June 21, 1938. F. S. SHIELDS 2,121,104

RUNNING REGISTER

Filed Dec. 31, 1935 2 Sheets-Sheet 1

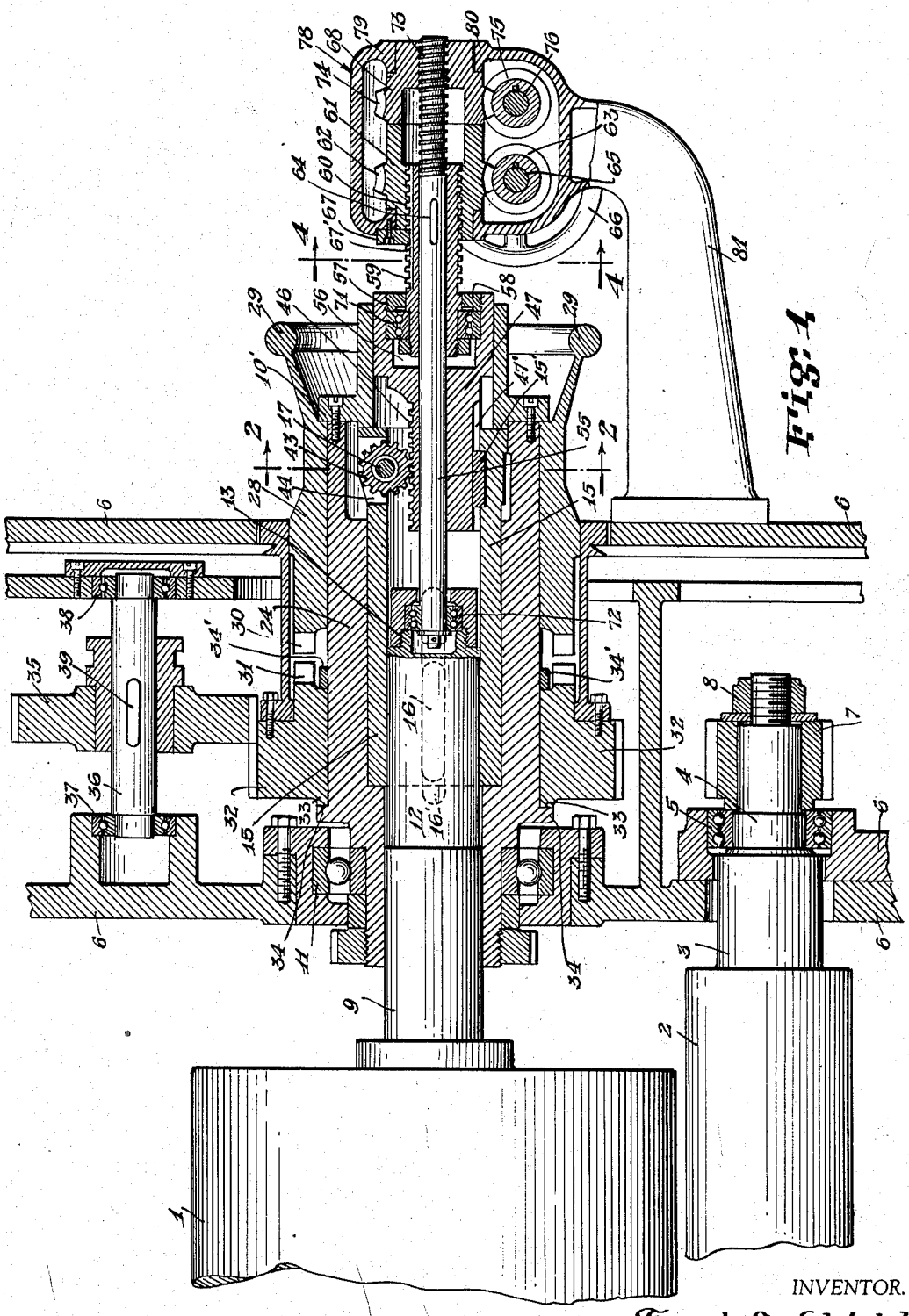


Fig. 4

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Filed Dec. 31, 1935 2 Sheets-Sheet 2

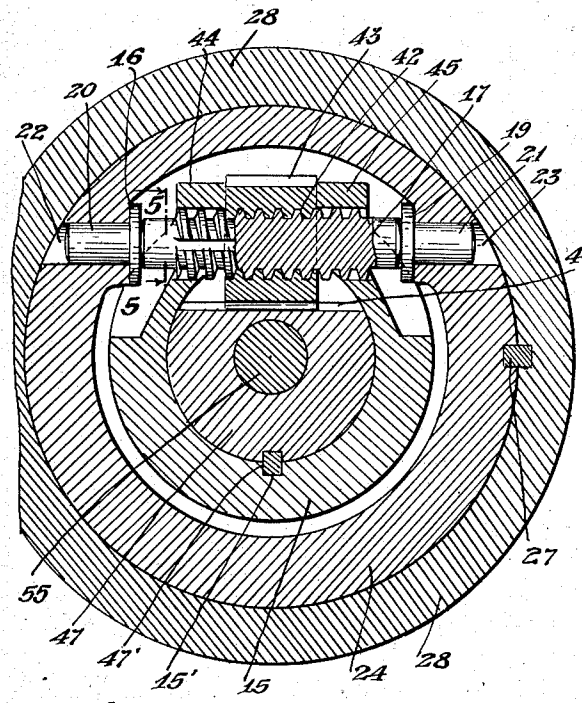


Fig: 2

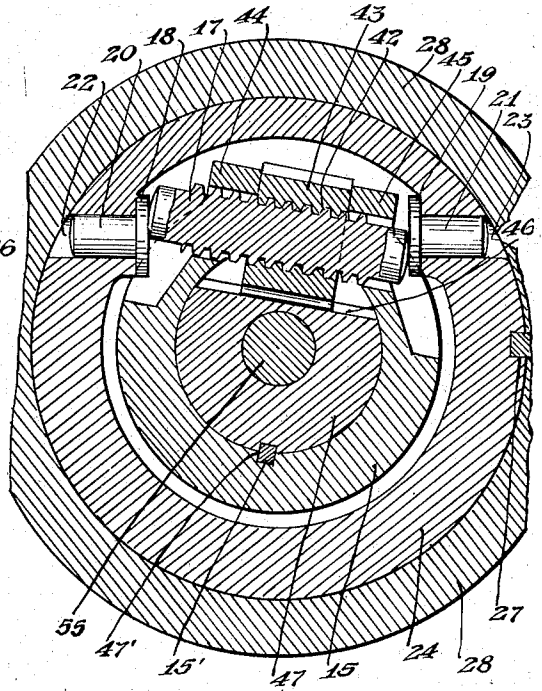


Fig: 3

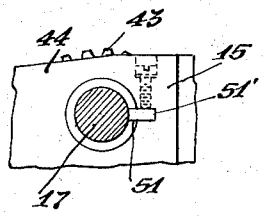


Fig: 5

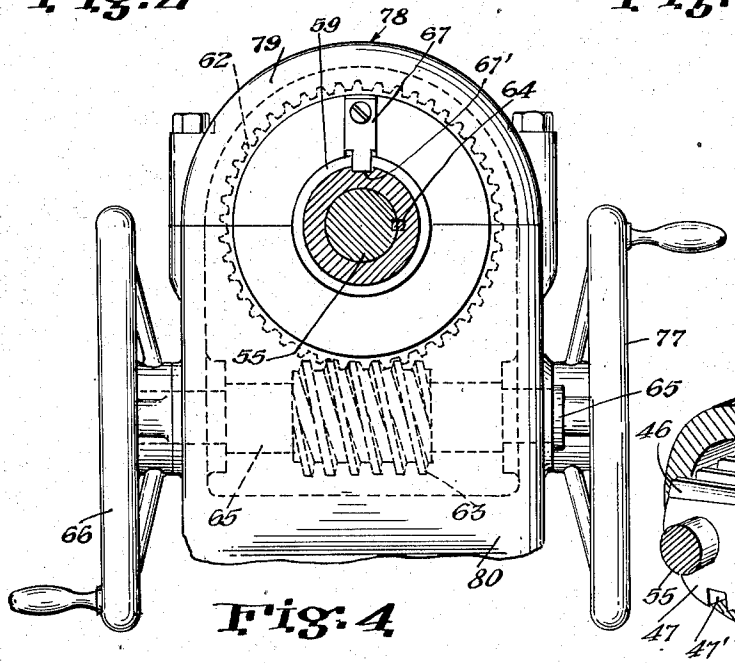


Fig: 4

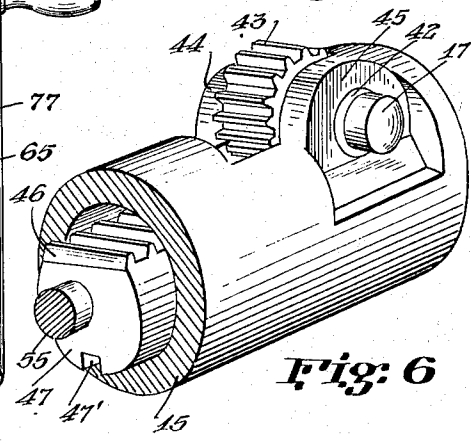


Fig: 6

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Patented June 21, 1938 2,121,104

UNITED STATES PATENT OFFICE

2,121,104

RUNNING REGISTER

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Application December 31, 1935, Serial No. 56,956

16 Claims. (Cl. 74—395)

My invention relates to a novel apparatus for and method of operating a printing and slotting cylinder and more particularly relates to novel apparatus for and methods of angularly adjusting the print and slotter drums while in operation.

A plurality of such drums are usually arranged to operate on an advancing sheet of material. These operations must register on the sheet in a predetermined relation. Thus, for example in printing different colors from a succession of such cylinders, the cylinders must operate in a fixed relation so that the printing will coordinate properly. Similarly in the case of slotting and printing, there must be a corresponding fixed relation between the slotting and printing cylinders. To this end, the relative positions of the cylinders must be adjusted axially and angularly with respect to each other.

Heretofore it has been proposed to obtain an angular adjustment of the drums by means of two meshing members, one of which presents helical surfaces so that when it is moved axially with respect to the other member it is also slightly rotated in respect thereto. Such an arrangement is disclosed in a patent to Barber Serial No. 1,745,467 issued February 4, 1930.

In accordance with the present invention a gear member having internal teeth meshing with a screw member is rotated about a screw member while at the same time it is held locked from axial movement with respect to the screw. As a result, the screw member which in turn is locked against rotation is compelled to move and in doing so acts against a head producing a tangential force to rotate the member on which it is mounted thereby producing an angular adjustment.

Accordingly an object of my invention is to provide novel apparatus for and methods of angularly adjusting a cylinder with respect to its drive.

A further object of my invention is to provide a screw member which produces a tangential force on a rotatable member for rotating said member about its axis. There are other objects of my invention which together with the foregoing detailed description which is to follow in connection with the drawings in which

Figure 1 is a longitudinal section through the whole device;

Figure 2 is a cross-section taken on line 2—2 of Figure 1;

Figure 3 is the same cross-section of Figure 2 showing several elements in displaced position;

Figure 4 is a partial cross-section taken on line 4—4 of Figure 1;

Figure 5 is a fragmentary detailed cross-section taken on line 5—5 of Figure 2.

Figure 6 is a perspective view of the adjusting mechanism of Figure 4.

Referring now more specifically to Figure 1, printing drum 1 cooperates with the platen 2 for printing on sheet fed therebetween. Inasmuch as the drive for the drum 2 is obtained directly from the source of power employed, the details of this drive are not disclosed since there is nothing novel, the drawings merely showing the shaft 3 extending from drum 2 and having an extension 4 thereof, rotatably mounted in the bearings 5 in frame 6. Extension 4 is in turn secured for rotation with the gear 7 held in driving contact with extension 4 by the lock nut 8. Gear 7, as will be understood, meshes with another gear not shown which in turn is connected to the driving source (not shown) in any well known manner.

The drum 1 is secured for rotation with the solid shaft 9 which has an extension shaft 12 of reduced diameter terminating in the threaded head 13 and which is provided with ball bearing 72 capable of carrying a thrust load. Encasing the extension shaft 12 is a sleeve 15 having an elongated keyway 16' which receives the key 16 mounted in extension shaft 12. Thus the shaft 9 and drum 1 are movable axially with respect to the sleeve 15 but constrained to rotate therewith through the key 16 for the purpose to be described hereinafter.

Sleeve 15 (Figure 2) carries a screw member 17, the ends of which engage heads 18 and 19 of the members 20 and 21 respectively, securely fastened in slots 22 and 23 in the outer sleeve 24, thus providing a rotating connection between the sleeves 15 and 24.

Sleeve 24 (Fig. 1) in turn, has a reduced portion 10 at one end which is mounted in ball bearings 11 housed in main frame 6 and at the other end retains a flanged member 10' providing a stop for clutch sleeve 28 to be described hereinafter. Sleeve 24 also has secured thereto a key 27 (Figure 2) which moves in a slot in sleeve member 28 for permitting axial movement of the clutch sleeve 28 with respect to the sleeve 24 but restraining the sleeve 24 for rotation with sleeve 28.

Clutch sleeve 28 (Figure 1) is provided at one end thereof with a handwheel 29 integral therewith, and with clutch jaws 30 at the opposite end thereof adapted to engage with clutch jaws 31 when the sleeve 28 is moved axially by handwheel

28 to permit such engagement. The clutch 31 is integral with a gear 32 freely mounted for rotation on the sleeve 24 and has a shoulder 33 abutting the shoulder 34 of sleeve 24 and a corresponding shoulder formed by the collar 34' on the opposite side secured to sleeve 24. The teeth of gear 32 mesh with a gear 35 keyed to the shaft 36 rotatably mounted at its opposite ends in the bearings 37 and 38 in the frame 6. Gear 35, which forms no essential part of the present inventions is merely illustrated as it happens to be part of the completed machine and transfers power for other operations of the mechanism. Power from a source (not shown) drives gear 32, which, when the clutch jaws 31 and 30 are in engagement, produces a corresponding rotation of the sleeve 28. Sleeve 28 keyed to the sleeve 24 in turn drives this sleeve, and sleeve 24 through its connection to sleeve 15 by way of the screw 17 drives the latter, which in turn is connected through a key 16 to the shaft extension 12, thereby driving the drum 1.

The angular adjustment of the drum 1 with respect to drum 2, in accordance with my invention by means of the driving connection between the sleeves 24 and 15 illustrated in detail in Figure 2. The screw 17 meshes with internal teeth 42 of a gear 43. Gear 43 which is securely held against axial movement between lugs 44 and 45, which form an integral part of sleeve 15, is provided with external teeth which mesh with the teeth 46 of the rack 47 (Figure 1). Screw 17 is provided with a keyway 51 (Figure 2) which engages a key 51' extending from sleeve 15 to prevent rotation of the screw 17.

As the rack 47 is moved axially in a manner to be described hereinafter, the gear 43 is rotated. Inasmuch, however, as the screw 17 is restrained from rotation, and gear 43 is prevented from any axial movement by the lugs 44 and 45 between which it is held, the only possible movement is an axial movement of screw 17 with respect to gear 43. The head of screw 17 in contact with block 18 thus produces a tangential force on sleeve 15 as a result of which a rotation of sleeve 15 is produced together with a rotary movement of the entire connection including the screw 17, gear 43, and lugs 44 and 45 as illustrated in Figure 3 by the new position which these parts have taken up. Since the rotation of sleeve 15 produces therewith a corresponding rotation of the drum 1 through the driving connections described in detail above, this angular adjustment of the sleeve 15 with respect to sleeve 24 produces a corresponding adjustment of the drum 1.

Referring now again to Figure 1, the method of rotating the rack 47 for producing this adjustment will now be described. Rack 47, freely mounted for axial slidable movement in sleeve 15 but engaged for angular movement through keyway 47' in rack 47 and key 15' secured in sleeve 15 which in turn is slidable on the shaft 55, has one end thereof hollowed as at 56 and has at this end an internal threaded portion 57 which engages the threads of a block 58 rotatable on screw 59 through the bearing 71. The teeth 60 of screw 59 mesh with the internal teeth of worm gear 61. The outer teeth 62 of worm gear 61 in turn mesh with the worm 63 which is keyed to shaft 65. One end of shaft 65 is secured to the handwheel 66 (Figure 4). As the handwheel 66 is rotated, shaft 65 through the worm 63 rotates the worm gear 61. Inasmuch as the worm gear 61 in turn is fixed against axial movement between the block 67 at one end thereof and the worm 68 at the other end thereof, and the screw 59 in turn is restrained from rotation by the slot or keyway 67' and cooperating key block 67 as shown in Figure 4 rotation of worm gear 61 will cause an axial movement of the screw member 59, causing a corresponding axial movement of the rack 47. Rack 47 in turn draws gear 43 for producing fine adjustments of the drum 1 as has already been described. Although rack 47 rotates with sleeves 15 and 24, in the manner that will now be obvious, about screw 59 on bearings 71, this entire mechanism can be shifted axially and it will be obvious that adjustments may therefore be obtained while the apparatus is in operation.

In order to obtain longitudinal adjustments of the cylinder 1, the shaft extension 12 is mounted for rotation about bearings 72 mounted in turn on shaft 55. Shaft 55, which is free to rotate in bearings 72 at one end and is keyed to the screw 59 forming the sleeve thereof at its other end, is provided with a screw member 73 at its free end which meshes with teeth in the fixed worm 68. The teeth 74 of worm 68 mesh with the worm 75 pinned to the shaft 76 for rotation therewith. Shaft 76 in turn is connected to the handwheel 77 for rotation thereby. As the handwheel 77 rotates to drive shaft 76, the worm 75 rotates worm gear 68. Worm gears 61 and 68 are mounted in a housing 78, which consists of the upper member 79 and lower support member 80 arranged so as to form bearings for the worm gears 61 and 68 and their corresponding worms and handwheels. The entire unit is mounted to main frame 6 by means of an extending brace 81. Inasmuch as the worm gear 68 is fixed against axial movement in the housing 78 which also houses the worm gear 61, as the worm gear 68 rotates, and inasmuch as screw 73 is locked against rotation by reason of the engagement of the keyway in screw 59 by the key 64 of shaft 55 an axial movement of the screw 73 is produced producing a corresponding movement of shaft 55. As the shaft 55 is moved axially it carries with it its bearings 72 and the housing 79 to move shaft extension 12 and drum 1 longitudinally for displacement with respect to drum 2. Shaft 12 by reason of the key 16 which engages keyway 16' is adjustable longitudinally with respect to the sleeve 15.

The operation of my mechanism will now be obvious. Normally, for producing rough adjustments of the drum 1, I disengage clutches 30 and 31 by the handwheel 29 which carries the sleeve 28 to the right. With the clutches 30 and 31 disengaged handwheel 29 may be rotated to in turn rotate the drum 1 until an approximate adjustment has been obtained. After the rough adjustment has been accomplished, the handwheel 29 is operated to move sleeve 28 to the left until the clutch jaws 30 and 31 engage. Thereafter, with the apparatus in operation, by observing printing operations, adjustments may be made first with the handwheel 66. Operation of the handwheel 66, as explained above, results in a longitudinal movement of the rack 47 which, in turn, produces a rotating movement of gear 43. The rotation of the gear 43, because of the non-rotating condition of worm 17 and because of the restraining of gear 43 between the lugs 44 and 45, can be translated only into a rotation of the connection between sleeves 24 and 15 with respect to sleeve 24. Similarly to produce axial movement of the drum, the handwheel 77 is operated, which operates through the shaft 55

to move the shaft 12 and drum 1 axially the required amount.

Although for purposes of illustration I have described a preferred form of my invention, it will be obvious that it may take other forms and I do not wish to be limited except by the appended claims:

I claim:

1. Means for adjusting the angular relationship between a driven shaft and a driving member comprising first and second sleeve members, said first sleeve being secured to said shaft and said second sleeve coacting with said driving member; a transversely movable member rotatably mounted on said first sleeve; abutting means secured to said second sleeve; and mechanism for displacing said transversely movable member with respect to said first sleeve and against said abutting means to produce a relative angular displacement between said first and second sleeves while said driving member is operating.

2. Means for adjusting the angular relationship between a driven shaft and a driving member comprising first and second sleeve members mounted concentric with said shaft, said first sleeve being secured to said shaft and said second sleeve coacting with said driving member; abutting means secured to said second sleeve; a screw member rotatably mounted on said first sleeve, said screw member having end portions projecting against said abutting means; and mechanism for displacing said screw member with respect to said first sleeve to produce a relative angular displacement between said first and second sleeves while said driving member is operating.

3. Means for adjusting the angular relationship between a driven shaft and a driving member comprising first and second sleeve members mounted concentric with said shaft, said first sleeve being secured to said shaft and said second sleeve coacting with said driving member; abutting means secured to said second sleeve; a screw member rotatably mounted on said first sleeve, said screw member having end portions projecting between said first and second sleeves; and means for displacing said screw member with respect to said first sleeve and against said abutting means to produce a relative angular displacement between said first and second sleeves comprising a pinion rotatably mounted on said first sleeve to coact with said screw member and a rack member having teeth coacting with said pinion.

4. Vernier means for adjusting the angular relationship between a driven shaft and a driving member comprising first and second sleeve members mounted concentric with said shaft, said first sleeve being secured to said shaft and said second sleeve coacting with said driving member; abutting means secured to said second sleeve; a screw member rotatably mounted on said first sleeve, said screw member having end portions projecting against said abutting means; and means for displacing said screw member with respect to said first sleeve and against said abutting means to produce a relative angular displacement between said first and second sleeves comprising a pinion rotatably mounted on said first sleeve, slidably keyed onto said screw member and internally threaded to coact with said screw member, and a rack member concentric within said first sleeve having teeth coacting with said pinion to rotate said pinion in accordance with the axial movement of said rack member to effect a corresponding displacement of said screw member.

5. A running register including vernier means for adjusting the angular relationship between a driven shaft and a driving member comprising first and second sleeve members mounted concentric with said shaft, said first sleeve being slidably keyed to said shaft and said second sleeve coacting with said driving member; a screw member rotatably mounted on and transverse of said first sleeve, said screw member having projecting end portions, and abutting means secured to said second sleeve cooperable with said end portions; and mechanism for displacing said screw member with respect to said first sleeve against said abutting means to produce a relative angular displacement between said first and second sleeves while said driving member is operating.

6. Means for adjusting the angular relationship between a driven shaft and a driving member comprising first and second sleeve members mounted concentric with said shaft, said first sleeve being secured to said shaft and said second sleeve coacting with said driving member; abutting means secured to said second sleeve; a screw member rotatably mounted on said first sleeve, said screw member having portions projecting between said first and second sleeves and against said abutting means; means for displacing said screw member with respect to said first sleeve and against said abutting means to produce a relative angular displacement between said first and second sleeves comprising a pinion rotatably mounted on said first sleeve to coact with said screw member and a rack member having teeth coacting with said pinion to rotate said pinion in accordance with the axial movement of said rack member to effect a corresponding displacement of said screw member; and means for axially displacing said rack member.

7. Means for adjusting the angular relationship between a driven shaft and a driving member comprising first and second sleeve members mounted concentric with said shaft, said first sleeve being secured to said shaft and said second sleeve coacting with said driving member; abutting means secured to said second sleeve; a screw member rotatably mounted on said first sleeve, said screw member having end portions projecting between said first and second sleeves; means for displacing said screw member with respect to said first sleeve and against said abutting means to produce a relative angular displacement between said first and second sleeves comprising a pinion rotatably mounted on said first sleeve to coact with said screw member, and a rack member having teeth coacting with said pinion to rotate said pinion in accordance with the axial movement of said rack member to effect a corresponding displacement of said screw member; and means for axially displacing said rack member comprising a threaded member, means for mechanically connecting said threaded and rack members permitting rotation therebetween, and means for axially displacing said threaded member.

8. Means for adjusting the angular relationship between a driven shaft and a driving member comprising first and second sleeve members mounted concentric with said shaft, said first sleeve being secured to said shaft and said second sleeve coacting with said driving member; abutting means secured to said second sleeve; a screw member rotatably mounted on said first sleeve, said screw member having portions pro-

jecting between said first and second sleeves and against said abutting means; means for displacing said screw member with respect to said first sleeve to produce a relative angular displacement between said first and second sleeves comprising a pinion rotatably mounted on said first sleeve to coact with said screw member, and a rack member having teeth coacting with said pinion to rotate said pinion in accordance with the axial movement of said rack member to effect a corresponding displacement of said screw member; and means for axially displacing said rack member comprising a threaded member, means for mechanically connecting said threaded and rack members permitting rotation therebetween, and means for axially displacing said threaded member comprising an internally threaded gear coacting with the threaded member, said gear being fixed against axial displacement, a pinion for rotating said gear, and means for rotating said pinion.

9. Vernier means for adjusting the angular relationship between a driven shaft and a driving member comprising first and second sleeve members mounted concentric with said shaft, said first sleeve being secured to said shaft and said second sleeve coacting with said driving member; abutting means secured to said second sleeve; a screw member rotatably mounted on said first sleeve, said screw member having end portions projecting between said first and second sleeves and against said abutting means; means for displacing said screw member with respect to said first sleeve and against said abutting means to produce a relative angular displacement between said first and second sleeves comprising a pinion rotatably mounted on said first sleeve, slidably keyed onto said screw member and internally threaded to coact with said screw member, and a rack member concentric within said first sleeve having teeth coacting with said pinion to rotate said pinion in accordance with the axial movement of said rack member to effect a corresponding displacement of said screw member; and means for axially displacing said rack member comprising a threaded member, means for mechanically connecting said threaded and rack members permitting rotation therebetween, and means for axially displacing said threaded member comprising an internally threaded worm gear coacting with the threaded member, said gear being fixed against axial displacement, a worm for rotating said gear, and a handwheel for rotating said worm.

10. A running register including vernier means for adjusting the angular relationship between a driven shaft and a driving member comprising first and second sleeve members, said first sleeve being secured to said shaft and said second sleeve coacting with said driving member; a transversely movable member rotatably mounted on said first sleeve; abutting means secured to said second sleeve; means for displacing said transversely movable member with respect to said first sleeve and against said abutting means to produce a relative angular displacement between said first and second sleeves; and means for roughly adjusting the angular position of said driven shaft comprising a third sleeve member concentric with and slidably keyed to said second sleeve member, and clutching means connecting said driving member and said third sleeve for permitting connection and disconnection to said driving member.

11. A running register including means for adjusting the angular relationship between a driven shaft and a driving member comprising first and second sleeve members mounted concentric with said shaft, said first sleeve being secured to said shaft, and said second sleeve coacting with said driving member; a screw member rotatably mounted on said first sleeve; abutting means secured to said second sleeve; means for displacing said screw member with respect to said first sleeve and against said abutting means to produce a relative angular displacement between said first and second sleeves; and means for adjusting the axial position of said driven shaft comprising a rod having a threaded end portion, a mechanical connection between said shaft and said rod permitting relative rotation therebetween, and means for axially displacing said rod.

12. A running register including means for adjusting the angular relationship between a driven shaft and a driving member comprising first and second sleeve members mounted concentric with said shaft, said first sleeve being secured to said shaft, and said second sleeve coacting with said driving member; a screw member rotatably mounted on said first sleeve; abutting means secured to said second sleeve; means for displacing said screw member with respect to said first sleeve and against said abutting means to produce a relative angular displacement between said first and second sleeves; and means for adjusting the axial position of said driven shaft comprising a rod having a threaded end portion, a mechanical connection between said shaft and said rod permitting relative rotation therebetween, and means for axially displacing said rod comprising an internally threaded member coacting with the threaded rod portion, said internally threaded member being held against axial movement, and means for rotating said internally threaded member to correspondingly axially displace said rod and said driven shaft.

13. A running register including vernier means for adjusting the angular relationship between a driven shaft and a driving member comprising first and second sleeve members, said first sleeve being secured to said shaft and said second sleeve coacting with said driving member; a transversely movable member rotatably mounted on said first sleeve; abutting means secured to said second sleeve; means for displacing said transversely movable member with respect to said first sleeve and against said abutting means to produce a relative angular displacement between said first and second sleeves; means for roughly adjusting the angular position of said driven shaft comprising a third sleeve member concentric with and slidably keyed to said second sleeve member, and clutching means connecting said driving member and said third sleeve for permitting connection and disconnection to said driving member; and means for adjusting the axial position of said driven shaft comprising a rod having a threaded end portion, a mechanical connection between said shaft and said rod permitting relative rotation therebetween, and means for axially displacing said rod.

14. Means for adjusting the angular relationship between a driven shaft and a driving member comprising first and second sleeve members mounted concentric with said shaft, said first sleeve being secured to said shaft and said second sleeve coacting with said driving member; abutting members secured to said second sleeve; a screw member rotatably mounted on said first sleeve, said screw member having end portions

projecting between said first and second sleeves and against said abutting members; means for displacing said screw member with respect to said first sleeve and against said abutting members to produce a relative angular displacement between said first and second sleeves comprising a pinion rotatably mounted on said first sleeve to coact with said screw member, and a rack member having teeth coacting with said pinion to rotate said pinion in accordance with the axial movement of said rack member to effect a corresponding displacement of said screw member; means for axially displacing said rack member comprising a threaded member, means for mechanically connecting said threaded and rack members permitting rotation therebetween, and means for axially displacing said threaded members; and means for adjusting the axial position of said driven shaft comprising a rod having a threaded end portion, said rod projecting centrally through said rack and threaded members, a mechanical connection between said shaft and said rod permitting relative rotation therebetween, and means for axially displacing said rod.

15. Vernier means for adjusting the angular relationship between a driven shaft and a driving member comprising first and second sleeve members mounted concentric with said shaft, said first sleeve being secured to said shaft and said second sleeve coacting with said driving member; abutting members secured to said second sleeve; a screw member rotatably mounted on said first sleeve, said screw member having end portions projecting between said first and second sleeves; means for displacing said screw member with respect to said first sleeve and against said abutting members to produce a relative angular displacement between said first and second sleeves comprising a pinion rotatably mounted on said first sleeve, slidably keyed onto said screw member and internally threaded to coact with said screw member, and a rack member concentric within said first sleeve having teeth coacting with said pinion to rotate said pinion in accordance with the axial movement of said rack member to effect a corresponding displacement of said screw member; and means for axially displacing said rack member comprising a threaded member, means for mechanically connecting said threaded and rack members permitting rotation therebetween, and means for axially displacing said threaded member comprising an internally threaded worm gear coacting with the threaded member, said gear being fixed against axial displacement, a worm for rotating said gear, and a handwheel for rotating said worm; means for roughly adjusting the angular position of said driven shaft comprising a third sleeve member concentric with and slidably keyed to said second sleeve member, and clutching means connecting said driving member and said third sleeve for permitting connection and disconnection to said driving member; and means for adjusting the axial position of said driven shaft comprising a rod having a threaded end portion, said rod projecting centrally through said rack and threaded members, a mechanical connection between said shaft and said rod permitting relative rotation therebetween, means for axially displacing said rod comprising an internally threaded member coacting with the threaded rod portions, said internally threaded member being held against axial movement, and means for rotating said internally threaded member to correspondingly axially displace said rod and said driven shaft.

16. Means for adjusting the angular relationship between a driven shaft and a driving member comprising first and second sleeve members, one of said sleeve members being secured to said shaft and the other of said sleeve members coacting with said driving member; a transversely movable member rotatably mounted on said first sleeve; abutting means secured to said second sleeve; and mechanism for displacing said transversely movable member with respect to said first sleeve and against said abutting means to produce a relative angular displacement between said first and second sleeves while said driving member is operating.

FRANK S. SHIELDS.