

June 2, 1942.

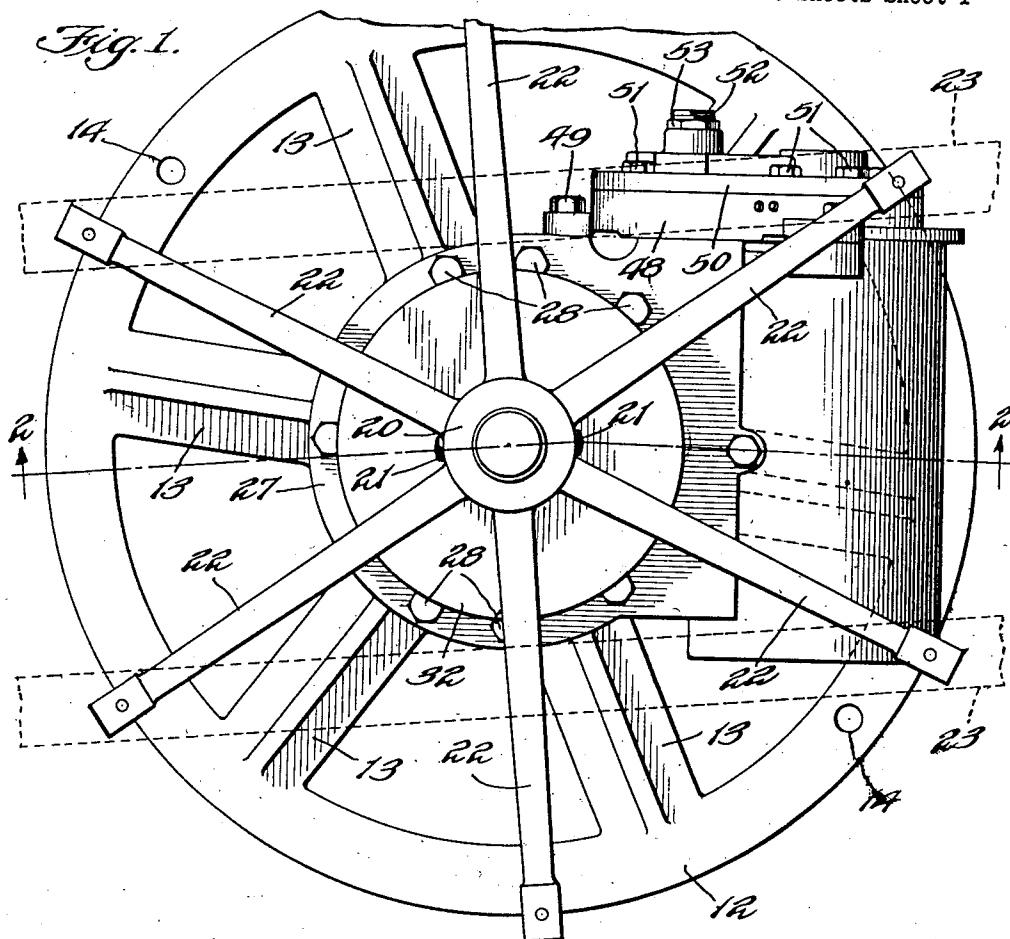
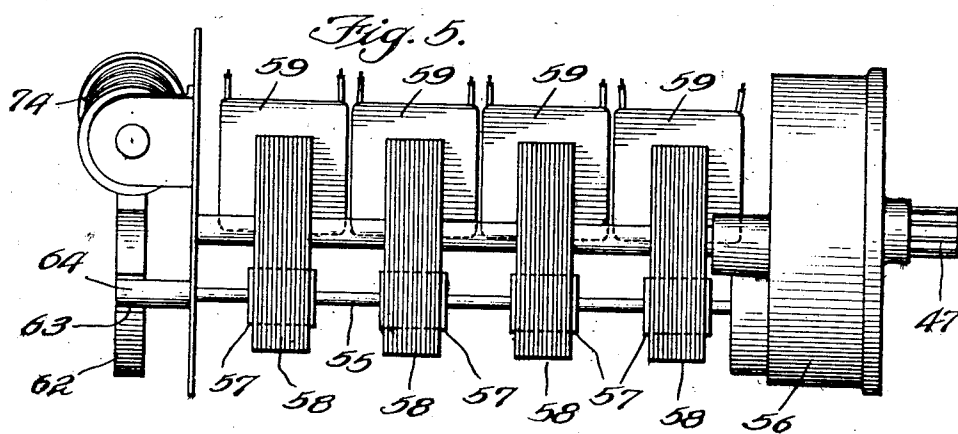
B. J. MERKLE

2,284,672

ANTENNA ROTATOR

Filed Aug. 26, 1939

3 Sheets-Sheet 1



INVENTOR:
Bernard J. Merkle
 BY *Kent W. Womall*
 ATTORNEY.

June 2, 1942.

B. J. MERKLE

2,284,672

ANTENNA ROTATOR

Filed Aug. 26, 1939

3 Sheets-Sheet 2

INVENTOR:
Bernard J. Tlerkle
BY *Kent W. Wourell*
ATTORNEY.

June 2, 1942.

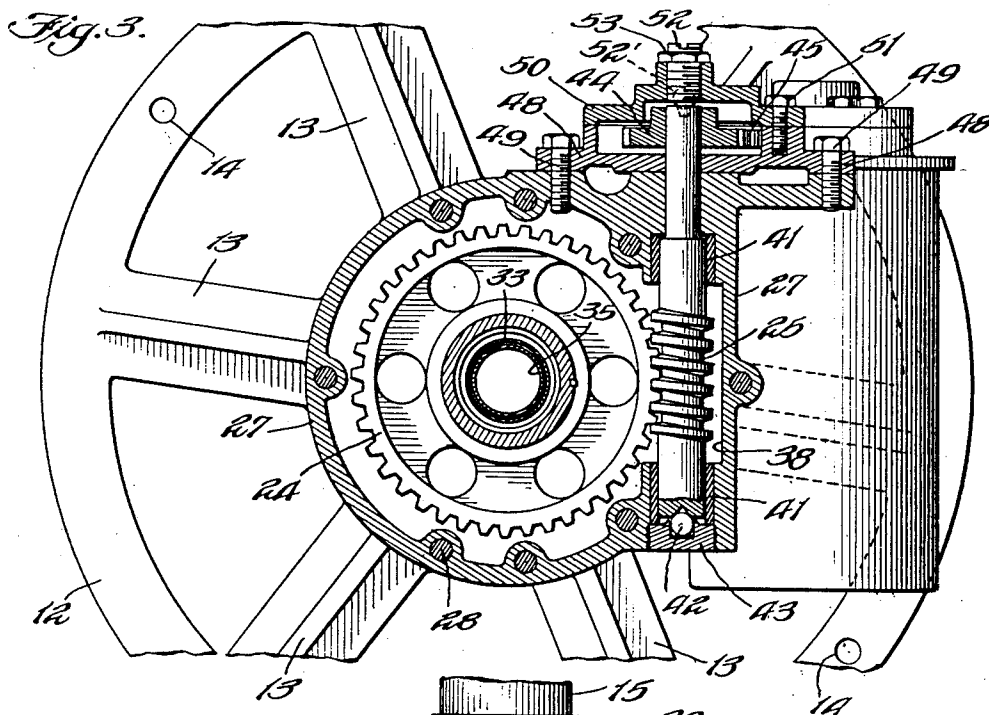
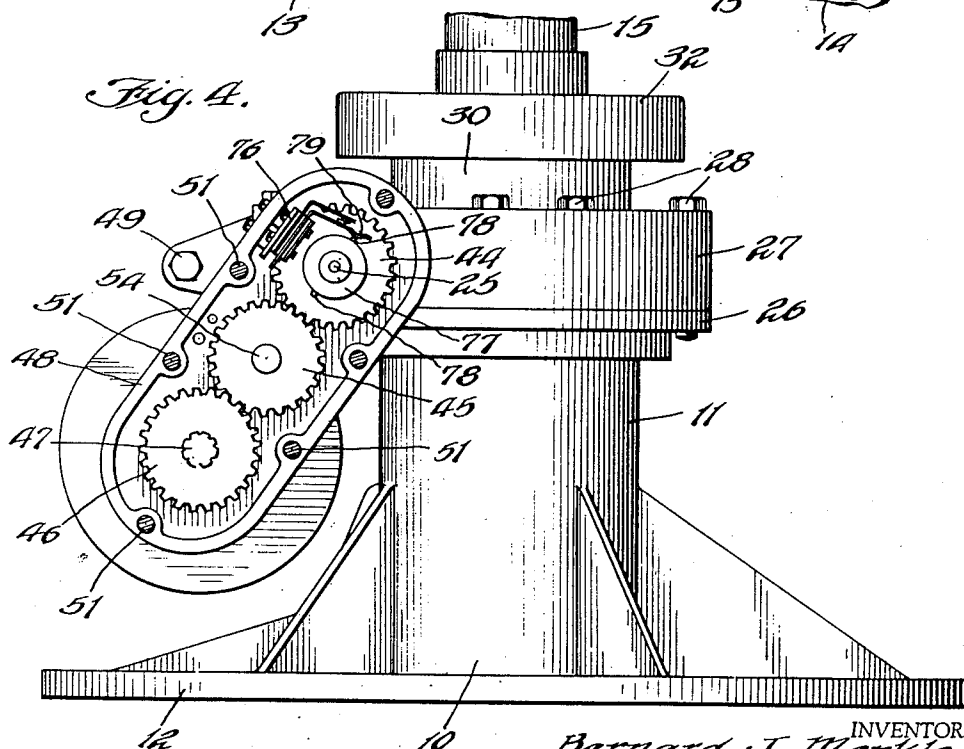
B. J. MERKLE

2,284,672

ANTENNA ROTATOR

Filed Aug. 26, 1939

3 Sheets-Sheet 3



INVENTOR:
Bernard J. Merkle
BY *Keut W. Wourell*
ATTORNEY.

UNITED STATES PATENT OFFICE

2,284,672

ANTENNA ROTATOR

Bernard J. Merkle, Chicago, Ill.

Application August 26, 1939, Serial No. 292,064

13 Claims. (Cl. 211—1.6)

This invention relates in general to a mechanism for rotating displays for merchandising, platforms for pianos, singers, or as a stage, airplane beacons, and the like, but is more particularly described as an antennae rotator by which radio antennae are set and changed in various rotative positions by moving them as desired in either direction.

An important object of the invention is in the provision of improved mechanism for rotating a suitable support in either direction.

A further object of the invention is in the provision of an improved reduction drive for positively rotating a support in either direction and holding it in any set position as desired.

A still further object of the invention is in the provision of improved driving and braking mechanism for operating a support in either direction, in providing a brake to overcome the inertia of the movable part; and in maintaining the support in any position to which it has been moved.

A still further object of the invention is in the provision of improved mounting and lubricating means for the rotating mechanism which also includes an unobstructed passage for conductors through the support and mounting mechanism.

Other objects of the invention will appear hereinafter, the preferred construction of which is shown in the accompanying drawings, in which—

Fig. 1 is a top view of an antenna rotator in accordance with this invention;

Fig. 2 is a sectional view taken substantially on the line 2—2 of Fig. 1;

Fig. 3 is a sectional view taken on the line 3—3 of Fig. 2;

Fig. 4 is a view illustrating a portion of the driving mechanism;

Fig. 5 is a plan view of a multi-motor drive; and

Fig. 6 is a wiring diagram for the motors and brake.

In positioning radio antenna for picking up distant stations or for the best reception for other stations it is desirable to change the horizontal angular positions of the antenna and to vary them as desired for the different stations.

The present invention provides a motor-driven mechanism for rotating an antenna support in either direction about a vertical axis for quickly moving the support and antenna into any desired angular position.

This mechanism is also applicable for con-

tinuously rotating airplane beacons, for supporting and rotating display stands such as merchandising displays, and also for supporting and rotating a stage for actors, singers and the like. For antenna rotators and airplane beacons it is desirable to provide an unobstructed passage for conductors which may lead through the mechanism itself to a suitable source of current supply or for suitable electrical connections.

Referring now more particularly to the drawings, a supporting base 10 has a centrally open upwardly extending hub portion 11 with an outer supporting rim 12 connected by ribbed spokes 13. If desired a number of holes 14 may be provided in the rim for bolting or otherwise securing the base to a suitable fixed support.

A tubular shell 15 is rotatably mounted in the hub by means of a roller thrust bearing 16 abutting a shoulder 17 near the lower end of the base, the lower end of the shell resting upon the bearing, and by means of the upper and lower needle bearings 18 and 19 which surround the sleeve at the upper and lower portions of the hub.

At the upper end of the sleeve 15 is an antennae or platform support comprising a central hub 20 secured to the sleeve by set screws 21 and having radiating arms 22 to which parallel antennae 23 or other supported means are secured.

In order to drive or rotate the sleeve in the base a gear 24 is keyed or otherwise secured to the sleeve at the top of the base and meshing with the gear at one side is a driving worm 25 which may be rotated in either direction. In order to enclose the gears the upper end of the base is provided with an extending flange 26 to which a casing 27 is secured by fastening bolts 28, the casing providing a mounting for the driving worm and extending above the gear with upwardly extending spaced rims 29 and 30 surrounding the shell 15 and together forming an overflow oil groove 31. Attached to the sleeve and overlying the rims 29 and 30 is a cap 32 which also has an outer downwardly extending flange for substantially covering and enclosing the rims.

In order to lubricate the bearings and the driving gear, to limit the amount of lubricant necessary, and also to provide a conduit for electrical conductors from the upper support through the base, a thin sleeve 33 is threaded at its lower end into a correspondingly threaded inwardly projecting flange 34 at the bottom of the base and extends upwardly through the shell

15 and free from contact therewith nearly to the top thereof. Another sleeve 35 is threaded into a fitting 36 at its upper end, is of less diameter than the sleeve 33, and extends downwardly therethrough nearly to the bottom of the sleeve 33, the sleeves being spaced apart and having no frictional contact or engagement with each other, the fitting 36 preferably resting upon the upper end of the shell 15 and properly centering and spacing the sleeve 35 within the outer sleeve 33.

A body of lubricant may thus be confined within the base outside of the sleeve 33 in which the lower end of the shell 15 and the bearings 16, 18 and 19 are immersed. At the upper end of the base in the flange portion 26 is an oil receiving groove 37 and communicating therewith below the worm 25 is a deeper oiling groove 38. In the top of the casing 27 is a fill opening closed by a screw cap 39 for replenishing lubricant in the system. A fibrous oil pad 40 may be provided having its lower end seated in the oiling groove 38 and extending upwardly around a portion of the worm 25 to insure lubrication thereof if there is any oil in this portion of the system. A similar oiling pad extends from groove 37 to lubricate the top of bearing 18. The cap 32 secured to the shell 15 prevents lubricant exuding or passing upwardly along the outside of the shell and if there is any surplus liquid which is thrown upwardly by the gears or works upwardly along the shell, it will be collected in the groove 31. The driving worm 25 is mounted in a suitable bore at one side of the casing 27 and in bearings 41 therein adjacent the ends of its driving portion. One end of the worm is engaged and positioned by a bearing 42 adjustable from the outer side of the casing by a threaded bearing gland 43. The other end of the worm projects through the casing and has a driving gear 44 secured thereto. This gear meshes with an idler gear 45 and a driving gear 46 mounted at its center upon a motor spline shaft 47. These three gears are preferably enclosed in a two-part casing, one part 48 secured directly to the base by bolts 49 and a capping part 50 secured to the other part by fastening bolts 51. In the cap portion at the end of the worm gear shaft is a threaded bearing gland 52 for an end thrust bearing ball 52' and with an outer set screw 53 for holding the bearing more securely in any adjusted position. The idler gear 45 is mounted upon a stub shaft 54 extending from the casing part 48.

Connected to the train of driving gears is an electrical driving motor comprising, as shown more clearly in Fig. 5, four separate motor units having a common drive shaft 55 connected to a reduction gearing enclosed in a casing 56 from which extends the spline shaft 47 for connection to the driving gear 46. Each motor unit comprises a rotor 57 fixed to the shaft 55, an armature 58 and a winding 59. Two of the units are connected for rotating the shaft 55 in one direction and the other two units are connected for rotating the shaft in the other direction by any suitable switch mechanism as shown for example in Fig. 6.

At the end of the motor shaft 55 opposite the reduction gearing is a brake mechanism comprising a brake drum 60 secured to the shaft, a brake band 61 in contact with the outer surface of the brake drum, and a flexible brake block 62 for compressing the brake band. The brake block is held in place around the drum by an

attached hanger 63 which engages a bearing pin 64 above the drum and the lower ends 65 and 66 of the brake block are spaced apart and extend outwardly below the drum on opposite sides of a bearing pin 67. Pivotaly mounted in the bearing pin is a brake actuator 68 in the form of a V-shaped piece, one extremity of which engages one end 65 of the brake block at one side of the bearing pin 67 and the actuator at the other side of the bearing pin 67 engages a bent extremity 69 of the other brake block end 66. This actuator is V-shaped for compactness of arrangement and its other or free end has a bent extremity 70 for engagement with the extremity of a plate 71 secured by a screw 72 to the movable armature 73 of an electromagnet 74. Whenever the magnet is energized the armature 73 is drawn upwardly or inwardly, engaging and operating the brake actuator 68 so that it is rotated upon its bearing pin 67 in a direction tending to force the ends 65 and 66 of the brake block apart against the resilience of the brake block or a spring 75 tending to draw its spaced extremities together and thereby to relieve frictional engagement of the brake band 61 so that the motor units are free therefrom to rotate the reduction gearing, and consequently the rotatable shell 15 in either corresponding direction.

In operation the brake is released at each actuation of the motor driving units in either direction and as soon as the energizing circuit to either set of motors is cut off the current to the brake magnet is also cut off and the brake is applied so that the driving mechanism is quickly stopped, thereby making it possible to accurately position the support 20 or the rotatable shell 15 in either direction of rotation. For the purpose of indicating the axial or rotary position of the support 20 an electric switch 76 may be mounted adjacent some rotating part of the mechanism, as the end of the worm shaft 25, shown in Fig. 4, the gear 44 being provided with a shouldered portion 77 having opposite projections 78 adapted to engage a resilient contact blade 79 of the switch for making successive contacts each time one of the projections is engaged. By suitable step by step indicating mechanism (not shown) the angular position of the support 20 may be indicated and designated so that it may be rotated in either direction therefrom by closing a proper switch to the driving mechanism.

In operating the units of the driving motor an arrangement as shown in Fig. 6 may be employed, comprising double pole switches R and L connected to one current supply main 80, the other current supply main 81 forming a common return for each of the four motor units a, b, c and d and for the brake winding 74. One switch R has a conductor 83 extending to the other side of the brake winding 74, and the other switch L has a conductor 84 extending to the windings of the opposite motors b and d and a conductor 85 connected through the conductor 83 to the other side of the brake winding 74. By this connection either pair of motors and the brake winding are energized at the same time, the brake winding being connected with either pair of motors. The motor units a and c drive the reduction gear in one direction and the motors b and d are connected to drive it in the other direction.

With this construction it is apparent that the support 20 may be driven continuously in either direction or may be operated at will in either

direction. For small variations of movement, in positioning antennae, for example, it would be operated slowly but accurately in either direction. If greater speed or less accuracy is desired the size of the motor or the ratio of the reduction gear may be changed. In a substantial mounting support of this kind where the inertia is considerable, a brake mechanism which works equally well for either direction of rotation is desirable so that the driving mechanism may be arrested and accurately stopped after each actuation of the motor. Although particularly designed for an antennae support this driving mechanism is also well adapted for all types of rotating display stands; it may be connected for intermittent, continuous and opposite rotation, depending upon the way the control switches are operated.

I claim:

1. In a rotatable support, a hollow vertical shell with a support at the top, a base into which the lower end of the shell is inserted, bearing means for supporting the lower end of the shell comprising a circular shoulder extending inwardly below the end of the shell, an anti-friction ring bearing interposed between the shell and shoulder, and an oil retaining sleeve secured to the inside of the shoulder and extending upwardly above the bearing within the shell, and means for rotating the shell in either direction.

2. In a rotatable support, a hollow vertical shell, a base having a circular opening to receive the shell with an inwardly extending rim at the bottom to support the shell at the lower end thereof, bearings in the base engaging the outside of the shell at a distance above the lower end thereof, and a sleeve secured to the rim at its lower end and extending upwardly within the shell above the height of the bearings to provide an oil receptacle in which the end of the sleeve and said bearings are immersed, and means for rotating the shell in either direction.

3. A rotatable support comprising a hollow vertical shell, a base with a vertical bore and an inward flange to support the lower end of the shell, bearings at the lower end and around the shell, a driving gear on the shell and means to rotate it, and a sleeve secured at its bottom to said flange and extending within the shell above the driving gear thereon to provide a receptacle for oil in which lower end of the shell, the bearings and the driving gear may be immersed.

4. A support of the class described, comprising a hollow vertical shell, a base with a vertical bore to receive the lower end of the shell, bearings for the shell in the base, a driving ring on the shell above the base, means for rotating the driving ring, a sleeve sealed to the base at the bottom and extending within the shell above the height of the driving ring to provide an oil retainer in the base, and a cover for enclosing the ring at the top of the base with an oil fill opening therein.

5. A structure in accordance with claim 4 in which the cover has an upwardly opening groove surrounding the shell, and a cap secured to the shell has a downward flange extending above the groove to provide a liquid seal for the base and shell.

6. A support of the class described, comprising a hollow vertical shell, a base with a vertical bore to receive the lower end of the shell, bearings for the shell in the base, a driving ring on the shell above the base, means for rotating the driving ring, a sleeve sealed to the base at the bot-

tom and extending within the shell above the height of the driving ring to provide an oil retainer in the base, and a second sleeve extending freely within the first one having means for supporting it at the top of the shell leaving the center open and extending downwardly substantially through the bore to provide an unobstructed and protected passage from the top of the shell through the base.

7. A rotatable support comprising a stationary base having a vertical bore through it, a hollow shell with its lower end mounted in the base and its upper end projecting above the base, means connected to the shell within the base for rotating it in either direction, and a pair of sleeves one within the other and both within the shell, the outer one connected to the base at its lower end to provide an oiling receptacle in the base, and the inner one supported at the upper end by the shell and extending through the base to provide a passage for conductors from the top of and carried by the shell.

8. The combination with a supporting base, of a hollow shell having its lower end rotatably mounted in the base and its upper end above the base providing a free support, a driving gear secured to the shell at the top of the base, means forming an oil receptacle at the top of the base below the gear, a cover for the receptacle enclosing the gear, a driving worm engaging the gear and mounted in the cover, a fibrous oiling pad extending from said receptacle and contacting with the worm, and means connected to the worm outside of the cover for driving it in either direction.

9. A structure according to claim 8 in which the top of the base also has means forming an oil receptacle below the driving worm, a bearing for said shell near the top of the base, fibrous pad means extending from said receptacle to lubricate the bearing from the top thereof and means for directing oil from this oil receptacle to lubricate the worm.

10. The combination with a vertical member having supporting means at its upper end, of a stationary base in which the lower end of the member is rotatably mounted, a driving gear secured to the member at the top of the base, a cover for the gear, a worm gear mounted in the cover and engaging the gear, a motor and a reduction drive connected thereto, a train of gears mounted in a casing secured to the cover connecting the worm gear and said reduction drive, and adjustable end bearings in the casing and cover for engaging the ends of the worm gear.

11. In a shaft positioner, a stationary base and a vertical member rotatably mounted at its lower end in the base and having supports free of the base at the upper end, an electric motor comprising a plurality of driving units with a common shaft, a driving gear train connecting the shaft and said member for rotating it, means for connecting certain of the units for rotating the member in one direction and the other units for reversely rotating the member, and a brake mechanism comprising a brake drum attached to the shaft and contact means for resiliently engaging the drum to hold it in fixed position, and electro-magnetic means energized when any of said motor units are actuated to operatively release said contact means allowing the shaft to turn freely.

12. A shaft positioner comprising a stationary base, a vertical member rotatably mounted at

its lower end in the base and having supports at its upper end free from the base, a driving motor comprising a plurality of separate electrical driving units and a common driving shaft therefor, a reduction gearing connected to one end of the shaft, a gear train from the reduction gearing to the member, a brake at the other end of the shaft having spring means for applying it and an electro-magnet for releasing it, certain of the motor units being operative to drive the shaft and said member in one direction and others to reversely rotate them, and circuit closing means for said units to include the brake electro-magnet with both units to release the brake and said

shaft for free driving rotation when any unit is energized for rotating it.

13. A structure in accordance with claim 11 in which the brake drum has a resilient brake block embracing the drum with projecting ends spaced apart and connected by a spring, the electro-magnet has a movable armature with a projecting arm, and an operating lever is pivoted adjacent said projecting ends and engages said arm for rotation by it when the electro-magnet is energized so that the lever engages and separates the projecting ends against the tension of the spring.

BERNARD J. MERKLE.