J. J. WALSER.

DRIVING MECHANISM.

APPLICATION FILED DEC. 5, 1908.

940,095.

Patented Nov. 16, 1909.

4 SHEETS—SHEET 1.

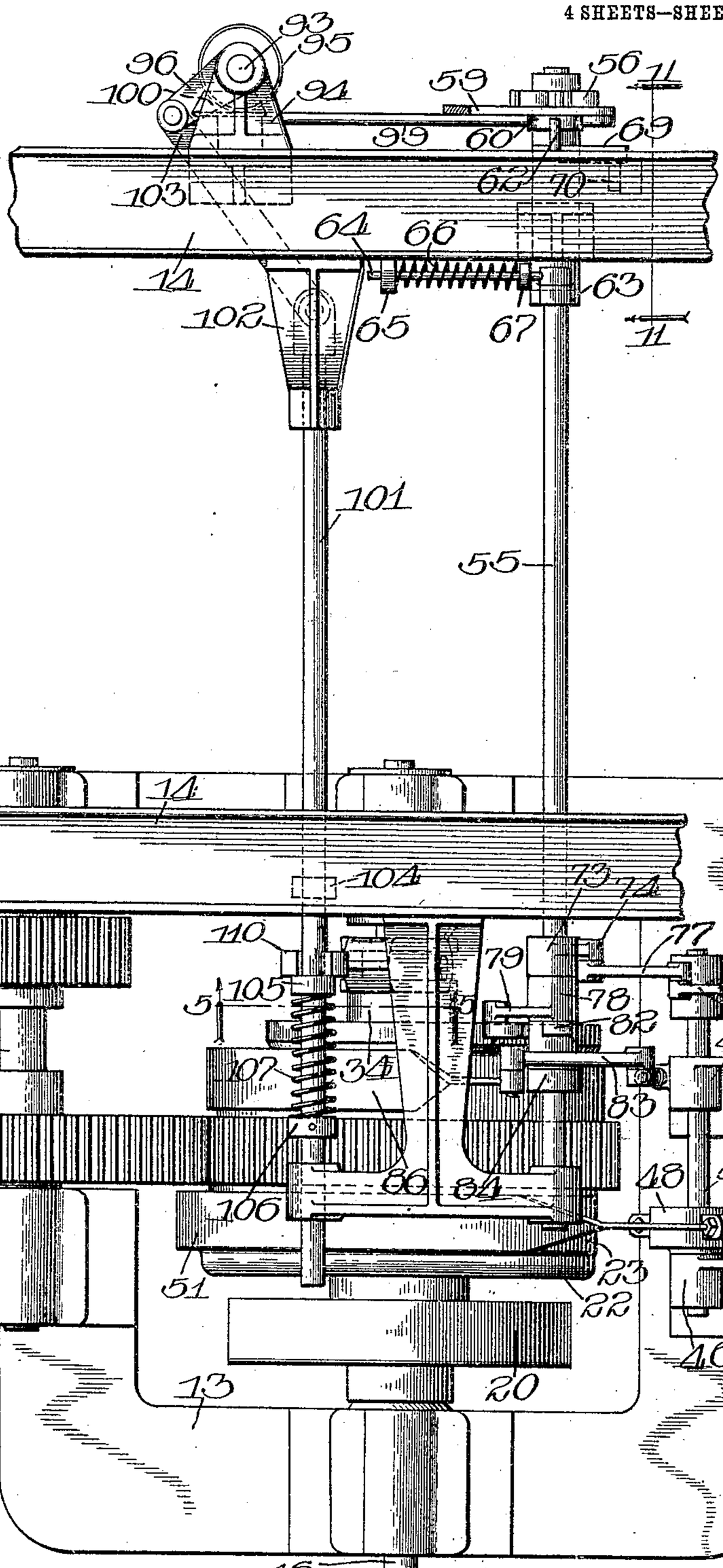

Fig. 1.

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4 SHEETS—SHEET 2.

Fig. 2.

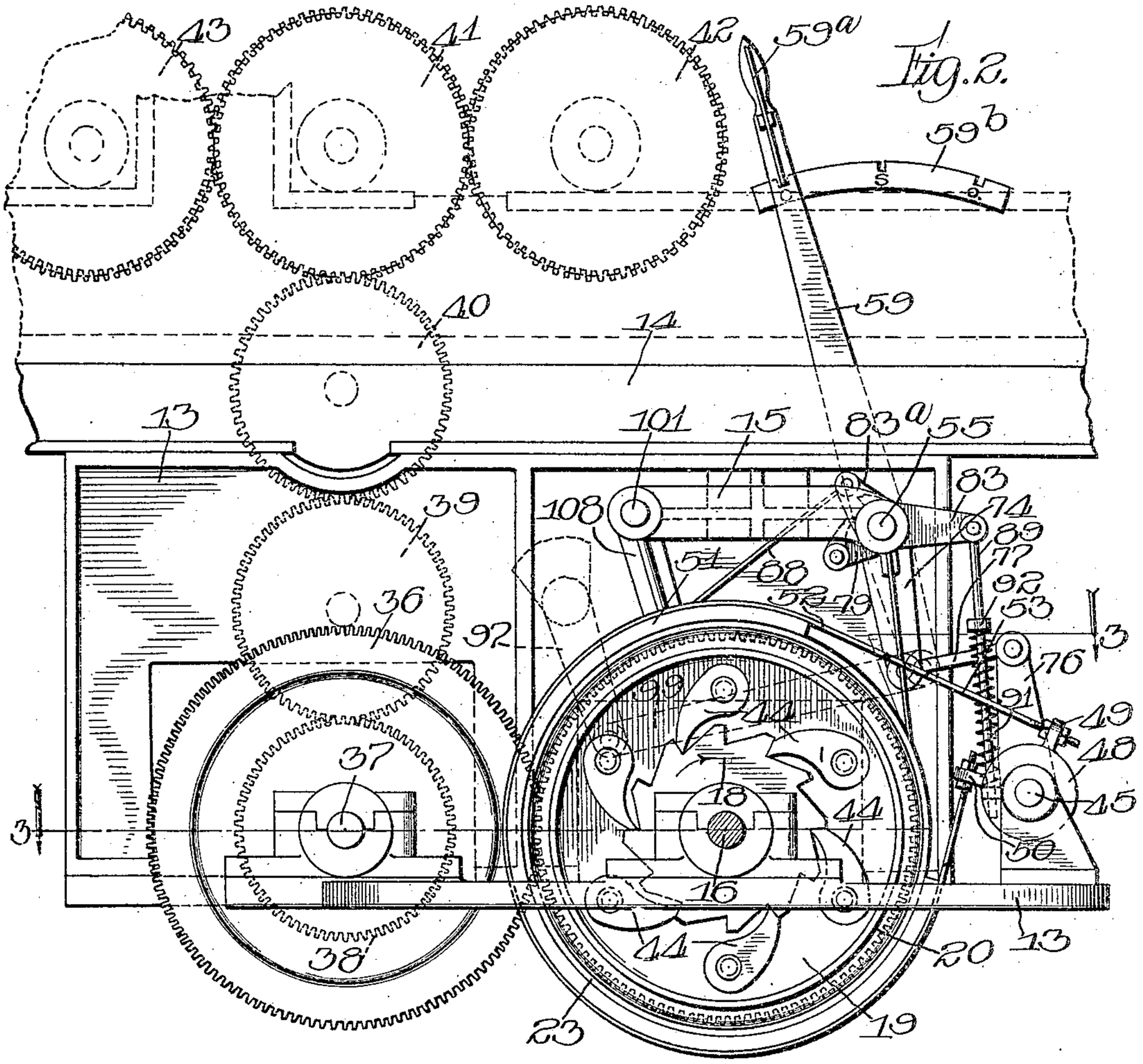
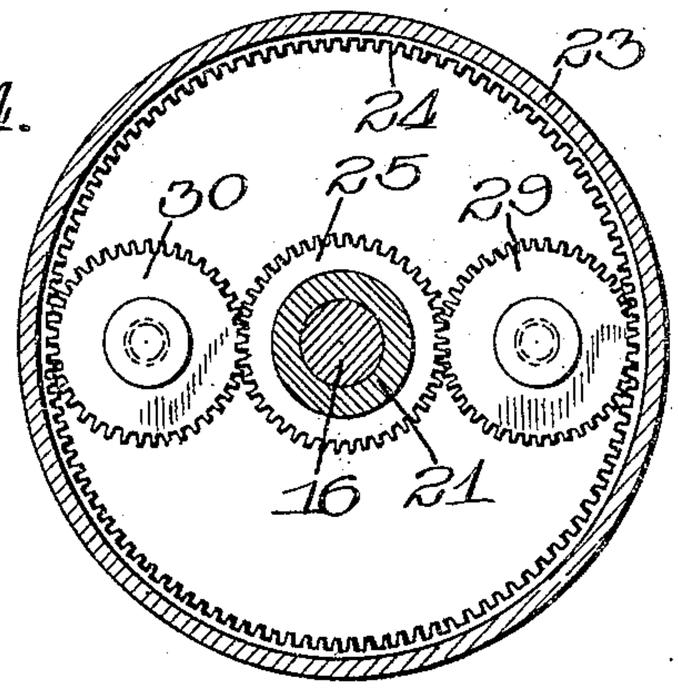


Fig. 4.



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4 SHEETS—SHEET 3.

Fig. 5.

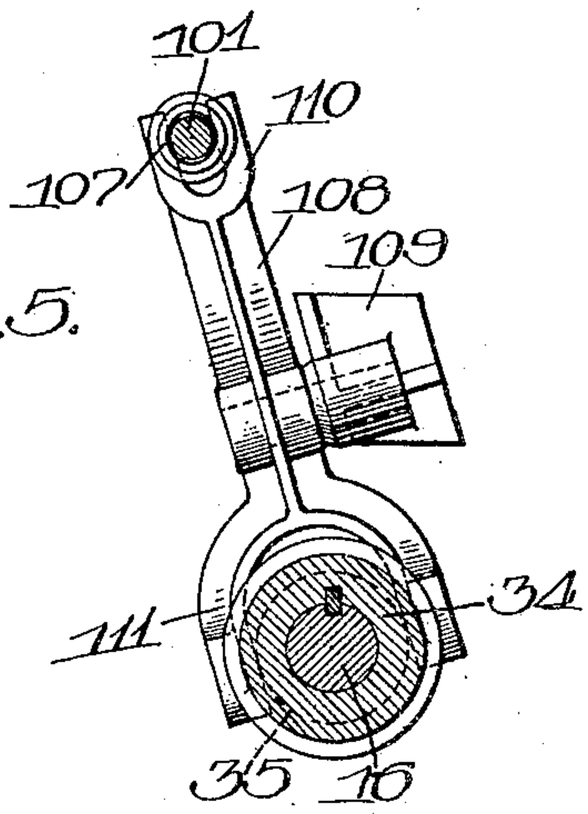


Fig. 6.

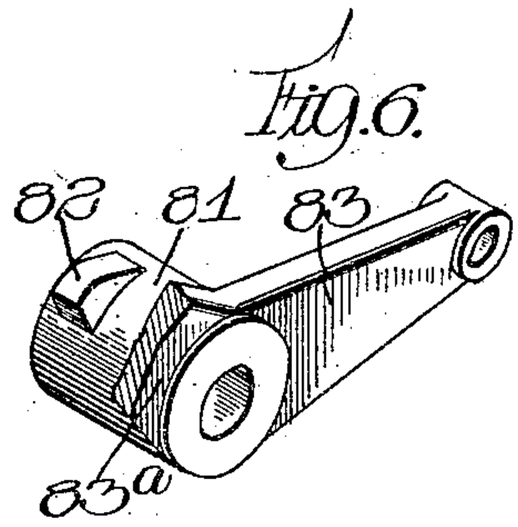
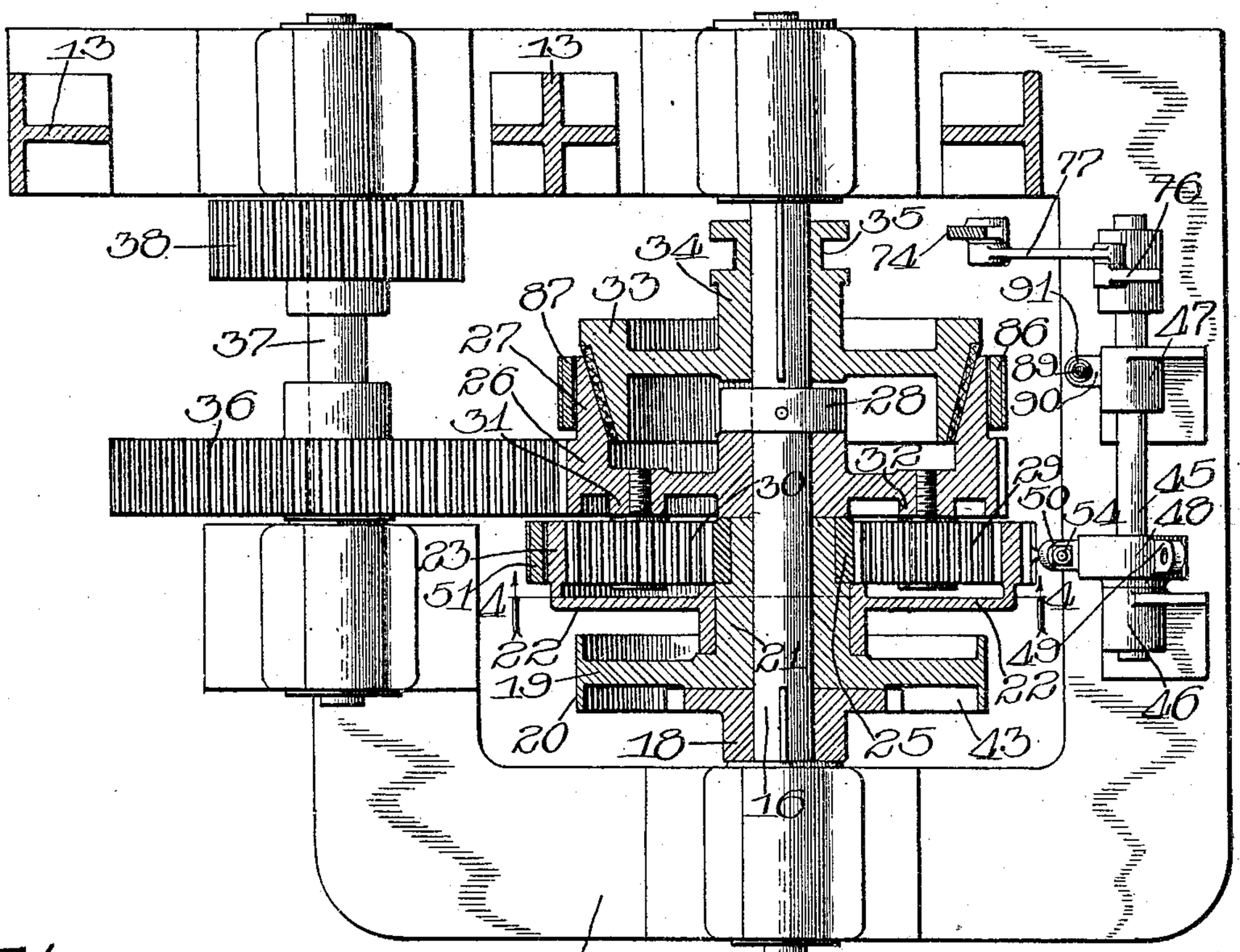


Fig. 3.



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4 SHEETS—SHEET 4.

Fig. 7.

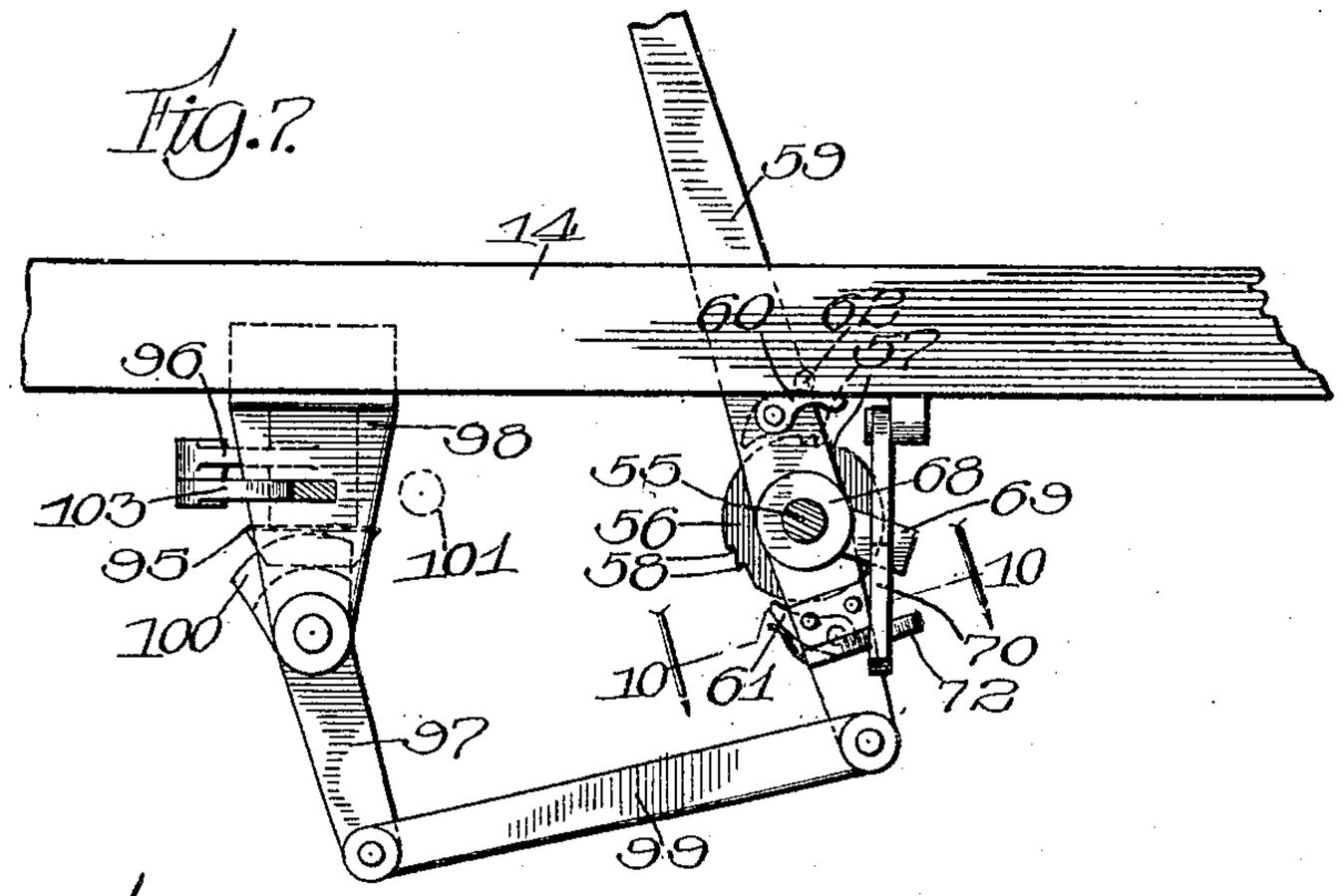


Fig. 9.

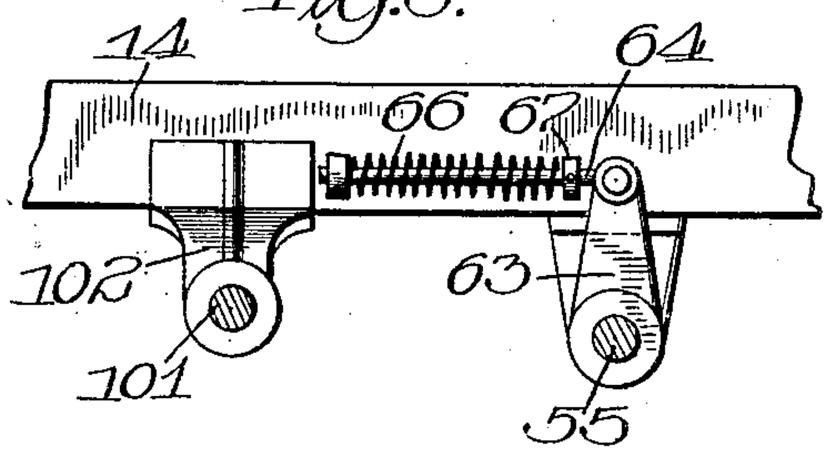


Fig. 8.

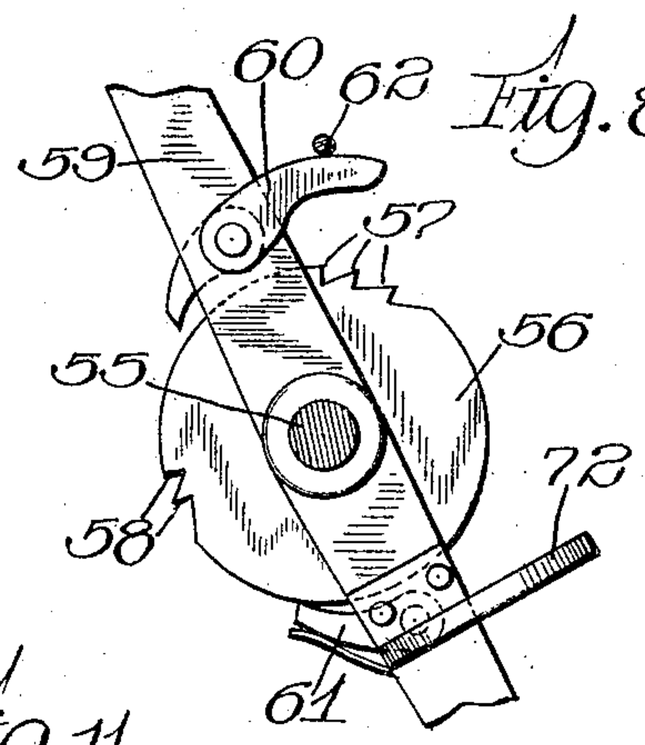


Fig. 10.

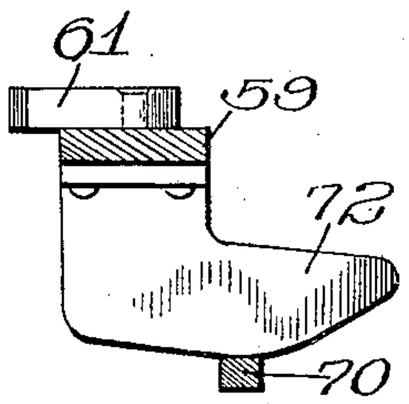


Fig. 11.

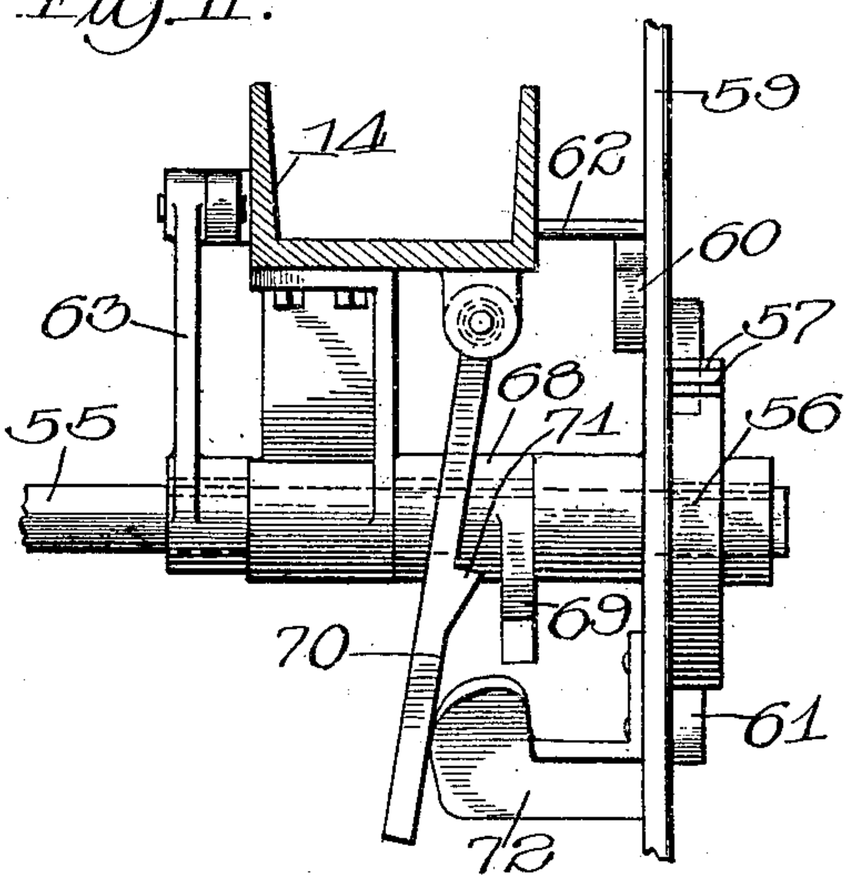
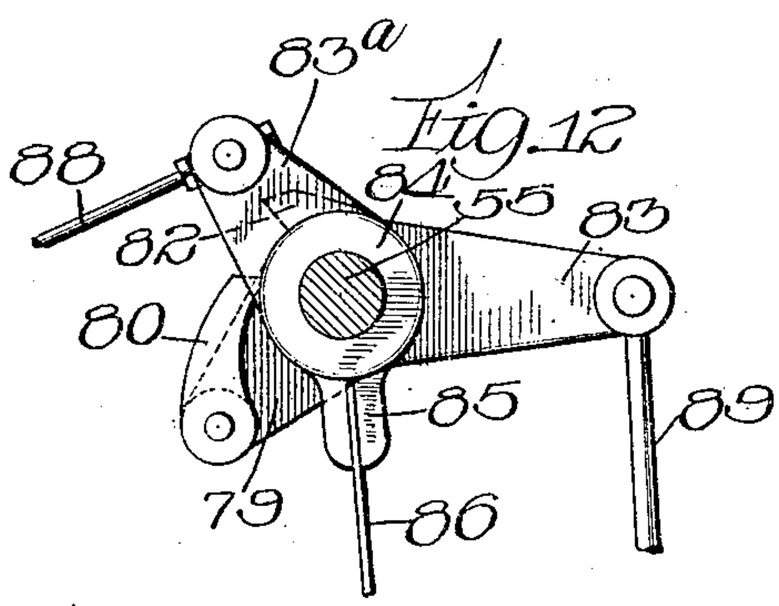


Fig. 12.



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UNITED STATES PATENT OFFICE.

JOSEPH J. WALSER, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE GOSS PRINTING PRESS COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

DRIVING MECHANISM.

940,095. Specification of Letters Patent. **Patented Nov. 16, 1909.**

Application filed December 5, 1908. Serial No. 466,121.

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 Driving Mechanism for Printing-Presses, of which the following is a specification, reference being had to the accompanying drawings.

My invention relates to driving mechanism especially adapted for a printing press in which it is desirable that a slow speed or full speed movement may be given to the press, and it is particularly adapted to such slow and fast speed driving mechanism as is adapted to be used in connection with a constant speed motor.

Heretofore in driving mechanism which is actuated by a shaft or a prime mover running at a constant speed and adapted to be shifted so that the printing press can be driven at either a slow or a fast speed, it has been customary to have the shifting mechanism so arranged that in shifting from the slow to the high speed the slow speed mechanism is thrown out of gear before the high speed mechanism is thrown in. When therefore such a machine as a printing press is being so driven, although the time which elapses between the throwing out of the slow speed and the throwing in of the high speed mechanism is but a moment, the printing press, running only by its own momentum, slows down slightly and when the higher speed mechanism picks it up there is likely to be a jerk which will snap the webs of paper across.

It is one of the objects of my invention to provide a mechanism in which the slow speed is not thrown out of gear until after the high speed mechanism engages, thereby preventing the slowing down of the press through running only by its own momentum during the moment of time which elapses between the engagement of the two speed mechanisms.

My invention is, as has been said, peculiarly adapted for use in connection with electric motors which are driven continuously at a high speed and which are much less expensive and more desirable in many respects than motors which by the control of a rheostat are themselves driven at different speeds in order to bring about the slow and high speed movements of a press.

My invention has further for its object the improvement in driving mechanism adapted to drive a driven machine at different speeds in sundry details hereinafter pointed out.

In the drawings:—Figure 1 is a top or plan view of my mechanism mounted in connection with the bed frame of a printing press. Fig. 2 is a side elevation showing in dotted lines part of the side frame and driving gears of a printing press in connection with my driving mechanism. Fig. 3 is a plan section on line 3—3 of Fig. 2. Fig. 4 is a section on line 4—4 of Fig. 3. Fig. 5 is an enlarged detail of the clutch-operating lever, being a section on line 5—5 of Fig. 1. Fig. 6 is an enlarged detail, being a view of the bell-crank lever for operating the stopping brake. Fig. 7 is an enlarged detail, being a view of the operating lever and its connections. Fig. 8 is a still further enlarged detail, showing the ratchet disk operated by the operating lever. Fig. 9 is an enlarged detail, showing the spring by which the main operating shaft is held in a normal position. Fig. 10 is an enlarged detail, being a section on line 10—10 of Fig. 7. Fig. 11 is an enlarged detail, being a section on line 11—11 of Fig. 1. Fig. 12 is an enlarged detail, being a view of the stopping brake operating mechanism.

13 indicates a frame which is mounted in a suitable pit below and to one side of the bed frame 14 of a printing press. 15 indicates a bracket secured to said frame 13.

16 indicates the main driving shaft which is journaled in the frame 13 and by suitable means, as by gear 17, is driven from a prime mover running at a constant high speed.

18 indicates a ratchet wheel which is keyed to the shaft 16.

19 indicates a disk which is provided with a peripheral flange 20 and a hub 21 and is loosely mounted upon the shaft 16 with its outer surface bearing against the inner surface of the ratchet wheel 18.

22 indicates a drum which is revolubly mounted upon the hub 21 of the disk 19 and provided with a flange 23 having an interior gear-ring 24.

25 indicates a gear which is mounted upon and fixedly secured to the hub 21 of the disk 19 within the drum 22.

26 indicates the main drive wheel in the form of a gear which is revolubly mounted

upon the shaft 16 and is provided with a clutch flange 27.

28 indicates a collar which is pinned to the shaft 16 and holds the various parts hereinabove described in position on the shaft.

29—30 indicate gears which are revolubly mounted upon studs 31—32 on the outer face of the gear 26 and engage with the gear 25 and with the interior gear 24 on the drum 22.

33 indicates a clutch member which is keyed upon the shaft 16 and is provided with a hub 34 having a peripheral groove 35 by means of which by the mechanism hereinafter described the clutch member 33 may be slid to and fro longitudinally of the shaft 16. The interior of the clutch flange 27 and the periphery of the clutch member 33 are beveled so that when the clutch member 33 is forced into the clutch flange 27 the clutch members will engage.

36 indicates a gear which is secured to a shaft 37 journaled in the frame 13. The gear 36 engages the gear 26 and drives the shaft 37.

38 indicates a gear secured to the shaft 37 by means of which through suitable gears, as 39—40—41—42—43, the press is driven.

44 indicates pawls (see Fig. 2) which are pivotally carried upon the outer surface of the disk 19 and adapted to engage the teeth on the ratchet wheel 18 so that when the drive shaft 16 is rotated to rotate the ratchet wheel in the direction indicated by the arrow in Fig. 2 the pawls 44 will be engaged by the ratchet teeth and the disk 19 will be carried around with the shaft 16.

It will be obvious from the above description that when the shaft 16 is driven continuously at high speed in the direction indicated by the arrow in Fig. 2 and the drum 22 is braked to prevent its rotation, the disk 19, through the engagement of the pawls 44 with the ratchet wheel 18, will be driven in the same direction and at the same speed. Through the medium of the gear 25, which engages the gears 29 and 30, these gears will travel on the interior gear-ring 24, carrying with them the gear 26 which will also move in the same direction but at a speed as much less than the speed of the shaft 16 as the diameter of the gear 25 is less than the diameter of the interior gear 24. For convenience of illustration, this proportion is illustrated as being about one to three, but in practice of course in driving the printing press this difference will ordinarily be much greater, say about one to eight, although of course it may be suitably varied. The gear 36 engaging the gear 26 will therefore be carried around, and, through the medium of the interposed gearing, 39 to 43, the press will be driven at a slow speed.

Referring particularly to Figs. 2 and 3, 45 indicates a rock shaft which is journaled in suitable bearings 46—47 on the framework 13. 48 indicates a collar which is keyed to the rock-shaft 45 and is provided with lugs 49—50 preferably integral therewith. 51 indicates a brake mounted upon a flexible brake band 52 and bearing upon the periphery of the drum 22. The ends of the flexible band 52 are connected by means of rods 53—54 to the lugs 49—50. The rock-shaft 45 is operated by mechanism hereinafter described and it will be obvious that when said rock-shaft is rotated in one direction the brake 51 will be tightened upon the flange 23 of the drum 22 so as to hold it against rotation, and that when the rock-shaft is rotated in the other direction the brake will be freed from the drum. On the other hand, it will be obvious that if the clutch 33 which is feathered upon the shaft 16 is forced into engagement with the clutch flange 27 on the gear 26, said gear 26 will be rotated in the same direction as the shaft and at the same speed as the shaft, driving the gear 36 and consequently the press at full speed. If the brake 51 is still applied to the drum 22 so as to hold it against rotation, the gears 29—30 will be carried around with it in the same direction and at the same speed of revolution around the shaft 16, and by their revolution around the shaft will speed gears 29—30 to a speed as much in excess of the speed of the shaft as the diameter of the interior gear-ring 24 exceeds the diameter of the gear-ring 25. This will cause the disk 19 to speed up to the same speed, throwing the pawls 44 out of engagement with the ratchet 18 by centrifugal force and allowing the disk 19 to run freely. Whenever the brake 51 is released, this excess speed will slow down the normal movement of the press as its momentum ceases. It is obvious therefore that in passing from the low speed to the high speed, the slow speed mechanism need not be disengaged before the high speed mechanism is thrown into engagement and there will therefore not be a moment of time in this passing from one speed to another during which the press, running by its own momentum, can slow down and cause breakages of the web, when the high speed is thrown into engagement. It will be obvious also that as the clutch is a friction clutch, and, by means of its beveled engaging surfaces is thrown into engagement relatively gradually, there will be sufficient slippage at first as the mechanism is moved from slow to high speed to prevent the sudden movement from slow to high speed and allow this change to be made gradually.

55 indicates a shaft which is journaled in a suitable bearing below one of the bed-plates 14 and at the other end in a suitable bearing in the bracket 15.

56 indicates a disk which is keyed or other-

wise secured upon the outer end of the shaft 55 and is provided with two sets of ratchet teeth 57—58 suitably disposed as hereinafter described upon its periphery.

59 indicates an operating lever which is journaled upon the shaft 55 near its outer end within and adjacent to the disk 56. The lever 59 is provided with the usual latch 59[a] which engages an arc bar 59[b] so that the lever may be locked in braking, slow-speed, or full-speed position.

60—61 indicate pawls which are carried by the lever 59 one at one side and the other at the other side of the disk 56 and adapted, respectively, to engage the teeth 57—58. When the lever 59 is swung in one direction the pawl 60 at the proper time, as hereinafter described, will engage the teeth 57 and rotate the disk 56 and therefore the shaft 55 in one direction; when the lever is swung in the other direction,—namely, from left to right in Fig. 2,—the pawl 61 will at the proper time as hereinafter described engage the teeth 58 rotating the disk 56 and consequently the shaft 55 in the other direction.

62 indicates a pin which is suitably mounted below the frame 14, and is adapted, when the lever 59 passes a certain point in its movement from right to left as hereinafter described, to engage the free end of the pawl 60, and, pressing it downward as the lever moves on, to free the pawl from the ratchet teeth 57.

Referring now to Figs. 1 and 9, where these parts are best shown, 63 indicates an arm which is secured to the shaft 55 and projects upward therefrom. 64 indicates a rod, one end of which is pivotally mounted upon the upper end of the arm 63, and the other end of which slides back and forth through a lug 65 on the frame 14. 66 indicates a spiral spring which is mounted on the rod 64 between the lug 65 and a collar 67 pinned to the rod 64 and operates to yieldingly hold the shaft 55 normally in the position shown in the several figures, as 7, 8 and 9.

68 (see Figs. 7 and 11) indicates a collar which is keyed to the shaft 55 and has integral with it a lug 69 which projects radially therefrom sloping somewhat downward.

70 indicates a rod which is pivotally suspended from a suitable bearing below the frame 14 and is provided with a latch 71. When free to take its normal position, the rod 70 will fall so that the latch bears upon the surface of the lug 69 and when the rock shaft 55 is rotated to a suitable point so that the lug 69 passes above the latch 71, the latch will drop below the lug 69 and thereby lock the shaft 55 against backward rotation which would otherwise be caused by the spring 66.

72 indicates a cam which is keyed upon the lower end of the lever 59 and which is adapted, when the upper end of the lever 59 is swung a suitable distance to the left in the several figures, to engage the lower end of the rod 70 and force it out so as to release the latch. When the lever is moved in the other direction, the cam is freed from the rod, allowing it to drop into normal position. The point at which the latch 71 engages the lug 69 will be hereinafter described when the operation of the mechanism is described.

73 indicates a collar which is keyed or otherwise secured to the rock-shaft 55 at a point opposite the inner end of the rock shaft 45.

74 indicates an arm which is secured to and projects downward from the collar 73.

75 indicates a collar which is secured to the outer end of the rock shaft 45 and is provided with an upward-projecting arm 76.

77 indicates a link which pivotally connects the lower end of the arm 74 with the upper end of the arm 76, whereby when the main rock-shaft 55 is rocked in either direction the shaft 45 will be correspondingly rocked.

78 indicates a collar which is keyed to the main rock shaft 55 and is provided with an arm 79.

80 indicates a pawl which is carried by the arm 79.

81 indicates a collar which is loosely mounted upon the main rock shaft 55 adjacent to the collar 78 and is provided with a lug 82 which is adapted to be engaged by the pawl 80 when the rock-shaft is rotated and at a suitable time so as to move the collar 81 with it. The collar 81 is also provided with arms 83 and 83[a] which are preferably formed integral therewith.

84 indicates a collar which is loosely mounted on the main rock shaft 55 adjacent to the collar 81 and is provided with a depending lug 85 which is split to hold one end of a flexible brake band 86. The brake band 86 encircles the exterior periphery of the clutch flange 27, and is provided with a brake 87 which bears upon the exterior periphery of said clutch flange. The other end of the flexible brake band 86, by means of a rod 88, is adjustably connected with the outer end of the arm 83[a] on the collar 81. When, therefore, the rock-shaft 55 is rocked backward, to a suitable distance, by the movement of the lever 59, the handle moving from left to right in the figures, the pawl 80 will, when said lever nears the backward limit of its motion, engage the lug 82, and, rocking the collar 81, will tighten the flexible brake band so as to brake the clutch-flange 27 and gear 26 and stop the press.

The arm 83 of the collar 81 carries pivotally connected with its outer end a rod 89, the lower end of which slides in a lug 90 on the bearing 47.

91 indicates a spiral spring which is in-

terposed between the lug 90 and a collar 92 pinned upon the rod 89. When the collar 81 is rocked to put on the brake, the spiral spring is compressed, and when, by the rocking of the main rock shaft 55 in the other direction, the pawl 80 is freed from the lug 82, the spring forces the arm 83 upward and releases the brake.

93 indicates a short vertical stub-shaft which is mounted in brackets 94 on the frame 14. The stub-shaft 93 carries upon its lower end a bevel gear 95, and, between said gear and its bearing, an arm 96, which projects horizontally from said stub-shaft.

97 indicates a lever which depends from and is journaled in a suitable bracket 98, depending from the frame 15. The lever 97 is connected at its lower end by means of a link 99 with the lower end of the lever 59, and at its upper end carries a segmental bevel gear 100 which is adapted to mesh with the bevel gear 95. When the lever 59 therefore is rocked in either direction, the lever 97 is rocked and by the segmental bevel gear 100 meshing with the bevel gear 95, the stub-shaft 93 is rocked in one direction or the other, carrying with it the arm 96.

101 indicates a rod which is slidingly mounted at one end in a bearing bracket 102 secured to the frame 14 and at the other end in the bearing 15 so that the rod 101 may be slid longitudinally of itself therein.

103 indicates a link which is pivotally connected at one end with the outer end of the arm 96 and at the other end with the end of the rod 101 which is mounted in the bearing bracket 102, whereby, by the rocking of the stub-shaft 93, the rod 101 will be moved longitudinally of itself, in one direction or the other according to the direction of the rocking of the stub-shaft 93.

104 indicates a collar which is pinned or otherwise secured to the rod 101.

105 indicates a collar which is slidingly mounted upon the rod 101.

106 indicates a collar which is pinned or otherwise secured to the rod 101.

107 indicates a spiral compression spring which is carried on the rod 101 between the sliding collar 105 and the keyed collar 106.

108 (see Fig. 5 where it is best shown) indicates a lever which is pivoted upon a suitable support 109 below the bracket 15. The lever 108 is provided at its upper end with a fork 110 which embraces the rod 101 so as to engage the collars 104—105. At the other end, the lever 108 is provided with a fork 111 which embraces the hub 34 on the clutch 33 lying in the groove 35, whereby, when said lever 108 is rocked by the engagement therewith of the collar 104 or 105 on the rod 101, the clutch 33 is slid in one direction or the other upon the main shaft 16 and is engaged with or disengaged from the clutch flange 27.

When the upper end of the lever 59 is swung from right to left in Fig. 2, the rod 101 by means of the above-described connections, will be moved in the direction indicated by the solid arrow in Fig. 1, and, consequently, the spring-seated collar 105 will be brought to bear upon the upper end of the lever 108, carrying it in the same direction, moving its lower end inward and throwing the clutch members above described into engagement. When the lever is moved from left to right, the rod 101 will be moved in the opposite direction, indicated by a dotted arrow in Fig. 1, the collar 105 will be freed from the fork 110, the collar 104 will be engaged by the fork, and the clutch will be disengaged.

The operation of the mechanism above described is as follows:—Supposing the parts to be in the position shown in the drawings,—that is to say, with the operating lever in the position shown particularly in Fig. 2,—the brake 87 will be loose from the clutch flange 27, the brake 51 will be loose from the drum 22, the cam 72 will be in the position shown in Fig. 11 so as to force the lever 70 out leaving the shaft 55 free to rotate backward, the spring 66 will yieldingly hold the main rock shaft 55 in the position shown in the several figures, the clutch members will be engaged, and the press will be running at full speed. It being desired to stop the press, the upper end of the operating lever 59 is moved to the right until the latch engages the notch in the brake end of the arc-bar. As the lever moves, the lever 97 is swung to the left, operating the segmental gear 95, moving the rod 101 inward toward the speeding mechanism and disengaging the clutch members. As the lever moves farther over, the pawl 61 engaging one of the notches 58 turns the disk 56 and consequently the shaft 55 so as to move the arm 79 upward, causing the pawl 80 to engage the lug 82, rotate the sleeve 84, and tightening the band 86 clamp the brake 87 upon the clutch flange 27 and stop the press. The cam 72 on the end of the lever 59 has by this movement been moved away from engagement with the rod 70, which then being free to fall swings to the right in Fig. 1 with the lug 71 bearing against the surface of the lug 69 ready to drop below it when the lug 69 is lifted by the rotation of the rock-shaft 55 in the other direction. The parts remain in this position while the press is stopped.

When it is desired to start the press, the operating lever is moved toward the left in the several figures. As it is moved toward the left, the rod 101, through the operation of the segmental and bevel gears, of course begins to move outward,—that is, toward the lever side of the press,—but the collars 104—105 are so spaced that the clutch members

are not thrown into engagement until after the lever has swung past the slow-speed notch on the arc-bar. As soon as the lever begins to move to the left, the pawl 60 engages one of the notches 67 on the disk 56, rotating it contra-clock-wise, as seen in Figs. 7 and 8, rocking the shaft 55 of course in the same direction. This rocking of the shaft 55 carries the arm 79 downward so that the pawl 80 is released from the lug 82 on the sleeve 81, which permits the spring 91 to operate the rod 89, rocking the sleeve 81 and freeing the brake band 87 from the clutch flange 27, leaving the mechanism free to move. As the shaft 55 is rocked, the arm 74, moving to the right in Fig. 2, through the connection of the link 77, rocks the arm 76 in the same direction and with it the rock-shaft 45. This of course moves the collar 48, and, tightening the flexible brake-band 52, clamps the brake 51 tightly upon the drum 22, locking it against rotation. The parts are so timed and adjusted that this is the position they have reached when the lever is in the middle or slow-speed notch of the arc-bar 59^b, and the clutch members not yet having been thrown into engagement by the movement of the rod 101, and the drum 22 being locked against rotation, the gear 26 will be run at the slow-speed, driving the press through the medium of the interposed gearing at its slow speed. The lug 69 is so placed on the collar 68 with relation to the shaft 55 and the cam 72 so shaped and positioned on the lever 59 that when the parts are in the slow-speed position, the lug 69 has been lifted to such a position that the latch 71 on the arm 70 has dropped below the lug 69, preventing the shaft 55 from being rotated backward into normal position by the action of the spring 66.

It being desired to cause the driving mechanism to run at full speed, the latch 59^a is disengaged and the lever moved farther to the left. The pin 62 engaging the free end of the pawl 60, as the lever is moved over, lifts the pawl 60 from the ratchet teeth 67, leaving the disk 56 and consequently the shaft 55 free to be moved to its normal position by the spring 66 as soon as the lug 69 is disengaged from the latch 71 on the lever 70 by the moving of the lever 70 out of place by the cam 72. As this, however, would operate to release the brake 51 from the drum 22, and at once throw the slow speed mechanism out of gear, this does not happen at once upon moving the lever. As the lever moves to the left, the clutch members are thrown into engagement by the longitudinal movement of the rod 101, which, moved into engagement gradually by means of their beveled surfaces as above described, permit sufficient slippage of the clutch members to prevent the mechanism being instantly raised from the low to the high speed, and allowing the speed to gradually increase. The driving mechanism will therefore be approaching its full speed before the brake 51 is disengaged from the drum. The gear 26 being thrown into the higher speed by this engagement of the clutch members, will cause the gears 29—30 to revolve around with it. This speed of revolution of the gears about the shaft 16 will of course, as said above, cause the disk 19 to be rotated at a still higher speed, which is permitted by the pawls 44 slipping over the ratchet wheel 18 and being thrown out by centrifugal force. The slow-speed operating mechanism is therefore not disengaged until after the higher speed is reached, preventing as has been said above, the momentary slowing down of the press through its running only by its own momentum. As the lever 59 is moved still farther to the left, the cam 72 engages the lower end of the arm 70, and, forcing it to one side, frees the lug 69 from the latch 71, permitting the spring 66 to instantly operate the rod 64 to rock the shaft 55 backward into its normal position, which, as above described, rocks the rock-shaft 45 clock-wise and frees the brake 51 from the drum 22, which, being mounted loosely with respect to the main driving shaft 16, is then free to slow down to the speed of the said shaft. At the same time the clutch members are thrown firmly into engagement, and the lever being locked by the latch 59^a on the arc-bar 59^b the mechanism is driven at full speed, driving the press at full speed.

What I claim as my invention and desire to secure by Letters Patent is:—

1. A variable speed device, comprising a driving-shaft, a main drive wheel having a clutch member, a coacting clutch member driven by said driving-shaft, speed-reducing gearing connected with said main drive wheel for driving the same from said driving-shaft at a slower speed, and means for connecting said speed-reducing mechanism with said driving-shaft and arranged to be automatically disconnected from the driving-shaft when said clutch members coöperate to increase the speed of said main drive wheel.

2. A variable speed device, comprising a driving-shaft, a main drive wheel having a clutch member, a coacting clutch member driven by said driving-shaft, speed-reducing gearing connected with said main drive wheel for driving the same from said driving-shaft at a slower speed, and ratchet mechanism for connecting said speed-reducing mechanism with said driving-shaft and arranged to be automatically disconnected from the driving-shaft when said clutch members coöperate to increase the speed of said main drive wheel.

3. A variable speed device, comprising a driving-shaft, a main drive wheel having a clutch member, a coacting clutch member

driven by said driving-shaft, speed-reducing gearing connected with said main drive wheel for driving the same from said driving-shaft at a slower speed, and means for connecting said speed-reducing mechanism with said driving-shaft and arranged to be automatically disconnected from the driving-shaft when said clutch members coöperate to increase the speed of said main drive wheel, said connecting means including a single lever for controlling the various speeds of said main drive wheel and also including operative connections between said lever and said clutch members.

4. A variable speed device, comprising a driving-shaft, a main drive wheel having a clutch member, a coacting clutch member driven by said driving-shaft, speed-reducing gearing connected with said main drive wheel for driving the same from said driving-shaft at a slower speed, ratchet mechanism for connecting said speed-reducing mechanism with said driving-shaft and arranged to be automatically disconnected from the driving-shaft when said clutch members coöperate to increase the speed of said main drive wheel, said connecting means including a single lever for controlling the various speeds of said main drive wheel and operative connections between said lever and said clutch members.

5. A variable speed device, comprising a main drive shaft, a main drive wheel loosely mounted on said shaft and having a clutch member, a coacting clutch member mounted on said drive shaft and rotating therewith, speed-reducing gearing connected with said main drive wheel for driving the same from said main drive shaft at a slower speed, and means for connecting said speed-reducing mechanism with said main drive-shaft and arranged to be automatically disconnected with said main drive-shaft when said clutch members coöperate to drive said main drive wheel substantially at full speed.

6. A variable speed device, comprising a main drive shaft, a main drive wheel loosely mounted on said shaft and having a clutch member, a coacting clutch member mounted on said drive shaft and rotating therewith, speed-reducing gearing connected with said main drive shaft at a slower speed, and ratchet mechanism for connecting said speed-reducing mechanism with said main drive shaft and arranged to be automatically disconnected with said main drive shaft when said clutch members coöperate to drive said main drive wheel substantially at full speed.

7. A variable speed device, comprising a main drive shaft, a main drive wheel loosely mounted on said shaft and having a clutch member, a coacting clutch member mounted on said drive shaft and rotating therewith, speed-reducing gearing connected with said main drive wheel for driving the same from said main drive shaft at a slower speed, and means for connecting said speed-reducing mechanism with said main drive shaft and arranged to be automatically disconnected with said main drive shaft when said clutch members coöperate to drive said main drive wheel substantially at full speed, said connecting means including a single lever for controlling the various speeds of said main drive wheel and also including operative connections between said lever and said clutch members.

8. A variable speed device, comprising a main drive shaft, a main drive wheel loosely mounted on said shaft and having a clutch member, a coacting clutch member mounted on said drive shaft and rotating therewith, speed-reducing gearing connected with said main drive wheel for driving the same from said main drive-shaft at a slower speed, ratchet mechanism for connecting said speed-reducing mechanism with said main drive shaft and arranged to be automatically disconnected with said main drive-shaft when said clutch members coöperate to drive said main drive wheel substantially at full speed, a single lever for controlling the various speeds of said main drive wheel and operative connections between said lever and said clutch members.

9. In combination, a main driving shaft, slow speed mechanism adapted to be driven by said driving shaft, high speed mechanism adapted to be driven by said driving shaft, gearing on said driving shaft adapted to be thrown into operative relation with either said slow speed mechanism or said high speed mechanism, means for moving said slow speed mechanism into operative relation with said gearing, then moving said high speed mechanism into operative relation with said gearing while said slow speed mechanism is still in operative relation therewith and then releasing said slow-speed mechanism from engagement with said gearing before said high-speed mechanism is released.

10. The combination with the driving train of a printing press, of a main driving shaft, slow speed mechanism adapted to be driven by said driving shaft, high speed mechanism adapted to be driven by said driving shaft, gearing on said driving shaft adapted to be thrown into operative relation with either said slow speed mechanism or said high speed mechanism and means for releasing said slow speed mechanism from engagement with said gearing before said high speed mechanism is released.

11. The combination with the driving train of a printing press, of a main driving shaft adapted to be driven at a constant speed, slow speed mechanism adapted to be driven by said driving shaft, high speed mechanism adapted to be driven by said

driving shaft, gearing on said driving shaft adapted to be thrown into operative relation with either said slow speed mechanism or said high speed mechanism, means for moving said slow speed mechanism into operative relation with said gearing, then moving said high speed mechanism into operative relation with said gearing while said slow speed mechanism is still in operative relation therewith and then releasing said slow-speed mechanism from engagement with said gearing before said high-speed mechanism is released.

12. In combination, a main driving shaft adapted to be driven at a constant speed, slow speed mechanism mounted on said driving shaft and adapted to be driven thereby, high speed mechanism mounted on said driving shaft and adapted to be operated thereby, means for throwing said slow speed mechanism into operative relation with said driving shaft, then throwing said high speed mechanism into operative relation with said driving shaft while said slow speed mechanism is still in operative relation therewith and then disconnecting said slow-speed mechanism before said high-speed mechanism is disconnected.

13. The combination with driven gearing, of a main drive shaft, slow speed mechanism mounted on said drive shaft and adapted to be operated thereby, high speed mechanism mounted on said drive shaft and adapted to be operated thereby, means for throwing said slow speed mechanism into operative relation with said driven gearing, then throwing said high speed mechanism into operative relation with said driven gearing while said slow speed mechanism is still in operative relation therewith and then releasing said slow-speed mechanism from engagement with said gearing before said high-speed mechanism is released.

14. The combination with driven gearing, of a main driving shaft adapted to be driven at a constant speed, slow speed mechanism mounted on said driving shaft, pawl and ratchet mechanism adapted to drive said slow speed mechanism from said driving shaft, high speed mechanism mounted on said driving shaft and adapted to be driven thereby, means for throwing said slow speed mechanism into operative relation with said driven gearing, then throwing said high speed mechanism into operative relation with said driven gearing while said slow speed mechanism is still in operative relation therewith and then releasing said slow-speed mechanism from engagement with said gearing before said high-speed mechanism is released.

15. The combination with the driving train of a printing press, of a main drive shaft, slow speed mechanism mounted on said drive shaft and adapted to be operated thereby, high speed mechanism mounted on said drive shaft and adapted to be operated thereby, means for throwing said slow speed mechanism into operative relation with said driving shaft, then throwing said high high speed mechanism into operative relation with said driving shaft while said slow speed mechanism is still in operative relation therewith and then disconnecting said slow-speed mechanism before said high-speed mechanism is disconnected.

16. In combination, a main driving shaft, slow speed mechanism adapted to be driven by said driving shaft, high speed mechanism adapted to be driven by said driving shaft, gearing on said driving shaft adapted to be thrown into operative relation with either said slow speed mechanism or said high speed mechanism, means for moving said slow speed mechanism into operative relation with said gearing, then moving said high speed mechanism into operative relation with said gearing while said slow speed mechanism is still in operative relation therewith, and then releasing said slow speed mechanism from engagement with said gearing before said high speed mechanism is released, said means including a lever and connections actuated by said lever for controlling the operation of said mechanisms.

17. The combination with the driving train of a printing press, of a main driving shaft, slow speed mechanism adapted to be driven by said driving shaft, high speed mechanism adapted to be driven by said driving shaft, gearing on said driving shaft adapted to be thrown into operative relation with either said slow speed mechanism or said high speed mechanism, means for moving said slow-speed mechanism into operative relation with said gearing, then moving said high-speed mechanism into operative relation with said gearing while said slow-speed mechanism is still in operative relation therewith and then releasing said slow speed mechanism from engagement with said gearing before said high speed mechanism is released, said means including a lever and means actuated by said lever for controlling the operation of said mechanisms.

18. The combination with the driving train of a printing press, of a main driving shaft adapted to be driven at a constant speed, slow speed mechanism adapted to be driven by said driving shaft, high speed mechanism adapted to be driven by said driving shaft, gearing on said driving shaft adapted to be thrown into operative relation with either said slow speed mechanism or said high speed mechanism, means for moving said slow speed mechanism into operative relation with said gearing, then mov-

ing said high speed mechanism into operative relation with said gearing while said slow speed mechanism is still in operative relation therewith, and then releasing said slow speed mechanism from engagement with said gearing before said high speed mechanism is released, said means including a lever and means actuated by said lever for controlling the operation of said mechanisms.

19. In combination, a main driving shaft adapted to be driven at a constant speed, slow speed mechanism mounted on said driving shaft and adapted to be driven thereby, high speed mechanism mounted on said driving shaft and adapted to be operated thereby, means for throwing said slow speed mechanism into operative relation with said driving shaft, then throwing said high speed mechanism into operative relation with said driving shaft while said slow speed mechanism is still in operative relation therewith, and then disconnecting said slow speed mechanism before said high speed mechanism is disconnected, said means including a lever and means actuated by said lever for controlling the operation of said mechanism.

20. The combination with driven gearing, of a main drive shaft, slow speed mechanism mounted on said drive shaft and adapted to be operated thereby, high speed mechanism mounted on said drive shaft and adapted to be operated thereby, means for throwing said slow speed mechanism into operative relation with said driven gearing, then throwing said high speed mechanism into operative relation with said driven gearing while said slow speed mechanism is still in operative relation therewith, and then releasing said slow speed mechanism from engagement with said gearing before said high speed mechanism is released, said means including a lever and means actuated by said lever for controlling the operation of said mechanisms.

21. The combination with driven gearing, of a main driving shaft adapted to be driven at a constant speed, slow speed mechanism mounted on said driving shaft, pawl and ratchet mechanism adapted to drive said slow speed mechanism from said driving shaft, high speed mechanism mounted on said driving shaft and adapted to be driven thereby, means for throwing said slow speed mechanism into operative relation with said driven gearing, then throwing said high speed mechanism into operative relation with said driven gearing while said slow speed mechanism is still in operative relation therewith, and then releasing said slow speed mechanism from engagement with said gearing before said high speed mechanism is released, said means including a lever and means actuated by said lever for controlling the operation of said mechanisms.

22. The combination with the driving train of a printing press, of a main drive shaft, slow speed mechanism mounted on said drive shaft and adapted to be operated thereby, high speed mechanism mounted on said drive shaft and adapted to be operated thereby, means for throwing said slow speed mechanism into operative relation with said driving shaft, then throwing said high speed mechanism into operative relation with said driving shaft while said slow speed mechanism is still in operative relation therewith, and then disconnecting said slow speed mechanism before said high speed mechanism is disconnected, said means including a lever and means actuated by said lever for controlling the operation of said mechanisms.

23. In combination, a driving shaft, a driving gear rotatably mounted on said shaft, a clutch member carried by said driving gear, a second clutch member carried by said shaft, slow speed gearing adapted to be operated by said shaft but to travel independently thereof, means for throwing said slow speed gearing into operative relation with said driving gear, then moving said clutch members into engagement, and then throwing said slow speed gearing out of operative relation with said driving gear after said clutch members are engaged.

24. The combination with a driving shaft, a driving gear rotatably mounted on said shaft, a clutch member carried by said driving gear, a second clutch member carried by said shaft, planetary gearing connected with said driving gear and adapted to be operated by said shaft and to travel independently thereof, and, when operatively connected with said driving gear, to move the same at a slow speed, means for moving said planetary gearing into operative relation with said driving gear, then moving said clutch members into engagement, and then throwing said planetary gearing out of operative relation with said driving gear after said clutch members are engaged.

25. In combination, a driving shaft, a driving gear rotatably mounted on said shaft, a clutch member carried by said driving gear, a second clutch member carried by said driving shaft, slow speed gearing carried by said driving shaft and adapted to be operated thereby but to travel forward independently thereof, a lever, and mechanism operated by a movement of the lever in one direction to successively throw said slow speed gearing into operative relation with said driving gearing, to move said clutch members into engagement, and then to throw said slow speed gearing out of operative relation with said driving gear.

26. In combination, a driving shaft, a driving gear rotatably mounted on said

driving shaft, a clutch member carried by said driving gear, a second clutch member carried by said driving shaft, slow speed gearing carried by said driving shaft and adapted to be thrown into operative engagement with said driving gear, pawl and ratchet mechanism adapted to drive said slow speed gearing by said driving shaft, a lever, and mechanism operated by said lever to successively as said lever is moved throw said slow speed gearing into operative relation with said driving gear, then move said clutch members into engagement, and then throw said slow speed gearing out of operative relation with said driving gear.

27. In combination, a driving shaft, a driving gear rotatably mounted on said driving shaft, a clutch member carried by said driving gear, a second clutch member carried by said driving shaft, slow speed gearing carried by said driving shaft and adapted to be thrown into operative engagement with said driving gear, pawl and ratchet mechanism adapted to drive said slow speed gearing by said driving shaft, a lever, mechanism operated by said lever to successively as said lever is moved throw said slow speed gearing into operative relation with said driving gear, then move said clutch members into engagement, and then throw said slow speed gearing out of operative relation with said driving gear, and brake mechanism adapted to be operated by said lever to brake said driving gear and stop the same.

28. In combination, a main driving shaft, a gear rotatably mounted on said driving shaft, means for driving said gear from said shaft adapted to permit said gear to travel independently of said shaft, a drum rotatably mounted on said shaft and having an internal gear, a brake for said drum, a driving gear rotatably mounted on said shaft, intermediate gears carried by said driving gear and adapted to mesh with said first gear and with said internal gear, a clutch member on said driving gear, a second clutch member carried by said shaft, means for applying said brake to said drum, for releasing the same, and for throwing said clutch members into engagement before said brake is released from said drum.

29. In combination, a main driving shaft, a gear rotatably mounted on said driving shaft, means for driving said gear from said shaft adapted to permit said gear to travel faster than said shaft, a drum rotatably mounted on said shaft and having an internal gear, a brake for said drum, a driving gear rotatably mounted on said shaft, intermediate gears carried by said driving gear and adapted to mesh with said first gear and with said internal gear, a clutch member on said driving gear, a second clutch member carried by said shaft, means for applying said brake to said drum, for releasing the same, for throwing said clutch members into engagement before said brake is released from said drum, said means including a lever adapted to control said braking and clutch shifting means.

30. In combination, a main driving shaft, a gear rotatably mounted on said driving shaft, means for driving said gear from said shaft adapted to permit said gear to travel faster than said shaft, a drum rotatably mounted on said shaft and having an internal gear, a brake for said drum, a driving gear rotatably mounted on said shaft, intermediate gears carried by said driving gear and adapted to mesh with said first gear and with said internal gear, a clutch member on said driving gear, a second clutch member carried by said shaft, means for applying said brake to said drum, for releasing the same, and for throwing said clutch members into engagement before said brake is released from said drum, said means including a hand-lever, and mechanism connected with said hand-lever and adapted when said hand-lever is moved in one direction to successively apply the brake to said drum, then move said clutch members into engagement, and then release the brake from said drum.

31. In combination, a main driving shaft, a gear loosely mounted on said shaft, pawl and ratchet mechanism adapted to drive said gear with said shaft but to permit the rotation of the same on said shaft in the same direction therewith and independently thereof, a drum, an internal gear on said drum, a driving gear, internal gears carried by said driving gear and adapted to mesh with said first gear and said internal gear, a brake for said drum, a clutch member carried by said drum, a second clutch member carried by said shaft, a rock-shaft, an operating lever, pawl and ratchet connections between said lever and said rock-shaft, a spring adapted to yieldingly hold said rock-shaft in normal position, connections between said rock-shaft and said brake adapted to automatically release the same when said rock-shaft is in normal position and to operate said brake to hold said drum against rotation when said lever is moved through a part of its movement, a latch adapted when said brake is applied to engage said rock-shaft and prevent the return thereof to normal position, mechanism operated by said lever by its further movement to throw said clutch members into engagement, and means operated by said lever to release said latch when said clutch members are engaged and permit said spring to return said latch to normal position.

JOSEPH J. WALSER.

Witnesses:
CHARLES E. PICKARD,
WILL H. DEBUSK.