W. EVENSEN.

VARIABLE SPEED DRIVING GEAR MECHANISM.

APPLICATION FILED JULY 1, 1910.

988,560.

Patented Apr. 4, 1911.

4 SHEETS—SHEET 1.

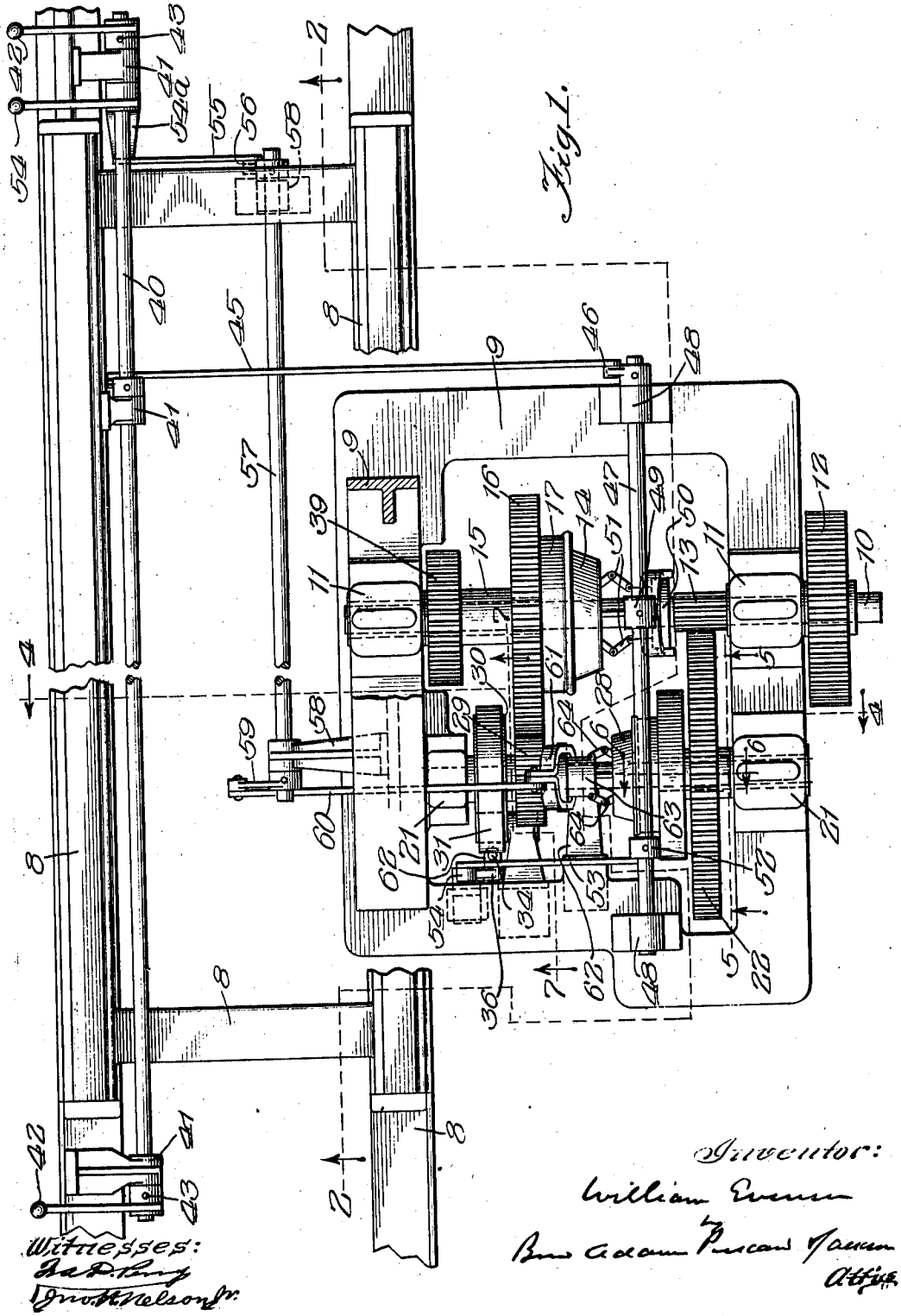

Fig. 1.

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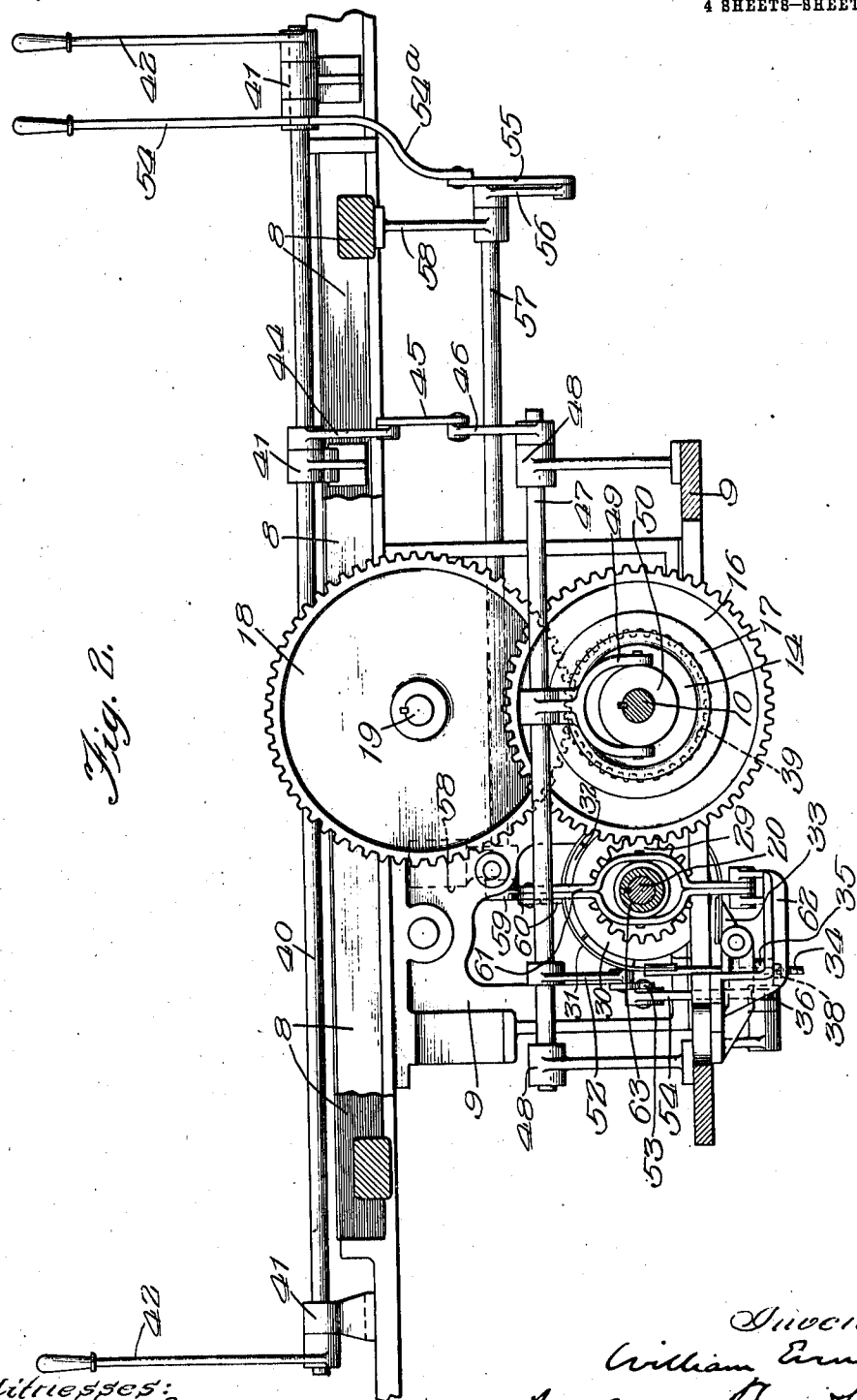

Fig. 2.

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4 SHEETS—SHEET 3.

Fig. 3.

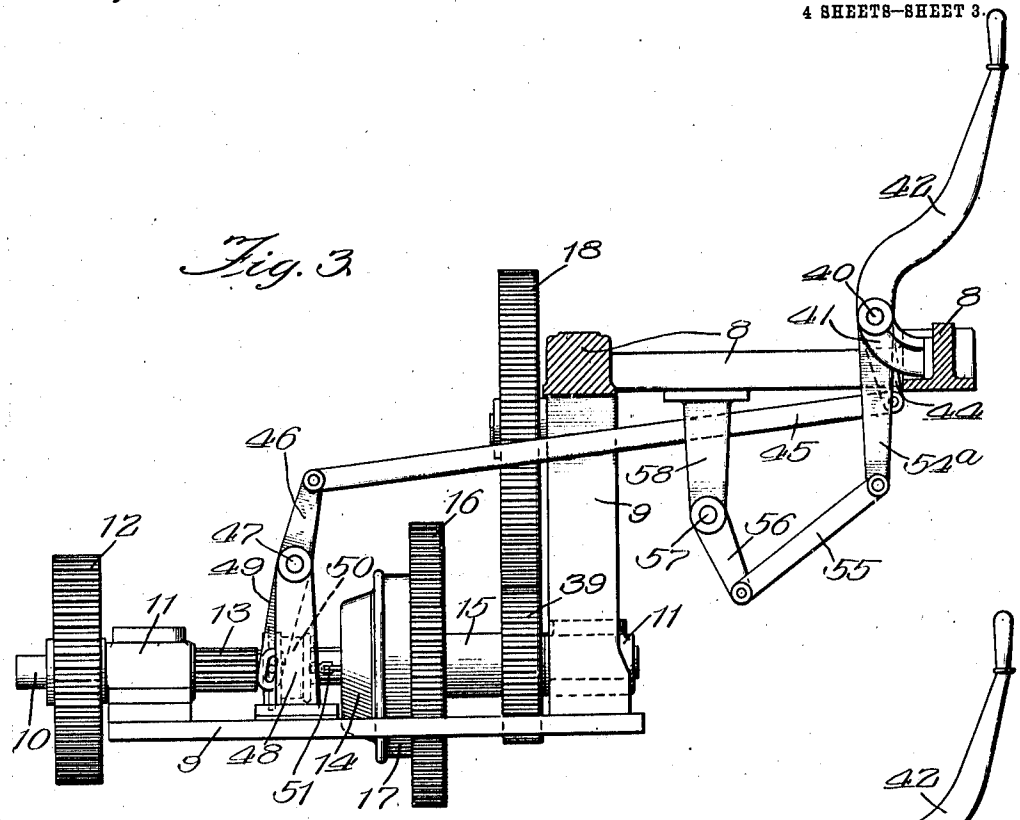

Fig. 4.

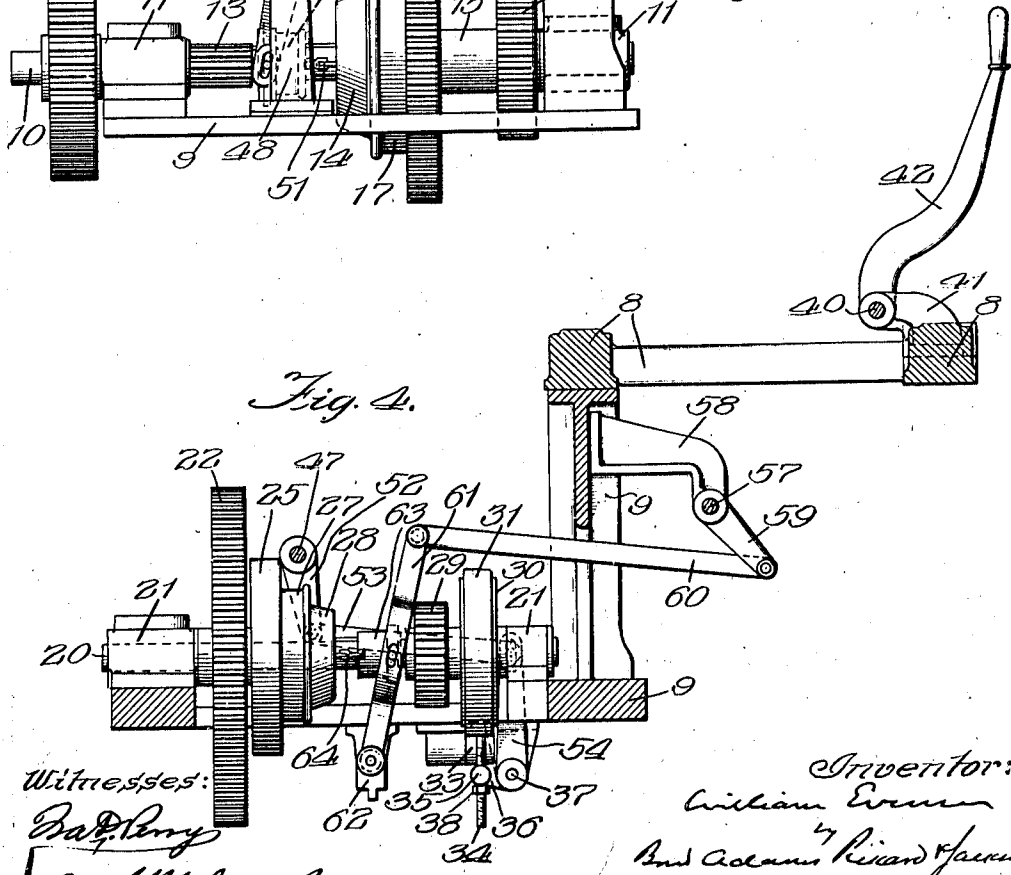

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Fig. 5.

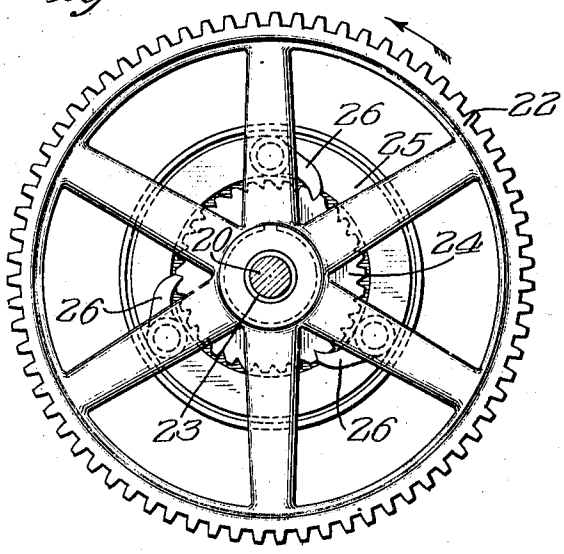


Fig. 6.

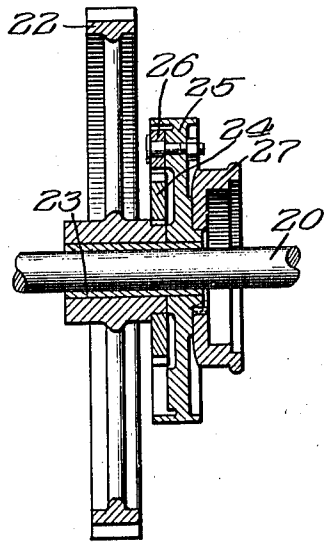
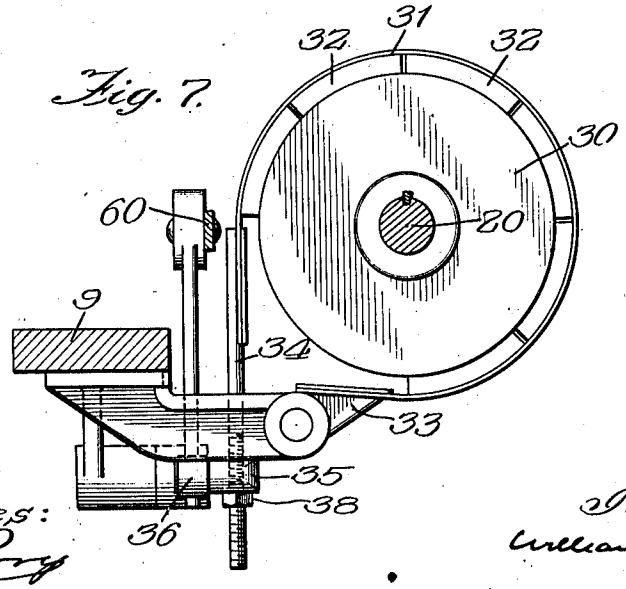


Fig. 7.



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UNITED STATES PATENT OFFICE.

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VARIABLE-SPEED DRIVING-GEAR MECHANISM.

988,560 Specification of Letters Patent. Patented Apr. 4, 1911.

Application filed July 1, 1910. Serial No. 569,929.

To all whom it may concern:

Be it known that I, WILLIAM EVENSEN, 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-Gear Mechanism for Printing-Presses, of which the following is a specification, reference being had to the accompanying drawings.

My invention relates to variable-speed driving mechanism for printing presses, and its object is to provide a new and improved driving mechanism for printing presses which may be driven by a high speed motor and which, with the motor running at continuous speed, may be shifted so that the press may be driven at slow speed or at high speed, and in which the shift from slow speed to high speed may be made without first disengaging the low speed, thus preventing the occurrence of an interval of time, during such shifting from slow to high speed, in which the press, not being positively driven, would slow down by its own momentum. I accomplish this object as illustrated in the drawings and as hereinafter described.

What I regard as new is set forth in the claims.

In the accompanying drawings,—Figure 1 is a top or plan view with part of the framework removed and cut away to expose the structure; Fig. 2 is a front elevation; Fig. 3 is a detail, being an end view of the driving mechanism seen from the right in Fig. 1; Fig. 4 is a detail, being a section on line 4—4 of Fig. 1; Fig. 5 is an enlarged detail, being a vertical cross-section on line 5—5 of Fig. 1; Fig. 6 is an enlarged detail, being a vertical section on line 6—6 of Fig. 1; and Fig. 7 is an enlarged detail, being a vertical section on line 7—7 of Fig. 1.

Referring to the drawings,—8 indicates a part of the framework of a printing press, the other parts of the press not being shown as they may be of any well-known type.

9 indicates the framework of the driving mechanism, which is mounted in a convenient position close to the framework of the printing press.

10 indicates a drive-shaft, which is journaled in suitable bearings, as 11, on the framework 9.

12 indicates a gear, which is secured near the outer end of the drive-shaft 10 and is adapted to be driven by any suitable high-speed motor (not shown).

13 indicates a pinion, which is keyed, or otherwise secured, upon the drive-shaft 10.

14 indicates a clutch-member, which is feathered on the drive-shaft 10 so as to move to and fro longitudinally thereon and is operated by mechanism hereinafter described.

15 indicates a hub, which is loosely mounted on the shaft 10.

16 indicates a gear, which is preferably formed integral with the hub 15, but may be secured thereto, of course, in any suitable manner.

17 indicates a clutch-member, which is formed integral with, or in any suitable manner secured to, the outer face of the gear 16, and is adapted to coact with the clutch-member 14.

39 indicates a driving-gear, which is either formed integral with or in any suitable manner secured to the hub 15 so as to rotate therewith.

18 indicates a gear, which is keyed to a shaft 19 journaled in the framework 8 of the press and by means of which, through suitable gearing (not shown), the press may be driven.

20 indicates a shaft, which is journaled in suitable bearings, as 21, mounted on the framework 9.

22 indicates a slow-speed gear, which meshes with pinion 13 and is loosely mounted on a bushing 23 loosely mounted on shaft 20, as is best shown in Fig. 6.

24 indicates a ratchet-wheel, which is keyed, or otherwise suitably secured, to the hub of the gear 22, as is best shown in Fig. 6.

25 indicates a wheel or spider, which runs loose on bushing 23 and carries, pivoted upon its outer surface, pawls 26 which are adapted to engage with the ratchet-wheel 24.

27 indicates a clutch-member, which is keyed, or otherwise secured, to the hub of the spider wheel 25, as is best shown in Fig. 6. 28 indicates a second clutch-member, which is feathered on shaft 20 so as to slide to and fro longitudinally thereon and rotate therewith. The clutch-member 28 is adapted to coact with clutch-member 27 in the usual manner and is operated to be engaged and disengaged therefrom by mechanism hereinafter described.

29 indicates a pinion, which is keyed, or

otherwise suitably secured, to shaft 20 and meshes with gear 16.

30 indicates a brake-pulley, which is keyed, or otherwise suitably secured, to shaft 20.

31 indicates a flexible brake-band provided upon its inner surface with a plurality of brake-shoes 32 engaging the surface of pulley 30. One end of the flexible brake-band 31 is secured to a bracket 33 mounted upon the framework 9, and the other end is secured to a pin 34 which is screw-threaded at its lower end and passes through a suitable opening in a bearing 35 on an arm 36 on rock-shaft 37. A nut 38 on the screw-threaded end of pin 34 bearing against the the bearing 35 is adapted to tighten or loosen the brake-band so as to suitably adjust it. The rock-shaft 37 is operated by mechanism hereinafter described.

40 indicates a rock-shaft journaled in suitable bearings, as 41, on the framework of the press 8.

42 indicates operating levers, which are suitably secured, as by pins 43, to the rock-shaft 40.

44 indicates a rock-arm, which is pinned, or otherwise suitably secured, to rock-shaft 40 and projects downward therefrom.

45 indicates a link, which is pivotally connected at one end with the lower end of the rock-arm 44 and at the other end with a rock-arm 46 pinned, or otherwise secured, to one end of a shaft 47 journaled in suitable bearings, as 48, on the framework 9.

49 indicates a clutch-shifter arm, which is pinned, or otherwise suitably secured, to shaft 47 above shaft 10, and is forked at its lower end so as to embrace a hub 50 which is feathered upon shaft 10 so as to slide longitudinally thereon, and is connected by usual toggle-joint levers 51 with clutch-member 14. These shifting levers and clutch-members are of any ordinary form and construction and operate in the well-known manner, whereby the rocking of shaft 47 in one direction or another through the link 45 by means of lever 42 will operate to engage or disengage the clutch-members.

52 indicates a rock-arm, which is secured to the rock-shaft 47.

53 indicates a link, which is pivotally connected at one end with the end of the rock-arm 52 and which is connected at the other end with a rock-arm 54 secured to rock-shaft 37. These parts are so adjusted that when the operating levers 42 are moved in a contra-clockwise direction the rock-shaft 47 is rocked in the opposite or clockwise direction, rocking the rock-shaft 37 in the same direction, thus moving downward the rock-arm 36 above described attached to said rock-shaft, thereby pulling down the rod 34, tightening the brake-band 31 and tightening the brake-shoes 32 upon the brake 30 for the purpose of stopping the machine. The movement is so timed that the braking effect is provided after the arm 42 is moved in a contra-clockwise direction beyond the positions indicated in the figures. When the levers 42 are rocked in a clockwise direction, the rock-shaft 40 is, of course, rocked in the same direction, and by means of rock-arm 44, link 45, rock-arm 46 and clutch-shifter 49 the movable clutch-member 14 is moved inward into the clutch-member 17, effecting a frictional engagement between them so as to cause the clutch-member 17, gear 16, hub 15 and driving gear 39 to rotate in the same direction as the gear 12, moving the press.

54 indicates a lever, which is journaled upon shaft 40 intermediate its ends with the arm 54ª extending below the shaft 40.

55 indicates a link, which is pivotally connected at one end with the lower end of the arm 54ª of lever 54 and at the other end is pivotally connected with a rock-arm 56 keyed, or otherwise secured, upon a rock-shaft 57 which is journaled in suitable brackets, as 58, on the framework 8.

59 indicates a rock-arm secured to rock-shaft 57.

60 indicates a link, which is pivotally connected at one end with the rock-arm 59 and at the other end with the upper end of a clutch-shifter 61 whose lower end is pivoted to a suitable bracket, as 62, on the framework 9, and which is adapted to engage a collar 63 slidingly mounted on shaft 20, and by means of toggle-levers 64, connected with clutch-member 28 to move the clutch-members into and out of engagement. The clutch-shifter is of the well-known kind and description and its connections with the clutch-member 28 are also of the well-known kind and description and need no detailed description here. The clutch-shifter operates in the usual manner to move the clutch-member 28 into and out of engagement with clutch-member 27. When the lever 54 is rocked in a clockwise direction, it, through the medium of arm 54ª, link 55 and rock-arm 56, rocks the rock-shaft 57 in a clockwise direction. By means of the rock-arm 59, link 60, the clutch-shifter is moved to the left in Fig. 4, moving the clutch-member 38 into engagement with clutch-member 27. The opposite movement of operating lever 54, of course, moves the parts in the opposite direction and locks the clutch-members.

The operation of the press is as follows: The shaft 10 being driven through gear 12 in a constant clockwise direction by a suitable high-speed motor (not shown) and the various clutch-members all being out of engagement and the brake free—that is to say, with the parts in the position shown in the drawings—the rotation of the shaft 10 is communicated by pinion 13 to slow-speed gear 32 which rotates in a contra-clockwise

direction—that is to say, in the direction indicated by the arrow in Fig. 5. This carries around with it the ratchet-wheel 24 in the same direction, and this movement, by means of the pawls 26 which engage the ratchet-teeth, is communicated to the spider 25 which runs loose on the bushing 23 and carries with it the clutch-member 27, all moving in a contra-clockwise direction. The shaft 20, of course, so far, remains idle. Operating lever 54 is then moved to the right—that is to say, in a clockwise direction—and the clutch-member 28, which is feathered on the shaft 20, is moved into engagement with the clutch-member 27. This causes the rotation of shaft 20, carrying with it pinion 29 which, engaging with gear 16, rotates it in a clockwise direction at slow speed, rotating with it driving-gear 39 and driving the press at slow speed. The speed, of course, will depend upon the relative number of teeth in pinion 13, gear 22 and in pinion 29 and gear 16, and may be varied, of course, to suit the demands of operation. The press being thus driven at slow speed, one of the levers 42 is swung to the right—that is to say, in a clockwise direction—rotating rock-shaft 40 in the same direction. This moves clutch-member 14 into engagement with clutch-member 17, driving clutch-member 17, gear 16, and driving-gear 39 in a clockwise direction and at high speed. As the engagement between the clutch-members is a frictional one and moves gradually into tighter engagement, as the clutch-member 14 is slid farther into clutch-member 17 in the usual manner, this speed will be taken on gradually and not suddenly, but will very shortly arrive at full speed so that the gear 39 is driven at the same speed as shaft 10. It will not be necessary to disconnect the slow-speed mechanism or throw it out of operative relation with the press before the high speed engagement is thrown into operation, as will be readily understood from the foregoing description. Of course as soon as the gear 16, which, as has been said, has been driven in a clockwise direction during the slow speed engagement, begins to take on higher speed by the engagement of the high speed clutches, the gear 29 will, of course, be speeded, but in the same direction in which it was previously running, and the slow-speed clutches 37 38, being still in engagement the pawls 26, will slip over the ratchet-teeth of ratchet-wheel 29 as the speed increases. The high speed movement being taken up, the hand-lever 54 may thereupon be rocked to the left—that is, in a contra-clockwise direction—to the position shown in the drawings, disengaging clutch-members 27 and 28. The press may, of course, be moved down to run at slow speed from high speed by reversing the above movements,—that is, by moving the hand lever 42 to the left in a contra-clockwise direction to the position shown in the drawings, and thus disengaging the clutch-members, while the hand-lever 54 may be rocked backward so as to bring the slow-speed mechanism into engagement, as above described. It being desired to stop the press, say from high speed, the operating levers 42 are rocked to the left in a contra-clockwise direction, which, by the time they have reached the position shown in the drawings, has released the clutch-members from frictional engagement with each other. Further movement in the same direction applies the brake, as has been above described, slowing down and ultimately stopping the press. If the press is running at slow speed and it is desired to stop it, the clutch-members are disengaged by the proper movement of levers 54 and the same movement of the lever 42 farther to the left applies the brake.

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

1. In combination, a main driving-shaft, a driving-gear rotatably mounted on said shaft, means for operatively connecting said driving-gear with said driving-shaft and disconnecting it therefrom, a second shaft, diminishing-speed gearing, gearing between said second shaft and said driving-gear, means for putting said diminishing-speed gearing into and out of operative relation with the gearing connecting said second shaft with said driving-gear, said means including pawl and ratchet mechanism between said diminishing-speed gearing and said connecting and disconnecting means.

2. In combination, a main driving-shaft, a driving-gear rotatably mounted on said shaft a clutch-member secured thereon, a second clutch-member slidingly mounted on said main driving-shaft, means for connecting and disconnecting said clutch-members, a pinion on said driving-shaft, a second shaft, a gear rotatably mounted on said second shaft and meshing with said pinion, a gear fast with said driving-gear on said driving-shaft, a pinion secured to said second shaft and meshing with said last-named gear, shiftable clutch mechanism on said second shaft, and pawl and ratchet mechanism between said gear on said second shaft and said clutch mechanism.

3. In combination, a main driving-shaft, a driving-gear rotatably mounted on said shaft and having a large gear rigidly connected with said driving-gear, clutch mechanism adapted to operatively connect said driving-gear with said shaft and disconnect it therefrom, a pinion on said main driving-shaft, a second shaft, a large gear rotatably mounted on said shaft, a clutch-member rotatable with reference to said second shaft and with reference to said large gear, pawl and ratchet mechanism between said large

gear on said second shaft and said clutch mechanism, a second clutch-member slidable on said shaft and adapted to coact with said first clutch-member, and a pinion fast on said second shaft and meshing with said large gear rigidly connected with said driving-gear on said first shaft.

4. In combination, a main driving-shaft, a main driving-gear rotatably mounted on said shaft, a large gear rigidly connected with said driving-gear, a clutch-member secured to said large gear and rotatable with it on said shaft, a second clutch-member feathered on said shaft and adapted to coact with said first clutch-member, a pinion secured on said shaft, a second shaft, a large gear rotatable thereon and meshing with said pinion, a ratchet-wheel secured to said large gear, a spider carried by said shaft and rotatable with reference to said shaft and with said large gear, pawls carried by said spider, a clutch-member rigidly connected with said spider, a second clutch-member feathered on said second shaft and adapted to coact with said first clutch-member, and a pinion secured to said second shaft and adapted to mesh with the large pinion rigidly connected with said driving-gear.

5. In combination, a main driving-shaft, a driving-gear rotatably mounted thereon, a large gear secured to the hub of said driving-gear, clutch mechanism adapted to operatively connect said driving-shaft with said driving-gear and to disconnect it therefrom, a pinion on said shaft, a second shaft, a bushing rotatably mounted on said second shaft, a large gear rotatably mounted on said bushing and meshing with said pinion on said first shaft, a ratchet-wheel secured to the hub of said large gear, a support rotatably mounted on said bushing, a pawl carried by said support and adapted to engage said ratchet-wheel when rotated in one direction, a clutch-member rigidly connected with said support, a second clutch-member feathered on said second shaft and adapted to be moved into and out of engagement with said first clutch-member, and a small gear on said second shaft meshing with the large gear on the hub of said driving-gear.

6. In combination, a main driving-shaft, a driving-gear rotatably mounted thereon, a large gear secured to the hub of said driving-gear, clutch mechanism adapted to operatively connect said driving-shaft with said driving-gear and to disconnect it therefrom, a pinion on said shaft, a second shaft, a bushing rotatably mounted on said second shaft, a large gear rotatably mounted on said bushing and meshing with said pinion on said first shaft, a ratchet-wheel secured to the hub of said large gear, a spider rotatably mounted on said bushing, pawls carried by said spider and adapted to engage said ratchet-wheel when rotated in one direction, a clutch-member secured on said spider, a second clutch-member feathered on said second shaft and adapted to be moved into and out of engagement with said first clutch-member, a small gear on said second shaft meshing with the large gear on the hub of said driving-gear, and brake mechanism on said second shaft.

7. In combination, a main driving-shaft, a driving-gear rotatably mounted on said shaft, mechanism for operatively connecting said driving-gear with said driving-shaft and disconnecting it therefrom, a second shaft, diminishing-speed gearing between said second shaft and said first shaft, said diminishing-speed gearing including pawl and ratchet mechanism adapted to operate in one direction of rotation but not in the other, and shifting means adapted to move said diminishing-speed gearing into and out of operative relation with said first shaft whereby said driving-gear may be brought into operative relation with said main driving-shaft in passing from slow to high speed without first throwing the diminishing-speed gearing out of operative relation.

8. In combination, a main driving-shaft, a driving-gear rotatably mounted thereon, clutch mechanism adapted to put said main driving-shaft into operative relation with said driving-gear, a second shaft, slow-speed driving mechanism carried on said second shaft and driven from said main shaft, clutch mechanism on said second shaft adapted to put said slow-speed driving mechanism into operative relation therewith, a rock-shaft, means for rocking said shaft, connections between said rock-shaft and the clutch mechanism on said main driving-shaft whereby by the rocking of said shaft the clutch mechanism may be thrown into and out of engagement, a lever rotatably mounted on said rock-shaft, and connections between said lever and the clutch mechanism on said slow-speed shaft adapted by the movement of said lever to throw said clutch mechanism into and out of engagement.

9. In combination, a main driving-shaft, a driving-gear rotatably mounted thereon, clutch mechanism adapted to put said main driving-shaft into operative relation with said driving-gear, a second shaft, slow-speed driving mechanism carried on said second shaft and driven from said main shaft, clutch mechanism on said second shaft adapted to put said slow-speed driving mechanism into operative relation therewith, brake mechanism, a rock-shaft, means for rocking said shaft, a second rock-shaft, connections between said two rock-shafts, connections between said second rock-shaft and the clutch mechanism on said main driving-shaft, connections between said second rock-shaft and said brake mechanism whereby

when said rock-shaft is rocked in one direction the brake may be thrown into engagement and when said rock-shaft is rocked in the other direction said clutch mechanism may be moved out of engagement and upon movement of the lever the brake mechanism operated, a lever journaled on said first rock-shaft, a third rock-shaft, and connections between said lever and said third rock-shaft and between said third rock-shaft and the clutch mechanism on said slow-speed shaft adapted to throw said slow-speed mechanism into and out of engagement.

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