H. C. SCHROEDER.

GEARING.

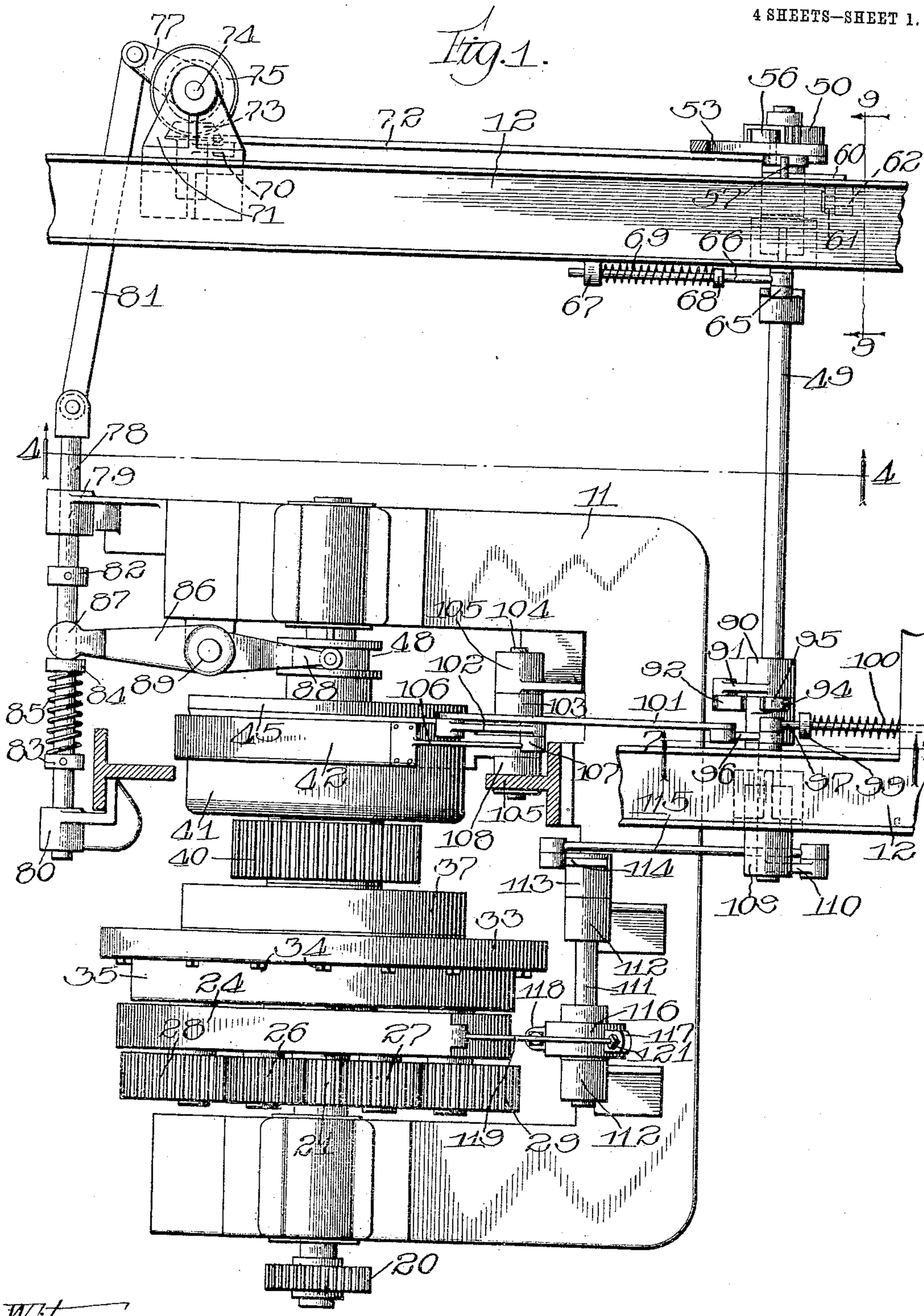
APPLICATION FILED DEC. 12, 1908.

940,200.

Patented Nov. 16, 1909.

4 SHEETS—SHEET 1.

Fig. 1.



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4 SHEETS—SHEET 2.

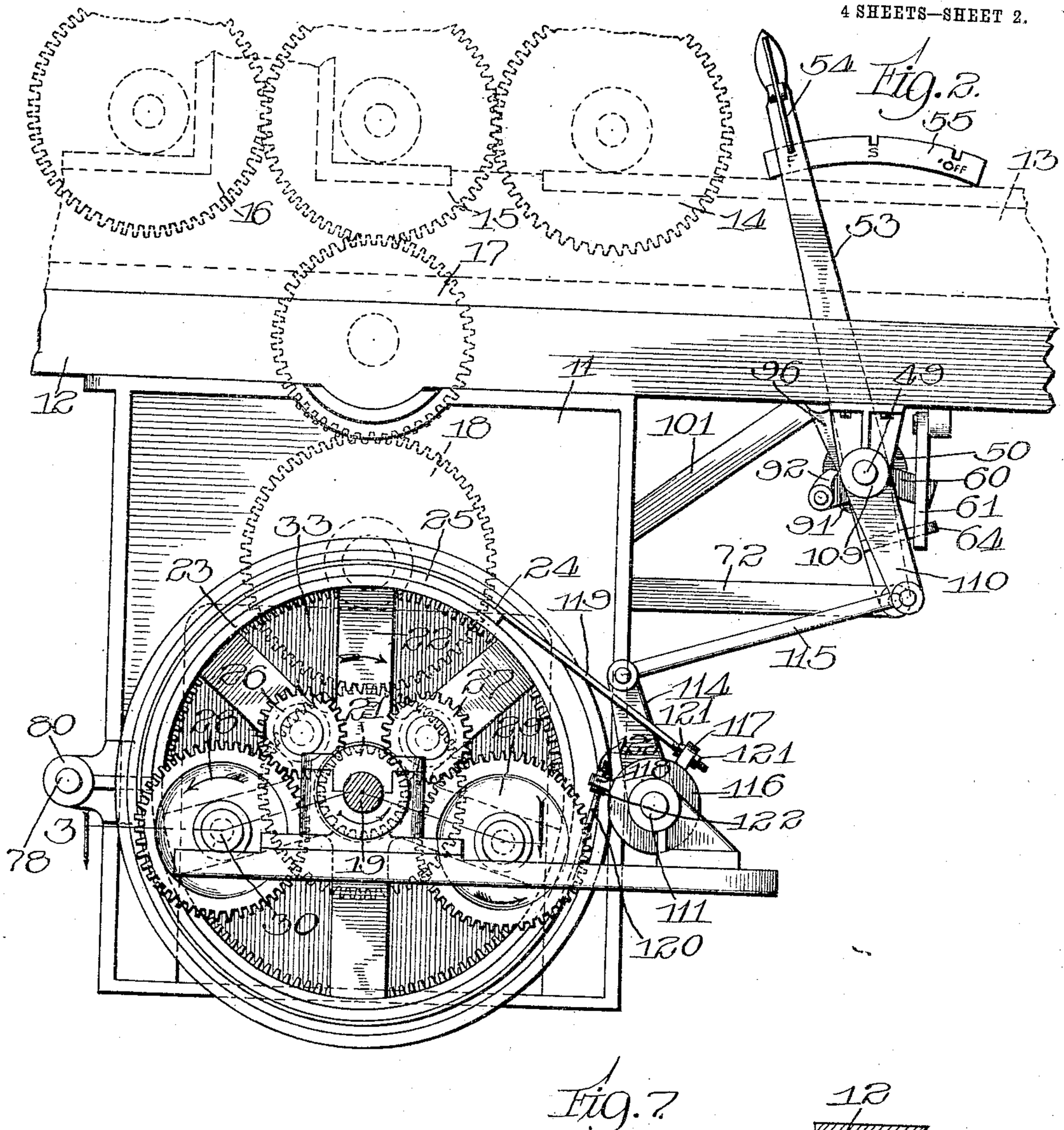
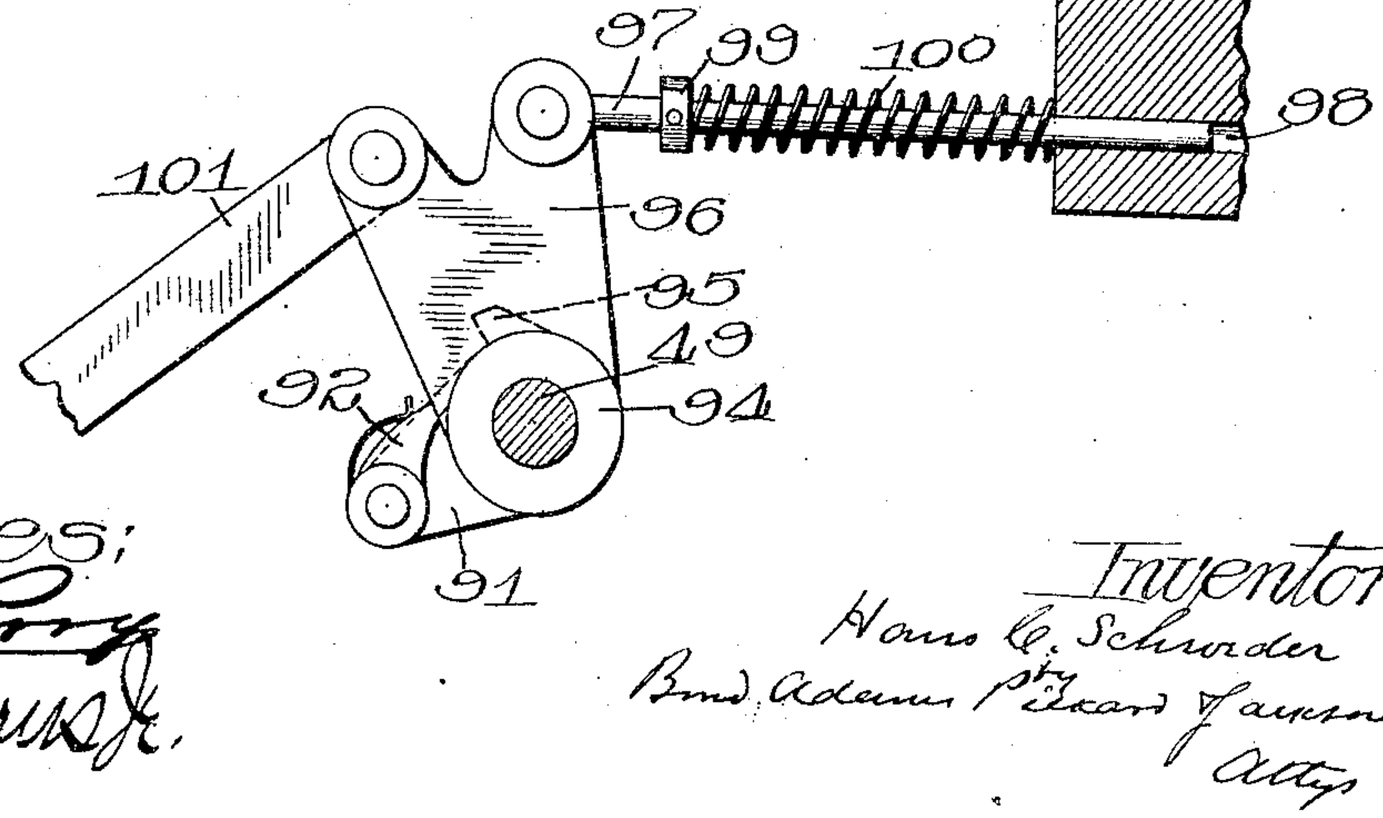


Fig. 2.

Fig. 7



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4 SHEETS—SHEET 3.

Fig. 5.

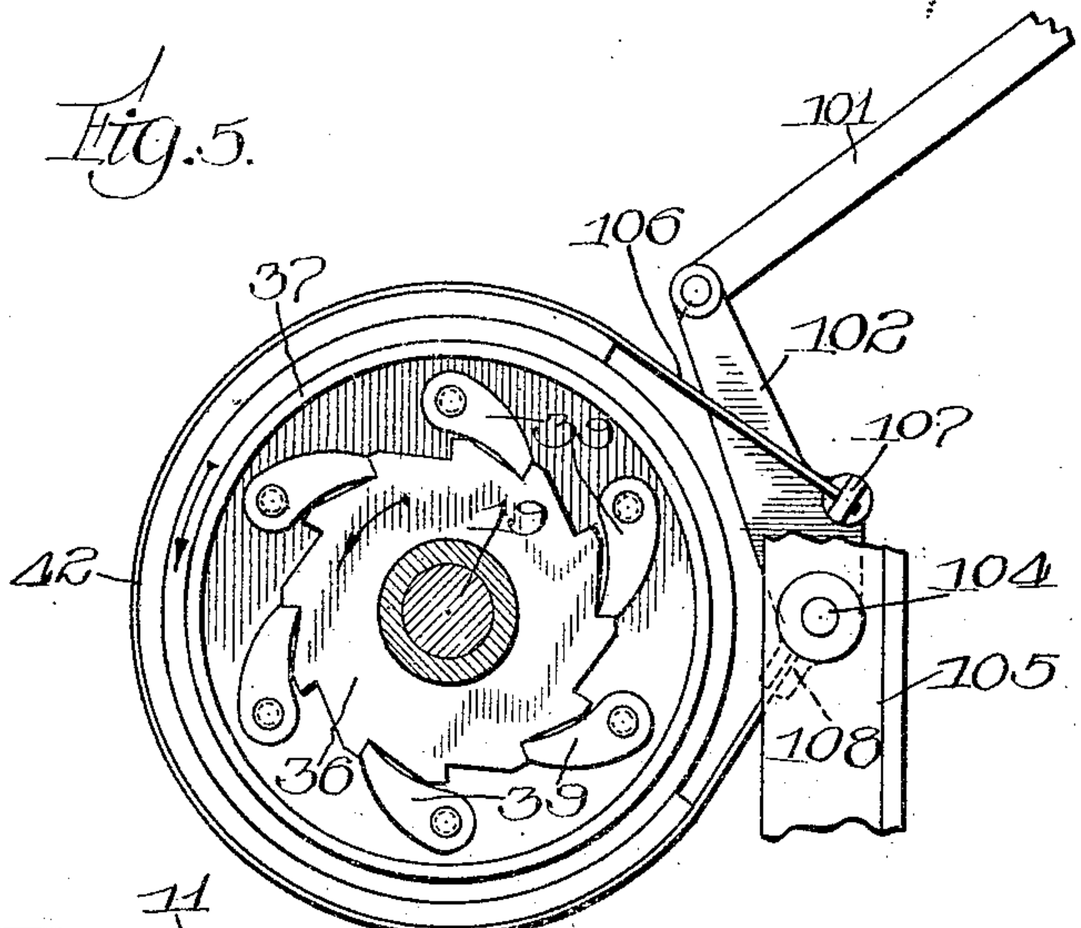


Fig. 3.

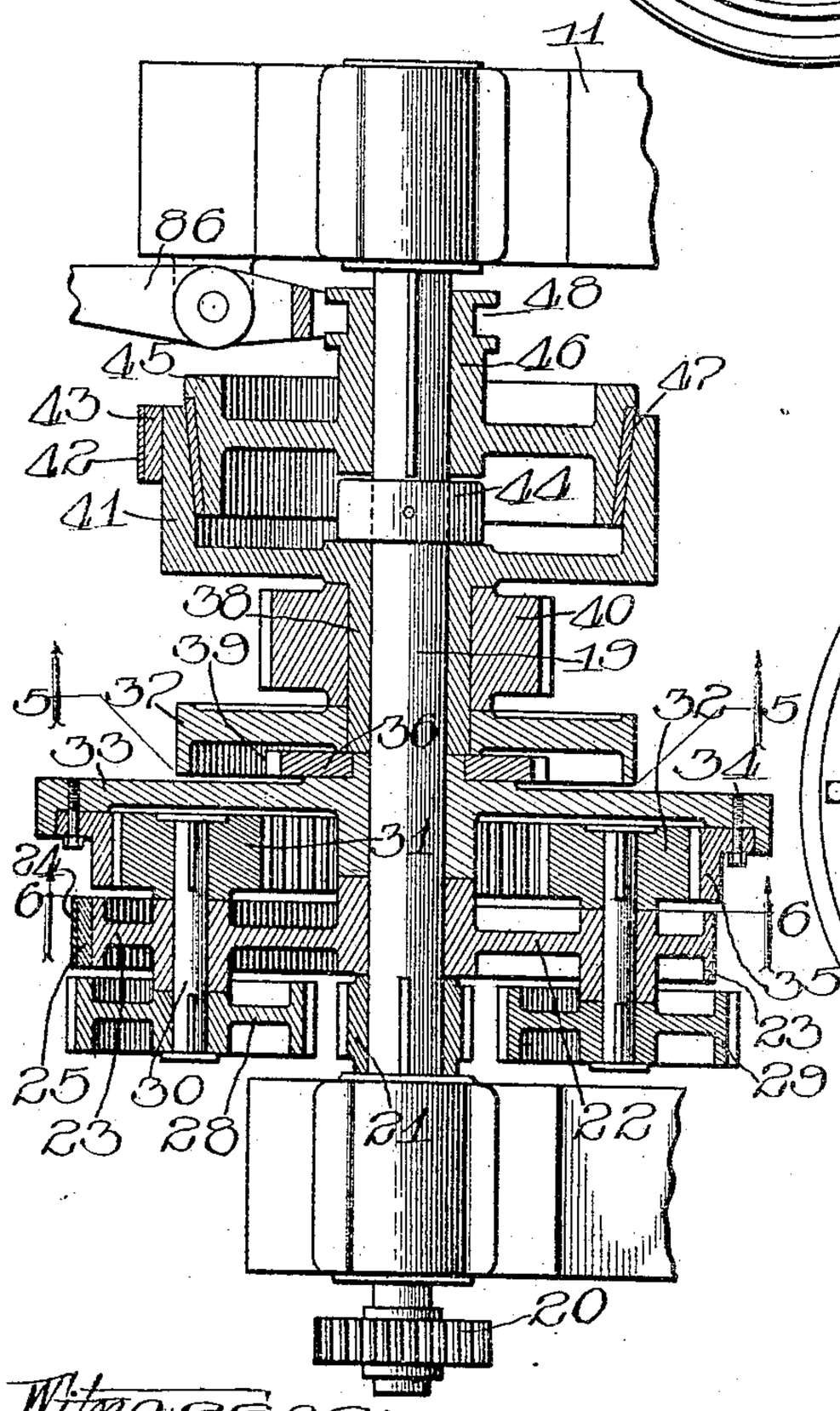
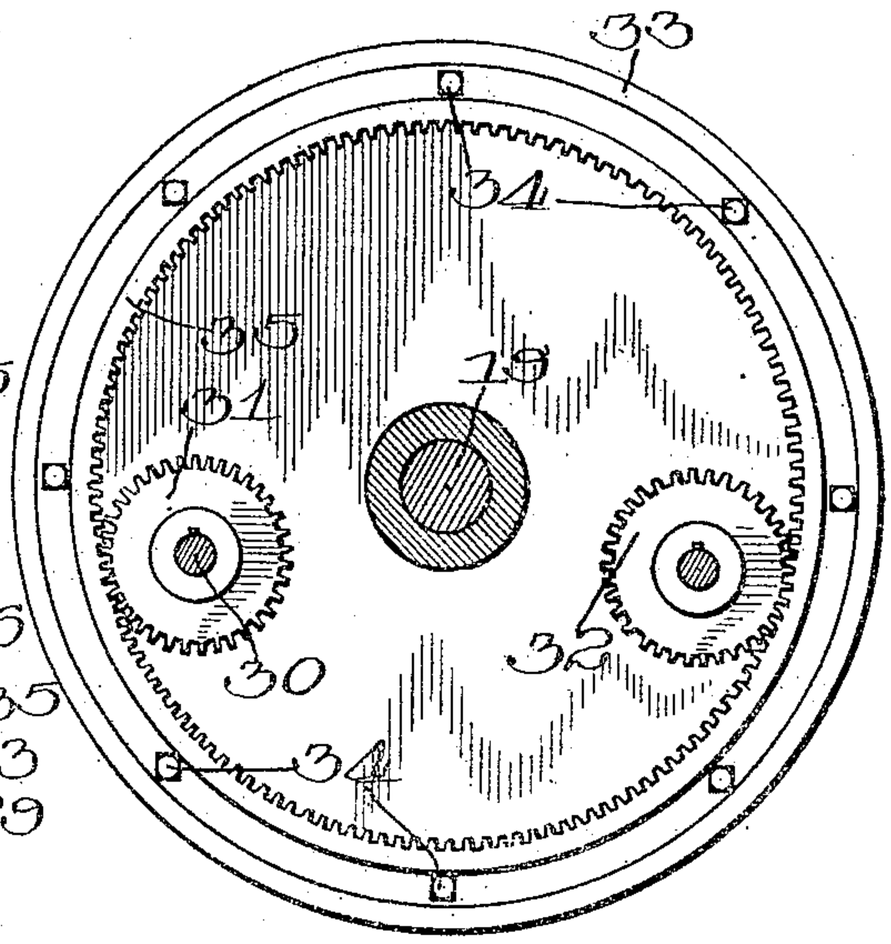


Fig. 6.



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4 SHEETS—SHEET 4.

Fig 4.

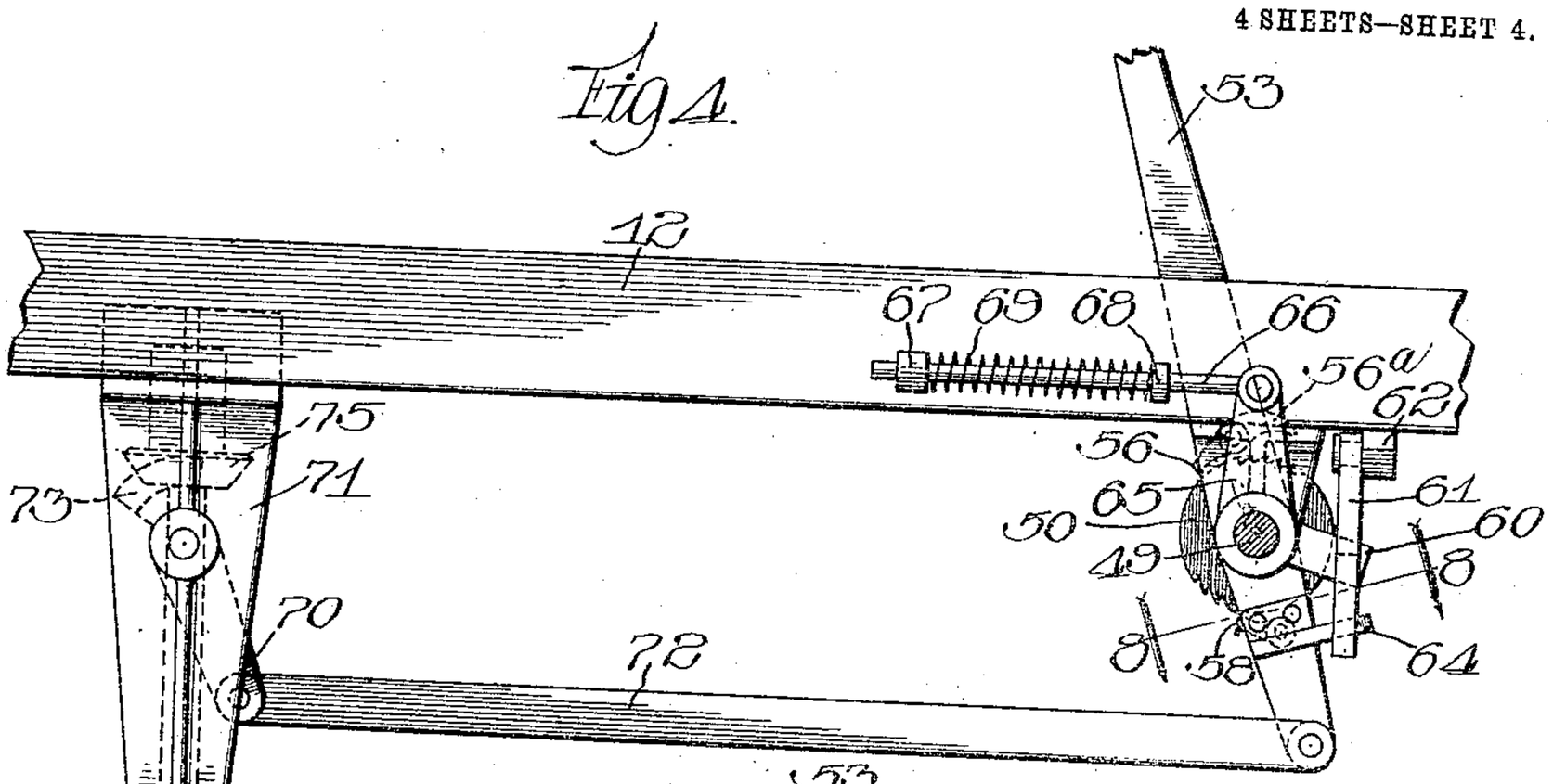


Fig. 8.

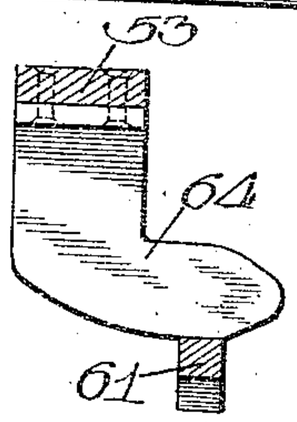


Fig. 9.

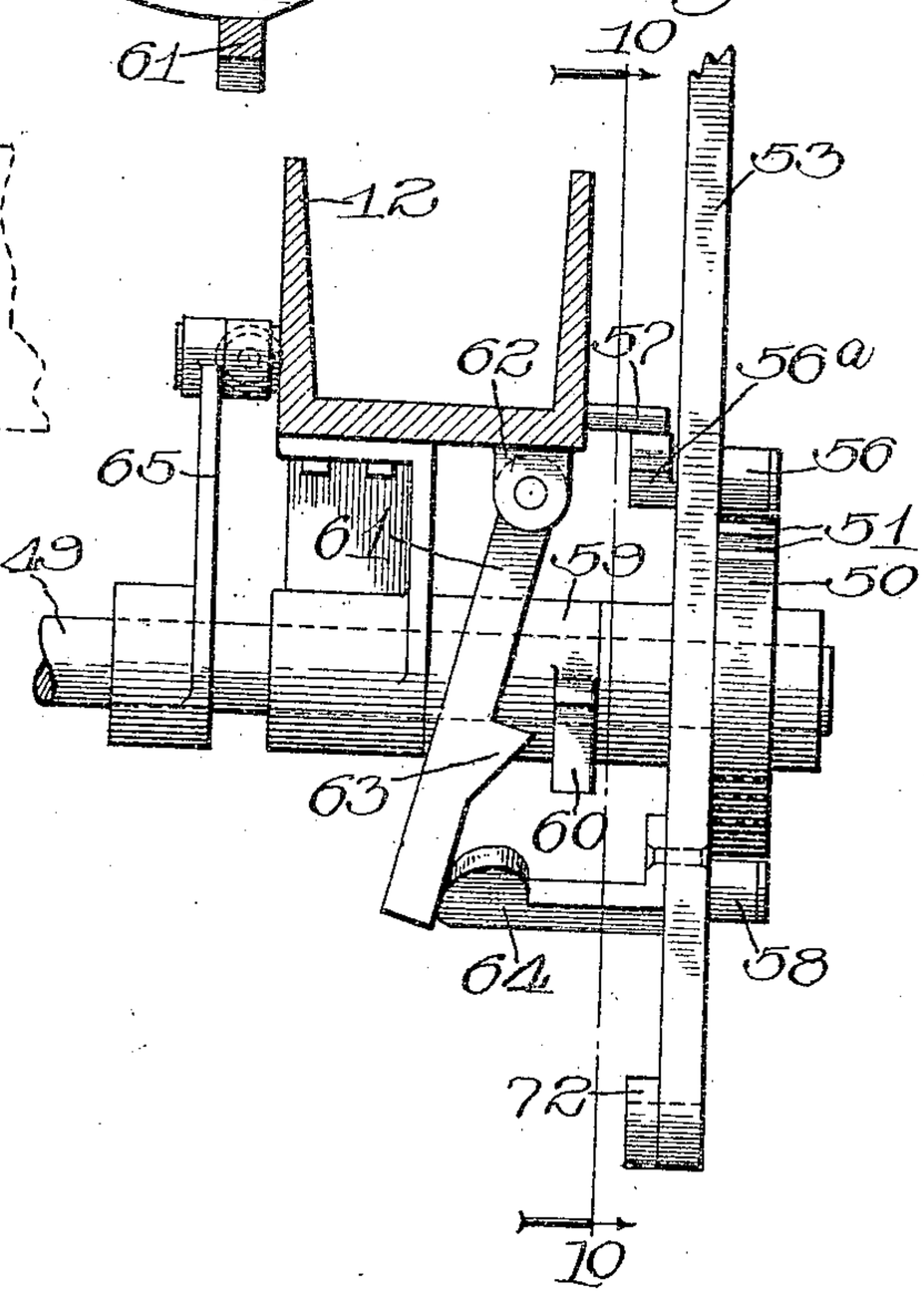
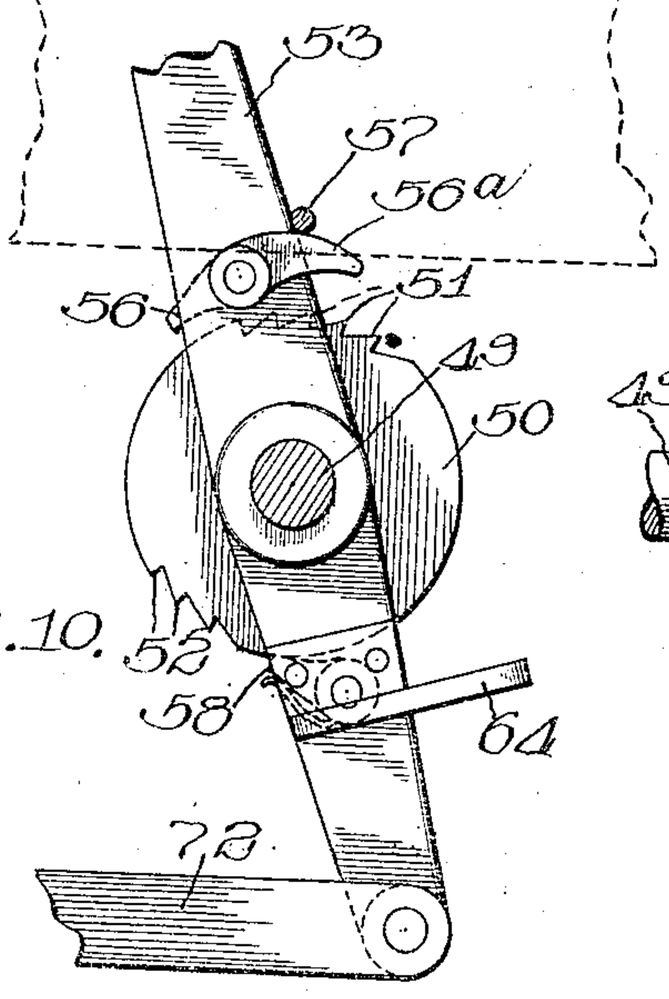


Fig. 10.



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UNITED STATES PATENT OFFICE.

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

GEARING.

940,200. Specification of Letters Patent. Patented Nov. 16, 1909.

Application filed December 12, 1908. Serial No. 467,179.

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 Gearing, 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 with one of the bed frames of the press partly broken away to expose the parts below. Fig. 2 is an end elevation, showing in dotted lines a part of the press frame and press driving gears. Fig. 3 is a section on line 3—3 of Fig. 2. Fig. 4 is a detail, being a section on line 4—4 of Fig. 1. Fig. 5 is a detail, being a section on line 5—5 of Fig. 3. Fig. 6 is a detail, being a section on line 6—6 of Fig. 3. Fig. 7 is an enlarged detail, being a section on line 7—7 of Fig. 1. Fig. 8 is an enlarged detail, being a section on line 8—8 of Fig. 4. Fig. 9 is an enlarged detail, being a section on line 9—9 of Fig. 1. Fig. 10 is an enlarged detail, being a section on line 10—10 of Fig. 9.

Referring to the drawings:—11 indicates the frame for the driving mechanism, and 12 indicates the bed plates of a press to which the driving mechanism is applied.

13 (shown in dotted lines in Fig. 2) indicates part of the side frame of the press on which are mounted driving gears 14—15—16—17,— all shown in dotted lines,—the gear 17 meshing with driving gear 15 and with a gear 18,—also shown in dotted lines,—which meshes with the driving gear on the driving mechanism hereinafter described.

19 indicates the main driving shaft, which is journaled in the frame 11 and is provided upon its outer end with a gear 20 which is adapted to be driven from any suitable source of power, as by a motor (not shown).

21 indicates a gear which is keyed upon the driving shaft 19.

22 indicates a spider which is revolubly mounted upon the shaft 19 adjacent to the gear 21 and is provided with a flange rim 23.

24 indicates a flexible brake band upon which is mounted a brake 25, which, engaging the flange 23 of the spider 22, is

adapted to hold the same against rotation when applied in the manner hereinafter described.

26—27 indicate small-sized gears which are revolubly mounted on suitable studs on the arms of the spider 22 and mesh with the gear 21.

28—29 indicate gears which are keyed or otherwise secured to stub-shafts 30 which are journaled in the arms of the spider 22 and mesh respectively with the gears 26—27.

31—32 indicate gears of smaller diameter than the gears 28—29 and keyed or otherwise secured to the other ends of the stub-shafts 30.

33 indicates a disk which is revolubly mounted upon the shaft 19 adjacent to the spider 22, and carries secured thereto by any appropriate means, as by bolts 34, a gear ring 35, which meshes with the gears 31—32.

36 indicates a ratchet wheel which is keyed or otherwise secured to the hub of the disk 33.

37 indicates a pawl disk which is keyed or otherwise secured upon a sleeve 38 which is revolubly mounted upon the shaft 19. The pawl disk 37 is provided with pawls 39 which are adapted to be engaged by the ratchet wheel 36 so that when the shaft and ratchet are rotated in the direction indicated by the arrow on Fig. 5 the sleeve 38 will be carried around with it.

40 indicates a gear which is keyed or otherwise secured to the sleeve 38, and, meshing with the gear 18, through the medium of the gears 17—14—15—16 operates to drive the press.

41 indicates a drum which forms one member of a clutch mechanism which is preferably formed integral with the sleeve 38.

42 indicates a flexible brake band to which is secured a brake 43 which is adapted when thrown on in the manner hereinafter described to brake the drum 41 and stop the mechanism.

44 indicates a collar which, pinned to the shaft 19, bears upon the interior surface of the drum 41 and operates to hold the parts in position.

45 indicates a clutch member which is provided with a hub 46 and is feathered upon the shaft 19 so as to slide longitudinally thereof. The inner periphery of the clutch drum 41 and the outer periphery of the clutch 45 are correspondingly beveled and the clutch member 45 is provided with a clutch band 47 which is adapted, when the clutch 45 is slid into engagement with the clutch drum 41, to engage the interior periphery thereof and cause the clutch drum 41 to be driven by the rotation of the clutch member 45 on the shaft 19. The hub 46 is provided with a peripheral groove 48.

From the above description, it will be obvious that when the shaft 19 by means of the gear 20 is driven in the direction shown by arrows in Fig. 2, the gears 28—29 will be driven, through the intermediate gears 26—27, in the same direction,—that is, in the direction indicated by arrows in the said figure,—and if the brake 25 is free from the rim of the spider 22 so as to permit it to rotate, the spider will be rotated in the same direction,—that is, in the direction indicated by arrow on Fig. 2,—the gears 31—32 traveling around on the interior gear ring 35, and the speed at which this revolution will occur will depend upon the relative size of the gear 21 and the interior gear ring 35. When, however, the brake is applied to the spider, in the manner hereinafter described, so as to hold it against rotation, the gears 28—29 will be merely rotated in their bearings, rotating in the same direction the gears 31—32 which are keyed to the same stub-shafts. This will cause the disk 33 to be rotated upon the shaft 19 and in the same direction, the speed of this rotation, however, being still further diminished by the difference in size between the gears 28—29 and the gears 31—32, thus driving the disk at a much slower speed than the shaft 19. The engagement of the ratchet wheel 36 with the pawls 39 will drive in the same direction and at the same speed the pawl disk 37, which, being keyed to the sleeve 38, will rotate the gear 40 in the same direction and at the same speed as the disk 33 and pawl disk 37, which, through the medium of the several driving gears 14 to 18, will drive the press at slow speed. Of course during this movement the clutch members will be thrown out of engagement in the manner hereinafter described. If now the clutch members are thrown into engagement by the inward movement of the hub 46, which engagement will be gradual and not sudden by reason of the beveled engaging surfaces of the clutch members, the clutch drum 41 will gradually, as the clutch members are thrown into complete and tight engagement, be rotated in the same direction as the shaft 19 and at the same speed as said shaft, rotating of course in the same direction the gear 40 and driving the press through the medium of the interposed gearing at high speed. Of course the pawl disk 37 will also be driven at the same speed. The brake 25 still being on during the engagement of the clutch members and the spider 22 being therefore held against rotation, the ratchet 36 will be driven at the slow speed above described, but the pawl 39 will slip over the ratchet teeth permitting the pawl-disk 37 and connected parts to be driven at the high speed.

It will be obvious from the above description that the high speed may thus be thrown into engagement before the slow speed is

thrown out of engagement, thus preventing the running of the press by its mere momentum and consequent slowing down during the period of shifting from one speed to the other. If the brake 25 is then thrown off, the spider 22 will be free to rotate and will take up a speed the same as the shaft 19 through the operation of the several gears connected therewith above described.

The relative sizes of the gears will of course be such as to secure the desired difference between the slow and the high speeds, and may be varied to suit the demands of the case, it being obvious that the greater the difference between the gear 21 and the internal gear 34 and between the gears 28—29 and 31—32, the greater will be the difference between the relative speeds of the shaft 19 and the disk 33 and therefore between the slow speed and the high speed of the same. When the clutch members are disengaged, the brake 25 also being disengaged, if the brake 43 is applied, in the manner hereinafter described, to the drum 41, the movement of the driving mechanism will be braked and the press driven thereby stopped.

The various parts above described are thrown into and out of engagement by the following mechanism. 49 indicates a rock shaft which is journaled in suitable bearings below the base frames 12. 50 indicates a ratchet wheel provided with two sets of teeth 51—52, which is keyed or otherwise secured to the outer end of the rock shaft 49. 53 indicates a hand-lever which is provided at its upper end with the usual latch 54 which is adapted to engage an arc-bar 55 so as to be held therein in either of three positions,—that is to say, with the press silenced, with the press running at slow speed, and with the press running at full speed,—as indicated respectively in Fig. 2 by the word "off" and by the letters "S" and "F", the parts in the several figures being represented in the position in which they are when running at full speed.

56 indicates a pawl which is pivoted on the lever 53 above the ratchet wheel 50 and is adapted to engage the ratchet teeth 51. The pawl 56 is provided with an arm 56^a which is adapted to be engaged by the pin 57 mounted in one of the base plates 12 so that when the lever is swung past the slow speed notch the pawl 56 will be lifted out of engagement with the teeth 51.

58 indicates a pawl which is pivotally carried upon the lower arm of the lever 53 and is adapted to engage the ratchet teeth 52 of the ratchet wheel 50 when the lever is swung to the right toward the "off" position.

59 (see Figs. 4 and 9) indicates a sleeve which is secured to the rock-shaft 49 and is provided with a lug 60, which, as is best shown in said figures, is preferably integral therewith and slopes slightly downward therefrom when the shaft 49 is in normal position.

61 indicates an arm which is pivotally connected at its upper end with a suitable bracket, as 62, on the under side of the base plate 12, and swings downward therefrom. The arm 61 is provided with a catch 63, which, when the arm 61 is free to swing to its lowest position and the rock shaft 49 is rocked as hereinafter described by raising the arm 61, is adapted to drop in behind and below the lug 60 and prevent the rock shaft 49 from being rocked back into its normal position until the latch 63 is disengaged.

64 indicates a cam which is carried upon the lower end of the lever 53 and is adapted, when the parts are swung into the position shown in the figures, to engage the lower end of the arm 61, and, throwing it outward, in the position best shown in Fig. 9, to free it from the lug 60, permit the rock shaft 49 to return to normal position.

65 indicates an arm which is keyed or otherwise secured to the rock shaft 49 and projects upward therefrom. 66 indicates a rod one end of which is pivotally connected with the arm 65 and the other end of which is slidingly mounted in a lug 67 on the frame 12.

68 indicates a collar which is secured to the rod 66.

69 indicates a spiral spring which, mounted upon the rod 66 between the lug 67 and collar 68, tends to yieldingly hold the rock shaft 49 in normal position,—that is to say, the position indicated by the several figures in which both brakes are off.

70 indicates a lever which is pivotally mounted in a suitable bracket 71 which depends from one of the frame bars 12 and is secured thereto. The lower end of the lever 70 is connected by a link 72 with the lower arm of the lever 53, and it carries upon its upper end a beveled segmental gear 73.

74 indicates a shaft which is journaled in suitable bearings in the bracket 71 and carries near its outer end a bevel gear 75 which meshes with the beveled segmental gear 73.

When the lever 53 is rocked in either direction, the lever 70 will be correspondingly moved through the medium of the link 72, and, through the medium of the beveled segmental gear 73 and gear 75, the shaft 74 will be given a partial rotation or be rocked in one direction or the other.

76 indicates a collar which is secured to the lower end of the shaft 74 and is provided with an arm 77 extending outward therefrom.

78 indicates a slide rod which is slidingly mounted in suitable bearings 79—80 secured to the framework.

81 indicates a link which is pivotally con-

nected at one end with the slide rod 78 and at the other end with the end of the arm 77, whereby, when the shaft 74 is rocked, as above described, the slide rod 78 will be moved longitudinally of itself in its bearings.

82 indicates a collar pinned or otherwise adjustably secured to the slide rod 78.

83 indicates a collar which is pinned or otherwise adjustably secured on the slide rod 78.

84 indicates a collar which is slidingly mounted on the rod 78 between the collars 82 and 83.

85 indicates a spiral spring which is carried upon the slide rod 78 between the collars 83 and 84.

86 indicates a lever which at one end is provided with a fork 87 which embraces the rod 78 and is adapted to be engaged by collars 82 and 84 and at the other end with a fork 88 which embraces the hub 46 and engages the peripheral groove 48 therein. The lever 86 is pivotally mounted upon a suitable bracket, as 89, on the frame 11.

It will be obvious from the above description that when the slide rod 78 is moved downward in Fig. 1 the collar 82 engaging the fork 87 will rock the lever in one direction and throw the clutch member out of engagement. When the slide rod is moved in the other direction, the spring-seated collar 84 will engage the fork 87, and, rocking the lever 86 in the other direction, will move the clutch members into engagement. It will also be evident that when the lever 53 is moved from right to left in Fig. 2 the relation of the parts is such that the clutch members will be moved toward one another and ultimately into engagement, and when the lever is moved in the other direction the clutch members will be moved away from each other and out of engagement, the pinned collars 82 and 83 and the spring-seated collar 84 being suitably spaced on said shaft to permit the engagement of the clutch members at the proper time,—that is to say, after the slow speed position of the lever has been passed in its movement from right to left.

90 indicates a collar which is keyed or otherwise secured to the shaft 49 and carries an arm 91 preferably integral therewith. The arm 91 carries a spring-seated pawl 92, best shown in Figs. 1 and 2.

94 indicates a collar which is revolubly mounted on the rock-shaft 49 adjacent to the collar 90, and is provided on its periphery with a lug 95 which is adapted to be engaged by the pawl 92 when the rock shaft is rotated clock-wise in Fig. 7 so as to rotate the collar 94 in the same direction. The collar 94 is provided with an arm 96 which projects upward therefrom and is preferably formed integral therewith.

97 indicates a rod which is pivotally connected at one end with the arm 96 and is adapted at its other end to slide freely in and out of an opening 98 in part of the framework 12 (see Fig. 7).

99 indicates a collar which is pinned or otherwise adjustably secured to the rod 97.

100 indicates a spiral spring which is carried on the rod 97 and bears at one end upon the collar 99 and at the other end upon the frame 12. The spiral spring 100 tends to yieldingly hold the arm 96 and sleeve 94 in the position shown in Fig. 7 and return the same to said position when said arm 96 is rocked to the right in Fig. 7.

101 indicates a link, one end of which is pivotally connected with the arm 96 on the collar 94. The other end of the link 101 is pivotally connected with an arm 102 which is secured to and preferably formed integral with a collar 103 secured to a shaft 104 which is rotatably mounted in suitable bearings 105 on the frame 11.

The brake band 42, by means of a rod 106, is connected with a lug 107 upon the arm 102, and the other end of the brake band 42 is secured to a suitable collar 108 loosely mounted upon the shaft 104. When the shaft 49 is rocked clock-wise in Fig. 7 by the swinging of the lever 53 to the right and consequent engagement of the pawl 58 with ratchet teeth 52 on disk 50, the collar 90 will be rocked with it, the pawl 92 engaging the lug 95, rocking the arm 96 against the action of the spring 100 and tightening the brake band 42 so as to brake the mechanism. When the shaft 49 is rocked in the other direction so that the pawl 92 is freed from the lug 95, the spring 100 will immediately rock the collar 94 back again and free the brake.

109 indicates a collar which is suitably secured to the end of the rock shaft 49 opposite the lever 53 and is provided with an arm 110 preferably integral therewith.

111 indicates a rock shaft which is journaled in suitable bearings 112 on the frame 11.

113 indicates a collar which is keyed or otherwise secured to one end of the rock shaft 111 in registry with the collar 109 and is provided with an arm 114 projecting upward therefrom and preferably integral therewith.

115 indicates a link which is pivotally connected at one end to the end of the arm 110 and at the other end with the end of the arm 114, whereby, when said rock shaft 49 is rocked in either direction, the rock shaft 111 will be correspondingly rocked.

116 indicates a collar which is keyed or otherwise secured to the rock shaft 111 in registry with the spider 22 and is provided upon its periphery with suitable lugs 117—118 preferably formed integral therewith. By means of flexible rods 119—120, the ends of the flexible brake band 24 are connected

respectively with the lugs 117 and 118. The ends of the rods 119—120 are screw-threaded so that they may be adjustably secured to the lugs 117—118 by means of nuts 121—122.

When the rock shaft 49 is rotated contra-clock-wise by the swinging of the lever 53 from its "off" position into the "slow" position,—that is to say from right to left in Fig. 2,—by means of the engagement of the pawl 56 with the ratchet teeth 51, the rock shaft 111 will be rocked in the opposite direction, tightening the brake band 24 and thereby braking the spider 22 and holding it against rotation. When the pawl 56 is thrown out of engagement with the ratchet teeth 51 by the pin 57 as the lever 53 passes the slow speed position, the spring 69 at once rocks the shaft 49 clock-wise back again to normal position, which, rotating the rock shaft 111 in the opposite direction, frees the brake 25 and permits the spider 22 to rotate.

The operation of the above described mechanism is as follows:—When the lever is in the full speed position as shown in the figures, the clutch members are engaged, both brakes are off, and, the arm 61 being thrown out by the cam 64, by the engagement with the lug 60, the shaft 49 is yieldingly held in normal position by the spring 69, and the driving mechanism is running at full speed. If the lever 53 is now swung to the right to the "off" position, the cam 64 will be moved out of the way of the arm 61 which will allow the arm 61 to drop toward its normal position with the latch 63 bearing against the surface of the lug 60 and ready to drop into position behind it when the lug 60 is raised by the rotation of the rock shaft 49 by the movement of the lever in the other direction as hereinafter described. As the lever 53 swings away from the full speed position, by the action of the link 72, segmental gear 73, bevel gear 75, rock shaft 74, and link 71, the slide rod 78 will be moved inward so as to disengage the clutch members by the action of the collar 82 on fork 87 of lever 86. By the same movement of the lever, the pawl 58, before the lever 53 reaches the "off" position, will engage the teeth 52 of the disk 50, rocking the shaft 49 clock-wise. Just before the lever reaches the "off" position, the pawl 92 will by its movement engage the lug 95 on collar 94, rocking it in the same direction, and, applying the brake 43 to the clutch drum 41, will stop the movement of the mechanism and of the press, and the parts will be held in this braked position as long as the lever is held in its "off" position.

The shaft 19 being of course driven at full speed and constant speed, the mechanism is now in position to be started. The latch on the lever 53 being released, the lever is moved from right to left. The pawl 56 immediately engages one of the teeth 51 on the ratchet 50, moving it contra-clock-wise in the figures, and rocking with it in the same direction the shaft 49 against the action of the spring 69. This movement first of all releases the pawl 92 from the lug 95, leaving the sleeve 94 free to be rocked by the spring 100 which immediately acts to rock the sleeve 94 and free the stopping brake 43 from the mechanism. The same movement of the lever begins to move the slide rod 78, but the parts are so spaced that the collar 84 does not immediately bear upon the fork 87 to throw the clutch members into engagement until after the slow speed position is passed. The rocking of the rock shaft 49, however, immediately begins to tighten the flexible brake band 24 and thus applies the brake 25 to the spider 22, holding the same against rotation. At the same time the lug 60 is lifted to a position permitting the arm 61 to move to its lowest position with the latch 63 dropping below the lug 60 and preventing the return of the rock shaft 49 by the operation of the spring 69 to its normal position until after the arm 61 is swung out again by the action of the cam on the further movement of the lever. When the lever 53 is thus held at the slow speed position, the pawl 56 is still in engagement with the teeth 51, but the lever has moved into such position that the lug 57 is just ready to act upon the arm 56^a of the pawl 56 so as to move it out of engagement with the ratchet teeth 51 upon the further movement of the lever 53. The stopping brake 43 being thus off, and the spider 22 being held against rotation by the brake 25, the mechanism and the press will be driven at the slow-speed in the manner hereinabove described, and will continue to so run until the further movement of the lever.

It now being desired to pass to the high speed, the lever is swung still farther to the left toward the position shown in the figures. The pin 57, as soon as the lever is swung out of slow-speed position, engaging the arm 56^a of the pawl 56, throws it out of engagement with the teeth 51, thus preventing further contra-clock-wise rocking of the rock shaft 49, which, however, is prevented by the engagement of the latch 63 with the lug 60 from itself being returned by the spring 69 to its normal position which would otherwise free the brake 25 from the spider 22. By this further movement of the lever, the spring-seated collar 84 coming into contact with the fork 87, rocks the lever 86 and throws the clutch members into engagement, causing the clutch drum 41 to gradually take the full speed of the driving shaft 19 and thus driving the mechanism and the press at full speed. As this full speed movement is taken up, and the mechanism is running by the engagement of the clutch members,

and just as a complete and tight engagement of the clutch members is being made, the cam 64 on the lower end of the lever 53 engaging the lower end of the arm 61, pushes it to one side, freeing the latch 63 from the lug 60. This permits the spring 69 to at once rock the shaft into normal position, freeing the brake 25 from the spider 22 and permitting it to take up the movement of the shaft 19. It will thus be seen that by a single movement of the lever from left to right, the stopping brake is thrown off, the slow speed mechanism is thrown into operative relation with the press, and that, as the movement of the lever continues the press is thrown into full speed before the slow speed mechanism is thrown out of operative relation. This, as has been pointed out, prevents the occurrence of a period of time between the throwing out of the slow speed and the throwing in of the high speed during which the press, running by its own momentum only, would slow down enough to cause breakages in the web when the high speed was thrown in.

I have shown in the drawings and described above hand-lever and rock shaft operated mechanism for throwing the slow speed mechanism into and out of operative relation with the driving gear and also mechanism for braking the press and loosening said brake, and these are the forms of mechanism which I prefer to use. Substantially these mechanisms, however, are shown and described in an application for Letters Patent heretofore filed by Joseph J. Walser, and the said details of the mechanism for operating the slow and high speed mechanisms are not my invention, and so far as my invention is concerned, other means may be used for operating the slow speed and high speed driving mechanisms of my invention.

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

1. In combination, a single driving shaft, a gear secured thereon, a driving gear rotatably mounted on said driving shaft, slow speed gearing carried on said driving shaft and driven by said first gear, connections between said slow speed gearing and said driving gear adapted to drive said driving gear in one direction, means for throwing said slow speed gearing into operative relation with said driving gear, a clutch member rotatably mounted on said driving shaft and rigidly connected with said driving gear, a second clutch member on said driving shaft and rotated thereby, and means for throwing said clutch members into engagement while said slow speed mechanism is still in operative relation with said driving gear.

2. In combination, a single driving shaft, a gear secured thereon, a driving gear rotatably mounted on said driving shaft, slow speed gearing carried on said driving shaft and driven by said first gear, pawl and ratchet connections between said slow speed gearing and said driving gear, a clutch member rotatably mounted on said driving shaft and rigidly connected with said driving gear, a second clutch member on said driving shaft and rotated thereby, and means for throwing said clutch members into engagement while said slow speed mechanism is still in operative relation with said driving gear.

3. In combination, a drive shaft, a driving gear rotatably mounted on said driving shaft, a gear keyed to said driving shaft, planetary gearing mounted on said driving shaft and adapted to be engaged with and to be driven by said fixed gear, pawl and ratchet connections between said planetary gearing and said driving gear, means for throwing said planetary gearing into operative relation with said driving gear, a clutch member on said driving gear, a second clutch member on said driving shaft, and means for throwing said clutch members into engagement while said slow speed mechanism is still in operative relation with said driving gear.

4. In combination, a driving shaft, a driving gear rotatably mounted on said shaft, a clutch member connected with said driving gear, a second clutch member mounted on said shaft and adapted to be moved into engagement with said first clutch member, a spider rotatably mounted on said shaft, stub-shafts journaled in said spider, gears mounted on said stub-shafts, gearing operatively connecting said shaft with the gears on said spider, gears carried on the other ends of said stub-shafts on said spider, an internal gear revolubly mounted on said driving shaft and adapted to be engaged by said last-mentioned gears, connections between said internal gear and said driving gear adapted to drive the same in one direction, a brake on said spider, means for applying the brake to said spider to hold the same against rotation and drive said driving gear at slow speed, and means for throwing said clutch members into engagement while said spider is still held against rotation.

5. In combination, a driving shaft, a driving gear rotatably mounted on said shaft, a clutch member connected with said driving gear, a second clutch member mounted on said shaft and adapted to be moved into engagement with said first clutch member, a spider rotatably mounted on said shaft, stub-shafts journaled in said spider, gears mounted on said stub-shafts, gearing operatively connecting said shaft with the gears on said spider, gears carried on the other

ends of said stub-shafts on said spider, an internal gear revolubly mounted on said driving shaft and adapted to be engaged by said last-mentioned gears, pawl and ratchet connections between said internal gear and said driving gear, a brake on said spider, means for applying the brake to said spider to hold the same against rotation and drive said driving gear at slow speed, and means for throwing said clutch members into engagement while said spider is still held against rotation.

6. In combination, a driving shaft, a driving gear rotatably mounted on said shaft, a clutch member connected with said driving gear, a second clutch member mounted on said shaft and adapted to be moved into engagement with said first clutch member, a spider rotatably mounted on said shaft, stub-shafts journaled in said spider, gears mounted on said stub-shafts, gearing operatively connecting said shaft with the gears on said spider, gears carried on the other ends of said stub-shafts on said spider, an internal gear revolubly mounted on said driving shaft and adapted to be engaged by said last-mentioned gears, pawl and ratchet connections between said internal gear and said driving gear, a brake on said spider, and lever operated mechanism adapted by the movement of the lever in one direction to successively apply said brake mechanism to said spider and hold the same against rotation, then by the further movement of said lever to throw said clutch members into engagement, and then when said clutch members are in engagement to release said brake.

7. In combination, a driving shaft, a driving gear rotatably mounted on said shaft, a clutch member connected with said driving gear, a second clutch member mounted on said shaft and adapted to be moved into engagement with said first clutch member, a spider rotatably mounted on said shaft, stub-shafts journaled in said spider, gearing operatively connecting said shaft with the gears on said spider, gears mounted on said stub shafts, gears carried on the other ends of said stub-shafts on said spider, an internal gear revolubly mounted on said driving shaft and adapted to be engaged by said last-mentioned gears, pawl and ratchet connections between said internal gear and said driving gear, a brake on said spider, lever-operated mechanism adapted by the movement of the lever in one direction to successively apply said brake mechanism to said spider and hold the same against rotation, then by the further movement of said lever to throw said clutch members into engagement, and then when said clutch members are in engagement to release said brake, and brake mechanism adapted to be applied to said clutch members to stop said driving gear.

HANS C. SCHROEDER.

Witnesses:
CHARLES E. PICKARD,
W. H. DE BUSK.