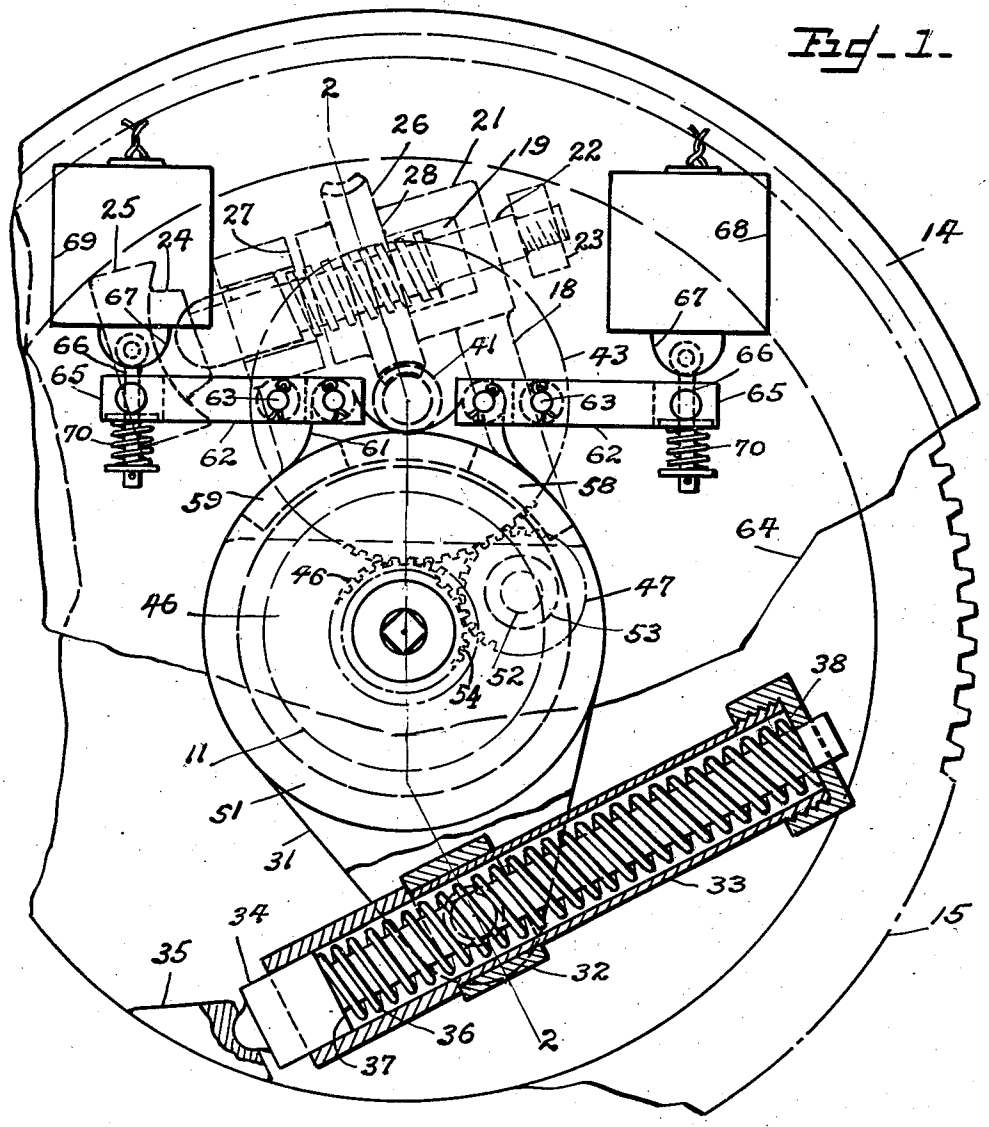
Dec. 5, 1939. W. F. HUCK 2,181,894

MEANS FOR REGISTERING PRINTING MACHINE CYLINDERS

Filed Aug. 12, 1936 8 Sheets-Sheet 1

Fig. 1.




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by Albert J. Horton

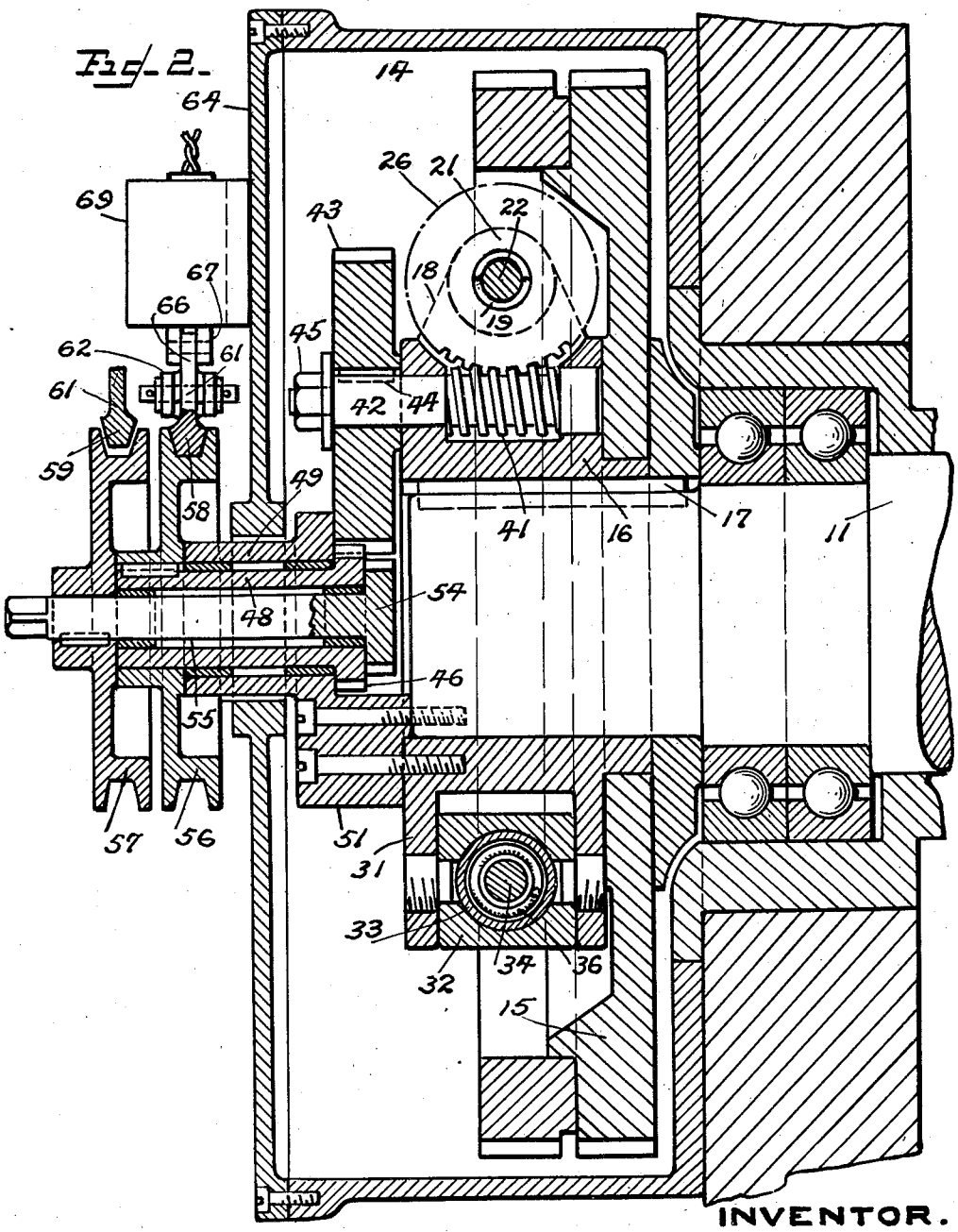
ATT'Y.

Dec. 5, 1939. W. F. HUCK 2,181,894

MEANS FOR REGISTERING PRINTING MACHINE CYLINDERS

Filed Aug. 12, 1936 8 Sheets-Sheet 2

Fig. 2.




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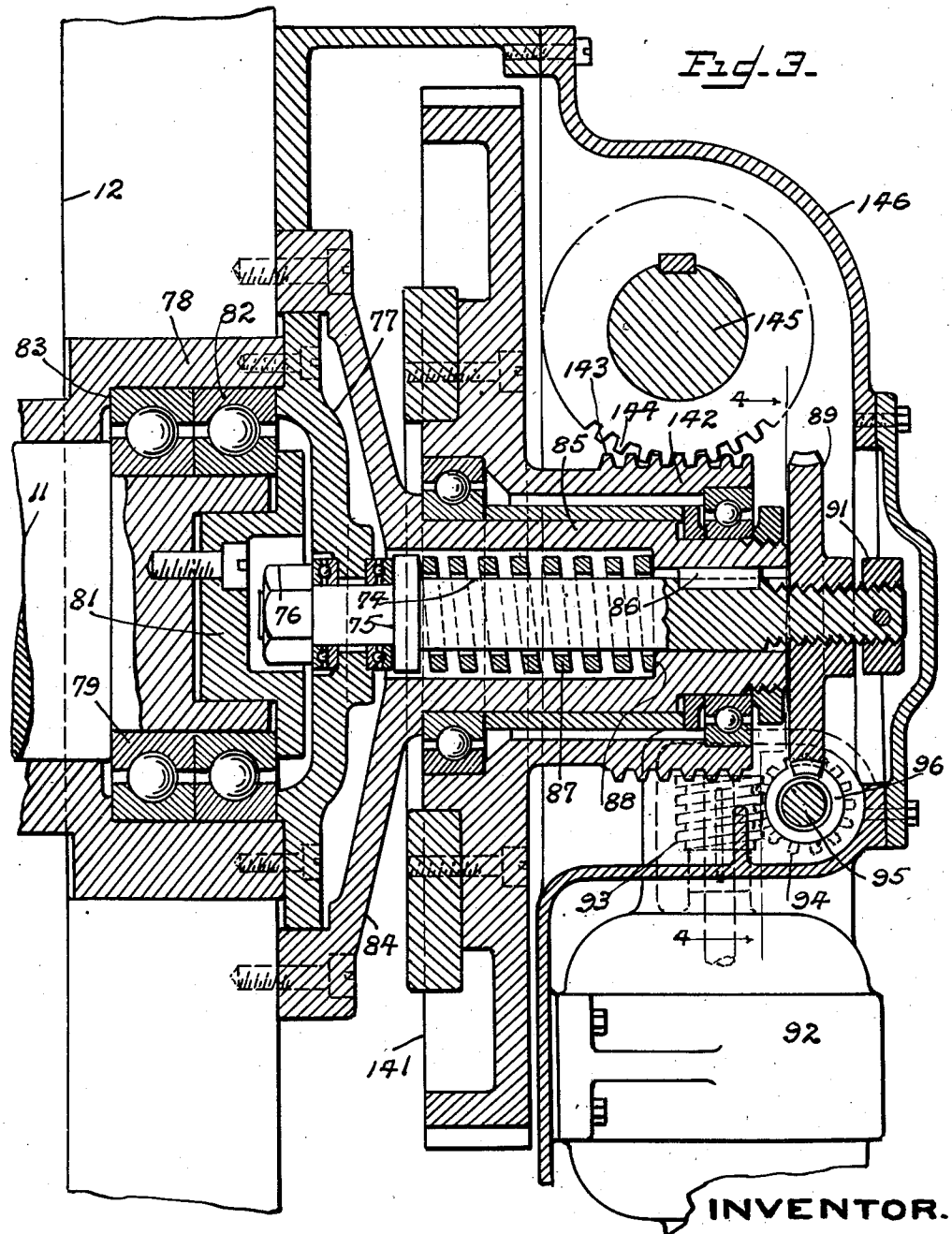
ATT'Y.

Dec. 5, 1939. W. F. HUCK 2,181,894

MEANS FOR REGISTERING PRINTING MACHINE CYLINDERS

Filed Aug. 12, 1936 8 Sheets-Sheet 3

Fig. 3.




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Dec. 5, 1939. W. F. HUCK 2,181,894

MEANS FOR REGISTERING PRINTING MACHINE CYLINDERS

Filed Aug. 12, 1936 8 Sheets-Sheet 4

Fig. 3.

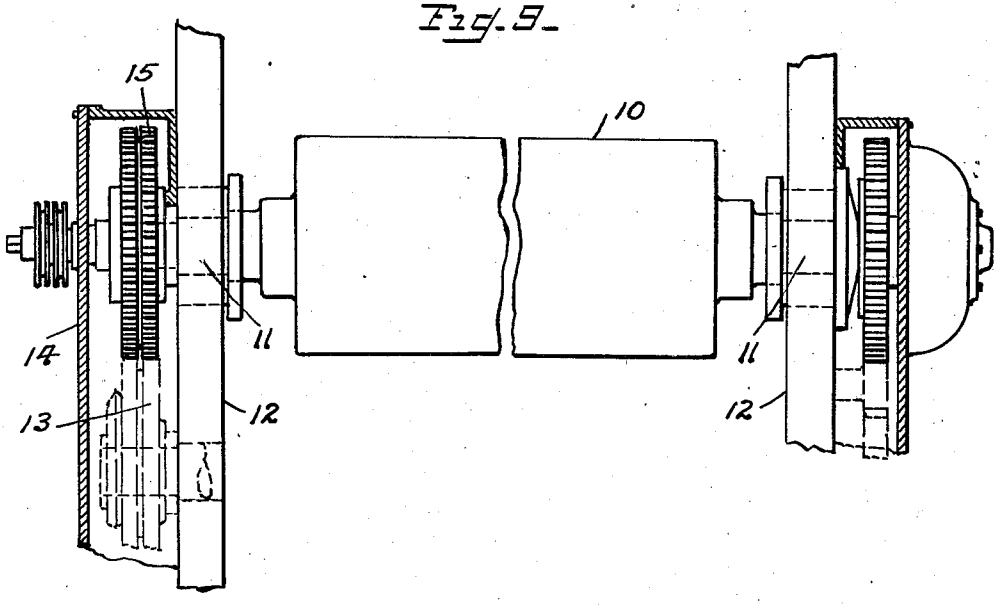
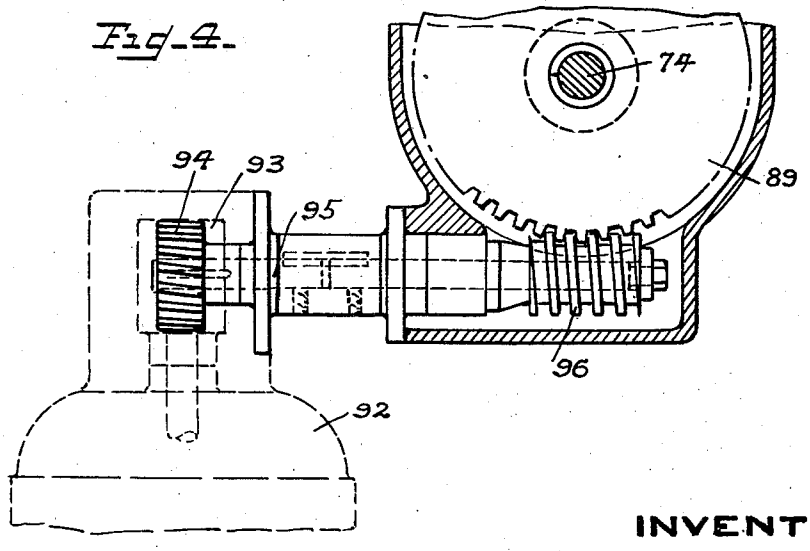



Fig. 4.




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Dec. 5, 1939. W. F. HUCK 2,181,894

MEANS FOR REGISTERING PRINTING MACHINE CYLINDERS

Filed Aug. 12, 1936 8 Sheets-Sheet 5

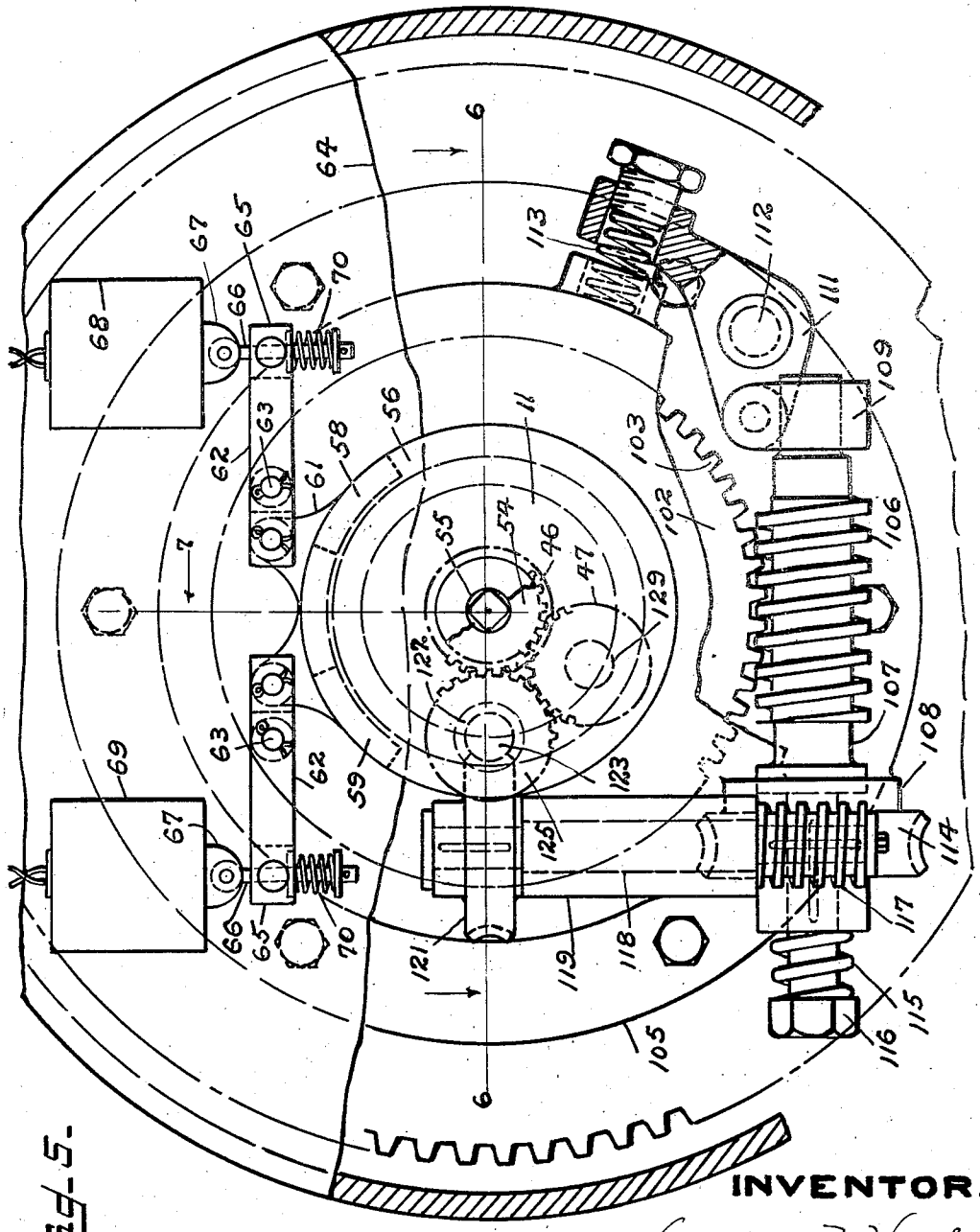



FIG. 5.

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Dec. 5, 1939. W. F. HUCK 2,181,894

MEANS FOR REGISTERING PRINTING MACHINE CYLINDERS

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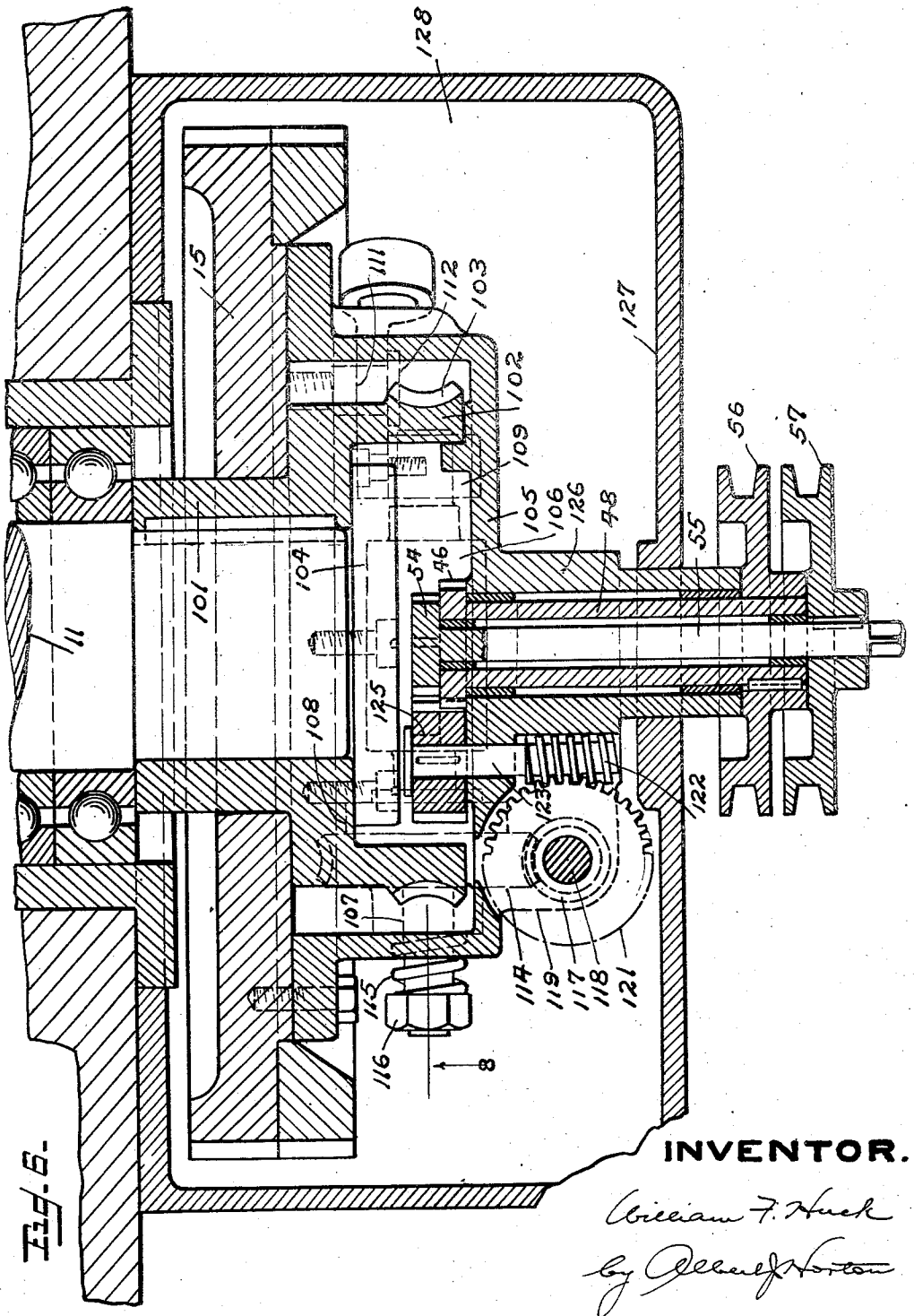



Fig. 6.

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Dec. 5, 1939. W. F. HUCK 2,181,894

MEANS FOR REGISTERING PRINTING MACHINE CYLINDERS

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Fig. 8.

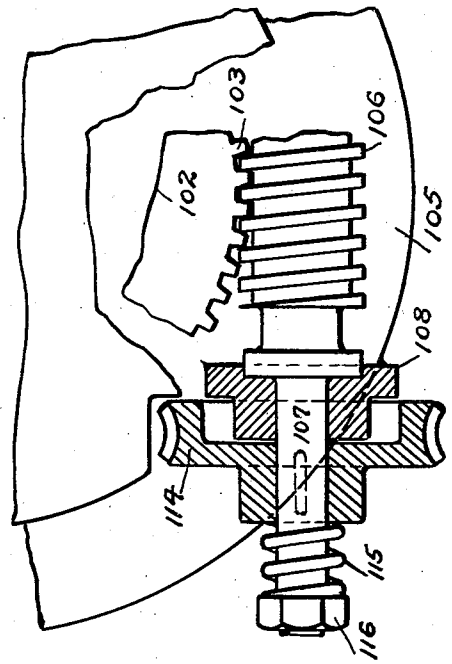



Fig. 10.

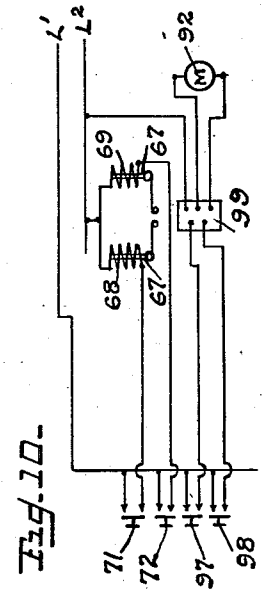
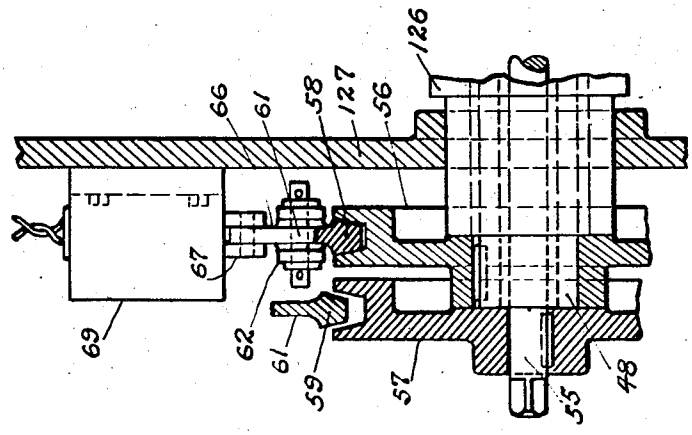



Fig. 7.




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Dec. 5, 1939. W. F. HUCK 2,181,894

MEANS FOR REGISTERING PRINTING MACHINE CYLINDERS

Filed Aug. 12, 1936 8 Sheets-Sheet 8

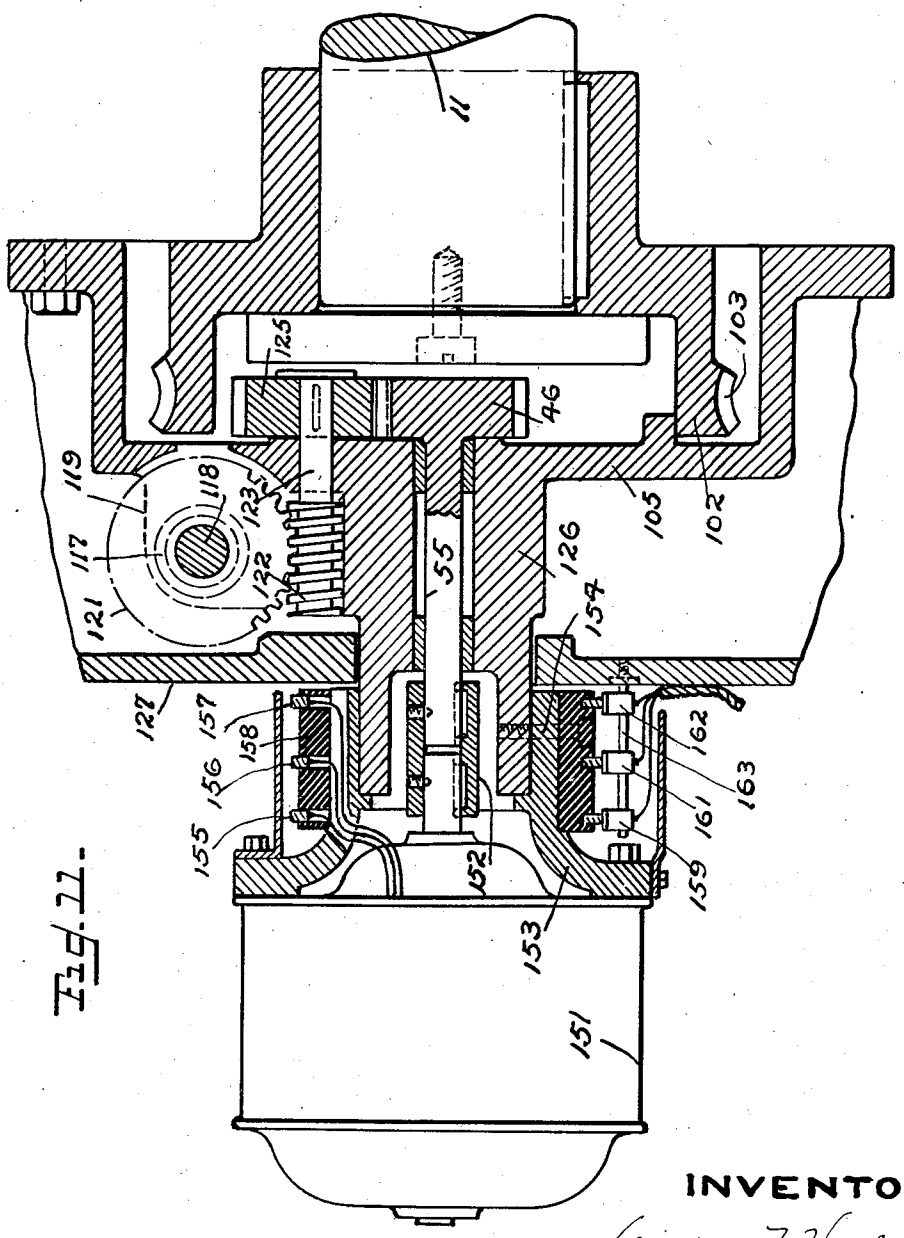



Fig. 11.

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Atty.

Patented Dec. 5, 1939 2,181,894

# UNITED STATES PATENT OFFICE

2,181,894

## MEANS FOR REGISTERING PRINTING MACHINE CYLINDERS

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Application August 12, 1936, Serial No. 95,505

13 Claims. (Cl. 101—248)

This invention relates to printing machines and particularly to that type of printing machine wherein several impressions are made in sequence, as for instance, a multi-color printing machine. More particularly, the invention relates to mechanism for adjusting a form cylinder rotatively and axially, to accurately register the printing, and which is operable if desired from a position remote from the cylinder, and while the machine is in operation.

The mechanism for adjusting the cylinder includes electrically operated devices, thus permitting the operation to be controlled from a position remote from the cylinder, preferably from a convenient position, such as at the delivery end of the machine, whereat an operator may readily observe the register of the printed matter. By the use of the principles and features of this invention, the form cylinder may be immediately adjusted to correct improper register of the printed matter, without interrupting the operation of the machine.

One object of this invention is to provide in a printing machine improved mechanism for rotatively adjusting a cylinder to compensate for irregularities in register of the printed matter.

Another object is to provide in a printing machine improved mechanism for axially adjusting a cylinder to compensate for irregularities in register of the printed matter.

Still another object is to provide a mechanism for axially adjusting a form cylinder of a printing machine without interfering with the ink roller drive associated therewith.

A further object is to provide mechanism for substantially simultaneously adjusting the form cylinder of a printing machine both rotatively and axially and which is adapted for remote control and is operative during machine operation.

Still further objects include the provision of electrically operable means for actuating the cylinder adjusting mechanism and remote control devices for said electrically operable means.

It is also an object of this invention to provide improvements in printing machines of generally improved construction, whereby the device will be simple, durable and inexpensive in construction, as well as convenient, practical, serviceable and efficient in its use.

With the foregoing and other objects in view, which will appear as the description proceeds, the invention resides in the combination and arrangement of parts, and in the details of construction hereinafter described and claimed.

The preferred embodiment of the invention is illustrated in the accompanying drawings, wherein:

Figure 1 is an end view of an adjusting mechanism, embodying features of this invention, applied at one end of a cylinder and which is adapted to be operated remote therefrom, to rotatively adjust the cylinder in respect to its driving means;

Figure 2 is a section on line 2—2 of Figure 1;

Figure 3 is a section of an adjusting mechanism, embodying features of this invention, applied to the other end of a form cylinder, associated with which is the driving means for an ink roller and the means for vibrating the roller, and which is adapted to be operated remote therefrom, to axially adjust the cylinder in respect to its associated parts;

Figure 4 is a section on line 4—4 of Figure 3;

Figure 5 is an end view of a somewhat modified form of cylinder rotative adjusting mechanism;

Figure 6 is a section on line 6—6 of Figure 5;

Figure 7 is a partial section on line 7 of Figure 5;

Figure 8 is a partial section on line 8 of Figure 6;

Figure 9 is a top view of a cylinder showing the disposition of the adjusting means of this invention in respect thereto;

Figure 10 is a schematic diagram of the electric circuits involved in the use of the mechanism shown in these drawings; and

Figure 11 is a partial side view of another modified form of rotative adjusting mechanism.

Referring first to Figure 9, it will be understood that the cylinder 10 may represent a form cylinder of a printing machine having a shaft 11 journaled in, and extending between, machine frame members 12. The shaft 11 is driven by a gear 13 in mesh with a gear 15, disposed in a casing 14 secured to the machine frame member 12 at one end of the cylinder. The cylinder 10, as is well understood, cooperates with an impression cylinder (not shown) and between which a web of material to be printed upon passes. From here the web passes between similar pairs of cylinders and on through the printing machine to a position known as the delivery end of the machine, at which position the completely printed product is delivered from the machine.

Referring to Figures 1 and 2, the shaft 11 is driven by the gear 13 through a composite gear 15, which although shown as being in two parts is to be considered for the purposes of this description as being a single part gear. The gear 15 is mounted for free rotation upon a sleeve 16 which is shown secured to shaft 11 by a key

17. The gear 15 is connected to the sleeve 16 to drive the shaft 11 in the forward direction by means of a bracket-like arm 18 formed on the sleeve 16 and having a bore 19 formed in a cylindrical member 21 thereof, in which is slidably mounted a nonrotatable stud shaft 22, which extends beyond the member 21 at each end thereof, being keyed to the arm 18 and having a nut 23 threaded upon end and engaging a shoe 24 at the other end, the shoe 24 in turn engaging a boss 25 formed on an end face of the gear 15.

The stud shaft 22 is provided with threads upon an intermediate portion thereof within the bore 19 of the member 21, which threaded portion is positioned within the bore of a rotatable worm-wheel 26 carried by the arm 18. Threads formed in the bore of the worm-wheel 26 cooperate with the threads on the shaft 22 to rotatively move the gear 15 and the sleeve 16 relatively to each other in either direction depending upon the direction of rotation of worm-wheel 26. The worm-wheel 26 is rotatably disposed between opposing shoulders 27 and 28 provided on the member 21.

Another arm 31 is provided on the sleeve 16 and has a hollow member 32 thereon in which is mounted a cylindrical shell 33. A plunger 34 is slidably mounted in the shell 33 and is urged therefrom into engagement with a lug 35, formed on the gear 15, by a spring 36. The spring 36 acts between a shoulder 37 formed on the plunger 34 and a closed end 38 of the shell 33. The spring pressed plunger 34 constantly urges the gear 15 in the rotative direction to insure positive contact of the lug 25 with the shoe 24 and to prevent loose motion between the same, the shaft 22 and the worm-wheel 26. The worm-wheel 26 is in mesh with a worm 41, the shaft 42 of which is journaled in arm 18 and extends parallel with the cylinder shafe 11 beyond one end of the sleeve 16. A gear 43 is secured to the extended end of a worm shaft 42 by a key 44 and a nut 45 threaded on the end of the shaft 42.

The above described mechanism is all enclosed in the casing 14 and revolves with the cylinder 10 about the axis of the shaft 11 in synchronism with the other moving parts of the printing machine. When it is desired to rotatively advance or recede the cylinder 10 in respect to a cylinder cooperating therewith in order to correct the register of the printed matter, the gear 15 and the cylinder shaft 11 must be rotated relatively to each other in the proper direction. This may be accomplished by rotation of the gear 43 whereby the worm-wheel 26 will be rotated upon the threaded portion of the stud shaft 22 to swing the gear 15 rotatively about the sleeve 16.

Gear 43 is herein adapted to be rotated with the worm 41 by being in mesh with a pinion 46 and an idler pinion 47. Pinion 46 is connected, herein shown formed as a part of, to a sleeve 48 which extends axially with respect to the cylinder shaft 11 outwardly through the casing 14, being journaled in a bearing 49 formed on a bracket 51 suitably secured to the sleeve 16 and rotatable therewith about the axis of shaft 11. The pinion 47 is supported upon a stud shaft 52 secured in and extending from a boss 53 formed on the bracket 51, and is also in mesh with a pinion 54. The pinion 54 is connected to, herein shown formed integral with, a shaft 55 which extends through and is journaled in the sleeve 48. At its outer end the shaft 55 is provided with suitable wrench or other tool engaging faces whereby it may be manually actuated if desired to cause rotation of the gear 43. It will be understood that pinions 46, 47 and 54 with their respective shafts all rotate with the bracket 51 and the sleeve 16 under normal conditions.

A brake drum herein in the form of a sheave 56 is keyed to the sleeve 48 and a brake drum or sheave 57 is keyed to the shaft 55 for rotation therewith. Brake shoes 58 and 59 are disposed in the grooves of sheaves 56 and 57 respectively. Each shoe has a lug 61 extending therefrom to which is pivoted one arm of a lever 62. The levers 62 are each pivoted at 63 to the end wall 64 of the casing 14. The other arm 65 of each of the levers 62 is pivoted for universal movement to a link 66 which in turn is pivotally secured to the plunger 67 of one or the other of solenoids 68 and 69. A spring 70 is provided and disposed between the plunger 67 and the free end of the arm 65 to take up lost motion and to maintain the parts in operative position. Energization of either solenoid will actuate its plunger 67 to rock the lever 62 connected thereto and press one of the brake shoes into braking engagement with one of the sheaves within the groove thereof. Herein the solenoids 68 and 69 are arranged to actuate the cooperating parts to cause the brake shoes 58 and 59 respectively to engage in the grooves of sheaves 56 and 57 respectively. The solenoids 68 and 69 may be energized by the actuation of push button switches 71 and 72 respectively, as shown in Figure 10. The push button switches 71 and 72 may be conveniently located at any desired position about the printing machine, preferably at a point where the machine operator can readily observe the register of the printed matter, for instance, at the delivery end of the machine.

Energization of solenoid 68, by actuation of push button switch 71 will through the instrumentality of the plunger 67, the link 66, the spring 70, and the lever 62 press the brake shoe 58 into braking engagement within the groove of the sheave 56. This action prevents further revolution of pinion 46 about the axis of the cylinder shaft 11 with the bracket 51 and sleeve 16, and due to the continuation of the revolution of the gear 43 about the axis of the cylinder shaft 11 and of it being in mesh with the pinion 46, gear 43 will be rotated about its own axis and thereby revolve the worm-wheel 26 about the stud shaft 22 to rotatively adjust the gear 15 by advancing it relatively to the sleeve 16 and the cylinder 10.

In like manner, energization of solenoid 69 by actuation of the push button switch 72 will actuate the brake shoe 59 to prevent revolution of pinions 47 and 54 about the axis of shaft 11 with bracket 51 and sleeve 16, and revolve the worm-wheel 26 in another direction about the stud shaft 22 to rotatively adjust the gear 15 by receding it relatively to the cylinder 10. In the above manner rotative adjustment of the cylinder 10 relatively to the machine parts cooperating therewith may be accomplished from a remote position, and register of the printed matter may be continuously maintained without interfering with the machine operation.

The mechanism for axially adjusting the cylinder 10, shown in Figures 3 and 4, comprises a spindle 74, one end of which is secured by means of a collar 75 formed thereon and a nut 76 threaded thereon to an end plate 77 of a closed bearing supporting sleeve 78 in which the shaft 11 is journaled. The sleeve 78 is mounted in the machine frame member 12 for axial movement relatively thereto and the shaft 11 is rotatively fixed

to the sleeve for axial movement therewith, one portion 79 of the roller bearing being secured to the end of shaft 11 by an end clamping member 81 and the other portion 82 of the roller bearing being secured to, and in the sleeve, by the end plate 77 which clamps it against an internal shoulder 83 formed in the sleeve.

A cover plate 84 secured to the frame member 12 is provided and has a sleeve portion 85 extending axially therefrom through which the spindle 74 extends and is secured thereto by a key 86 to prevent it rotating relatively to the shaft 11 or the sleeve 78 but axially slidable with the shaft and sleeve relatively to the cover plate 84. A spring 87 is provided which is disposed about the spindle 74 and has one end in abutment with the collar 75 and the other end in abutment with a shoulder 88 formed on the sleeve portion 85, whereby due to the tension of the spring 87, the shaft 11 through its connection with the spindle, as above described, is constantly urged axially in one direction.

The spindle 74 extends beyond the outer end of the sleeve portion 85, whereat it is reduced in diameter and threaded to receive an internally threaded worm-wheel 89 which abuts the outer end of the sleeve portion 85. Rotation of the worm-wheel 89 in one direction, due to it abutting the end of the sleeve portion 85, will pull the spindle 74 and with it the shaft 11, through the connecting parts, end plate 77, bearing sleeve 78, roller bearing portions 82 and 79, and the end clamping member 81, against the tension of the spring 87 in one direction to adjust the cylinder 10 axially in one direction to correct improper register or alignment of the printed matter in the machine. Rotation of the worm-wheel in the other direction will release the shaft 11 and permit its movement axially in the other direction by the spring 87 to adjust the cylinder 10 axially in the other direction. A collar 91 is secured to the outer end of the threaded portion of the spindle 74 to limit the movement of the same, and shaft 11 in the direction of the movement thereof given them by the spring 87 during the latter operation by abutting against the worm-wheel 89 when the limit of movement has been attained.

The worm-wheel 89 is rotated by means of a reversible electric motor 92 through the instrumentality of a worm 93 on the motor shaft, a worm-wheel 94 driven by the worm 93 and mounted on a shaft 95, and a worm 96 secured to the shaft 95 and in mesh with the worm-wheel 89. The motor 92, referring to Figure 10, may be energized from a remote position, preferably one from which register of the printed matter may be readily observed, such as at the delivery end of the machine by push button switches 97 and 98, one acting through a suitable electric control 99 to cause the motor 92 to rotate in one direction and the other to cause rotation of the motor in the other direction.

In this instance, the sleeve portion 85 forms a bearing support for a separately driven gear 141 from which an ink roller (not shown) is driven. The driven gear 141 has a hollow hub extension 142, upon which is formed helical gear teeth 143, which are in mesh with the teeth of a helical gear 144 connected by a shaft 145 to the ink roller reciprocating mechanism (not shown). A casing 146 secured to frame member 12 is provided to cover the above described parts and upon which the motor 92 is mounted.

By the use of the mechanism shown in Figures 1 and 2, the arcuate range of the rotative adjustment of the cylinder 10 is somewhat limited. Where a greater arcuate range of such adjustment is desired, the form of mechanism shown in Figures 5–8 inclusive may be provided. In this form the cylinder shaft 11 has mounted thereon and keyed thereto a sleeve 101 having a recessed extending portion 102 upon the periphery of which worm-wheel teeth 103 are formed. A plate 104 fastened to the end of the cylinder shaft 11 and to the sleeve 101 retains the sleeve on the end of the shaft. A hollow, generally cylindrical, bracket 105 is secured to the end face of the gear 15, which, in this instance, is rotatably mounted upon the sleeve 101. Mounted on the bracket 105 is a worm 106, the shaft 107 of which is journaled at one end in a bearing lug 108 formed on the bracket 105 and at the other end in a bearing 109 pivoted to an arm of a lever 111 in turn pivoted at 112 to the bracket 105. The other arm of the lever 111 is arranged to be continuously urged away from the bracket 105 by a spring 113 whereby the worm 106 is maintained in proper mesh and with no backlash with the worm-wheel teeth 103.

A worm-wheel 114 is secured to an end of the shaft 107 extending beyond the bearing lug 108, and is continuously urged against the same by a spring 115 acting between the worm-wheel 114 and a nut 116 threaded in the shaft end. A worm 117 in mesh with the worm-wheel 114 is secured to one end of a shaft 118 which is journaled in a bearing 119 formed on the bracket 105, and extends therefrom to have a worm-wheel 121 secured upon its other end. The worm-wheel 121 meshes with a worm 122 formed on a shaft 123 which is journaled in the end face 124 of the bracket 105 and has a pinion 125 secured to its inner end.

The bracket 105 has a hollow hub 126 extending therefrom through the end wall 127 of a casing 128 provided to cover the above described parts and to support the solenoids 68 and 69 and the associated parts actuated thereby consisting of the plungers 67, the levers 62, links 66, and brake shoes 58 and 59. The brake shoes 58 and 59 as in the previous form are adapted to engage in the grooves of sheaves 56 and 57 respectively. The sheaves 56 and 57 are secured to the outer ends of the sleeve 48 and the shaft 55 respectively. The sleeve 48 in this instance is journaled in the hollow hub 126 and the shaft 55, as before, is journaled in the sleeve 48. As in the previously described form, a pinion 46 is secured upon the inner end of the sleeve 48 and a pinion 54 is secured upon the inner end of the shaft 55. The idler gear 47 meshing with the pinion 54 in this instance is rotatively supported upon the bracket 105 at 129. The pinion 125 is in mesh with both pinions 46 and 47.

In similarity with the operation of the previously described form shown in Figures 1 and 2, selective energization of solenoids 68 and 69 will apply a braking action upon either sheaves 56 or 57, whereby either pinion 46 or 47 will be restrained from revolving about the axis of the shaft 11 and, therefore, continued revolution of the gear 15 and the bracket 105 about the toothed sleeve 101 and the axis of the shaft 11, will rotate the pinion 125 with its shaft 123 and the worm 122. Rotation of the pinion 125 and the worm 122 through the instrumentality of the worm-wheel 121, the worm 117, the worm-wheel 114, and the worm 106, will rotatively adjust the cylinder shaft 11 and the gear 15 relatively to each other

in either direction depending upon which of the solenoids is energized. By the use of the mechanism shown in Figures 5–8 inclusive such adjustment may be made over a range of 360° should occasion demand the same, thereby permitting, if required, the adjustment of the cylinder 11 one complete revolution in respect to a cooperating cylinder or other machine part.

In the form shown in Figure 11, a reversible electric motor 151 is directly connected to the shaft 55 of the form shown in Figure 6 by a suitable coupling 152. In this instance, the gear 46 is secured to the shaft 55 and may be rotated in either direction by the motor 151 when the same is actuated. The motor 151 has a sleeve like bracket 153 secured to the end of its casing. The bracket 153 fits over the end of the hollow hub 126 and is secured thereto by a screw 154. Contact rings 155, 156 and 157 are mounted upon an insulating ring 158 which is secured to the bracket 153. Brushes 159, 161 and 162 connected to a motor control box (not shown) by suitable conductors are mounted on a bracket 163 secured to the casing 127 and respectively contact the rings 155, 156 and 157 to properly energize the motor 151. By this arrangement the gear 125 may be rotated in either direction by the motor 151 to adjust the cylinder shaft 11 and the gear 15 relatively to each other in either direction. While the motor 151 is shown in Figure 11 as being connected to the shaft 55 and through gears 46 and 125 to actuate the parts shown in Figure 6, it is obvious that it could be associated with the parts of the form shown in Figure 2 to rotate gear 43 through gear 46 and thereby obtain the results desired in the use of that form.

By the provision, in a printing machine, of the above described rotative and axial adjusting means for a cylinder, an operator may adjust a cylinder either axially or rotatively or adjust it both ways substantially simultaneously, while the machine is in operation and continually maintain the printed matter in register longitudinally, laterally or diagonally in respect to the printed sheet. These operations can be accomplished by an operator positioned remote from the cylinder at a position from which the printed sheet is clearly visible.

It will be understood that the invention may be embodied in other specific forms without departing from the spirit or essential attributes thereof, and it is therefore desired that the present embodiment be considered in all respects as illustrative and not restrictive, and it will be further understood tha each and every novel feature and combination present in or possessed by the mechanism herein disclosed forms a part of the invention included in this application.

What I claim is:

1. In a printing machine, a rotatable cylinder, means to adjust said cylinder axially, said means including a spindle secured to and extending axially from said cylinder, said spindle having threads formed thereon, a worm-wheel on said spindle cooperating with said threads to axially move said spindle when rotated, means to rotate said worm-wheel in either direction, and means to control said worm-wheel rotating means from a position remote from said cylinder.

2. In mechanism to axially move a rotatably mounted cylinder, a spindle secured to and extending from said cylinder, and being relatively rotatable in respect thereto, said spindle having threads thereon, a member rotatably mounted on said spindle and having threads cooperating with the threads on the spindle to move the same, and with it the cylinder, axially in one direction when the member is rotated in one direction, and a spring arranged to urge said spindle and cylinder axially in the other direction when said member is rotated in the other direction.

3. In a printing machine, a cylindrical member, a driving gear member, mechanism operably interposed between said members to rotatively adjust one of said members relatively to the other member and including cooperating relatively rotatable elements, a yieldable member for biasing one element for operable engagement with another element to prevent backlash, and means actuated by the rotation of the cylindrical member to rotate certain of said elements relatively to another.

4. In a printing machine, a cylinder, a cylinder driving gear, mechanism for rotatively adjusting said gear relatively to said cylinder and including a pair of cooperating elements, a first of said elements engaging a part on said gear and being adapted to move axially to rotate the gear relatively to the cylinder, and the second of said elements being rotatably mounted on the first element and adapted to move it axially, and yieldable means for biasing the axially-movable first element into engagement with the said part of the gear.

5. In a printing machine, a cylinder, a cylinder driving gear, a sleeve secured for rotation with the said cylinder and upon which said gear is rotatably mounted, mechanism to rotatably adjust said gear relatively to said cylinder and including gear teeth on the periphery of said sleeve, a bracket secured to said gear, a sleeve driving gear having teeth in mesh with the teeth on said sleeve and being mounted on said bracket, said bracket having a sleeve extending therefrom, a pinion having a shaft journaled in said bracket sleeve, means to rotate said pinion shaft, and gearing carried by said bracket and connecting said sleeve driving gear and said pinion, and yieldable anti-backlash components interposed in the said mechanism for rotatively adjusting said gear relative to said cylinder.

6. In a printing machine, a cylinder, a cylinder driving gear, a sleeve secured for rotation with the said cylinder and upon which said gear is rotatably mounted, mechanism to rotatably adjust said gear relatively to said cylinder and including gear teeth on the periphery of said sleeve, a bracket secured to said gear, a sleeve driving gear having teeth yieldingly in mesh with the teeth on said sleeve and being mounted on said bracket, said bracket having a sleeve extending therefrom, a pinion having a shaft journaled in said bracket sleeve, an electric motor secured to, and carried by, said bracket sleeve and having its shaft connected to said pinion shaft, and gearing carried by said bracket and connecting said sleeve driving a gear and said pinion.

7. In a printing machine, a cylinder, a cylinder driving gear, a sleeve secured for rotation with the said cylinder and upon which said gear is rotatably mounted, mechanism to rotatably adjust said gear relatively to said cylinder and including gear teeth on the periphery of said sleeve, a bracket secured to said gear, a sleeve driving gear having teeth in mesh with the teeth on said sleeve and being mounted on said bracket, means for yieldably maintaining the sleeve driving gear in mesh with the teeth on the sleeve, said bracket having a sleeve extending therefrom, a first pinion having a hollow shaft journaled in said

bracket sleeve, a second pinion having a shaft journaled in said hollow shaft, a brake drum connected to each shaft, and gearing carried by said bracket and connecting said first and second pinions to said sleeve driving gear

8. In a printing machine, a cylinder member, a driven member, means operably interposed between the cylinder member and driven member to drivingly connect said driven member to said cylinder member and including separate relatively movable cooperating components, one of the components being supported by one member and axially movable to engage the other member to augularly move the members relative to each other, and yieldable means operably interposed between the said members to constantly bias the axially movable component into engagement with the said other member to permit the adjusting movement of the said members relative to each other to prevent backlash in the adjusting mechanism.

9. In a printing machine, a cylinder, a driven member, means operably interposed between the cylinder and driven member to drivingly connect said driven member to said cylinder and including a pair of elements, one of said elements being axially movable and engaging the driven member and the other element rotatably mounted upon the axially-movable element and cooperating therewith to axially move it, the axially-movable member being supported for movement with the cylinder and engaging the driven member so that axial movement of the axially-movable member rotatably adjusts said cylinder and said driven member relative to each other, a gear connected to said rotatable element, a pair of pinions drivingly connected to said gear, the axis of said pinion being in alinement with the axis of said cylinder, a gear being mounted for rotation bodily about the axis of said pinion, separate brake means for selectively engaging said pinions, means to selectively actuate either of said brake means to prevent rotation of the pinion connected thereto, and yieldable means operably interposed between the cylinder and driven member to constantly bias the axially-movable member into engagement with the driven member.

10. In a printing machine, a cylinder, a driven member, means operably interposed between the cylinder and driven member to drivingly connect the cylinder and driven member and including an axially-movable member, a member rotatable relative to the axially-movable member and cooperating therewith to axially move the axially-movable member, a terminal of the axially-movable member engaging the driven member to rotatably move the driven member relative to the cylinder, means engageable from a point exterior of the cylinder and operable by the movement of the cylinder to actuate the said rotatable member, and means interposed between the cylinder and rotatable member to constantly bias the axially-movable member to engagement with the driven member so that axial movement of the axially-movable member adjustably moves the cylinder in angular relation to the driven member.

11. In a printing machine, a cylinder, a driven member, means operably interposed between the cylinder and driven member to drivingly connect the cylinder and driven member and including an axially-movable member, a member rotatable relative to the axially-movable member and cooperating therewith to axially move the axially-movable member, a terminal of the axially-movable member engaging the driven member to rotatably move the driven member relative to the cylinder, a gear operably connected with the said rotatable member, a pair of pinions drivingly connected to said gear, said gear being mounted for rotation bodily about the axis of said pinions, a brake drum connected to each pinion, a brake shoe cooperating with each of said drums, and means interposed between the cylinder and rotatable member to constantly bias the axially-movable member to engagement with the driven member so that axial movement of the axially-movable member adjustably moves the cylinder in angular relation to the driven member.

12. In a printing machine, a form cylinder rotatable in an axially movable bearing constructed and arranged to hold the cylinder against axial movement relative thereto, the bearing having a rotatable part and a non-rotatable part, an adjusting mechanism including an axially movable non-rotatable adjusting member operably connected to the non-rotatable part of the bearing, means to move the adjustable member and thereby the bearing and cylinder axially in one direction, and resilient means engaging the said adjusting member to bias the adjusting member and thereby the bearing and cylinder in the opposite direction to prevent backlash in the adjusting mechanism.

13. In a printing machine, a cylinder, a cylinder driving gear supported with the cylinder and augularly adjustable relative thereto, a worm gear fixed relative to the cylinder and rotatable therewith, a worm rotatably supported by the said cylinder gear in mesh with the worm gear, and yieldable means for normally biasing the worm towards meshing relation with the worm gear.

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