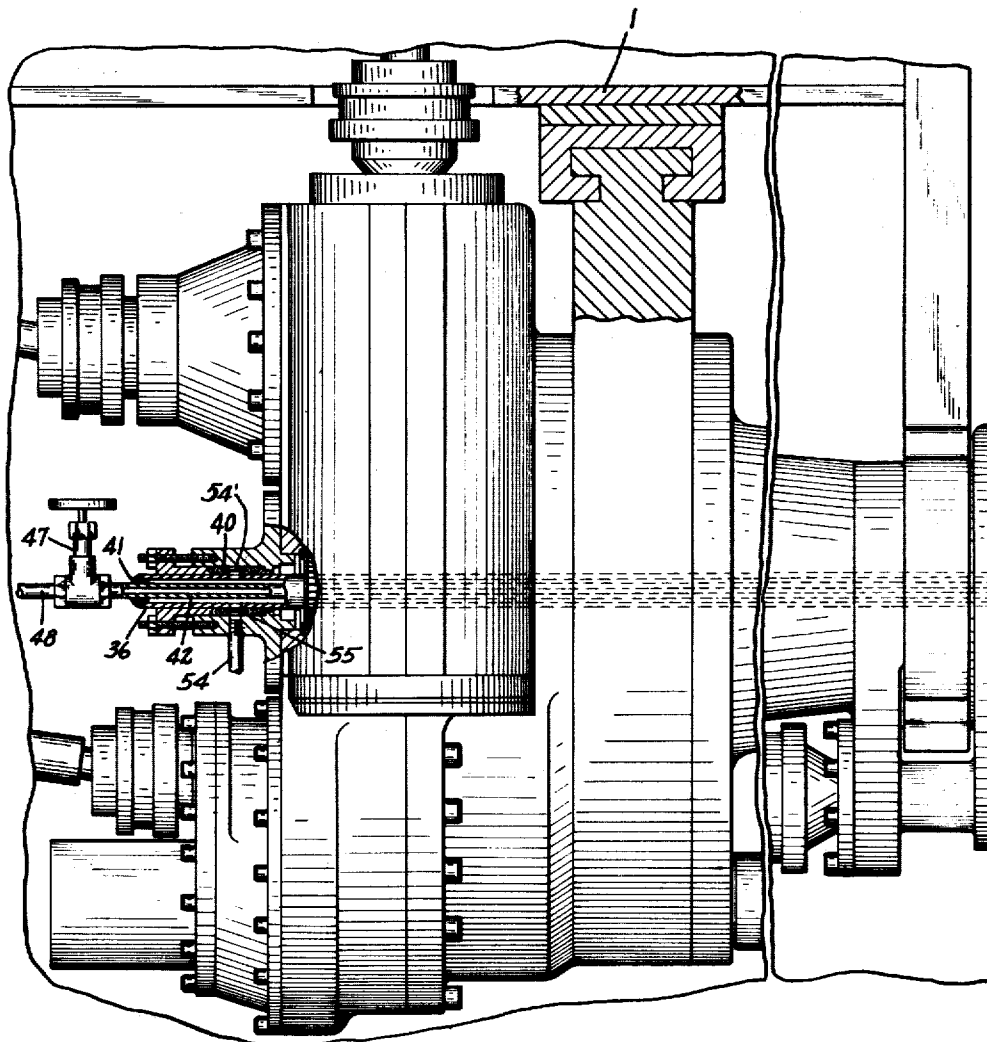
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FIG. 1b.



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FIG. 3.

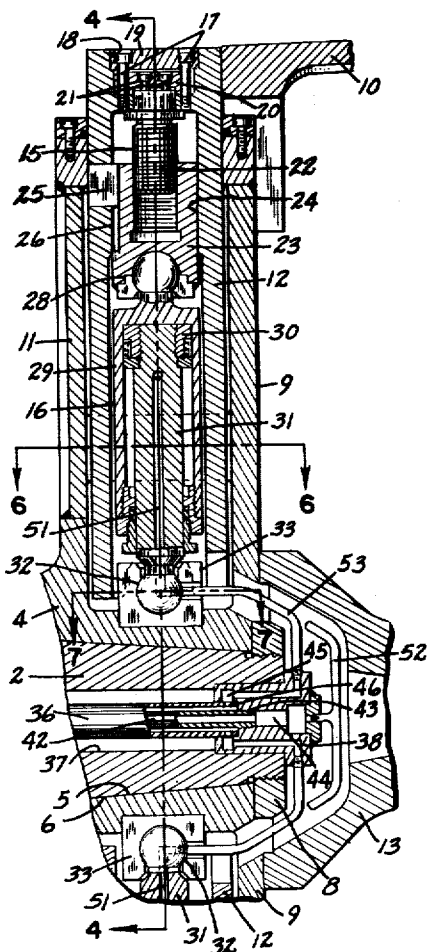


FIG. 4.

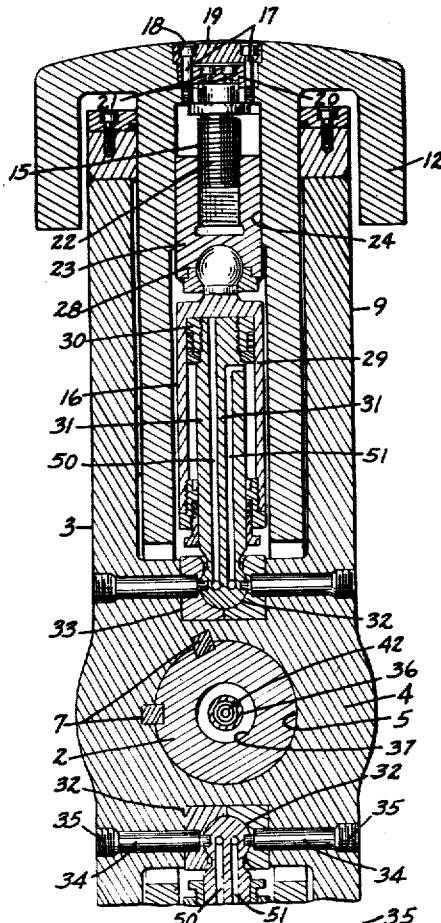


FIG. 5.

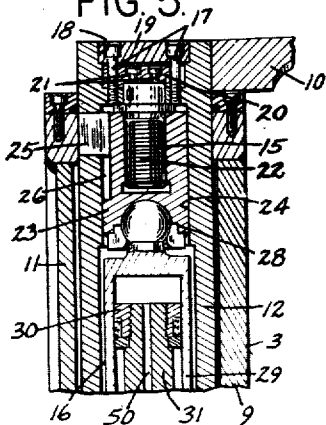


FIG. 6.

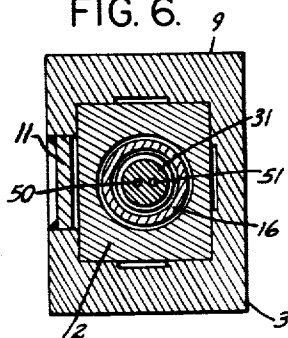
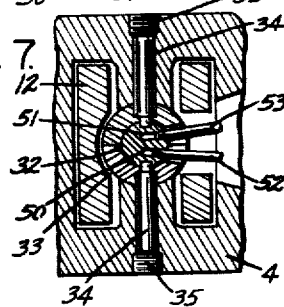


FIG. 7.



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ADJUSTING MECHANISM FOR BORING ARMS OF A ROTARY BORING HEAD

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9 Claims. (Cl. 262—26)

This invention relates to arm adjusting mechanism and more particularly to an adjusting mechanism for the retractable boring arms of a boring head of a mining apparatus of the type known as the "Twin-Bore Miner."

In a continuous miner of the type known as a twin borer, a pair of revolving cutting and disintegrating heads cut overlapping horizontal bores in the mineral of a solid mine vein and, in such a miner, it is desirable to retract the cutter arms of the heads to provide clearance as the miner is moved rearwardly in the bores formed thereby. In a bore miner of a known type, the cutting and disintegrating heads have adjustable boring arms which are moved radially toward and from the axes of rotation of the heads and mechanical adjusting devices have been provided for effecting arm adjustment. The present invention contemplates improvements over such known type of miner in that the boring arms of the revolving heads are provided with coacting mechanically and hydraulically operated adjusting devices for adjusting the outer boring arms toward and from the axes of head rotation and novel guiding means is provided for guiding the boring arms during such arm adjustments.

An object of the present invention is to provide an improved adjusting mechanism. Another object is to provide an improved adjusting mechanism comprising coacting mechanically and fluid operated adjusting devices. Yet another object is to provide an improved adjusting means embodying coacting mechanically and power operated adjusting devices. A further object is to provide an improved adjusting means for the boring arms of a rotary boring head. A still further object is to provide an improved hydraulically retractable boring arm structure. Still another object is to provide an improved coacting screw and nut and fluid operated cylinder and piston operating adjusting mechanism. Another object is to provide an improved arm guiding means with which the improved adjusting mechanism is associated. These and other objects and advantages of the invention will, however, hereinafter more fully appear.

In the accompanying drawings there is shown for purposes of illustration one form which the invention may assume in practice.

In these drawings:

Figs. 1a and 1b, taken together, constitute a fragmentary horizontal longitudinal section, with parts shown in plan, through a revolving boring head of a "Twin-Bore Miner" in which an illustrative form of the invention is embodied.

Fig. 2 is a longitudinal section taken through one of the adjustable boring arms, showing details of the improved adjusting mechanism, an arm being shown in fully extended position.

Fig. 3 is a section similar to Fig. 2, showing the boring arm in hydraulically retracted or collapsed position.

Fig. 4 is a section taken on line 4—4 of Fig. 3.

Fig. 5 is a fragmentary section taken in the plane of Fig. 3, showing a boring arm in fully mechanically retracted position.

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Fig. 6 is a cross section taken on line 6—6 of Fig. 3, showing the arm guiding means and the associated adjusting mechanism.

Fig. 7 is a fragmentary cross section taken on line 7—7 of Fig. 3.

In this illustrative construction, as shown in the drawings, a frame 1 has journaled thereon a horizontal, longitudinally extending drive shaft 2 on which a rotating boring head 3 is mounted. The boring head has a central rotary hub or hub portion 4 formed with a conical bore 5 for receiving a tapered portion 6 of the drive shaft, and the hub is keyed at 7 to the shaft and a suitable retaining nut 8 securely holds the head in position on the tapered portion of the shaft. The boring head has extensible radial arms 9 extending outwardly from the hub and these radial arms carry forwardly projecting cutter supporting or boring arms 10 suitably detachably secured in position. As the boring head is rotated and advanced toward the work during the mining operation the cutter supporting or boring arms 10 cut out concentric kerfs or annuli in the mineral to form concentric cores of mineral, in a well-known manner.

The radial arms 9 of the boring head are desirably of a box-like telescopic construction and of rectangular shape in cross section and include outer arm portions 11 integral with the hub and inner portions 12 telescopically arranged within the outer portions. Both the inner and outer arm portions carry the cutter supporting or boring arms 10 and by adjustment in length of the radial arms of the head the outer cutters may be moved radially toward and from the axis of head rotation. Thus, the cutter head may be expanded into cutting position and may be retracted or collapsed to provide clearance within the bore formed thereby during rearward movement of the head in its bore. Projecting centrally from the hub of the rotating head is a pilot cutter 13 (Fig. 1a) of suitable form. As the boring head is rotated during the mining operation concentric cores of mineral are formed in the solid mine vein by the annular kerfs cut by the inner and outer cutter supporting arms 10 and the central cutter 13, and suitable core breakers may be provided on the arms for breaking away or dislodging the cores as mining progresses, also in a well-known manner.

Now referring to the improved adjusting mechanism for the lengthening or shortening of boring arms of the boring head, it will be noted that coacting mechanical and fluid operated adjusting devices 15 and 16 are arranged in coaxial relation within the telescopic arms of the head (Fig. 1a) in a protected and relatively compact manner. Detachably secured, as by screws 17, within a circular recess 18 in the adjustable outer end of each of the adjustable arm portions 12 is a circular cap 19 and a circular rotatable member 20 is held in position in the bore by this cap. Secured, as by screws 21, to the rotatable member 20 is an adjusting screw 22 and when the cap 19 is removed the screw 22 may be rotated by a suitable manual turning instrument. The screw is threadedly engaged with a nut 23 guided in a cylindrical bore 24 in the adjustable arm portion 12 and this nut is held against rotation in its bore by a key 25 engaging a keyway 26 formed longitudinally on the exterior of the nut.

Pivotaly attached at 28 to the inner portion of each of the nuts 23, as by a conventional ball and socket joint, is the outer end of a fluid cylinder 29 arranged within the bore of the inner arm portion 12 and a piston 30 secured to the inner end of the piston rod 31 is reciprocally mounted in the bore of the cylinder. Each piston rod is pivotally connected at 32, as by a conventional ball and socket joint, to a cylindrical block 33 suitably detachably secured to the hub of the boring head. The blocks are desirably split, as shown in Fig. 7, and are seated in a

counterbore in the head, and the parts are held in position in the counterbore by pins 34 secured against outward displacement by threaded portions 35. The ball and socket joints between the opposite ends of the cylinder and piston rod compensate for any misalignment of the parts.

The fluid supply means for the adjusting cylinders 29 comprises an outer conduit or pipe 36 arranged centrally within an axial bore 37 in the drive shaft 2 and the front end of this pipe (Figs. 1a and 3) is secured to a hollow head or cap 38 secured, as by screws 39, to the drive shaft. The rear end of this pipe (Fig. 1b) extends rearwardly through a packing gland 40 and is secured, as by welding, at 41 to a coaxial inner conduit or pipe 42. The front end of the inner pipe is secured at 43 to the head or cap 38 and its interior communicates with a bore 44 in the cap. The cap has an annular chamber 45 which is connected by ports 46 in the outer pipe 36 with the annular space between the inner and outer pipes. Connected to the rear end of the inner pipe is a conventional hand valve 47 and a supply conduit 48 is suitably swivelly coupled to this valve thereby to permit the valve, the coaxial pipes, etc., to revolve with the boring bead without interrupting flow therethrough.

The piston rods 31 have parallel passages 50 and 51 communicating with the bores of the cylinders at the opposite sides of the pistons 30 and branched conduits 52 and 53 (Figs. 1a and 3) connect these pistons with the interiors of the coaxial pipes 36 and 42 respectively. The supply pipe 48 leads to a suitable source of pressure fluid, desirably liquid under pressure, while a supply pipe 54 leads to such suitable source of pressure fluid and communicates through an annularly grooved member 54' and radial ports 55 with the annular space between the coaxial pipes.

Thus, when the valve 47 is open, fluid under pressure may flow through the pipes 48, 42 to the chamber 44 and through the branched conduit 52 and the passages 50 in the piston rods to the outer ends of the cylinder bores thereby to cause the cylinders to move axially outwardly, moving the outer boring arms to their outermost position. When it is desired to collapse the head, the fluid supply through the inner pipe and chamber 44 may be cut off and suitably vented and fluid under pressure may be supplied through the branched conduit 53, through the outer pipe 36, through chamber 45 and the branched conduit 53 and through passages 51 in the piston rods to the cylinder bores at the inner sides of the pistons thereby to move the cylinders inwardly to retract the outer boring arms. By suitably trapping the fluid within the cylinders, the boring arms may be firmly locked in adjusted position.

The mode of use of the improved adjusting mechanism will be clearly apparent from the description given. A preliminary manual adjustment of the outer boring arms may be effected by the screw and nut mechanism 15 thereby to enable the cutting of bores of different diameters and the outer boring arms may move inwardly and outwardly with respect to the axis of rotation of the boring head by operating the hydraulic cylinder and piston mechanism 16. Fluid under pressure supplied to the outer ends of the cylinders may effect expansion of the boring head by moving the outer cutter arms outwardly and the boring head may be collapsed by retracting the outer boring arms upon fluid supply to the inner ends of the fluid cylinders to cause inward movement of the cylinders. Fluid may be trapped in the cylinders to lock the boring arms of the head in either their expanded or collapsed positions. As the outer boring arms are adjusted radially with respect to the axis of rotation of the boring head the coacting rectangular guiding elements of the radial arms of the head serve adequately to guide the outer boring arms.

As a result of this invention, an improved adjusting mechanism is provided embodying coacting separately operable adjusting devices constructed and arranged in a

novel manner. By provision of the mechanical adjusting devices the outer boring arm may be adjusted into different predetermined positions to expand the boring head to different diameters and the fluid operated adjusting mechanism may effect movement of the outer boring arms to the expanded position or may effect collapse or retraction of the head. The novel arrangement of the screw and nut device and the cylinder and piston device within the guiding structure of the extensible boring arm lends itself not only for compactness but also provides for a protected mechanism and one which may be readily and easily operated. These and other advantages of the invention will be clearly apparent to those skilled in the art.

While there is in this application specifically described one form which the invention may assume in practice, it will be understood that this form of the same is shown for purposes of illustration and that the invention may be modified and embodied in various other forms without departing from its spirit or the scope of the appended claims.

What I claim as new and desire to secure by Letters Patent is:

1. In combination, a rotary hub, a cutting member adjustable radially on said hub, telescopic tubular guides supporting said adjustable cutting member, and coaxial relatively adjustable devices one operating through the other and independently adjustable to effect extension of said telescopic guides to adjust said member outwardly, one of said devices embodying means whereby it may be set in predetermined adjusted positions and said other device acting through said one device to move said cutting member irrespective of the predetermined adjusted position of said one device, said tubular guides housing said adjustable devices in all adjusted positions of said cutting member.

2. A combination as set forth in claim 1 wherein one of said adjusting devices comprises relatively reciprocable fluid cylinder and piston elements extending longitudinally within said tubular guides, and universal pivotal connections are provided respectively between the inner end of one of said cylinder and piston elements and said hub and between the outer end of the other of said cylinder and piston elements and said other adjusting device.

3. A combination as set forth in claim 2 wherein said other adjusting device comprises cooperating screw and nut elements having relative axial adjustment, and the universal pivotal joint between said outer end of said other element and said other adjusting device is engaged with one of said screw and nut elements.

4. A combination as set forth in claim 2 wherein means is arranged coaxially with said hub for supplying pressure fluid to said cylinder element while said hub revolves and including a fluid connection with said cylinder element.

5. In combination, a revoluble support, a cutting member supported by and adjustable rectilinearly toward and from the axis of rotation of said support, tubular telescopic guides on said support for guiding said cutting member during its rectilinear adjusting movement, means coacting with one of said guide elements for effecting a preliminary adjustment of said cutting member to vary and maintain its extent of adjustment, and means coaxial with said preliminary adjusting means for moving said member rectilinearly between its limits of adjustment as maintained by said preliminary means, said preliminary and coaxial adjusting means extending longitudinally of and enclosed within said tubular guides in all adjusted positions of said cutting member, said preliminary adjusting means embodying means adapted to be set in predetermined adjusted positions and said coaxial adjusting means acting through said preliminary adjusting means to move said cutting member irrespective of the predetermined adjusting position of said preliminary adjusting means.

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6. A combination as set forth in claim 5 wherein said preliminary adjusting device comprises relatively rotatable screw and nut elements having relative axial movement.

7. A combination as set forth in claim 6 wherein said coaxial means comprises relatively reciprocable cylinder and piston elements one of which is operatively connected to one of said screw and nut elements.

8. A combination as set forth in claim 7 wherein one of said cylinder and piston elements has a universal pivotal connection with said support and the other cylinder and piston element has a universal pivotal connection with said one of said screw and nut elements.

9. A combination as set forth in claim 6 wherein one of said screw and nut elements is nonrotatable relative to its associated guide and a key and keyway connection is provided whereby said one element has axial movement relative to its associated guide during its adjustment.

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