J. J. WALSER.

VARIABLE SPEED DRIVING MECHANISM.

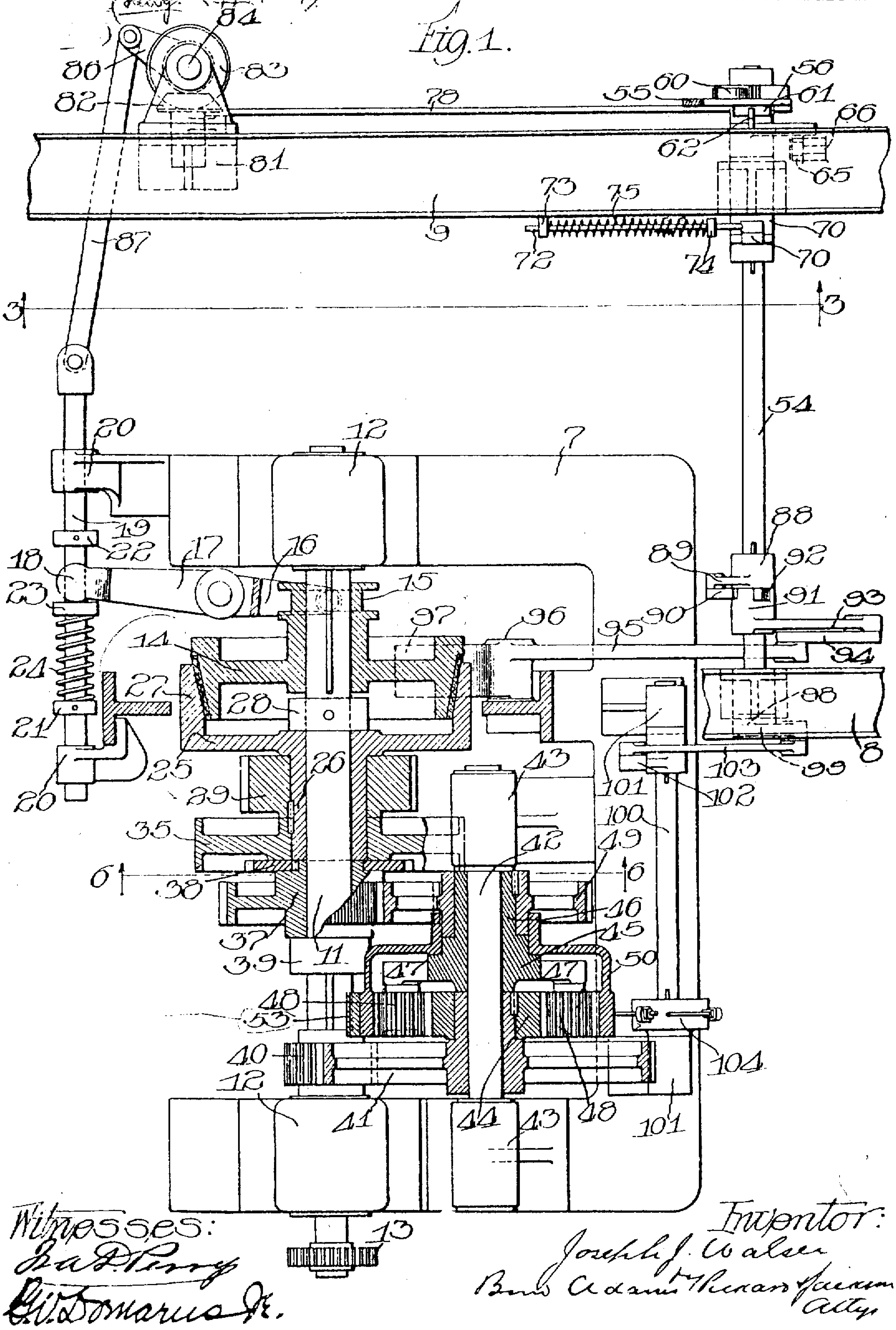
APPLICATION FILED FEB. 4, 1909.

940,626.

Patented Nov. 16, 1909.

3 SHEETS—SHEET 1.

Fig. 1.



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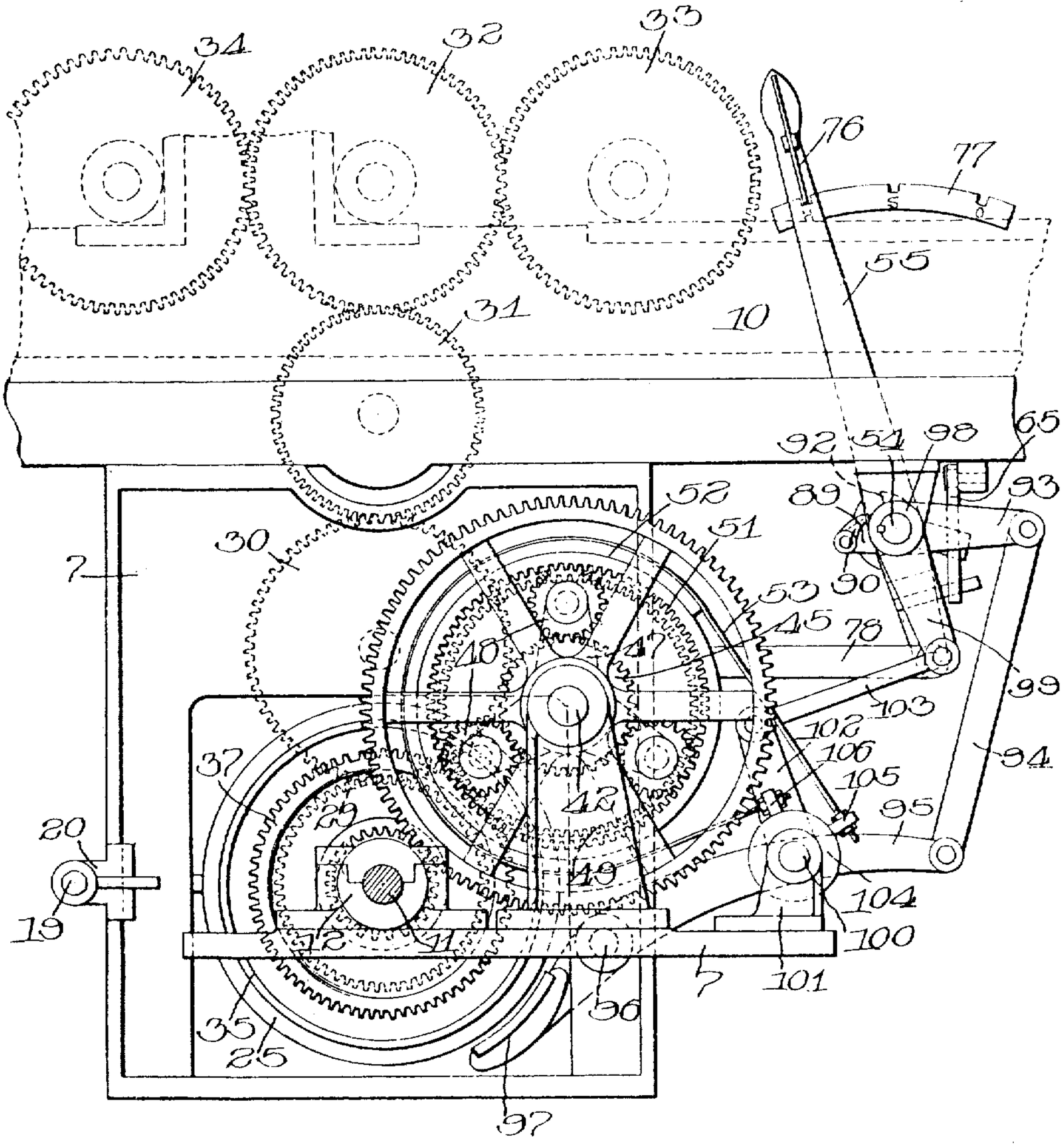
3 SHEETS—SHEET 2.

Fig. 2.



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3 SHEETS—SHEET 3.

Fig. 3.

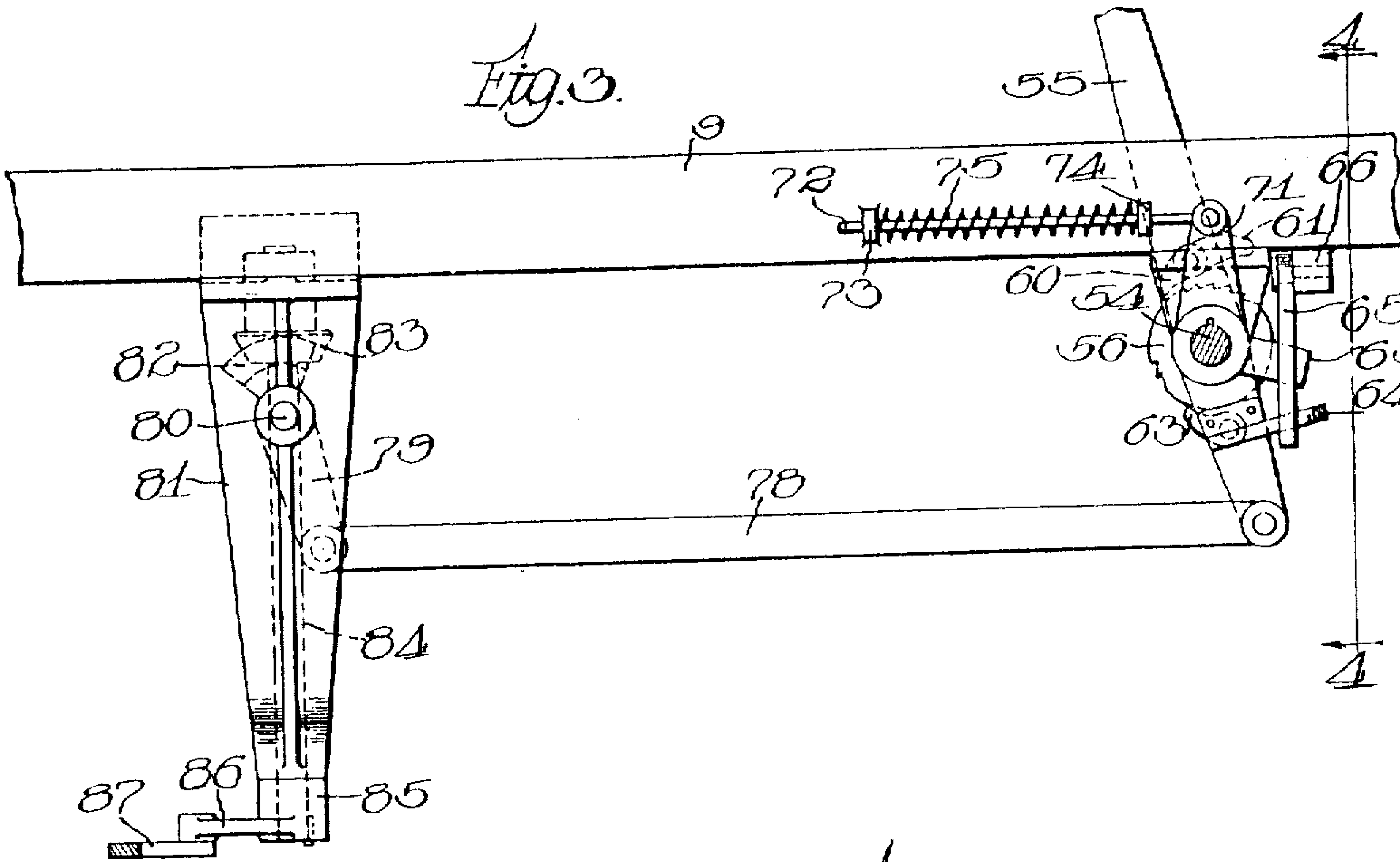


Fig. 4.

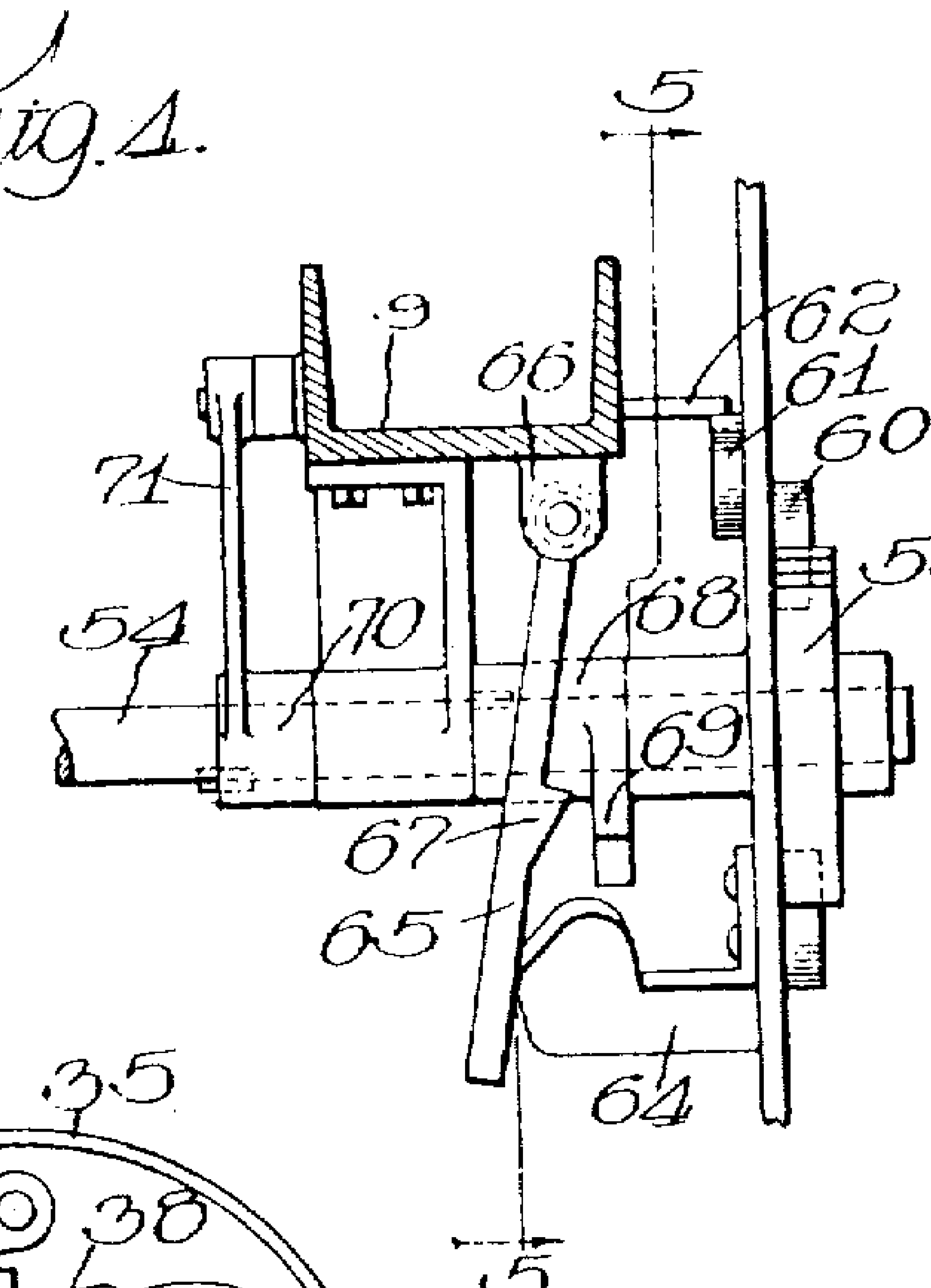


Fig. 5.

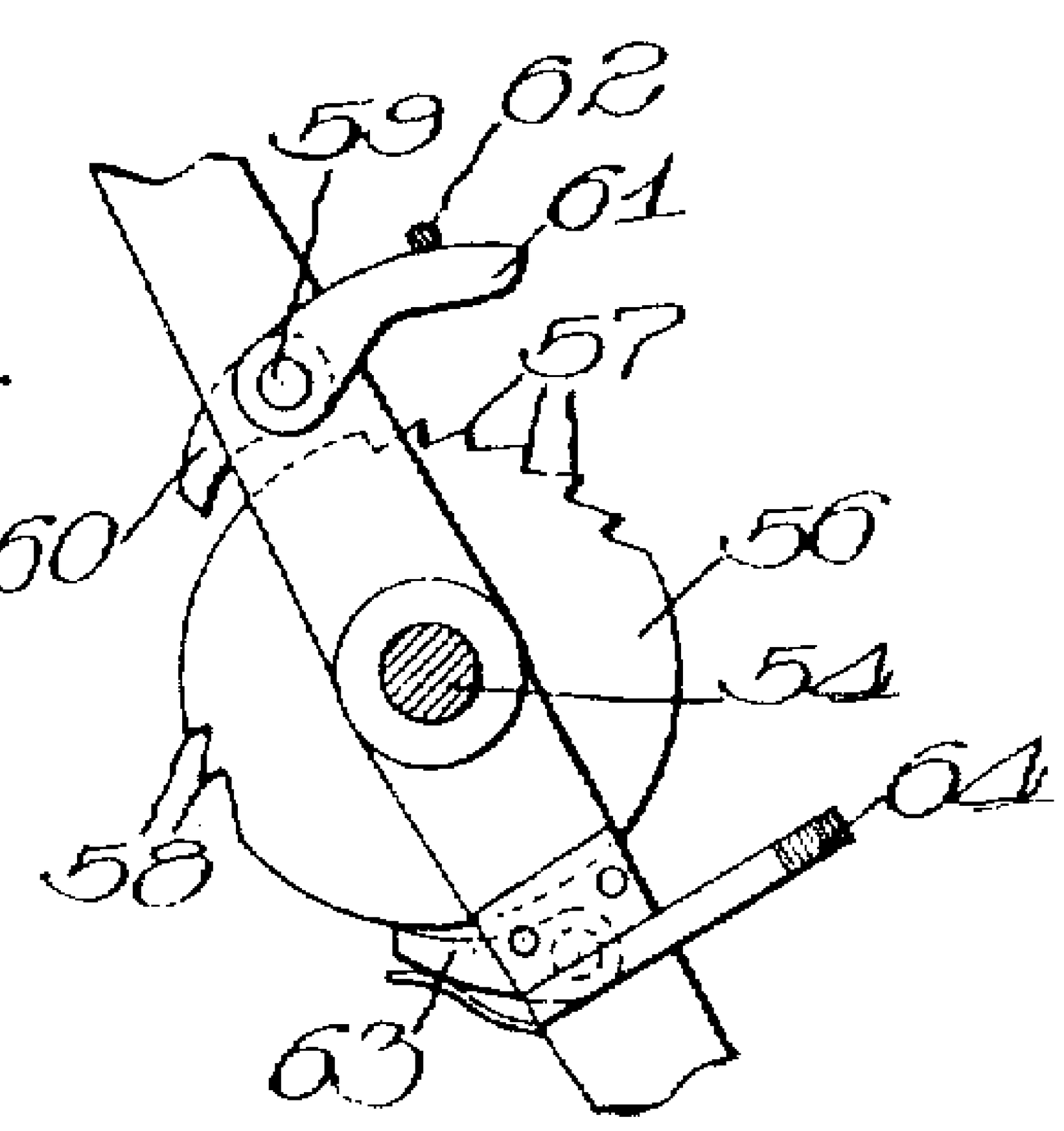
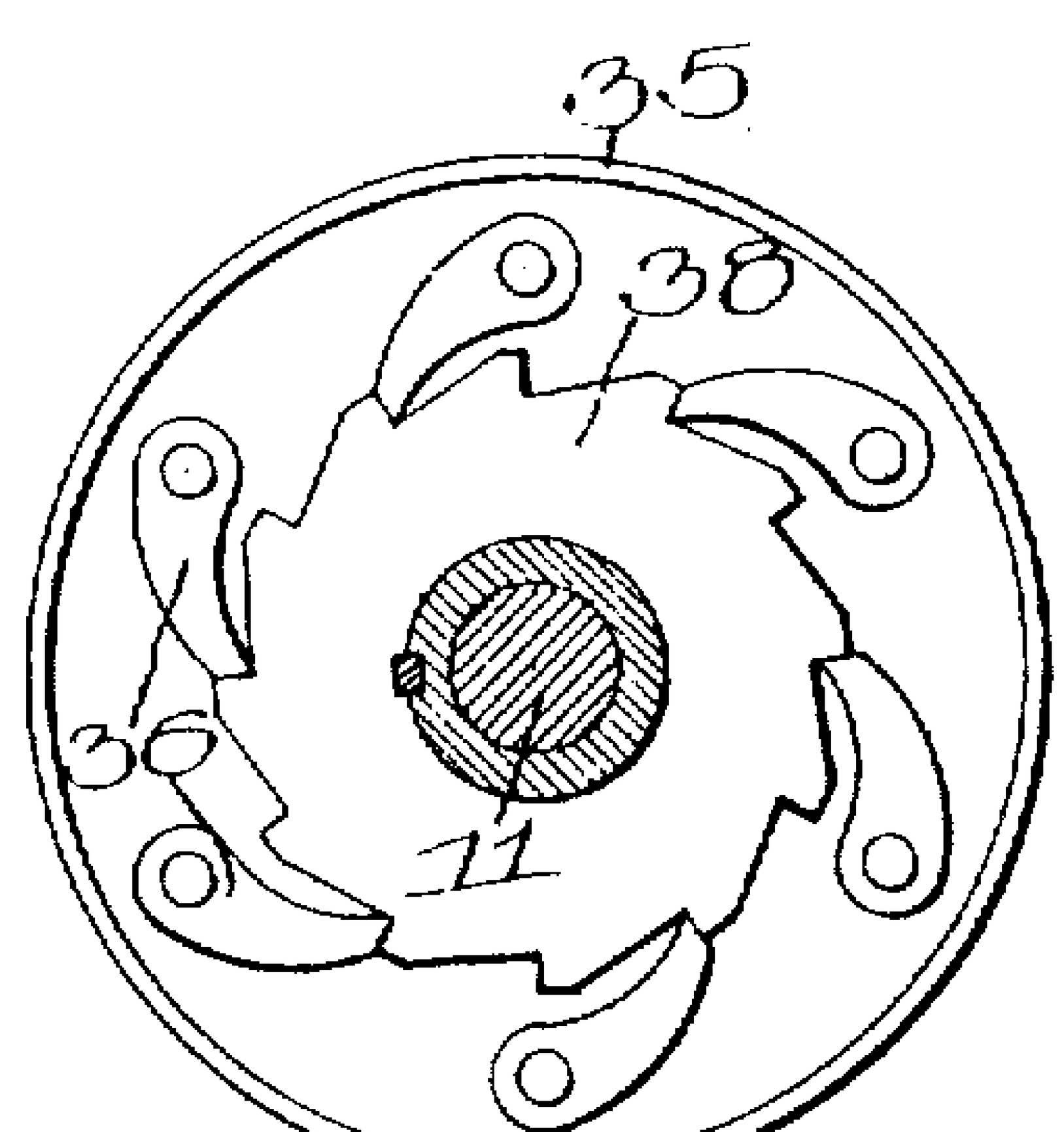


Fig. 6



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UNITED STATES PATENT OFFICE.

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VARIABLE-SPEED DRIVING MECHANISM.

940,626. Specification of Letters Patent. Patented Nov. 16, 1909.

Application filed February 4, 1909. Serial No. 476,158.

To all whom it may concern:

Be it known that I, JOSEPH J. WALSER, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Variable-Speed Driving Mechanism, of which the following is a specification, reference being had to the accompanying drawings.

My invention relates to driving mechanism which, driven by a driving-shaft rotating at a determined speed, may be given a high and low speed for the purpose of driving machines in which such plurality of speed is desirable, particularly printing presses, and the object of my invention is to provide a new and improved driving mechanism of the character described, in which the slow speed mechanism will not be disconnected until the high speed mechanism is being brought into engagement, thus avoiding the coming of an interval of time between the throwing off of the low and the throwing in of the high speed, during which the press, or similar driven machine, running by its own momentum alone would be apt to slow down, and in the case of a printing press particularly cause the breakage of the webs.

In the accompanying drawings,—Figure 1 is a top or plan view partly in horizontal section; Fig. 2 is an end view, showing a portion of the side frame and some of the driving gears of a printing press in dotted lines; Fig. 3 is a section on line 3—3 of Fig. 1; Fig. 4 is a section on line 4—4 of Fig. 3; Fig. 5 is a section on line 5—5 of Fig. 4; and Fig. 6 is a detail of the ratchet and drum driving connections, being a section on line 6—6 of Fig. 1.

Referring to the drawings,—7 indicates a frame, and 8 and 9 the side frame-bars upon which rest a side-frame 10 of the press indicated by dotted lines in Fig. 2.

11 indicates the main driving-shaft, which is journaled in suitable bearings, as 12, in the frame 7.

13 indicates a driving-pinion, which is adapted to be connected to a suitable source of power, preferably a high-speed motor driven at a constant desired speed.

14 indicates a clutch-member, which is feathered on the shaft 11 and is adapted to be slid longitudinally thereof. On the hub of the clutch-member 14 is a peripheral groove 15 which is adapted to be engaged by the forked end 16 of a shifting-lever 17 pivoted to the framework. The other end of the shifting-lever 17 is provided with a fork 18 which straddles a shift-bar 19 slidingly mounted in suitable bearings 20 on the frame.

21—22 indicate collars, which are pinned to the slide-bar 19 a suitable distance apart.

23 indicates a collar, which is loosely mounted on the slide-bar 19, with a spiral-spring 24 interposed between it and the collar 21.

When the shifting-lever 17 is shifted in one direction or the other by the engagement of the collars 23—24 on the slide-bar 19 in the manner hereinafter described the clutch-member 14 will be slid in one direction or the other longitudinally of the shaft 11.

25 indicates a clutch-member, which is journaled on the shaft 11 and is provided with a hub 26. The clutch-member 25 is provided with a flange 27 whose inner surface is beveled to engage the correspondingly beveled outer periphery of the clutch-member 14 so that when the two are forced into engagement by the movement of the clutch-member 14 the clutch-member 25 will be rotated with the shaft 11.

28 indicates a collar pinned on the shaft 11 and abutting upon the interior surface of the clutch-member 25 and holding it in position in one direction.

29 indicates a gear, which is secured upon the hub 26 of the clutch-member 25. By means of intermediate gear 30 meshing with said gear 29, intermediate gear 31 meshing with the gear 30 motion is communicated to the driving gears 32—33—34 of the press shown in dotted lines in Fig. 2.

It will be obvious that when the clutch-members 14 and 25 are forced into engagement by the sliding of the clutch-member 14 on the shaft 11, the clutch-member 25 will be rotated at the same speed as the shaft 11 and in the same direction and the press will be driven at full speed.

35 indicates a drum, which is secured on the hub 26 of the clutch-member 25 and is provided with a plurality of pawls 36 on its outer surface—that is, the surface away from the gear 29.

37 indicates a gear, which is rotatably mounted upon the shaft 11, its inner end

abutting upon the outer surface of the clutch-drum 35.

38 indicates a ratchet-disk, which is fixed upon the hub of the gear 37 against the outer surface of the drum 35 and is adapted to engage the pawls 36 of the drum 35.

39 indicates a collar, which is pinned upon the shaft 11 against the outer face of the gear 37, thus coöperating with the collar 28 to hold the parts in position on the shaft against longitudinal movement thereof, but permitting the free rotation of the parts upon the shaft.

40 indicates a pinion secured to the shaft 11 inside the bearing 12.

41 indicates a large gear, which is rotatably mounted upon a shaft 42 and meshes with the pinion 40. The shaft 42 is fixed in suitable bearings, as 43, on the frame 7.

44 indicates a gear, which is secured upon the inner end of the hub of the gear 41 and rotates therewith.

45 indicates a spider provided with a hub 46 which is rotatably mounted upon the shaft 42 and is provided with a plurality of arms 47, shown three in number. Upon each of the arms 47 is mounted a pinion 48, which pinions mesh with the gear 44.

49 indicates a gear, which is secured upon the hub 46 of the spider 45.

50 indicates a drum, which is revolubly mounted upon the hub 46 of the spider 45 and the hub of the gear 49 so as to rotate freely thereon. The inner surface of the drum 50 is provided with a peripheral gear 51, which meshes with the gears 48 on the spider 45. The outer periphery of the drum is provided with a brake 52 operated by a flexible brake-band 53 in the manner hereinafter provided so as to hold the drum 50 tight against rotation.

The gear 49 on the hub of the spider 45 meshes with the gear 37 on the shaft 11.

From the above description, it will be obvious that if the drum 50 is not held against rotation, but if the drum 50 is freed from the brake 52 and allowed to rotate freely, the rotation of the large gear 41 driven by the pinion 40 will by means of the gear 44 rotate the gears 48 on the spider 45 and the drum 50 will be rotated without rotating the spider. If, on the other hand, the drum is braked and held against rotation, the engagement of the gear 44 on the hub of the large gear 41 with the gears 48 will cause them to travel around the drum by reason of their engagement with the internal gear 51 on said drum and will rotate the spider 45. The driving-shaft 11 being rotated in a clockwise direction, the large gear 41 will be carried in the opposite direction, and the drum 50 being held fast the spider will travel around in the same direction as the gear 41—that is to say, in a contra-clockwise direction—and at a much slower speed by reason of the difference in size of the pinion 40, large gear 41, and the different sizes of the gear 44 and the gear 51. By reason of the engagement of the gear 49, which is fast to the hub of the spider, the gear 37 on the driving-shaft 11 will be driven in the same direction as the shaft, but at a much slower speed, depending, of course, upon the relative diameters of the gearing above described. This will rotate the ratchet-disk 38 in the same direction and at the same speed, and the ratchet-disk 38 engaging the pawls 36 on the disk 35 will drive it and the gear 29, which is fixed to the hub of the clutch member 25, in the same direction and at the same speed, thus through the medium of the gears 30 and 31 driving the driving gears 32—33—34 of the press at slow speed.

I have illustrated in the drawings suitable mechanism for throwing the clutch-members into and out of engagement and for applying the brake to the drum 50.

54 indicates a rock-shaft, which is journaled in suitable bearings on the frame-bars 8 and 9.

55 indicates a hand-lever, which is journaled upon the end of the rock-shaft 54.

56 indicates a disk, which is keyed upon the end of the rock-shaft 54 just outside of the lever 55 and abutting against the same. The disk 56 is provided with two sets of ratchet-teeth 57 and 58 disposed upon opposite sides of its periphery.

59 indicates a pin, which is rotatably mounted in the lever 55 and carries upon one end and fixed thereto a dog 60 which is adapted to engage with the ratchet-teeth 57, and upon the other end and secured thereto an arm 61 which, as the lever swings from right to left in Figs. 3 and 5, is adapted to be engaged by a pin 62 on the outside of the frame-bar 9 so as to force the arm 61 down and lift the dog 60 from the ratchet-teeth 57, as hereinafter described.

63 indicates a spring-seated pawl on the lower arm of the lever 55, which is adapted to engage the ratchet-teeth 58 on the disk 56 when the lever is swung in the opposite direction—that is from left to right in Figs. 2, 3 and 5.

64 indicates a cam on the lower arm of the lever 55, which is adapted as the lever is moved into the position shown in Figs. 2 and 3 to engage a swinging arm 65 which hangs pivotally suspended from suitable bearings, as 66, on the under side of the side-bar 9 and is provided with a latch 67.

68 indicates a collar secured on the rock-shaft 54 and provided with an arm 69, preferably integral therewith, which, when the rock-shaft is rocked into slow-speed position, hereinafter described, is lifted so that when the swinging arm 65 is freed from the cam 64 the latch 67 will fall below the arm 69 and hold it so as to prevent the shaft 54

from rocking backward until said arm and latch are freed by the swinging of the arm 65 from the cam 64.

70 indicates a collar secured to the rock-shaft 54 and provided with an upward-extending arm 71.

72 indicates a rod, one end of which is pivotally connected with the upper end of the arm 71 and the other end slides freely in a lug 73 on the frame-bar 9, the lug being suitably perforated to receive the rod 72.

74 indicates a collar, which is pinned, or otherwise adjustably secured, on the rod 72, and between which and the lug 73 is interposed a spiral-spring 75 which is compressed when the rock-shaft is rocked so as to move the arm 71 to the left in Fig. 3 and tends to restore the same to normal position when free to act.

The hand-lever 55 is provided with the usual spring-seated dog 76 which is adapted to engage notches in a rack-bar 77. These notches are three in number, marked H, S and O, to indicate, respectively, the high-speed, slow-speed and off position.

78 indicates a link, one end of which is pivotally connected with the lower end of the lever 55 and at the other end with a lever 79 which is journaled upon a horizontal axle 80 in suitable hangers 81 depending from the frame-bar 9. The upper end of the lever 79 is provided with a segmental beveled rack 82 which meshes with a beveled gear 83 secured to a shaft 84 which is vertically journaled in the hanger 81.

85 indicates a collar secured to the lower end of the shaft 84 and provided with a horizontally-extending arm 86.

87 indicates a link, which is pivotally connected at one end with the arm 86 and at the other end with the end of the shift-bar 19.

It will be evident that as the lever 55 is rocked in one direction or the other the shaft 84 will be rocked in one direction or the other by the action of the beveled rack-segment 82 on the beveled gear 83, and swinging the arm 86 correspondingly this, by the connection of the link 87 will slide the slide-bar 19 in one direction or the other in its bearings. When the lever 55 is swung to the left in Figs. 2 and 3, this motion will move the slide-bar toward the frame-bar 9, and when the spring-seated collar 23 engages the fork 18 and shifting-lever 17 the shifting-lever will be rocked to slide the clutch-member 14 into engagement with the clutch-member 25. When the lever is moved in the opposite direction, the slide-bar 19 is moved in the opposite direction and the clutch-member is disengaged.

88 indicates a collar secured to the shaft 54 and provided with an arm 89 on which is mounted a pawl 90.

91 indicates a collar, which is loosely mounted upon the rock-shaft 54 and is provided upon its surface with a lug 92 adapted to be engaged by the pawl 90. The collar 91 is also provided with an arm 93, preferably formed integral therewith.

94 indicates a link, which is pivotally connected at its upper end with the end of the arm 93 and at its lower end to the outer end of a brake-lever 95 which is journaled in a suitable bearing 96 on the frame and carries at its other end a brake 97 which is adapted to engage the outer periphery of the clutch-member 25 and when brought to bear against it to brake the said clutch-member and stop its rotation.

98 indicates a collar on the end of the rock-shaft 54 and keyed, or otherwise secured, thereto.

99 indicates an arm on the collar 98, preferably integral therewith, and depending downward therefrom.

100 indicates a rock-shaft journaled in suitable bearings, as 101, in the frame 7 and provided at one end with an arm 102 extending upward therefrom.

103 indicates a link, which is pivotally connected at one end to the arm 99 and at the other end to the arm 102 on the rock-shaft 100.

104 indicates a collar, which is keyed, or otherwise secured, to the rock-shaft 100 opposite the brake 52 and provided with lugs 105—106 to which the ends of the flexible brake-band 53 are adjustably secured. When the collar 104 is rocked clockwise, as hereinafter described, it is obvious that the brake-band will be tightened and the brake applied to the drum 50. When the rock-shaft 100 is rocked in the opposite direction the brake will be freed.

The operation of the above-described device is as follows: The drawings indicate the parts in the full-speed position with the hand-lever 55 moved to the extreme left in Fig. 2 and the latch 76 in the high-speed notch. In this position the clutch-members 14 and 25 are forced into engagement with each other and the press is driven at full speed in the manner above described. In this position also the cam 64 is in engagement with the swinging arm 65, swinging it out from its normal position, and the arm 61 has been engaged by the pin 62 to lift the latch 60 out of the ratchet-teeth 57 and the rock-shaft 54 is yieldingly held in normal position by the spring 75, the brakes 52 and 97 both being off. If the lever is now swung to the right to the off position this movement will first of all operate the shifting-bar 19 to move the clutch-members 14 and 25 out of engagement. Before the lever reaches the off position the pawl 63 engages one of the ratchet-teeth 58 on the disk 56 and the rock-shaft 54 is rocked in a clockwise direction. This, of course, rocks the

collar 88, on which the arm 89 and its pawl 90 are so disposed that just before the off position is reached the pawl 90 engages the lug 92 on the collar 91, rocks the same in the same direction with the rock-shaft and rocking the arm 93 downward rocks the brake 97 upward and brings it into engagement with the flange 27 on the clutch-member 25, causing the stoppage of the mechanism and the press, or other driven machine, is brought to rest. It now being desired to start the mechanism up, the lever 55 is swung toward the slow-speed position. As soon as the swinging of the lever begins the link 78 is, of course, moved to the right in Fig. 3, rocking the lever 79, rotating the gear 83 and moving the shift-bar 19 toward the side-bar 9 and bringing the collar 23 into position to bear upon the shifting-lever 17. The collars 21—23 are so spaced upon the shift-bar that the lever 17 is not rocked until after the hand-lever 55 reaches the slow-speed position, but the collar 23 by the movement to slow-speed position is brought into position to be ready to swing the shifting-lever 17 as soon as the lever 55 passes the slow-speed position. As the lever 55 is rocked from off to slow-speed position, the dog 60, which is at that time riding upon the periphery of the disk 56, engages one of the ratchet-teeth 57, rocking the disk 56 and the rock-shaft 54 in a contra-clockwise direction, compressing the spring 75. This rocking of the rock-shaft frees the pawl 90 from engagement with the lug 92, permitting the collar 91 to rotate and the brake 97 will fall away from the flange 27 on the clutch-member 25 by its own weight. The parts are so positioned that this movement of the rock-shaft through the operation of the collar 98, arm 97, link 103, and arm 102, rocks the rock-shaft 100 in a clockwise direction and tightens the brake 52 upon the drum 50, holding it against rotation and causing the press to be driven at slow speed in the manner above described. This rocking of the rock-shaft 54 by the movement of the lever 55 into slow-speed position has, by the time it reaches slow-speed position, raised the arm 69 on the collar 68 to such a position as to permit the latch 67 on the swinging arm 65, which is still free from the cam 64, to drop below the said arm 69 and thus hold the rock-shaft against backward rotation by the action of the spring 75 until said latch is released.

It being desired to move the parts into full-speed position, the lever 55 is swung toward the full-speed notch, and this further movement of the lever causes the gradual engagement of the clutch-members 14 and 25 which begin to come into engagement as soon as the lever is moved beyond the slow-speed notch, the beveled surfaces permitting the movement of the clutch-member 14—which is the same as that of the shaft 11—to be taken up, not suddenly, but relatively gradually by the clutch-member 25. As these clutch-members begin to come into engagement so as to impart to the clutch-member 25 a higher speed, the movement of the lever causes the arm 61 to be brought into engagement with the pin 62 and the dog 60 to be freed from the ratchet-teeth 57. The cam 64 as these clutch-members begin to move into high-speed engagement engages the lower end of the swinging lever 65, forcing the latch 67 out from engagement with the arm 69 and permitting the spring 75 to act. The spring 75, being free to act, causes the swinging of the arm 71 in a clockwise direction, rotating the collar 70 and the rock-shaft 54 in the same direction and throwing off the brake 52 from the drum 50, allowing the same to rotate freely. The press is now driven at full speed. As has been said, the clutch-members 14 and 25 are thrown into engagement with one another so that the clutch-member 25 begins to take up the increased speed before the brake on the drum 50 is thrown off and therefore while the slow-speed mechanism is still running. Of course this will drive the gear 29 and the drum 35 at a greater speed, but this speed will not be communicated to the rest of the slow-speed mechanism because the pawls will slip over the teeth of the ratchet 38.

That which I claim as my invention, and desire to secure by Letters Patent, is,—

1. In combination, a driving-shaft, a driving-gear rotatably carried on said shaft, clutch mechanism carried by said shaft and adapted when engaged to rotate said driving-gear with said shaft, means for throwing said clutch mechanism into and out of engagement, a countershaft, slow-speed mechanism mounted on said countershaft, gearing between said driving-shaft and said slow-speed mechanism, and pawl and ratchet mechanism between said slow-speed mechanism and said driving-gear on said driving-shaft and gearing connecting said pawl and ratchet mechanism with said slow-speed mechanism.

2. In combination, a driving-shaft, a driving-gear rotatably carried on said shaft, clutch mechanism carried on said shaft and adapted when engaged to rotate said driving-gear with said shaft, means for throwing said clutch mechanism into and out of engagement, a countershaft, slow-speed planetary gearing mounted on said countershaft, gearing between said planetary gearing and said driving-shaft, and pawl and ratchet mechanism between said planetary gearing and said driving-gear on said driving-shaft and gearing connecting said pawl and ratchet mechanism with said slow-speed mechanism.

3. In combination, a driving-shaft, a driv-

ing-gear rotatably carried on said shaft, a clutch-member connected with said gear on said driving-shaft, a clutch-member carried by said driving-shaft and adapted to be thrown into engagement with said first clutch-member, a countershaft, planetary gearing carried by said countershaft, gearing between said planetary gearing and said driving-shaft, gearing operated by said spider, and pawl and ratchet connections between said last-named gearing and said driving-gear on said driving-shaft.

4. In combination, a main driving-shaft, a driving-gear rotatably carried on said driving-shaft, clutch mechanism mounted on said driving-shaft and connected with said driving-gear and adapted when thrown into engagement to rotate said driving-gear with said shaft, a countershaft, a spider on said countershaft, a drum concentric with said countershaft and rotatable with reference to said spider, means for holding said drum against rotation, an internal gear on said drum, pinions on said spider adapted to mesh with said internal gear, a pinion concentric with said countershaft and adapted to mesh with the pinions on said spider, slow-speed gearing between said last-named pinion and said driving-shaft, gearing driven by said spider, and pawl and ratchet connections between said last-named gearing and the driving-gear on said driving-shaft.

5. The combination with a driving-shaft, a clutch-member rotatably mounted on said driving-shaft, a gear secured to said clutch-member, a second clutch-member slidingly mounted on said driving-shaft, and means for moving said clutch-members into and out of operative engagement, of a pinion on said driving-shaft, a second shaft, a large gear rotatably mounted on said second shaft and meshing with said pinion, a small gear secured to said large gear, a spider rotatably mounted on said second shaft, a drum rotatably mounted on the hub of said spider and carrying an internal gear, pinions on said spider and meshing with said smaller gear on said second shaft and with the internal gear on said drum, a gear carried by said spider, a gear on said driving shaft, connections between said last-named gear and said rotatable clutch-member adapted to rotate said clutch-member from said last gear in one direction, a brake for holding said drum against rotation, and connections between said brake and said clutch moving mechanism.

6. The combination with a driving-shaft, a clutch-member rotatably mounted on said driving-shaft, a gear secured to said clutch-member, a second clutch-member slidingly mounted on said driving-shaft, and means for moving said clutch-members into and out of operative engagement, of a pinion on said driving-shaft, a second shaft, a large gear rotatably mounted on said second shaft and meshing with said pinion, a small gear secured to said large gear, a spider rotatably mounted on said second shaft, a drum rotatably mounted on the hub of said spider and carrying an internal gear, a pinion on said spider and meshing with said smaller gear on said second shaft and with the internal gear on said drum, a gear carried by said spider, a gear on said driving-shaft, pawl and ratchet connections between said last-named gear and said first-named clutch-member, a brake for holding said drum against rotation, and connections between said brake and said clutch moving mechanism.

7. The combination with a driving-shaft, a clutch-member rotatably mounted on said driving-shaft, a gear secured to said clutch-member, a second clutch-member slidingly mounted on said driving-shaft, and means for moving said clutch-members into and out of operative engagement, of a pinion on said driving-shaft, a second shaft, a large gear rotatably mounted on said second shaft and meshing with said pinion, a small gear secured to said large gear, a spider rotatably mounted on said second shaft, a drum rotatably mounted on the hub of said spider and carrying an internal gear, pinions on said spider and meshing with said smaller gear on said second shaft and with the internal gear on said drum, a gear carried by said spider, a gear on said driving-shaft, a ratchet-wheel secured to said last-named gear, a drum secured to the hub of said first-named clutch-member, pawls on said drum adapted to engage said ratchet-wheel, a brake for holding said drum against rotation, and connections between said brake and said clutch moving mechanism.

8. The combination with a driving-shaft, a clutch-member rotatably mounted on said driving-shaft, a gear secured to said clutch-member, a second clutch-member slidingly mounted on said driving-shaft, and an arm for moving said clutch-members into and out of operative engagement, of a pinion on said driving-shaft, a second shaft, a large gear rotatably mounted on said second shaft and meshing with said pinion, a small gear secured to said large gear, a spider rotatably mounted on said second shaft, a drum rotatably mounted on the hub of said spider and carrying an internal gear, pinions on said spider and meshing with said smaller gear on said second shaft and with the internal gear on said drum, a gear carried by said spider, a gear on said driving-shaft, connections between said last-named gear and said rotatable clutch-member adapted to rotate said clutch-member from said last gear in one direction, a brake for holding said drum against rotation, a hand-lever, connections between said hand-lever and said clutch-operating arm, connections between

said hand-lever and said brake whereby when said hand-lever is moved in one direction the brake will be applied to said drum and as the lever is moved further in the same direction the said clutch-members will be brought into engagement and as they are brought into engagement said brake released.

9. The combination with a driving-shaft, a clutch-member rotatably mounted on said driving-shaft, a gear secured to said clutch-member, a second clutch-member slidingly mounted on said driving-shaft, and an arm for moving said clutch-members into and out of operative engagement, of a pinion on said driving-shaft, a second shaft, a large gear rotatably mounted on said second shaft and meshing with said pinion, a small gear secured to said large gear, a spider rotatably mounted on said second shaft, a drum rotatably mounted on the hub of said spider and carrying an internal gear, pinions on said spider and meshing with said smaller gear on said second shaft and with the internal gear on said drum, a gear carried by said spider, a gear on said driving-shaft, connections between said last-named gear and said rotatable clutch-member adapted to rotate said clutch-member from said last gear in one direction, a brake for holding said drum against rotation, a hand-lever, connections between said hand-lever and said clutch-operating arm, connections between said hand-lever and said brake whereby when said hand-lever is moved in one direction the brake will be applied to said drum and as the lever is moved further in the same direction the said clutch-members will be brought into engagement and as they are brought into engagement said brake released, said lever being adapted by its movement in the opposite direction to move said clutch-members out of engagement.

JOSEPH J. WALSER.

Witnesses:
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W. A. Furnner.