H. C. SCHROEDER.

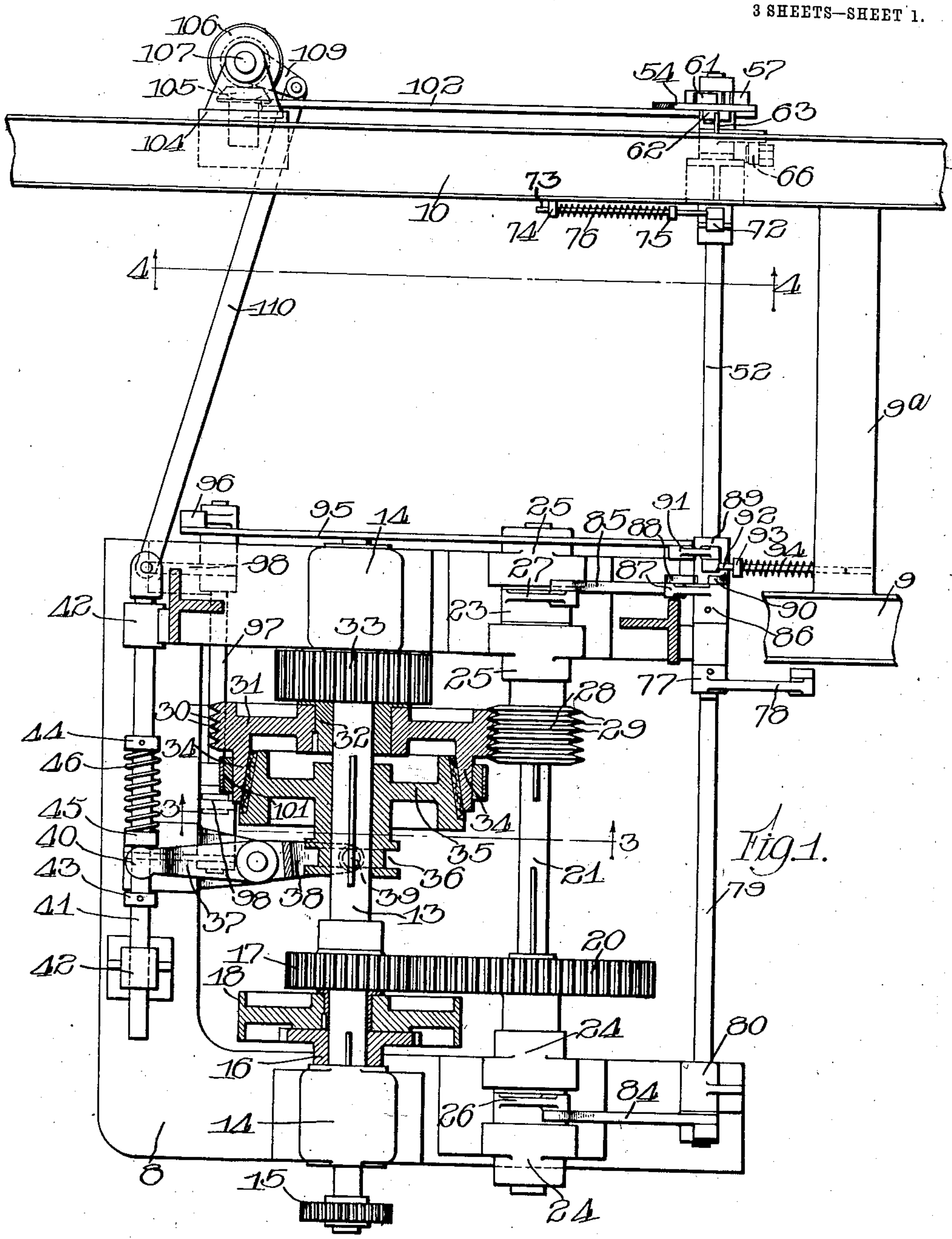
VARIABLE SPEED DRIVING MECHANISM.

APPLICATION FILED JAN. 14, 1909.

940,201.

Patented Nov. 16, 1909.

3 SHEETS—SHEET 1.



Witnesses:
[signature]
[signature]

Inventor:
Hans C. Schroeder.
By Bond, Adams, Pickard & Jackson
his Attorneys.

H. C. SCHROEDER.

VARIABLE SPEED DRIVING MECHANISM.

APPLICATION FILED JAN. 14, 1909.

940,201. Patented Nov. 16, 1909.

3 SHEETS—SHEET 2.

Fig. 2.

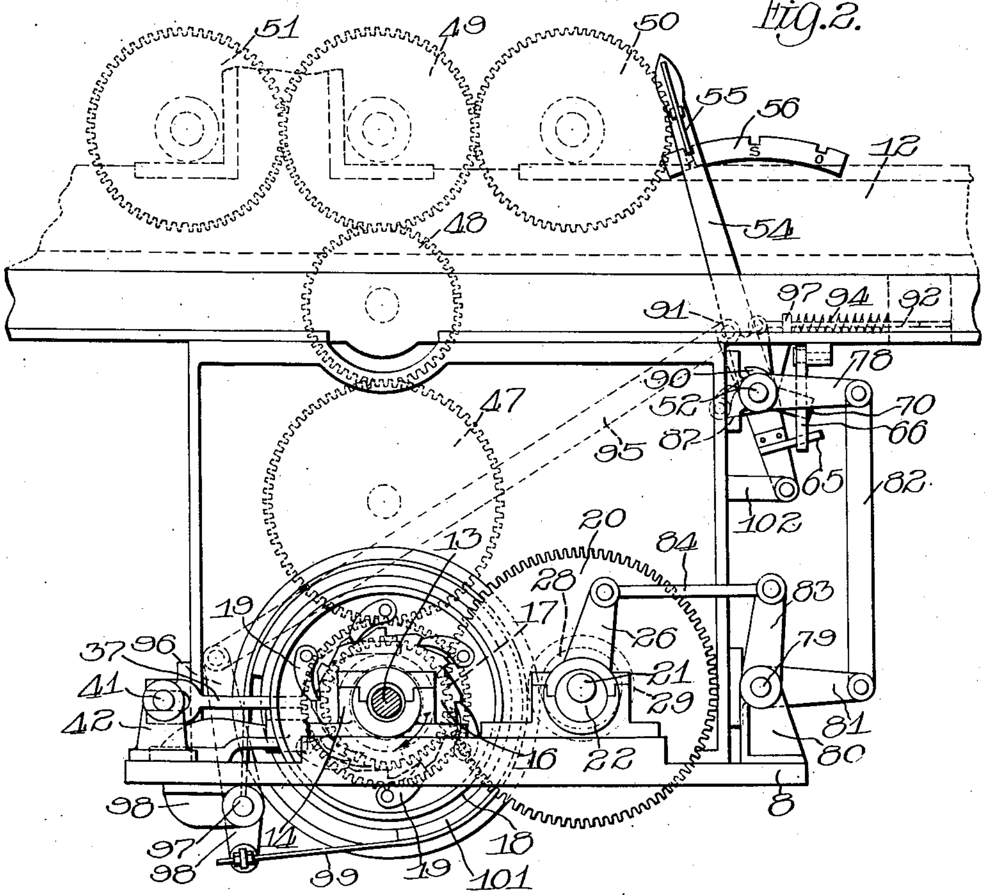
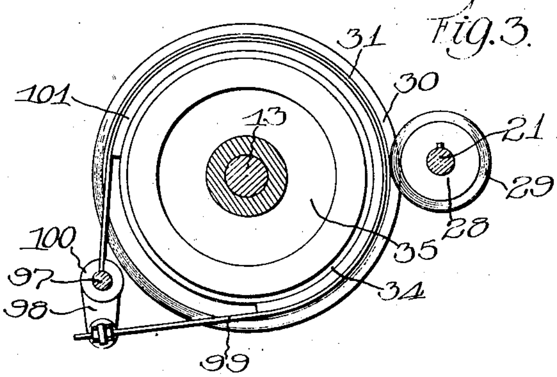


Fig. 3.



Witnesses:
Ira J. Perry
G. W. Demarus Jr.

Inventor:
Hans C. Schroeder.
By Bond, Adams, Pickard & Jackson
his Attorneys.

H. C. SCHROEDER.

VARIABLE SPEED DRIVING MECHANISM.

APPLICATION FILED JAN. 14, 1909.

940,201. Patented Nov. 16, 1909.

3 SHEETS—SHEET 3.

Fig. 4.

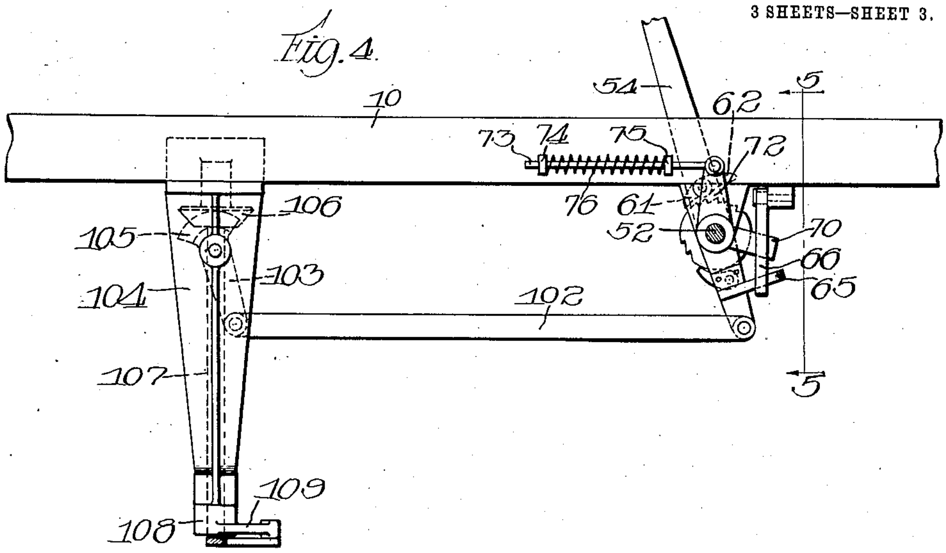


Fig. 6.

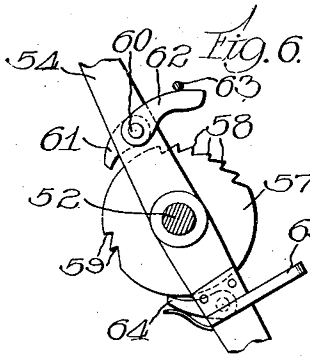


Fig. 5.

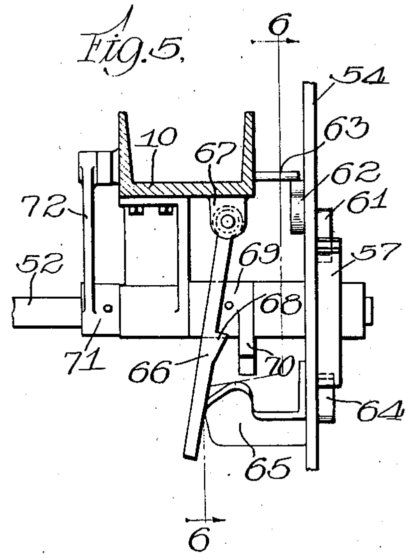
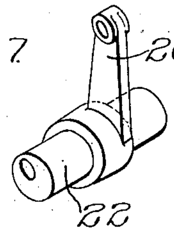


Fig. 7.



Witnesses:
Ira P. Perry
F. W. Donarus Jr.

Inventor:
Hans C. Schroeder
By Bond, Adams, Pickard & Jackson
his Attorneys.

UNITED STATES PATENT OFFICE.

HANS C. SCHROEDER, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE GOSS PRINTING PRESS COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

VARIABLE-SPEED DRIVING MECHANISM.

940,201. Specification of Letters Patent. Patented Nov. 16, 1909.

Application filed January 14, 1909. Serial No. 472,299.

To all whom it may concern:

Be it known that I, HANS C. SCHROEDER, a subject of the German Emperor, 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 variable speed driving mechanism particularly adapted for the driving of printing presses, and its object is to produce a new and improved driving mechanism which, driven by a suitable source of power—preferably a high speed motor operating at a constant speed—may be readily and easily shifted so as to drive the press at a slow speed or high speed rate, and particularly to produce such a driving mechanism as will permit the high speed to be thrown in before the slow speed is thrown off so that there may not lapse an interval during the passing from one to the other during which the press, running only upon its momentum, would be likely to slow down, causing a sudden jerk upon the throwing in of the positive drive and causing the breakage of webs.

In the drawings,—Figure 1 is a top or plan view; Fig. 2 is an end view, showing a portion of the side frame of a press and several of the driving gears in dotted lines; Fig. 3 is a detail, being a section on line 3—3 of Fig. 1, showing a side elevation of one of the clutch members, the friction drive therefor and the brake; Fig. 4 is an enlarged detail, being a section on line 4—4 of Fig. 1; Fig. 5 is an enlarged detail, being a section on line 5—5 of Fig. 4; Fig. 6 is an enlarged detail, being a section on line 6—6 of Fig. 5; and Fig. 7 is a detail, showing one of the eccentrics for shifting the movable shaft.

Referring to the drawings,—8 indicates a bed-plate, and 9—10 indicate portions of the side frame upon which the base of the side frame 12 (seen in dotted lines in Fig. 2) of the press is mounted, and which serve to support some of the parts hereinafter described.

13 indicates a driving shaft, which is journaled in suitable bearings, as 14, on the bed-plate 8, and is driven by a driving pinion 15 secured to the outer end of the driving shaft 13 and driven from any suitable source of power, as from a high-speed motor.

16 indicates a ratchet-wheel, which is keyed, or otherwise secured, to the shaft 13.

17 indicates a pinion, which is loosely mounted on the shaft 13.

18 indicates a drum, which is secured in any suitable manner to the hub of the pinion 17 so as to rotate therewith.

19 indicates pawls, which are carried on the outer surface of the drum 18 and are adapted to be engaged by the teeth of the ratchet-wheel 16 when it rotates in the direction indicated by an arrow in Fig. 3.

20 indicates a gear, which is keyed, or otherwise secured, to a shaft 21 and adapted to mesh with and be engaged by the pinion 17. The shaft 21 is journaled in eccentrics 22—23, which are journaled in suitable bearings 24—25 on the bed-plate 8. The eccentrics 22—23 are provided, respectively, with arms 26—27, preferably integral therewith, and so placed upon the eccentrics 22—23 that when the shaft 21 is in position the arms come respectively between the bearings 24 and bearings 25. It will be obvious that when the arms 26—27 are rocked in the manner hereinafter described the eccentrics 22—23 will be rotated and the shaft 21 thereby will be moved slightly toward and away from the shaft 13.

28 indicates a friction pulley, which is keyed, or otherwise secured, to the shaft 21 and is preferably provided with a number of circumferential ridges 29 which engage circumferential ridges 30 on a clutch-drum 31 which is keyed, or otherwise rigidly mounted, upon the hub 32 of a driving pinion 33,—the hub 32 being loosely mounted on the shaft 13. The clutch-drum 31 is provided with a clutch-flange 34 whose inner surface is beveled to form one clutch member.

35 indicates a clutch-member, which is feathered upon the shaft 13 and has its outer periphery beveled to conform to the bevel upon the interior of the clutch-flange 34 so that when the two clutch-members are forced together they may engage one another tightly. The hub of the clutch-member 35 is provided with a circumferential groove 36.

37 indicates a shifting lever, which is

pivotally mounted on the framework, and one end of which is provided with a fork 38 which embraces the hub of the clutch-member 35 and is provided with rollers 39 which engage the peripheral groove 36. The other end of the shifting lever is provided with a fork 40 which straddles a shifting-bar 41 slidingly mounted in suitable supports, as 42, on the base of the machine.

43—44 indicate collars, which are pinned, or otherwise adjustably secured, upon the shaft 41 a suitable distance apart.

45 indicates a collar, which is loosely mounted on the shifting-bar 41 between the collars 43—44.

46 indicates a spiral spring, which is interposed between the fixed collar 44 and the movable collar 45, and which when the parts are in the position shown in Fig. 1 bears upon the forked end 40 of the shifting lever 27.

It will be obvious that by the shifting of the rod 41 in the manner hereinafter described, the shifting lever 37 may be moved so as to slide the clutch-member 35 on the shaft 13 and move it into or out of engagement with the clutch-drum 31. If the clutch members 35 and 31 are not in engagement with each other and the shaft 21 is shifted so as to bring the friction pulley into tight engagement with the clutch-drum 31, shaft 13 on being rotated in the direction shown by arrows in Fig. 2 will carry around with it the ratchet 16 whose ratchet teeth engaging the pawls 19 will drive the drum 18, driving the pinion 17, the larger gear 20 and the shaft 21. The forced frictional engagement between the friction pulley 28 on the shaft 21 and the clutch-drum 31 will cause the clutch-drum 31 to rotate carrying with it the driving pinion 33 at a speed much slower than the speed of the shaft 13, which relative amount of speed will be determined by the difference between the pinion 17 and the gear 20 and the difference in diameters between the friction pulley 28 and the clutch drum 31. The driving pinion 33 being thus driven, the motion is communicated to the press by means of gearing 47—48—49—50—51, shown in dotted lines on Fig. 2, in which 47—48 represent intermediate gears and 49—50—51 sundry of the gears of the press. On the other hand, if the shaft 21 is moved outward from the shaft 13 by the rocking of the arm 26 above described so as to move it slightly but sufficiently to free the friction pulley 28 and clutch-drum 31 from frictional engagement with each other, and if the clutch-member 35 is slid into engagement with the clutch-flange 34, the shaft 13, driving the clutch-member 35, will drive the clutch-member 31 and consequently the pinion 33 at the same speed as the shaft 13 and in the same direction driving the press at high speed. The shifting of the parts is accomplished by the mechanism hereinafter described, a greater part of which, however, forms no part by itself of my present invention.

52 indicates a rock-shaft, which is journaled in suitable bearings in the frame bars 9—10.

54 indicates a lever, which is loosely mounted on the rock-shaft 52 near its outer end and is provided at its upper end with the usual latch 55 which engages a suitable number of notches in a rack-bar 56. As shown, these notches are three in number, a notch for high speed and marked H, a notch for slow speed marked S and a notch at which the drive is thrown out and the brake thrown on marked O.

57 indicates a disk, which is keyed, or otherwise secured, upon the outer end of the shaft 52 which is outside of and adjacent to the surface of the lever 54. This disk 57 is provided with two sets of ratchet-teeth 58 and 59 upon opposite portions of its periphery.

60 indicates a rock pin, which is journaled in the lever 54 and carries upon one side of the lever a dog 61 which is adapted to engage with the ratchet-teeth 58 and upon the other side of the lever an arm 62 projecting outward from the rock-shaft in a direction opposite to that of the dog 61.

63 indicates a pin mounted in the frame-bar 10, which is adapted as the lever is rocked into fast position to engage the arm 62 and lift the dog 61 out of the ratchet-teeth 58, as best shown in Fig. 6.

64 indicates a pawl, which is mounted upon the lower arm of the lever 54 below the disk 57 and is adapted to engage the ratchet-teeth 59, as hereinafter described.

65 indicates a cam, which is secured upon the lower arm of the lever 54 and which is adapted as the upper part of the lever swings to the left to engage and swing out from its normally vertical position a swinging arm 66 which is pivotally connected at its upper end with and depends downward from suitable lugs 67 secured to the under side of the side frame-bar 10. The arm 66 is provided with a latch 68.

69 indicates a collar, which is secured to the rock-shaft 52 and which carries a projecting arm 70 which, when the arm 70 is swung up by the rocking of the rock-shaft 52 into slow-speed position, as hereinafter described, is adapted to be engaged and to be held against backward rotation by the swinging under it of the latch 68 on the swinging arm 66 when the same freed from the cam 65 swings into normal vertical position.

71 indicates a collar, which is secured to the rock-shaft 52 and is provided with an upward-projecting arm 72.

73 indicates a rod, which is pivotally connected at one end to the upper end of the

arm 72 and near its outer end passes through a suitable lug 74 secured to the side frame-bar 10 and suitably perforated to permit the sliding of the rod 73 longitudinally of itself therein.

75 indicates a collar, which is fixed upon the rod 73.

76 indicates a spiral spring, which, bearing against the lug 74 and collar 75, tends to force the rod 73 to the right in Fig. 4 and to rock in a clockwise direction the collar 71 and therefore the rock-shaft 52 when allowed freedom of action, as hereinafter described.

77 indicates a collar, which is secured to the end of the rock-shaft 52 opposite the lever 54 and carries an arm 78 preferably integral therewith.

79 indicates a rock-shaft, which is journaled in suitable bearings, as 80, in the bed-plate 8, and is provided at one end below the collar 77 with an arm 81 suitably secured thereto.

82 indicates a link, which is pivotally connected at one end with the arm 78 on the collar 77 and at the other end to the end of the arm 81 on the rock-shaft 79 whereby, when the rock-shaft 52 is rocked in one direction or the other, the rock-shaft 79 will be correspondingly rocked.

83 indicates an arm, which is suitably secured to the other end of the rock-shaft 79 and is connected by a link 84 with the arm 26. Another arm on the rock-shaft 79 and at its other end, (like the arm 83, but not shown, it being behind the other parts on the drawings), is simply connected by a link 85 to the arm 27 on the collar 23.

It will be obvious from the above that when the rock-shaft 52 is rocked the rock-shaft 79 will be correspondingly rocked and rocking the arms 26 and 27 the eccentric collars 22 and 23, turning in their bearings, will move the shaft 21 toward and away from the shaft 13 a slight distance but sufficient to bring the friction pulley into tight frictional engagement with the clutch 31 or to move it out of such frictional engagement. This motion should not be sufficient to entirely free the gear 20 from the pinion 17, it being preferable that said gears should remain in engagement in order to facilitate ease and sureness of operation in the manner hereinafter described.

86 indicates a collar keyed, or otherwise secured, to the shaft 52 and provided with an arm 87 which carries a pawl 88.

89 indicates a collar, which is loosely mounted upon the rock-shaft 52 adjacent to the collar 86 and is provided upon its upper surface with a lug 90 adapted to be engaged by the pawl 88, so that when the rock-shaft 52 is rotated clockwise, as hereinafter described, the pawl 88 may at a suitable time engage the lug 90 and rock the collar 89 in the same direction. The collar 89 is provided also with an arm 91, preferably integral therewith.

92 indicates a rod, which is pivotally connected at one end with the arm 91 and at its other end slides in a suitable opening in a portion of the framework, as crossbar 9^a.

93 indicates a collar, which is secured to the rod 92, between which collar and a suitable portion of the framework, as the crossbar 9^a, is interposed a spiral spring 94 which tends to normally rock the collar 89 in a contra-clockwise direction and yieldingly maintain it in the position shown in the figures, especially Fig. 2.

95 indicates a link, which is pivotally connected at its upper end with the arm 91 and at its lower end with an arm 96 secured to one end of a rock-shaft 97 which is journaled in suitable bearings, as 98, below the bed-plate of the machine, which shaft, it will be readily understood, is through the medium of said link 95 rocked in one direction or the other with the rocking of the collar 89 on the shaft 52.

98 indicates an arm secured to and depending downward from the rock-shaft 97 opposite the flange 34 of the clutch-member 31.

99 indicates a flexible brake-band, one end of which is adjustably secured in the arm 98 and the other end is secured in the collar 100 on which the arm 98 is carried.

101 indicates a brake-member, which surrounds the outer periphery of the flange 34 on the clutch-member 31 and is tightened thereon by the brake-band 99 when operated by the arm 98, as hereinafter described.

102 indicates a link, one end of which is pivotally connected with the lower end of the lever arm 54 and the other end with the lower end of a swinging lever 103 which is journaled in suitable bearings in hangers 104 which are secured to and depend downward from the side frame-bar 10. The upper arm of the lever 103 carries a beveled rack-segment 105 which meshes with a beveled gear 106 secured near the upper end of a shaft 107 journaled in the hangers 104.

108 indicates a collar, which is secured to the lower end of the shaft 107 and carries an arm 109 preferably formed integral therewith.

110 indicates a link, one end of which is pivotally connected with the arm 109 and the other end with one end of the shift-bar 41. When the lever 54 is rocked, the beveled gear 106 will be rotated in one direction or the other and swinging the arm 107 will by means of the link 110 slide the shift-bar 41 longitudinally of itself in one direction or the other in its bearings.

The operation of the device is as follows: In the drawings the parts are shown in the high-speed position,—that is to say with the

friction pulley 28 out of tight engagement with the clutch-drum 31 and with the clutch members 31 and 35 in engagement, causing, as has been above described, the rotation of the drum 31 and pinion 33 at the same speed as the clutch member 35 and driving the press at high speed. The lever 54 is thereupon swung to the right to the off notch O. Through the medium of the link 102 this movement of the lever will rock the lever 103 and by the engagement of the beveled rack-segment 105 with the beveled gear 106 will rock the shaft 107, pull the link 110 in a direction toward the upper portion of the drawing in Fig. 1, pulling the shift-bar 41 in the same direction, and by the bringing of the collar 43 into contact with the end of the shifting lever 37 will slide the clutch-member 35 out of engagement with the clutch-member 31. As this movement to the right continues, the arm 62 on the rock-pin 60 is freed from engagement with the pin 63, allowing the dog 61 to drop upon the periphery of the disk 57, passing over the ratchet-teeth 58 as the movement of the lever continues. This same movement of the lever swings the cam 65 out of engagement with the swinging arm 66, allowing it to drop free from engagement with the cam but not falling under the arm 70 until that is lifted so as to permit its engagement, as hereinafter described. As the lever 54 nears the off notch O the pawl 64 engages one of the ratchet-teeth 59 and turning the wheel 57 rocks the shaft 52 in a clockwise direction. Just before the lever reaches the off notch the pawl 88 on the arm 87 on the collar 86—which collar is being rotated clockwise by the rocking of the shaft 52—engages the lug 90 on the collar 89 and rocks it clockwise against the action of the spring 94. This moving the arm 89 also in a clockwise direction moves the link 95 from left to right in Figs. 1 and 2 and rocking the shaft 97 tightens the flexible brake-band upon the brake and binds the same to the flange 34 of the clutch-drum 31, breaking the press and bringing it to a stop.

When it is desired to start the press, the hand-lever 54 is moved to the left. This causes the engagement of the dog 61 with one of the ratchet-teeth 58 on the disk 57, and rotating it contra-clockwise in the figures rocks the shaft 52 in the same direction. This rocking of the rock-shaft 52 through the arm 78 and link 82 rocks the rock-shaft 79 in a contra-clockwise direction. Through the medium of the links 84—85 the arm 83 and its corresponding arm (not shown) the eccentric collars 22 and 23 are rocked in the same direction in their bearings, and the shaft 21 is moved toward the shaft 13, bringing the friction pulley 28 into tight engagement with the clutch-drum 31 causing its rotation and the consequent rotation of the pinion 33 at slow speed, as above described. This same motion of the rock-shaft 52 has lifted the lug 70 on the collar 69, permitting the latch 68 on the swinging arm 66—which up to this point is free from the cam 65—to drop under the arm 70 and thus hold the rock-shaft, which has been rocked against the action of the spring 76, against return movement until free to move, as hereinafter described. The swinging of the lever 54 in this direction has also through the arm 103 and beveled rack-segment 105 rotated the gear 106, the shaft 107 and moved the shift-bar 41 until the collar 45 has been brought into contact with the end of the shifting-lever 37 ready to move the shifting-lever upon further movement of the lever 54 to bring the clutch-members into engagement. The lever 54 has not yet been brought into position to cause the pin 63 to engage the arm 62 and rock the dog 61 out of engagement with the ratchet-teeth 58. This same rocking of the shaft 52 has, of course, rocked the collar 86 in the same direction and freed the lug 90 on the collar 89 from the pawl 88. This leaves the spring 94 free to act, which thereupon immediately rocks the collar 89 contra-clockwise, releasing the brake from the clutch-member as soon as the movement of the lever in this direction has started. The lever therefore being in the slow-speed position, the brake is off, the clutch-members 31 and 35 not yet brought into engagement and the press is running at slow speed. It being desired to thereupon drive the press at high speed, the lever 54 is moved toward the high-speed position. The first movement of the lever in this direction shifts the shift-bar 41 so as to throw the shifting-lever 37 and bring the clutch members 31 and 35 into engagement with one another, which engagement, it will be obvious, will be gradual and not sudden on account of the beveled bearing surfaces above described,—a further yielding being permitted by a spring 46. This engagement of the clutch-members begins before the disengagement of the friction-pulley 28, and the clutch-drum 31 taking up the more rapid movement will, of course, cause a momentary highly accelerated speed of the shaft 21 and therefore, through the gears 20 and 17, cause a corresponding acceleration of the drum 18,—this movement, however, being permitted by the slipping of the pawls over the ratchet-wheel 16. It follows that the low-speed mechanism is not disengaged until after the high speed begins to engage and the press begins to run toward the higher speed, preventing as has been said above, the lapse of a moment of time during which the press would be running by its own momentum. As the higher speed begins to be taken up, the pin

63 engages the arm 62 and lifts the pawl 61 out of engagement with the teeth 58. At about the same time the cam 65 is brought into engagement with the swinging arm 66, swinging it to one side and freeing the latch 68, leaving the rock-shaft 52 free from engagement both of the pawl 61 with the disk 57 and of the latch 68 with the arm 70. The spring 76 thereupon left free to act immediately rocks the arm 72 and rocking the rock-shaft 52 clockwise brings the parts into the position shown in the several figures. This rocking of the rock-shaft by the spring 76 by the operation of the arm 78, link 82, and arms 81 rocks the rock-shaft 79, rocking, as has been above described but in the opposite direction, the eccentric collars 22 on the shaft 21 and moving the said shaft away from the shaft 13 sufficient to free the friction wheel 28 from frictional engagement with the clutch-member 31, allowing the parts which have been momentarily accelerated to slow down to normal speed. The further movement of the lever to the full-speed position forces the clutch-members 31 and 35 into tight contact with one another, giving to the clutch-drum 31 the full rotary speed of the shaft 13 and driving the press at full speed.

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

1. The combination with a driving-shaft, a clutch-member rotatably mounted on said driving-shaft, a driving-pinion connected 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 engagement, of a pinion rotatably mounted on said driving-shaft, means for rotating said pinion in one direction from said driving-shaft, a counter-shaft, a gear on said counter-shaft of larger size than said pinion and meshing therewith, a friction device on said counter-shaft adapted to frictionally engage the periphery of said first clutch-member, and means for shifting said counter-shaft toward and from said driving-shaft and causing frictional engagement between said counter-shaft and said first clutch-member.

2. The combination with a driving-shaft, a gear rotatably mounted on said driving-shaft, a clutch-member fixedly connected with said gear, and a second clutch-member slidingly mounted on said driving-shaft and adapted to be brought into engagement with said loose clutch-member and drive the same, of a pinion rotatably mounted on said driving-shaft, pawl and ratchet connections between said driving-shaft and said pinion, a counter-shaft adapted to be moved toward and away from said driving-shaft, a large gear on said counter-shaft meshing with said pinion, a friction member on said counter-shaft adapted when said counter-shaft is moved toward said driving-shaft to frictionally engage said loose clutch-member, means for moving said clutch-members into and out of engagement, and means for moving said counter-shaft toward and away from said driving-shaft.

3. The combination with a driving-shaft, a gear rotatably mounted on said driving-shaft, a clutch-member fixedly connected with said gear, and a second clutch-member slidingly mounted on said driving-shaft and adapted to be brought into engagement with said loose clutch-member and drive the same, of a pinion rotatably mounted on said driving shaft, pawl and ratchet connections between said driving-shaft and said pinion, a counter-shaft adapted to be moved toward and away from said driving-shaft, a large gear on said counter-shaft meshing with said pinion, a friction member on said counter-shaft adapted when said counter-shaft is moved toward said driving-shaft to frictionally engage said loose clutch-member, a clutch shifting device for moving said clutch-member into and out of engagement, a hand-lever, connections between said hand-lever and said clutch shifting device, means operated by said lever for shifting said counter-shaft toward and away from said driving-shaft, said lever and its connecting devices being adapted when said lever is moved in one direction to first move said counter-shaft toward said driving-shaft and bring said friction device into friction engagement with said loose clutch-member, then, as said lever is moved farther in the same direction, to operate said clutch-moving means to cause engagement of said clutch members and, as said clutch-members are brought into engagement to shift said counter-shaft away from said driving-shaft.

4. The combination with a driving-shaft, a gear rotatably mounted on said driving-shaft, a clutch-member fixedly connected with said gear, and a second clutch-member slidingly mounted on said driving-shaft and adapted to be brought into engagement with said loose clutch-member and drive the same, of a pinion rotatably mounted on said driving-shaft, pawl and ratchet connections between said driving-shaft and said pinion, a counter-shaft adapted to be moved toward and away from said driving-shaft, a large gear on said counter-shaft meshing with said pinion, a friction member on said counter-shaft adapted when said counter-shaft is moved toward said driving-shaft to frictionally engage said loose clutch-member, a clutch shifting device for moving said clutch members into and out of engagement, a brake, a hand-lever, connections between said hand-lever and said clutch-shifting device, means operated by said lever for shifting said counter-shaft toward and away from said driving-shaft, said lever and its connections be-

ing adapted when said lever is moved in one direction to first move said counter-shaft toward said driving-shaft and bring said friction device into frictional engagement with said loose clutch-member, then as said lever is moved farther in the same direction, to operate said clutch-moving means to throw said clutch members into engagement, and, as said clutch-members are brought into engagement, to shift said counter-shaft away from said driving-shaft, said connections being also adapted as said lever is swung in the opposite direction to move said clutch-members out of engagement.

5. The combination with a driving-snaft, a gear rotatably mounted on said driving-shaft, a clutch-member fixedly connected with said gear, and a second clutch-member slidingly mounted on said driving-shaft and adapted to be brought into engagement with said loose clutch-member and drive the same, of a pinion rotatably mounted on said driving shaft, pawl and ratchet connections between said driving-shaft and said pinion, a counter-shaft adapted to be moved toward and away from said driving-shaft, a large gear on said counter-shaft meshing with said pinion, a friction member on said counter-shaft adapted when said counter-shaft is moved toward said driving-shaft to frictionally engage said loose clutch-member, a clutch shifter for moving said clutch-members into and out of engagement, a brake adapted to be applied to said loose clutch-member, a hand-lever, connections between said hand-lever and said clutch-shifter, connections operated by said lever for shifting said counter-shaft toward and away from said driving-shaft, and connections between said lever and said counter-shaft and between said lever and said brake, said lever and its connections being adapted when said lever is moved in one direction to first move said counter-shaft toward said driving-shaft and bring said friction device into friction engagement with said loose clutch-member, then, as said lever is moved farther in the same direction, to operate said clutch-moving means to throw said clutch members into engagement, and, as said clutch-members are brought into engagement, to shift said counter-shaft away from said driving-shaft, said connections being also adapted, as said lever is swung in the opposite direction, to move said clutch-members out of engagement, and, as said lever is moved to the limit of its motion in the backward direction, to clamp said brake upon said loose clutch-member.

HANS C. SCHROEDER.

Witnesses:
ALBERT H. ADAMS,
W. H. DE BUSK.