

Dec. 13, 1927.

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STARTING AND STOPPING DEVICE FOR MACHINES

Filed April 11, 1924

3 Sheets-Sheet 1

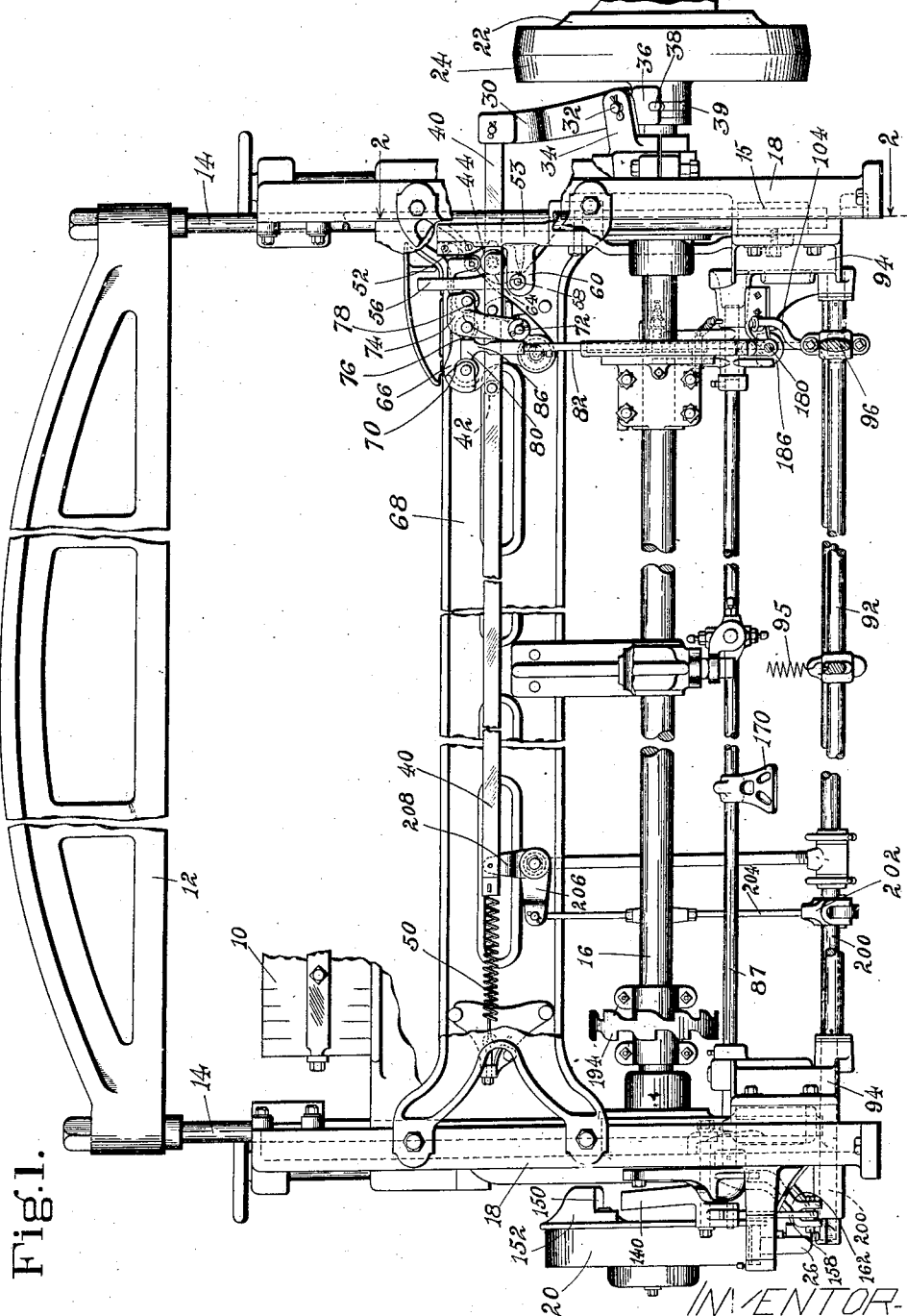


Fig. 1.

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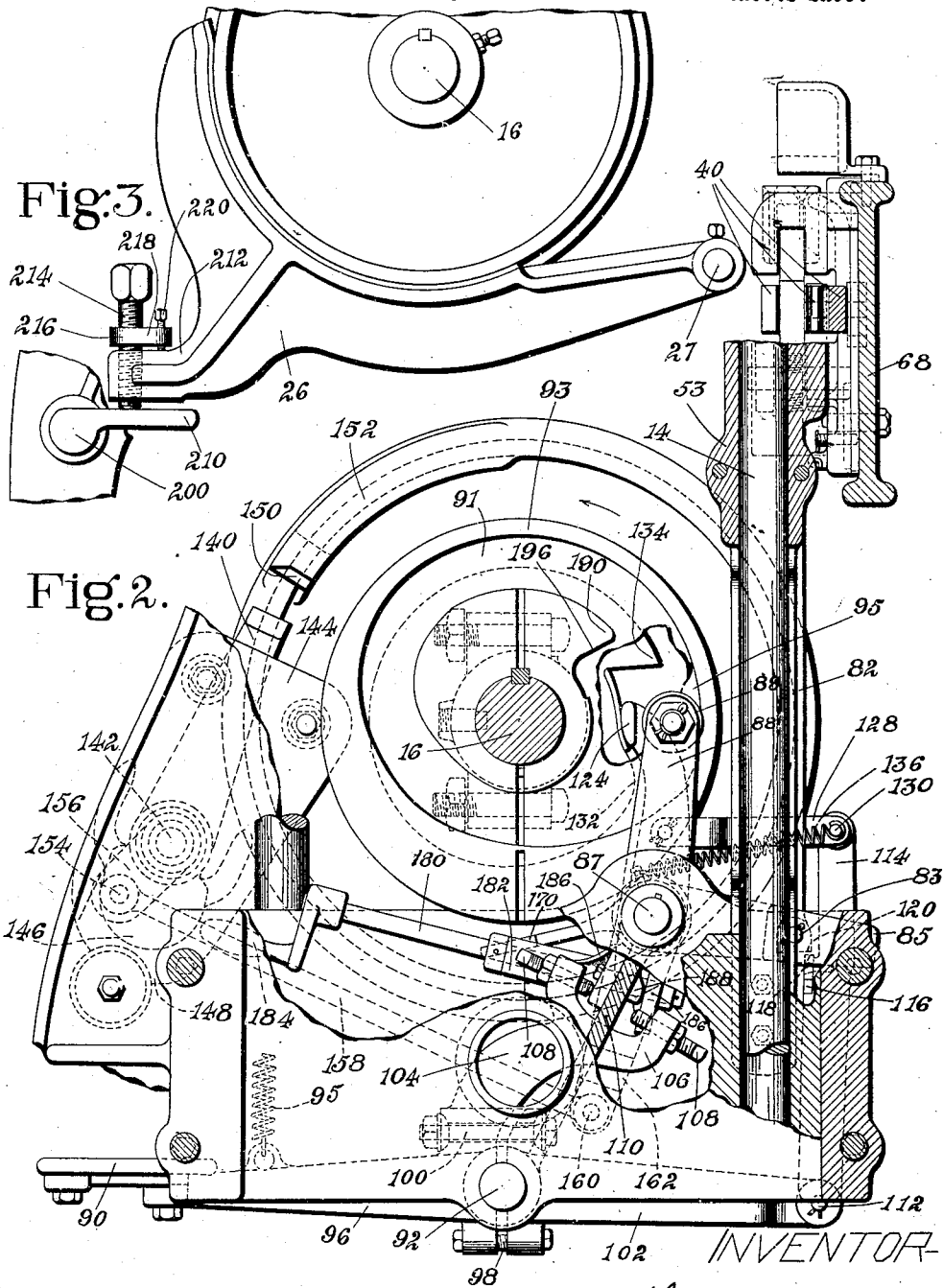
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3 Sheets-Sheet 3

Fig. 4.

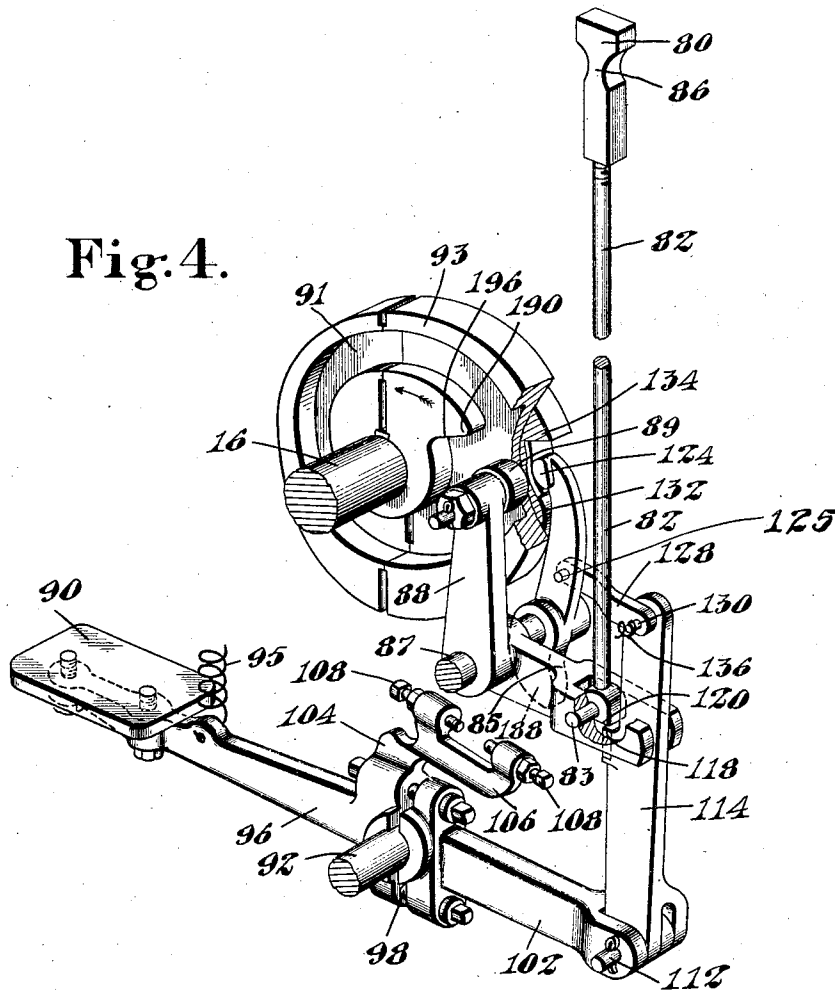
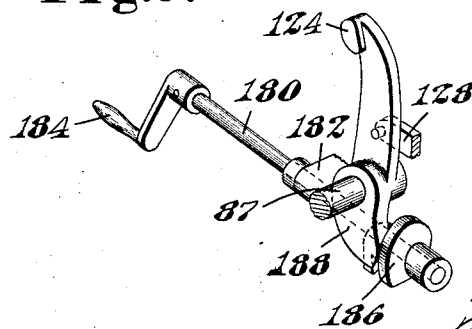


Fig. 5.



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Patented Dec. 13, 1927.

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STARTING AND STOPPING DEVICE FOR MACHINES.

Application filed April 11, 1924. Serial No. 705,952.

This invention relates to controlling means for machines and, more particularly, to such means as will serve as safety devices in connection with starting and stopping mechanisms of machines.

For the purposes of illustration the invention is disclosed in connection with a sole cutting machine which comprises characteristically a cutting block and a heavy beam movable toward and from the block to force a die through work supported on the block. While such machines have commonly been provided with a clutch of the one-revolution, non-repeating type and also with safety devices to prevent repetition of the operation of the machine except upon a further operation of the control member by the operator, a great deal of difficulty has been experienced in providing means that will positively insure against such repetition of the machine and the possibility of damage to the work or to the machine or of injury to the operator. The reason for this difficulty resides largely in the fact that such a machine is so constructed and arranged that the heavy beam must be brought to rest at the upper end of its path of movement. Hence, even a small tendency of the beam-driving shaft to overthrow is apt to result in a repetition of the operation since the heavy beam tends to exaggerate the overthrow of the shaft, thus facilitating a repetition of the cycle of operations.

In view of these facts, it is an object of the invention to provide improved means for safe-guarding the operator during the operation of a machine of the type referred to and for insuring against undesired or harmful operation of the machine, for example, while attempts are being made to adjust or replace any part or parts which are working improperly or which, for any other reason, need to be adjusted or replaced.

With this end in view and in accordance with one feature of the invention, such a machine is provided with means for automatically disconnecting the starting means from the clutching means in case of overthrow of the driving shaft to a predetermined extent. In this way the operator is

apprised of improper operation of the clutch or of the braking means, when depression of the treadle fails to secure an operation of the machine. The machine is also provided with means for preventing effective operation of the starting means in case the shaft should not complete its revolution. This might occur, for instance, as a result of a too forcible application of the brake following adjustment of the brake by an inexperienced or careless operator. Thus, failure of the starting means to operate after either an underthrow or overthrow of the shaft provides an effective way of preventing injury to the operator from undesirable operation of the machine while the operator is attempting to adjust or repair it or when for any other reason it is unsafe or disadvantageous for the machine to operate. Preferably, too, and as shown, improved means is provided for disconnecting the starting means from the clutch controlling means automatically in each cycle of operations so that the manually controllable starting member must be returned to initial position before the operator can regain control of his machine to cause a second or succeeding cycle of operations. In other words, depression of the treadle in the illustrated machine will be followed by only one cycle of operations irrespective of the length of time the treadle may be held in depressed position, it being necessary to release the treadle and permit it to rise to initial position in order to initiate another operation of the machine.

In order that the shaft may not overthrow beyond a predetermined point in case of slippage of the brake or even in case of failure of the brake through breakage or complete destruction thereof, there is provided a stop which is interposed at the proper time in the path of a shoulder projecting from and rigidly connected to the shaft so that upon contact of the shoulder with the stop the rotation of the shaft is terminated, this feature being shown and claimed in my copending application Serial No. 424,223, filed Nov. 15, 1920. Since this emergency stopping of the machine in the manner described may under

certain conditions result in prevention of control of the machine through the usual control member, improved means is provided for enabling the operator to regain control of the machine. Preferably and as shown this auxiliary controlling means comprises an auxiliary treadle which is so connected as to operate the same starting means normally operated by the main treadle or other manually operable controlling means. Unless the brake has been repaired in the meantime, operation of the machine through the auxiliary controlling means would result as before in the locking of the shaft after a predetermined amount of overthrow thereof. Hence, even with a careless or ignorant workman no overthrow of the shaft can take place to the extent of causing a repetition of the operative stroke of the beam, and thus injury to the operator and damage to the work are effectively prevented.

In the illustrated machine the starting and stopping means comprises a member having direct connections to operate the clutch on the shaft of the machine and a pair of cams movable during the upward and downward movements of the beam for positively moving the said member in opposite directions whereby the clutch is moved by power means unyieldingly into and out of operative position. By reason of the positive engagement of the clutch parts at the beginning of an operation of the machine, the work is properly performed and the parts of the machine retain correct relation to each other so that the beam reaches its normal high point at the termination of each cycle of operations. It will be readily understood that the positive disconnection of the clutch at a predetermined point in the upward movement of the beam contributes materially to proper operation of the machine, it being obvious that a lagging disconnection of the clutch would be likely to cause overthrow of the shaft. Preferably, and as shown, one of the cams is movable from operative to inoperative position to permit engagement of the clutch through a yielding connection, and in the reverse direction, by power means controlled from the shaft of the machine so that the cam is restored to operative condition sufficiently early in the cycle to insure its proper operation during upward movement of the beam to cause disconnection of the clutch in a positive manner.

In another aspect the invention resides in the provision, in connection with the starting means of machines, of a cam member having a movable and a fixed side operative to cause in a positive manner the unclutching of the shaft from the driving element, connections controlled from the shaft being operative to place the movable side of the cam member in operative position to cause disconnection of the clutch at the proper time.

In the construction shown, the movable side of the cam member is locked in operative position while the machine is at rest to hold a clutch controlling member in clutch disengaging position. When the movable side of the cam member is unlocked by means under the control of the operator the clutch controlling member is instantly operated by a spring, tensioned in the preceding cycle of the machine, to cause clutching of the driving element to the shaft. Since the operator must merely unlock the movable side of the cam member to cause starting of the machine the labor of operating the machine is reduced to a minimum.

Another feature of the invention is that which relates to means by which the operator may lock his machine against unauthorized operation during his absence, or while adjustment or repair is being made with respect to any part thereof, this means comprising in the construction shown a hand operated member movable to one position to disconnect the starting means from the treadle or other manually operable controlling means for the machine and movable to another position to restore such connection.

Other features of the invention and novel combinations of parts will be described in the specification and pointed out in the appended claims.

In the drawings,

Fig. 1 is a view in front elevation and partly in section of a sole cutting machine illustrating one embodiment of the invention;

Fig. 2 is a detail view partly in section along the line 2, 2 in Fig. 1;

Fig. 3 is a detail view of the brake mechanism.

Fig. 4 is a detail view of mechanism for controlling the clutch mechanism; and

Fig. 5 is a detail view of the treadle-releasing device.

In the illustrated machine, which is of the type known as a sole cutting machine, there is provided a cutting block one end of which is shown at 10 in Fig. 1. It is upon this block that the work is placed. Subsequently a die is located in proper relation to the work so as to be forced therethrough in the descent of a presser member such as that shown at 12. For operating the beam or presser member 12, rods 14 are rigidly connected thereto, one pair at each end of the beam, each pair of rods being connected at their lower ends by means of a yoke 15 having connections with an eccentric strap and eccentric (not shown) on a main shaft 16 of the machine. Preferably, and as shown, the shaft 16 which is mounted in bearings in end frames 18 of the machine has fastened fixedly thereto at one end a brake wheel 20, and at its other end a clutch part 22 in the form of a wheel cone. The shaft

16 also carries, adjacent to the cone member 22, a power pulley or other driving element 24 loosely mounted on the shaft for rotation thereon, it being understood that the driving element 24 may be driven from any suitable source of power. When the pulley is moved to the right in Fig. 1 and pressed against the cone member 22 the rotation of the pulley is communicated to the shaft 16 through the friction clutch formed by the conical surfaces on the cone 22 and on the pulley 24. On the contrary, when the pulley 24 is moved to the left in the said figure, it is disconnected from the cone member 22 and continues its rotation independently of the shaft which should promptly be brought to rest through the operation of a brake, of any well-known type, here shown as a brake shoe 26, pivoted at 27 to a rigid support, which co-operates with the curved braking surface of the brake wheel 20. Means is provided under the control of the operator for connecting and disconnecting the pulley 24 from the shaft 16. While the said means is under the control of the operator as to the time of operation, the construction and arrangement is preferably such that power means controlled from the shaft of the machine insures the operation of the starting and stopping means in a positive manner and at predetermined times, thereby contributing to efficiency and safety in the operation of the machine. As shown, the means for moving the power pulley 24 into and out of co-operative relation to the cone member 22 comprises a lever 30 pivoted at 32 to a bracket 34 extending outwardly from the frame of the machine, the lower end of the lever 30 having a yoke part 36 to embrace a hub portion of the power pulley 24 and to engage with studs 38 extending out from a ring 39 mounted for rotation in a groove in said hub portion, the arrangement being such that the lever 30 may shift the pulley 24 along the shaft 16 without interfering with the rotation of the pulley. Pivottally connected to the upper end of the lever 30 is a clutch controller member 40 consisting of two bars spaced from each other by spacing members, one of which is indicated at 42 and another at 44 in Fig. 1 of the drawings. Secured to the member 40 at the free end thereof is a spring 50, the other end of which is secured to a fixed portion of the frame of the machine, the spring being an extension spring, adjustable as to tension, which tends constantly to move the member 40 toward the left in Fig. 1 of the drawings to cause application of the clutch. When the member 40 is released through treadle-operated connections hereinafter described to the action of the spring 50, the clutch is thrown into operation and the shaft 16 immediately starts its revolution which results in the lowering of the beam 12 toward the cutting

block 10. Mounted to move with the beam 12 is a cam 52 which operates to engage the roll 44 carried by the member 40 whereby the said member is moved positively in a direction to cause firm engagement of the clutch parts, thereby insuring that the presser member will be moved to its lower point in its operation on the work and returned toward its upper position of rest before disconnection of the clutch takes place. As shown, cam 52 is carried by a bracket 53 rigidly mounted on one of the rods 14. It will be understood that if slippage between the clutch parts were permitted during cutting operations on the work the beam might not complete its operative stroke and that there would then be failure on the part of the machine to perform its work properly. By the inclusion of the cam 52 the efficiency of the machine is secured in a simple and effective manner.

The treadle-operated connections referred to in the foregoing description as operative to release the member 40 to the action of the spring 50 comprises, in the illustrated construction, a lever 56 pivoted at 58 to an arm 60 rigidly connected to the bracket 53 which is fixedly attached to one of the rods 14. As shown, this lever 56 is a holding or locking member and has a cam portion 64 adapted to contact with the roll 44 to hold the roll and the member 40 at the extreme limit of the positions reached by these parts in their movement toward the right in Fig. 1 during which the clutch parts are disconnected. Means is provided for operating the lever 56, comprising a cam having a fixed side and movable side. To this end, secured to a bracket 66, carried by one of the strengthening bars or girders 68 of the machine frame, is a roll 70 stationary in space but rotatable to serve as an antifriction member constituting the fixed wall of the cam. Pivoted at 72 upon the same bracket 66 is a lever 74 forming the movable side of the cam which carries an anti-friction roll 76 directly opposed to the roll 70. Preferably, the lever 74 carries a second roll 78 in a position to contact with the lever 56. In the construction shown an upper widened end 80 of a reciprocable rod 82 is normally positioned between the rolls 70 and 76, while the machine is at rest to operate as a latch or lock to cause the lever 74 to maintain the lever 56 in its vertical operative position, it being understood that while the lever 56 is in operative position the member 40 is maintained at the right end of its limit of movement in clutch disconnecting position. When the rod 82 is moved upwardly by connections to be described, the rolls 70 and 76 engage in the concavities at each side of the neck portion 86 of the rod 82 under the action of the spring 50 whereby the lever 56 is permitted to swing away from its vertical

operative position, thus releasing the roll 44 and the member 40 to movement under the operation of the spring 50. As before stated, this movement of the member 40 causes, through the lever 30, clutching of the members 22 and 24 whereby the machine is started in operation, the starting of the machine being followed almost instantly by the operation of the cam 52 as above described.

Means is provided in the illustrated machine for positively disconnecting the clutch at a predetermined point in the upward movement of the beam 12. This is conveniently accomplished by an arrangement through which the means for disconnecting the clutch is operated through a direct connection with the beam or with one of the rods 14 which are rigidly connected to and moved with the beam. In the illustrated machine the lever 56 with its cam 64 is utilized for the purpose of moving the member 40 positively in the clutch releasing direction. Since the lever 56 is mounted on the arm 60 of the bracket 53 which is rigidly attached to one of the rods 14, it is necessary only to restore the lever 56 to its vertical operative position in time for the proper operation of the cam 64 on the roll 44 during upward movement of the cam.

This is accomplished by moving the rod 82 downwardly at the proper time, thereby spreading apart the rolls 70, 76 and causing the lever 74 to operate on the lever 56 whereby the latter is restored to operative position. Preferably, and as shown, the described downward movement of the rod 82 is accomplished in a positive manner by means which will now be described.

Pivotally connected at 83 (Figs. 2 and 4) to the lower end of the rod 82 is one end of a forked lever arm 85, the said arm being rigidly connected to a shaft 87 extending longitudinally of the machine in parallel relation to the shaft 16 and mounted rotatably in bearings provided in the brackets 94. Also fixedly secured to the shaft 87 is an arm 88 carrying a roll 89 for movement along the cam groove 91 in the cam wheel 93. Upon inspection of Fig. 2 it will be seen that the cam groove 91 is broadened out very considerably along one portion of its course, as at 95, to permit free movement of the lever arm 88, this being necessary in order that the rod 82 may be moved upwardly freely to start the machine in operation, there being, as just described, an unyielding connection between the rod 82 and the arm 88. As will be hereinafter described, the rod 82 is disconnected from its initial actuating means directly after the rotation of the shaft 16 begins. Shortly after this takes place the roll 89 moves into the restricted part of the cam path 91 whereby the roll is moved away from the center of the cam 93, thus causing rocking of the shaft 87 in a direction to depress the rod 82. Hence, the rod 82 is pulled downwardly in a positive manner, thereby spreading the rolls 70, 76 restoring the lever 56 to operative position. Since this occurs, as already stated, early in the revolution of the shaft and of the cam wheel 93, but after the cam 64 on the lever 56 has been carried down below the roll 44, the cam 64 is in position to engage the roll 44 on the clutch controlling member 40 on upward movement of the beam to move the member 40 toward the right in Fig. 1 whereby the clutch is disengaged by power means unyieldingly actuated for the purpose of insuring disconnection of the clutch at a predetermined point in the upward movement of the beam 12.

In order that the operator may exercise control of the machine, manually operable means is provided for the purpose which, in the illustrated construction, comprises a treadle 90 (Figs. 2 and 3) fixedly secured to a shaft 92 extending longitudinally of the machine and rotatably mounted in bearings at each end furnished by brackets 94 fixedly attached to the end frames 18 of the machine. The treadle is held normally in raised position by a spring 95. Preferably, one of the arms 96 which secures the treadle 90 to the shaft 92 is secured to the shaft by means of adjustable bolts 98, 100 which connect the arm 96 to a second arm 102 extending rearwardly from the shaft 92. It will be understood that by proper manipulation of the bolts 98 and 100 the inclination of the arm 102 with respect to the arm 96 may be changed at will and the arms secured fixedly in adjusted relation. Fixedly secured to the shaft 92 or to the arm 96 is a bracket 104 provided with a forked portion of two arms 106, each carrying a set screw 108 for contact with a bracket extension 110 rigid with one of the brackets 94, whereby up and down movements of the treadle 90 have fixed limits set thereto, it being possible, however, to vary the treadle movements as determined by these or similar limits through proper manipulation of the set screws 108 in each of the arms 106. Pivotally connected at 112 to the rear end of the adjustable arm 102 is a link 114 which is provided at a point intermediate between its ends with a plate 116 which provides a shoulder 118 for engagement with a corresponding shoulder 120 on the rod 82, it being clear that when the treadle 90 is depressed the link 114 is elevated to lift the rod 82. Adjustment of the arm 102 with respect to the treadle is made after the treadle has been adjusted by set screws 108 to suit the operator, the extent of adjustment of arm 102 being such that the rod 82 is lifted high enough on depression of the treadle to bring the concavities at the neck portion 86 of the rod 82 opposite to the rolls 70, 76 thereby

5 permitting the cam lever 56 to move to inoperative position so that the member 40 is instantly moved by the spring 50, thus causing the clutch members 22, 24 to contact with each other to start the machine in operation.

10 Preferably, and as shown, the arrangement of the starting means is such that the treadle must be released and allowed to return to initial position before the operator can initiate a second operation of the machine. For accomplishing this result there is provided in the construction shown a lever 124 pivotally mounted on the oscillatory shaft 87. Pivoted to the lever 124 at a point 125 (Fig. 4) intermediate between the ends thereof is a link 128, the outer end of which is pivoted at 130 to the upper end of the link 114. Almost immediately after the starting of the rotation of the main shaft 16 upon actuation of the clutch, the lever 124 is operated by the cam 132 to move the link 114 in a direction to disengage the shoulder 118 on the link from the corresponding shoulder 120 on the rod 82. In this way the treadle is disconnected from the rest of the starting means, that is, from the rod 82 and the parts controlled thereby, thus making it necessary for the operator to release the treadle before the shoulders 118 and 120 can be caused to reengage as a preliminary to another cycle of the machine. Practically at the end of the rotation of the shaft 16 the upper end of the lever 124 drops off of the high point 134 of the cam 132, thereby permitting a spring 136 to return the link 114 with its shoulder 118 thereon in a direction to cause alinement of the shoulder with the shoulder 120 on the rod 82 when the treadle is released.

40 Means is preferably provided for locking the shaft 16 against overthrow in case of failure of the brake 26 due to breakage of the brake or insufficiency thereof from any cause whatever, the said means comprising, in the construction shown, a stop 140 pivoted upon a stud 142 fixed to a plate 144 bolted to the frame of the machine, the stop 140 having a portion or extension 146 extending on the lower side of the pivot stud 142 into a heavy curved seat member 148 adapted to form a strong support for the stop 140. For co-operation with the stop 140 there is provided a shoulder 150 on a projection 152 from the brake wheel 20 (Figs. 1 and 2). As before stated, this stop feature is described and claimed in applicant's copending application Serial No. 424,223 filed Nov. 15, 1920. Pivoted at 154 to a projection 156 on the stop 140 at the other side of the pivot point 142 thereof is a link 158 pivoted at its other end at 160 to an arm 162 which is rigid with the shaft 87. Hence, when the treadle 90 is depressed to initiate a cycle of operations of the machine the

stop 140 is at the same time withdrawn from the path of the shoulder 150 so as to interpose no obstruction to the rotation of the shaft 16. Should the brake completely fail to operate, the shaft 16 will overthrow until it brings the shoulder 150 into contact with the upper end of the stop 140, whereby repetition of the cycle is prevented and the operator saved from the possibility of injury. In this event, the cam 132 will operate the lever 124 in such manner as to disconnect the treadle 90 from the rod 82, thereby preventing the starting of the machine in the usual manner. After the brake has been adjusted or repaired the operator may regain control of his machine by tripping the clutch through an auxiliary treadle 170 fixedly secured to the shaft 87. As already described, the arm 85 is fixedly secured to the shaft 87, the arm being pivoted at 83 to the lower end of the rod 82. Since this arm 85 is extending rearwardly from the shaft 87 while the auxiliary treadle 170 extends forwardly therefrom, it will be clear that depression of the treadle 170 results in the elevation of the arm 85 in a direction to cause tripping of the starting means through the upward movement of the rod 82 in the manner already described.

55 Preferably, the machine is provided with means which may be utilized by the operator for preventing accidental operation of the machine during repairs or unauthorized use of his machine in his absence. As shown, this means takes the form of a provision for disconnecting the treadle from the starting rod 82 so that even if the treadle be depressed the machine will not be started in operation. The said means comprises, in the illustrated machine, a rotary shaft 180 supported in a bearing 182 carried by a bracket extension rigid with bracket 94 at one end of the machine. At the outer end of the rod 180 is a handle 184 and at the other end of the rod 180 is a screw cam member 186 so arranged as to engage on one side of the tail 188 of the lever 124 so that upon a half rotation of the rod 180 the lever 124 is rocked to the right in Fig. 2 to cause disconnection, in the manner already described, of the shoulder 118 with respect to the shoulder 120 on the rod 82, thus making it impossible for any one to start the machine upon depressing the treadle 90.

60 Means is preferably provided for warning the operator in case of imperfect operation of the clutch or of the brake. Since defects of this character in operation would at once manifest themselves in underthrow or overthrow of the shaft, advantage is taken of this displacement of the normal position of the shaft at the end of the cycle of operations to effect a change in the starting means, rendering it inoperative to start the machine in operation upon depression of the

treadle in the usual manner. Hence, when the operator finds that he cannot start his machine he is in this way warned of a dislocation in the function of some part or parts of the machine which must be corrected before the machine can be operated as usual. While the lever 124 is utilized as already described for the purpose of disconnecting the treadle from the starting means early in each cycle of the machine so that the treadle must be released by the operator before the starting means can again be tripped, this lever 124 is conveniently used to co-operate with other elements to provide the means for throwing the machine out of operation in case of overthrow or underthrow of the shaft. Following a predetermined amount of overthrow of the shaft 16 which is relatively small in amount and less than the distance between the shoulder 150 and the stop 140 when the parts are in the normal position of rest as shown in Figure 2, the cam 132 will operate upon the lever 124 to move the treadle link 114 into disconnected relation with respect to the rod 82 of the starting means. Hence, if the brake 26 is ineffective for any reason so as to permit overthrow of the shaft 16 the operator will find it impossible to start his machine after such an overthrow of the shaft even though it has not been sufficient to cause the shoulder 150 to contact with the locking stop 140. The operator will be forced to adjust his brake which is easily accomplished in the manner that will be presently described. Following the tightening of the brake by an inexperienced or careless operator it is possible that the shaft will not complete its rotation, in which case the roll 89 of the lever 88 may be resting above the point 190 in the cam groove 91, with the starting treadle locked against depression. The operator upon examining his machine would discover the situation and would be very likely to attempt to complete the rotation of the shaft 16 by using a hand lever which may be temporarily engaged with the stepped wheel 194 (Fig. 1) on the shaft 16. By this means he is enabled to turn the shaft so that the roll 89 comes to occupy the broadened portion 95 of the cam groove 91. The treadle may now be depressed whereas, while the roll 89 of the lever 88 was above the point 190, the treadle was locked against depression. However, while the roll 89 was above the point 190 and in the cam groove 91, the lever 124 was at the same time above the point 134 on the cam 132 so that the clutch actuating means stood disconnected from the starting means. Even if the shaft had turned far enough for the roll 89 to engage with the outer end portion of the surface 196 below the point 190 so that the treadle could be partly depressed, forcing the roll along a portion of the surface 196, still the treadle would be inoperative to operate the starting means since the high point 134 of the cam 132 is to the rear of the high point 190 in the cam path 91, and hence the lever 124 is held out in such position as to disconnect the treadle from the starting means as represented by the rod 82. Here again, if the operator attempts to adjust the shaft by means of a hand lever engaged with the stepped wheel 194, the machine will not at once start into operation as it would if the attempted starting of the machine by depressing the treadle had been effective to lift the rod 82. It will be obvious that an unexpected operation of the machine while the operator had the hand bar in the stepped wheel 194 might result in serious injury to the operator. To correct the condition the operator must loosen up to an extent the overtightened brake 26 so that the shaft 16 will stop in the normal position shown in Fig. 2 of the drawings where the roll 89 of the lever 88 is in the broadened part 95 of the cam groove 91. It will be clear then, that the relationship between the roll 89 of the lever 88 and the end of the lever 124 with respect to the relatively displaced high points 190, 134 of the cams which operate the two levers 88 and 124 is an important one designed to insure protection to the inexperienced operator or repair man when it becomes necessary to adjust the brake or clutch or other part to secure perfect working of the machine and effective control thereof through the treadle.

Mounted in the end frames 18 in bearings provided for the purpose is a shaft 200 (Fig. 1) which is to the rear of the shaft 92. Fixedly secured to the shaft 200 is an arm 202 to which is pivoted at its outer end a rod 204, the upper end of which is in turn pivoted to the bell crank 206, the other arm 208 of which is pivotally secured to the adjacent end of the bar 40. The bell crank 206 serves also as a support for one end of the controlling member 40 the other end of which is slidably mounted in a guideway in the end frame 18. As shown in Figs. 1 and 3, the end of the shaft 200 is extended through one of the end frames 18 so as to be in position to operate the brake 26 through an arm 210 rigid with the shaft 200. Preferably, the connection between the brake 26 and the arm 200 is established by means comprising an extension 212 rigid with the brake 26 and provided with an interiorly screw threaded opening for a screw threaded bolt 214 which is adjustable in the extension 212 to engage the arm 210. Threaded on the bolt 214 is a clamping plate 216 having an extension 218 in which is a set screw 220 adapted to be adjusted to engage the adjacent surface of the extension 212, the purpose of the set screw 220 being to cause a clamping tension of the plate 216

with respect to the bolt 214 to hold the latter in adjusted position. When it is desired to adjust the bolt 214 with respect to the arm 210 only one wrench is necessary and that is used to engage the head of the bolt to turn the latter as may be desired, since the clamping plate 216 is not affected by turning movement of the bolt but retains its clamping relation to the bolt, whatever the adjustment of the latter.

Through the connections just described, including the bell crank 206, it will be clear that the bar 40 controls the application of the brake in a positive manner, the connections between the bar and the brake being unyielding so that the brake is pressed with the requisite firmness against the brake wheel 20.

It is believed that the operation of the machine will be easily understood from the foregoing description. However, it may be desirable to provide a brief summary of the operations of the important parts of the machine, particularly those that relate to ease in operating the machine and to the safety of the operator while the machine is operating properly and also when it is operating improperly. When the operator steps on the treadle 90 the rod 82 is moved upwardly until the rolls 70, 76 engage in the concavities at the neck portion 86 of the rod 82, thus permitting the spring 50 to move the bar 40 to the left in Fig. 1 whereby the machine is started in operation. It will be clear that the power for throwing in the clutch is furnished by the spring 50 and that all the operator has to do is to exert sufficient force to lift the rod 82 and hence that the effort required of the operator is reduced to a minimum. As pointed out in the foregoing description the positive engagement of the clutch and its disengagement at the end of the cycle are controlled by cams connected to and movable with the beam of the machine so that the timing of these operations is related definitely to the movements of the beam, thus contributing materially to proper operation of the machine. Should the main shaft overthrow for any reason whatever the operator will be warned when this overthrow has taken place to a predetermined extent by failure of the treadle to start the machine when it has been depressed in the usual manner. The operator may then adjust the brake by the means provided for the purpose and in attempting to secure proper adjustment he is protected from an unexpected operation of the machine through the operation of means designed to render the starting means inoperative, the said means residing in part in the relationship between the high points of the cams at 134 and 190 respectively in their relation to each other and to the le-

vers controlled by them, as has been pointed out in detail in the foregoing description. Through the emergency treadle 170 the operator may regain control of the machine in case the main treadle 90 is locked against operation. Furthermore, through the handle 184 the machine may be locked against unauthorized use while the operator is away, thus preventing trifling with the machine in such a way as to put it out of order or to cause some unexpected operation when work is resumed by the regular operator.

Having described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In a machine of the character described, a shaft, a power pulley mounted on the shaft for rotation thereon, a clutch for operatively connecting the pulley to the shaft, a controller member for causing clutching and unclutching of the power pulley, a cam for locking the control member in unclutching position, means under control of the operator for moving the cam to inoperative position, and a second cam for moving the controller member to cause positively disconnection of the clutch to terminate a cycle of operations of the machine.

2. In a machine of the character described, a work supporting bed, a beam movable toward and from the bed in pressure applying operations, a shaft, connections between the shaft and the beam for causing reciprocations of the latter, a power pulley mounted for rotation on the shaft, a controller member for causing clutching and unclutching of the power pulley to the shaft, means operated in timed relation to the downward movement of the beam for causing in a positive manner clutching of the power pulley to the shaft through said controller member and, a cam operated in a positive manner at a predetermined point in the upward movement of the beam for operating on the controller member to cause disconnection of the pulley from the shaft.

3. In a machine of the character described, a work supporting bed, a beam movable toward and from the bed in pressure applying operations, a shaft, connections between the shaft and the beam for causing reciprocations of the latter, a power pulley mounted for rotation on the shaft, a controller member for causing clutching of the power pulley to the shaft, a cam member connected to move with the beam for operating on the clutch controlling member during downward movement of the beam to insure firm clutching of the power pulley to the shaft, and a second cam also connected to move with the beam and arranged to operate on the clutch controller member to insure disconnection of the clutch at a predetermined point in the upward movement of the beam.

4. In a machine of the character described, a shaft, a power pulley mounted for rotation on the shaft, a clutch for connecting the power pulley to the shaft, a clutch controlling member, a spring constantly tending to move said member in a direction to cause clutching of the pulley to the shaft, a cam having a movable side under the control of the operator for locking said member against the action of the spring, the arrangement being such that upon movement of the movable side to inoperative position the spring becomes operative to cause clutching of the pulley to the shaft, and an automatically actuated member for returning the movable side of the cam to locking position.
5. In a machine of the character described, a shaft, a power pulley mounted for rotation on the shaft, a clutch for connecting the power pulley to the shaft, a clutch controlling member, a spring constantly tending to move said member in a direction to cause clutching of the pulley to the shaft, a cam under the control of the operator for locking said member against the action of the spring, the arrangement being such that upon movement of the locking cam to inoperative position the spring becomes operative to cause clutching of the pulley to the shaft, and power means for causing clutching of the power pulley to the shaft following initiation of the clutching operation by said spring.
6. In a machine of the character described, a shaft, a power pulley mounted for rotation on the shaft, a clutch for operatively connecting the pulley to the shaft, a clutch controlling member, a spring constantly tending to move said member in clutching direction, a member for holding the controlling member against operation by the spring, a lock under the control of the operator for locking the holding member in operative position, release of the holding member permitting the spring to operate on the controlling member to initiate operation of the clutch, power means for insuring firm engagement of the clutch parts following the operation of the spring, and power means comprising the holding member for causing disengagement of the power pulley with respect to the shaft at a predetermined point in the rotation of the latter.
7. In a machine of the character described, a shaft, a power pulley mounted for rotation on the shaft, a clutch for operatively connecting the pulley to the shaft, a clutch controlling member, a spring constantly tending to move the member in a clutch operating direction, a cam operative to insure firm clutching engagement of the pulley with respect to the shaft through a positive engagement with the controlling member, and a cam arranged to be locked to hold the controlling member against the operation of the spring, the last mentioned cam being movable in one direction to release the member to the operation of the spring and movable in the opposite direction to serve as a means for causing, in a positive manner, disconnection of the pulley from the shaft.
8. In a machine of the character described, a shaft, a power pulley mounted for rotation on the shaft, a clutch for operatively connecting the pulley to the shaft, a clutch controlling member, a spring constantly tending to move the controlling member in a direction to cause clutching of the pulley to the shaft, a cam having two walls facing in opposite directions, one wall of the cam being movable to inoperative position to release the clutch controlling member to the operation of the spring, and means for causing operation of the cam at a predetermined point in the rotation of the shaft, both walls of the cam being operative for causing positive movement of the clutch controlling member whereby the clutch may be caused in a positive manner to disengage the power pulley with the shaft.
9. In a machine of the character described, a shaft, a power pulley mounted for rotation on the shaft, a clutch for operatively connecting the pulley to the shaft, a clutch controlling member, a spring constantly tending to move the clutch controlling member in a direction to cause clutching of the pulley to the shaft, a cam member operative under power to cause in a positive manner disconnection of the clutch, means for locking the cam member in operative position, and means under the control of the operator for unlocking the cam member, the arrangement being such that upon unlocking the cam member the clutch controlling member becomes operative by said spring to cause clutching of the pulley to the shaft.
10. In a machine of the character described, a shaft, a power pulley mounted for rotation on the shaft, a clutch for operatively connecting the pulley to the shaft, a clutch controlling member movable in opposite directions to cause clutching and unclutching of the pulley with respect to the shaft, a spring constantly tending to move the controlling member in one direction, a cam member operative to move the clutch controlling member in the opposite direction from the spring, said cam member being movably mounted to release the controlling member to the operation of the spring, a lock for holding the cam member in operative position, and a member under the control of the operator for releasing the lock, thus initiating operation of the controlling member by said spring.
11. In a machine of the character described, a shaft, a power pulley mounted for rotation on the shaft, a clutch for operatively connecting a pulley to the shaft, a

clutch controlling member, a manually operable member for initiating clutching of the pulley to the shaft, a connection between the manually operable member and the clutch controlling member, adapted to be actuated by the manually operable member to cause clutching of the pulley to the shaft, means for disengaging the manually operable means from the connection shortly after the shaft starts to rotate after the clutching of the pulley thereto, said means being power operated to insure that the manually operable member must be returned to initial position in order to regain control of the clutch controlling member, and power operated means for actuating the connection to cause unclutching of the pulley from the shaft.

12. In a machine of the character described, a shaft, a power pulley mounted for rotation on the shaft, a clutch for operatively connecting a pulley to the shaft, a clutch controlling member, a manually operable member for initiating clutching of the pulley to the shaft, a connection between the manually operable member and the clutch controlling member, and means for causing disconnection of the manually operable member with respect to the clutch controlling member comprising a lever having a link connected with said connection, a cam on the shaft for operating the lever at a predetermined point in the rotation of the shaft whereby the manually controllable member must be returned to initial position to regain control of the clutch, and a second cam on the shaft for operating the controlling member to disconnect the pulley from the shaft at the termination of the cycle of operations of the machine.

13. In a machine of the character described, a shaft, a power pulley mounted for rotation on the shaft, a clutch for operatively connecting the pulley to the shaft, starting means comprising a manually controllable member for causing clutching of the pulley to the shaft, a lock for preventing overthrow of the shaft beyond a predetermined amount, said lock having a connection with the manually controllable member for rendering the lock inoperative upon actuation of the manually controllable member, and an auxiliary controlling member arranged for operation by the operator to cause clutching of the pulley to the shaft in case the manually controllable member is rendered inoperative to start the machine.

14. In a machine of the character described, a shaft, a pulley mounted for rotation on the shaft, a clutch for operatively connecting the pulley to the shaft, a clutch control member, a manually controllable member for operating the clutch control member to cause engagement of the clutch, means for rendering the manually controllable member

ineffective when the shaft overthrows to a predetermined extent, and an auxiliary member which may be utilized by the operator to operate said clutch control member when the manually controllable member becomes ineffective.

15. In a machine of the character described, a shaft, a pulley mounted for rotation on the shaft, a clutch for operatively connecting the pulley to the shaft, a treadle for causing clutching of the pulley to the shaft, a clutch controlling member, a connection between the treadle and the clutch controlling member, members operative when the shaft overthrows a predetermined amount for rendering said connection ineffective, a second treadle, and connections between the second treadle and the first-mentioned connection whereby the second treadle may be used to cause clutching of the pulley to the shaft.

16. In a machine of the character described, a shaft, a pulley mounted for rotation on the shaft, a clutch for operatively connecting the pulley to the shaft, a treadle for causing clutching of the pulley to the shaft, a connection between the treadle and the clutch comprising a reciprocable member, a link connected to the treadle and operatively connected with said reciprocable member, and a hand operated member for moving the link to inoperative position and locking it in such position so that the treadle is inoperative to cause clutching of the pulley to the shaft.

17. In a machine of the character described, a shaft, a pulley mounted for rotation on the shaft, a clutch for operatively connecting the pulley to the shaft, a manually operable control member, connections between the member and the clutch for causing movement of the latter to clutching position, means for rendering the control member ineffective under certain conditions of operation of the machine, and an auxiliary control member having connections to the clutch which may be utilized when the first-mentioned control member becomes ineffective.

18. In a machine of the character described, a shaft, a pulley mounted for rotation on the shaft, a clutch for operatively connecting the pulley to the shaft, a manually controllable member normally operable for causing clutching of the pulley to the shaft, a connection between the member and the clutch, and a hand operated member for disengaging the manually controllable member from the connection and for locking it in such condition so that the manually controllable member is inoperative to cause clutching of the pulley to the shaft, the hand operated member being adapted to be rendered ineffective for actuating the connection during the operation of the machine.

19. In a machine of the character de-

scribed, a shaft, a power pulley mounted for rotation on the shaft, a clutch for operatively connecting the pulley to the shaft, a clutch controlling member, a spring constantly tending to move the member in a clutch operating direction, a cam arranged to be locked to hold the controlling member against the operation of the spring, a lock for the cam, and means for releasing the lock so that the cam is movable in one direction to release the member to the operation of the spring, thereby causing clutching of the pulley to the shaft, the cam being movable in the opposite direction to serve as a means for returning the member to clutch disengaging position.

20. In a machine of the character described, a shaft, a power pulley mounted for rotation on the shaft, a clutch for operatively connecting the pulley to the shaft, a clutch controlling member, a spring constantly tending to move the controlling member in a direction to cause clutching of the pulley to the shaft, a cam having two walls facing in opposite directions for causing positive movement of the clutch controlling member whereby the clutch may be caused in a positive manner to disengage the power pulley with the shaft, one wall of the cam being movable to inoperative position to release the clutch controlling member to the operation of the spring, a lock operative to hold the movable wall against movement whereby the clutch controlling member is held in clutch disengaging position, and means under the control of the operator for moving the lock to inoperative position thereby starting the machine in operation.

21. In a machine of the character described, a shaft, a pulley mounted for rotation on the shaft, a clutch for operatively connecting the pulley to the shaft, starting means for controlling the clutch comprising a manually operable member, a cam on the shaft, and a lever controlled by the cam for causing disconnection between the manually operable member and the rest of the starting means upon a predetermined amount of overthrow of the shaft.

22. In a machine of the character described, a shaft, a pulley mounted for rotation on the shaft, a clutch for operatively connecting the pulley to the shaft, starting means for controlling the clutch, and means for disconnecting the starting means from the clutch in case the shaft has overthrown to a predetermined extent.

23. In a machine of the character described, a shaft, a pulley mounted for rotation on the shaft, a clutch for operatively connecting the pulley to the shaft, starting means for controlling the operation of the clutch, means for preventing effective operation of the starting means in case the

shaft fails to make a complete revolution due, for instance, to excessive application of the brake, and means for preventing effective operation of the starting means in case the shaft overthrows to a predetermined extent.

24. In a machine of the character described, a shaft, a pulley mounted for rotation on the shaft, a clutch for operatively connecting the pulley to the shaft, starting means for controlling the clutch comprising a manually operable member, a cam fixed on the shaft, a lever arranged to be operated by the cam, and latching means controlled by the lever for preventing operation of the starting means by the manually operable member following a predetermined amount of overthrow of the shaft.

24. In a machine of the character described, a shaft, a pulley mounted for rotation on the shaft, a clutch for operatively connecting the pulley to the shaft, starting means, comprising connectible and disconnectible members, for controlling the clutch, a lock for preventing overthrow of the shaft beyond a predetermined amount, and means for causing disconnection of the starting members to prevent effective operation of the starting means in case the shaft has overthrown to the extent of engaging the lock.

26. In a machine of the character described, a shaft, a pulley mounted for rotation on the shaft, a clutch for operatively connecting the pulley to the shaft, starting means comprising a manually operable member for controlling the operation of the clutch, and a lever controlled by the shaft for causing disconnection of the manually operable member and thus preventing effective operation of the starting means in case the shaft fails to make a complete revolution due, for instance, to excessive application of the brake.

27. In a machine of the character described, a shaft, a pulley mounted for rotation on the shaft, a clutch for operatively connecting the pulley to the shaft, a lock for preventing overthrow of the shaft beyond a predetermined amount, a cam and lever for controlling the lock, and a cam and lever so related to the first cam and lever as to be operative for preventing operation of the clutch when the shaft overthrows sufficiently to contact with the lock to stop the shaft.

28. In a machine of the character described, a shaft, a power pulley mounted on the shaft for rotation thereon, a clutch for operatively connecting the pulley to the shaft, a controller member for causing clutching and unclutching of the power pulley, a cam for moving the controller member to cause positively disconnection of the clutch to terminate a cycle of operation of the machine, means for connecting the cam

to the controller member, and a manually operable member having connections for controlling said means.

29. In a machine of the character described, a shaft, a pulley mounted for rotation on the shaft, a clutch for operatively connecting the pulley to the shaft, starting means for controlling the operation of the

clutch, and means for preventing effective operation of the starting means in case the shaft stops short of making a complete revolution.

In testimony whereof I have signed my name to this specification.

MILTON H. BALLARD.