June 19, 1923. 1,459,435

H. J. BOE ET AL

STOP MECHANISM

Filed April 16, 1920 3 Sheets-Sheet 1

Fig. 1.

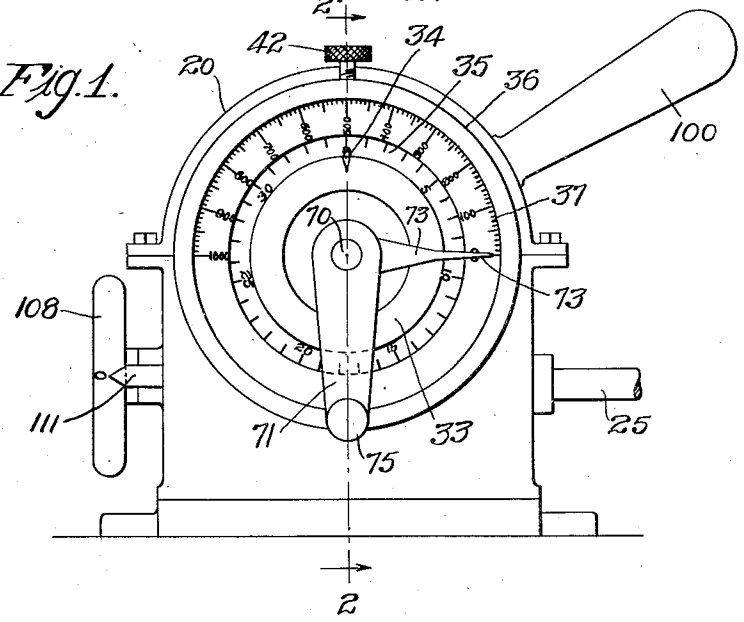
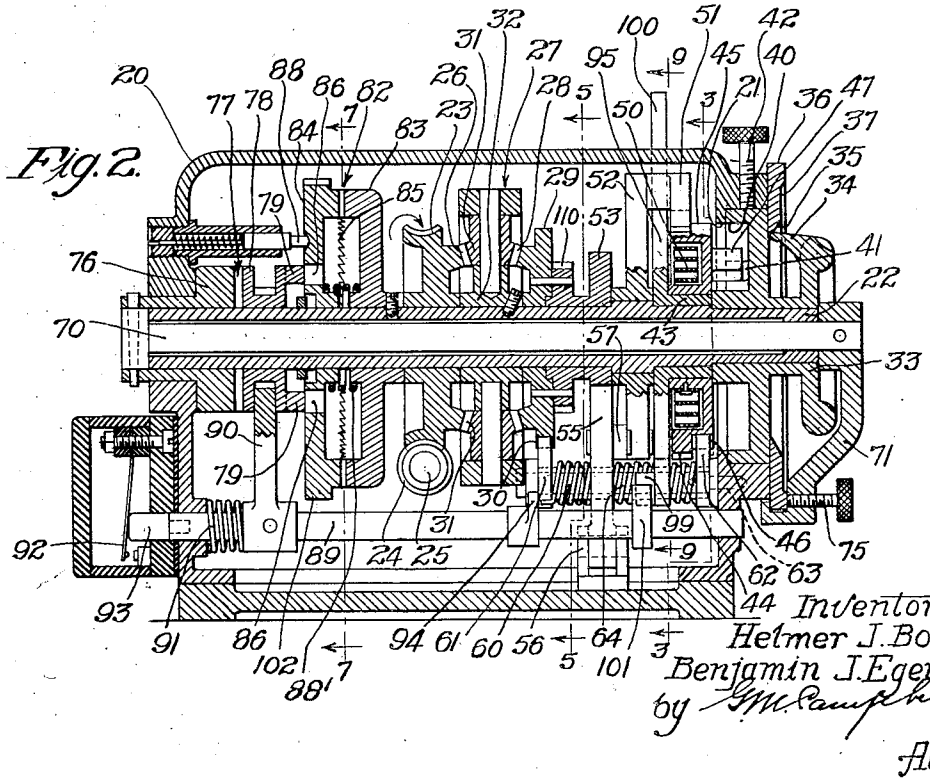


Fig. 2.



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H. J. BOE ET AL

STOP MECHANISM

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Fig. 3.

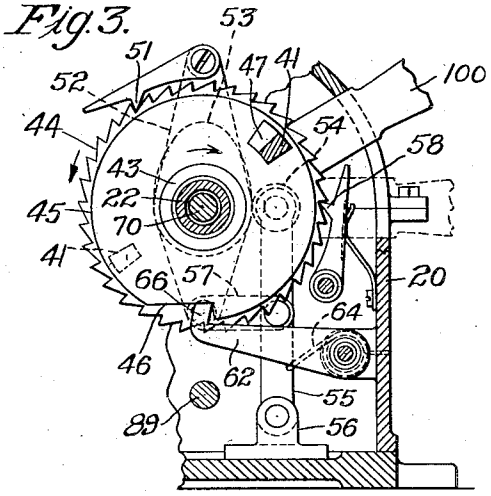


Fig. 4.

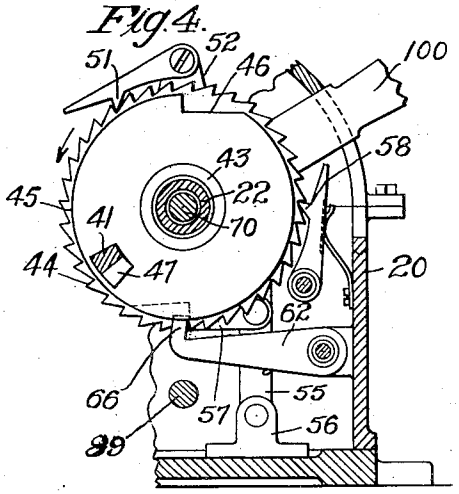


Fig. 5.

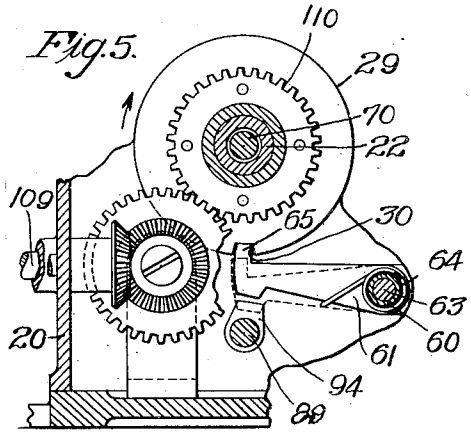


Fig. 6.

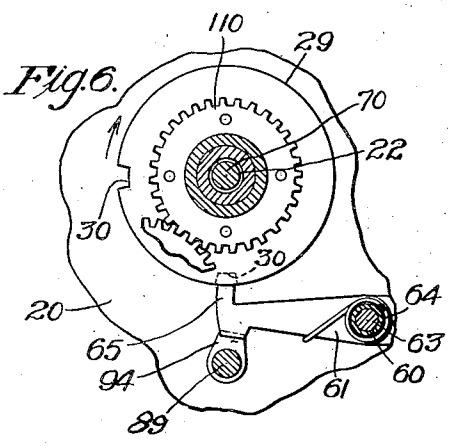


Fig. 7.

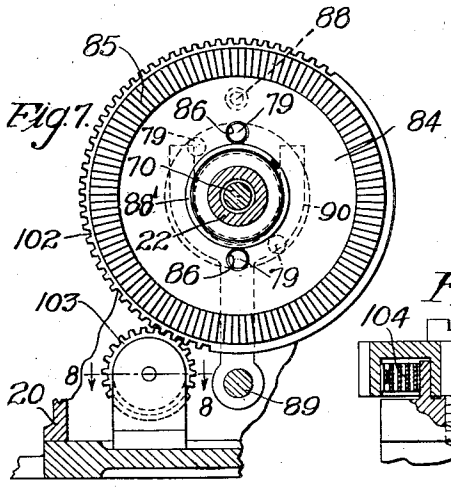


Fig. 8.

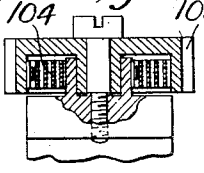
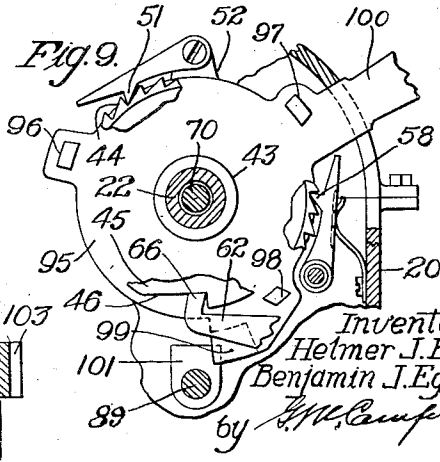


Fig. 9.



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Atty.

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H. J. BOE ET AL

STOP MECHANISM

Filed April 16, 1920 3 Sheets-Sheet 3

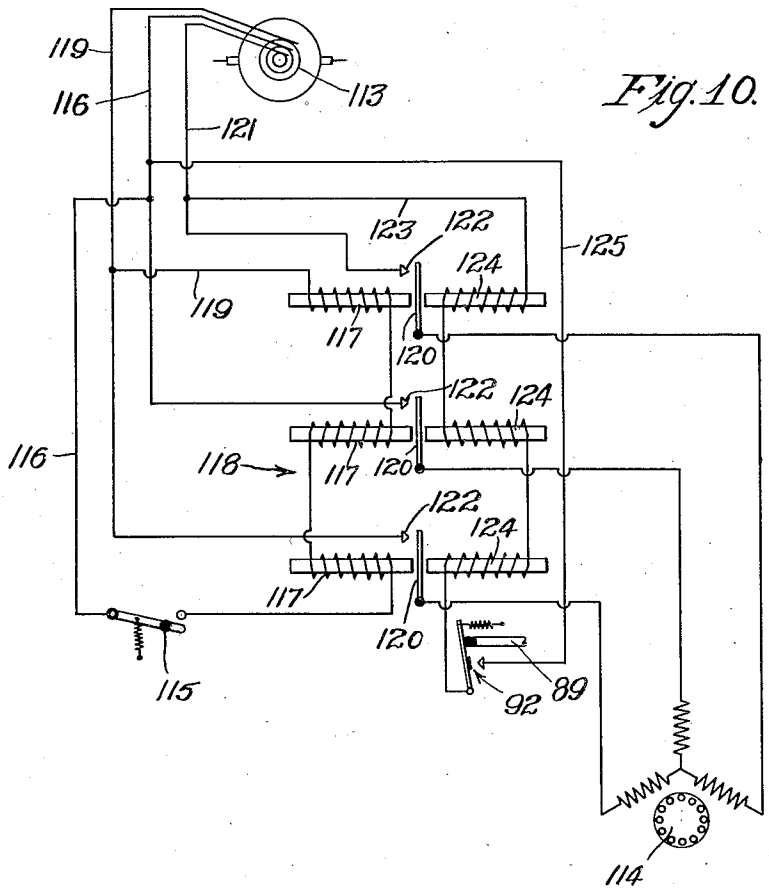

Fig. 10.

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Patented June 19, 1923. 1,459,435

UNITED STATES PATENT OFFICE.

HELMER J. BOE, OF CHICAGO, AND BENJAMIN J, EGERT, OF BROOKFIELD, ILLINOIS, ASSIGNORS TO WESTERN ELECTRIC COMPANY, INCORPORATED, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

STOP MECHANISM.

Application filed April 16, 1920. Serial No. 374,397.

To all whom it may concern:

Be it known that we, HELMER J. BOE and BENJAMIN J. EGERT, citizens of the United States, residing at Chicago, in the county of Cook and State of Illinois, and at Brookfield, in the county of Cook and State of Illinois, respectively, have invented certain new and useful Improvements in Stop Mechanisms, of which the following is a full, clear, concise, and exact description.

This invention relates to stop mechanisms, and more particularly to a combined registering and stop mechanism for use in controlling different classes of machines.

The object of the invention in general is to provide an improved stop mechanism for machines which may be set to accurately register the revolutions or reciprocations of the machine and to stop the machine after a predetermined number of revolutions or reciprocations.

In accordance with the general features of this invention there is provided a mechanism comprising a plurality of rotatable parts adapted to be moved from a set position to a zero or let-off position in response to a predetermined number of revolutions of a part and to operate in their let-off positions to control the stopping of the machine. More specifically, the invention comprises a plurality of rotatable parts adapted to be successively driven at different speeds from a rotatable or reciprocating member and from a set to a zero or let-off position, in which position they jointly control the operation of a stop mechanism for the machine with which it is associated.

In the drawings in which this mechanism is illustrated in connection with a strand operating mechanism:

Fig. 1 is a front elevation of the stop mechanism with a portion of the driving shaft projecting therefrom;

Fig. 2 is a vertical cross section through the machine on the line 2—2 of Fig. 1;

Fig. 3 is a transverse partial sectional view taken on the line 3—3 of Fig. 2 with the parts shown in their normal position, the normal position being the position of the parts after an operation;

Fig. 4 is a similar view with the parts shown in a set position;

Fig. 5 is a transverse partial sectional view taken on the line 5—5 of Fig. 2 with the parts shown in their normal position;

Fig. 6 is a similar view with the omission of certain parts and showing the position of the parts in an advanced position;

Fig. 7 is a transverse partial sectional view taken on the line 7—7 of Fig. 2 with the parts shown in their normal position;

Fig. 8 is an enlarged horizontal section taken on the line 8—8 of Fig. 7;

Fig. 9 is a transverse partial sectional view taken on the line 9—9 of Fig. 2 with the parts shown in their normal position, and

Fig. 10 is a diagram of the electrical circuit controlled by the stop mechanism for stopping the driving motor.

The stop mechanism is mounted within a casing 20 provided with an opening 21 at one end through which extends a hollow shaft 22. Mounted loosely on the hollow shaft 22 intermediate its ends is a worm gear 23 which is driven by a worm 24 mounted upon a shaft 25 which extends through the casing 20 and is connected by suitable gearing to the capstan of the strand operating machine. The worm gear 23 is provided on one side with a bevel gear 26 which forms part of a differential 27, the opposite driving member of which is a bevel gear 28 provided with a disk-like portion 29 the peripheral surface of which is provided with a notch 30, the normal position of which before and after an operation is as shown in Fig. 5. Bevel pinions 31—31 mounted from a casing 32 of the differential, which is secured to the hollow shaft 22, form a driving connection between the bevel gears 26 and 28.

Rotatably mounted on the end of the hollow shaft 22, which extends through the

casing 20, is a setting member 33 equipped with a pointer 34 which registers with a scale 35 marked on a plate 36. The scale 35 is used to set the mechanism for any length of strand from one thousand to thirty-five thousand in even thousands. The plate 36 is provided with a second scale 37 which is used to set the mechanism for any length of strand under one thousand in multiples of ten. The setting member 33 is provided with a cup shaped portion 40 which turns in the opening 21 of the casing 20 and is provided with a lug 41 on its inside vertical surface. A locking screw 42 which extends through the casing and engages the peripheral surface of the cup shaped portion 40 holds the setting member 33 in a set position. Rotatably mounted on a sleeve 43 which is loose on the hollow shaft 22 and contacting with the sleeve portion of the setting member 33 is a ratchet wheel 44 equipped with a disk-like portion 45 the peripheral surface of which is provided with a notch 46, as more clearly shown in Fig. 3. Projecting from the side face of the ratchet 44 is a lug 47 which projects into the path of the lug 41. Suitably mounted within a hollow portion of the ratchet 44 is a spiral spring 50 which, when released, turns the ratchet in the opposite direction to that in which it is turned by an associated driving pawl 51. The driving pawl 51 is carried upon one end of a lever 52 which is rotatably mounted on the hollow shaft 22. Revolving with the bevel gear 28 is a cam 53 which engages a roller 54 on the end of a vertically disposed lever 55 pivoted to a bracket 56. Pivoted to the lever 55 intermediate the roller 54 and the bracket 56 is a short connecting link 57 which connects the lower end of the lever 52 to the lever 55. Every revolution of the cam in the direction indicated by the arrow in Fig. 3 will rock the lever 55 which through the connecting link 57 will rock the lever 52 carrying the pawl 51, thereby advancing the ratchet 44 one tooth in a direction opposite to the movement of the cam 53. A retaining pawl 58 is suitably mounted from the casing 20 to retain the ratchet 44 in its advanced position.

A sleeve 60 carrying arms 61 and 62 is mounted below the ratchet 44 on a supporting stud 63 which is suitably secured to the casing 20. A coil spring 64 mounted around the sleeve 60 functions to keep the arms 61 and 62 bearing upward. The arms 61 and 62 at their ends are each provided with an upturned portion 65 and 66 which register respectively with the disk-like portion 29 of the bevel gear 28 and the disk-like portion 45 of the ratchet 44.

Within the hollow shaft 22 is a shaft 70 carrying at one end an arm 71 which has attached thereto a pointer 73. The pointer 73 registers with the scale 37 marked on the plate 36 and is used to set the mechanism for any length of strand to be measured under one thousand feet in multiples of ten. A locking screw 75 is provided for locking the arm 71 when set. Secured to the opposite end of the shaft 70 is a member 76 of a clutch 77 which is rotatably mounted on the hollow shaft 22 with the other member 78 also slidable thereon. As shown in Figs. 2 and 7, the clutch member 78 is equipped with pins 79—79 set 180° apart. Located on the hollow shaft 22 between the clutch member 78 and the worm gear 23 is a clutch 82 composed of two members 83 and 84. The clutch member 83 is secured to the shaft 22 while the clutch member 84 is slidable thereon. The engaging faces of the members 83 and 84 have teeth 85 cut thereon and when the member 83 is turned, the member 84 will be turned also. The clutch member 84 is provided with two openings 86 in its face opposite to the teeth 85. The openings 86 are 180° apart and are adapted to register with the pins 79—79 on the clutch member 78. A spring latch 88 functions to hold the member 84 in its normal position when it is not being revolved by its associated member 83. A spring 88′ interposed between the clutch members 83 and 84 functions to separate them when pins 79 and openings 86 register. This is to allow the member 84 to be reset.

Slidable in suitable bearings in the casing 20 and below the hollow shaft 22 is a rod 89 which carries a shifting fork 90 for shifting the clutch member 78. A coil spring 91 on the rod 89 between the casing 20 and the fork 90 serves to move the rod 89 longitudinally when released. One end of the rod 89 projects through the casing and in sliding, opens or closes a switch 92, the projecting end of the rod 89 being equipped with an insulated tip 93.

A stop 94 secured to the rod 89 engages a downwardly projecting lug on the arm 61 when the arm is in a set position, as shown by the dotted position of the arm 61 in Fig. 5.

Secured to the sleeve 43 is a disk-like member 95 provided with a plurality of cam surfaces 96, 97, 98 and 99 and an operating handle 100. The cam surface 99 cooperates with a lug 101 on the rod 89 to shift it to open the switch 92 when resetting the mechanism. The function of these cam surfaces and the handle will be explained in the description of the operation of the mechanism.

As shown in Figs. 7 and 8, the clutch member 84 is provided with gear teeth 102 on its peripheral surface which engage a spring driven pinion 103. When the clutch member 84 is being moved by its associated member 83 a spring 104 within the pinion 103 is being wound to store energy to return the

clutch member 84 to its normal position when released, whereupon it is locked by the latch 88.

In Figs. 1 and 2 the mechanism is shown in a zero position. To set the mechanism for say 18, 280 feet, the operator turns the setting member 33 in a clockwise direction to register the pointer 34 with a mark representing 18 on the scale 35, thereby setting the mechanism for 18,000 feet. In moving the pointer 34 to the mark 18 the lug 41 is moved from the full line position shown in Fig. 3, which is the position of the parts after an operation, or the normal position, to the dotted position. The setting of 280 feet is the next operation, which is done by turning the arm 71 carrying the pointer 73 in a counter clockwise direction until the pointer registers with a mark on the scale 37 which represents 280 feet. As shown in Figs. 2 and 7, by turning the arm 71 the clutch 77 which carries the pins 79—79 is turned also, thereby setting the pins such an angular distance from the opening 86 in the clutch member 84 as will represent 280 feet. In Fig. 7 the pins 79—79 and the openings 86 are shown in full lines in a zero position, while the dotted line position of the pins 79 represents a position set for 280 feet. After setting the pointers 34 and 73 the lock screws 42 and 75 respectively are set to secure them in position. After an operation of the mechanism it is necessary to reset the parts to their normal position whether the same setting is used or a new setting, and this is done after the resetting of the pointers. To reset the parts the handle 100 is moved down against the action of the spring 50 from the full line position to the dotted position, as shown in Fig. 3, and then allowed to return.

In moving the handle 100 down, the cam 99 engages the lug 101 and shifts the rod 89 which through the fork 90 secured thereto draws the pins 79 from the openings 86 in the clutch member 84, thereby allowing the member 84 which has been disengaged from the member 83 by spring 88′ to return to its zero position under the action of the spring driven pinion 103, as shown in Fig. 7. The rod 89 in moving, opens the switch 92 and thereafter is locked from moving back under the action of the spring 91 by a subsequent downward movement of the arm 61. The cam 98 now coming into engagement with the arm 62 moves it downward, thereby moving the upturned portion 66 along with the arm 61 and its upturned portion 65 from the notches 46 and 30. This downward movement of the arms 61 and 62 is completed just as the rod 89 completes its movement of opening the switch 92 and drawing the pins 79 from the openings 86 thereby locking the rod 89 from returning, due to the upward projecting lug 94 on the rod 89. The cams 96 and 97 in engaging the pawls 51 and 58 move them away from the teeth on the ratchet 45, thereby allowing it and the lug 47 thereon to revolve under the action of the spring 50 to bring the lug 47 into contact with the lug 41. The notch 46 which is on the ratchet is thereby moved away from the engaging end 66 of the arm 62 which thereafter rides on the peripheral surface of the disk-like portion 45 of the ratchet 44.

The worm gear 23 is geared down from the speed of the capstan on the strand operating machine (not shown) to such a speed that it will revolve one complete revolution for every thousand feet of strand passing around the capstan. For every revolution of the worm 23 the ratchet 44 is advanced one tooth through the cooperating cam 53 and parts 54, 55, 57, 52 and the pawl 51. The ratchet 44 has 35 teeth, one tooth for every thousand feet of strand passing around the capstan, and in setting the pointer 34 on the mark 18 on the scale 35 the notch 46 is set such a distance from the upturned portion 66 of the arm 62 as will allow the arm 62 to move into it after 17,000 feet of strand have passed around the capstan. Since the notch 30 makes one complete revolution for every thousand feet of strand operated upon the arm 61 has to be held away from the peripheral surface of the disk-like portion of the gear 29 until after 17,000 feet of strand have been operated upon. At this time the arm 62 enters the notch 46 thereby allowing the arm 61 to engage the peripheral surface of the disk-like portion of the gear 29 ready to enter the notch 30 at the end of 18,000 feet, thereby locking the bevel gear 28 of the differential 27 from further movement. The locking of the bevel gear 28 causes the casing 32 of the differential to revolve, and being secured to the hollow shaft 22 causes it and the clutch 82 secured thereto to revolve at the rate of one-half revolution per thousand feet. The spring latch 88 is forced to ride on the surface of the member 84 when the clutch 82 revolves. When this movement has registered the openings 86 in the clutch member 84 with the pins 79 of the clutch 77, which means that 280 feet of strand have passed around the capstan in addition to 18,000 feet, the pins 79 will enter the openings 86 and allow the rod 89 to move under the action of the spring 91, thereby closing the switch 92 which operates a solenoid switch in the circuit to stop the driving motor and therefore the machine. At the instant the pin 79 and openings 86 register, the clutch members 83 and 84 are disengaged through the action of the spring 88′, thereby allowing the member 84 under the action of the spring driven pinion 103 to return to its zero position.

A hand wheel 108 is provided (as shown in Fig. 1) to place the notch 30 opposite the

arm 61 in case the mechanism for some reason is run for a fraction of a thousand feet and it is desired to reset the mechanism. The hand wheel 108 is mounted on a shaft 109 which when revolved drives suitable gearing which meshes with a gear 110 secured to the bevel gear 29 which has the notch 30 cut in it. A pointer 111 on the casing 20 and a mark on the hand wheel 108 serve to guide the operator in bringing the notch 30 opposite the arm 61. While operating the hand wheel 108 the handle 100 is held down to allow the member 84 to return or remain at its starting position.

If the number of feet of strand to be measured is in even thousands, the pointer 73 is placed at zero on the scale 37 which places the pins 79 opposite the openings 86 so that when the arm 61 moves into the notch 30 the stop 94 is free and this allows the rod 89 to move and thereby close the switch 92.

In the circuit diagram illustrated in Fig. 10. 113 represents a generator or any suitable source of power for driving a motor 114 to operate the strand operating machine. In starting the machine after a measuring operation a push button switch 115 is operated to close a circuit from the generator 113 through conductor 116, the contacts of switch 115, through energizing coils 117 of a suitable solenoid switch 118, and conductor 119, back to the generator 113. The energization of the coils 117 attracts armatures 120, thereby closing a circuit from the generator 113 through conductor 121, contacts 122, and the armatures 120 to the motor 114.

When the contacts of the switch 92 are closed by the movement of the rod 89 after a certain number of feet of strand have been measured, a circuit is closed through conductors 121, 123, associated energizing coils 124, switch 92, and conductors 125 and 116 to the generator 113. The energization of the coils 124 attracts the armatures 120, thereby opening the circuit through the contacts 122 to the motor 114 and stopping the machine.

What is claimed is:

1. In a mechanism for controlling the operation of a machine at the completion of a predetermined number of revolutions or reciprocations, the combination with the machine of a registering mechanism adapted to be operated thereby, including a rotatable member and a rotatable and reciprocable member adapted to be successively rotated from a set to a zero or let-off position to register in units or fractions thereof the number of revolutions or reciprocations of the machine, a differential driving means for said rotatable member and rotatable and reciprocable member, means for moving said rotatable and reciprocable member longitudinally at the zero position thereof, and stop mechanism for the machine controlled by the longitudinal movement of said rotatable and reciprocable member.

2. In a mechanism for controlling the operation of a machine at the completion of a predetermined number of revolutions or reciprocations, the combination with the machine of a registering mechanism comprising a plurality of rotatable members, driving means therefor including a differential for driving in succession said rotatable members from a set to a zero position to register in units or fractions thereof the number of revolutions or reciprocations of the machine, means associated with one of said rotatable members and operated after a predetermined movement thereof to shift the drive of said differential to said other rotatable member, and a stop member released by said rotatable members in their zero or let-off positions to control the stopping of the machine.

3. In a mechanism for controlling the operation of a machine at the completion of a predetermined number of revolutions or reciprocations, the combination with the machine of a registering mechanism comprising a plurality of rotatable members, driving means therefor including a differential adapted to drive in succession said rotatable members from a set to a zero position to register in units and fractions thereof the number of revolutions or reciprocations of the machine, and a stop member released by said rotatable members in their zero position to control the stopping of the machine.

4. In a mechanism for controlling the operation of a machine at the completion of a predetermined number of revolutions or reciprocations, the combination with the machine of a registering mechanism adapted to be operated thereby including a rotatable member and a rotatable and reciprocable member adapted to be successively rotated from a set to a zero or let-off position to register in units and fractions thereof the number of revolutions or reciprocations of the machine, a differential driving means for said rotatable member and rotatable and reciprocable member, means associated with one of said rotatable members and operated after a predetermined movement thereof to shift the drive of said differential to said other rotatable member, means for moving said rotatable and reciprocable member longitudinally at the zero position thereof, and stop mechanism for the machine controlled by the longitudinal movement of said rotatable and reciprocable member.

5. In a mechanism for controlling the operation of a machine at the completion of a predetermined number of revolutions or reciprocations, the combination with the machine of a registering mechanism adapted to

be operated thereby including a rotatable member and a rotatable and reciprocable member adapted to be successively rotated from a set to a zero or let-off position to register in units or fractions thereof the number of revolutions or reciprocations of the machine, a differential driving means for said rotatable member and said rotatable and reciprocable member, means associated with said rotatable member and operated after a predetermined movement thereof to shift the drive of said differential to said rotatable and reciprocable member, means for moving said rotatable and reciprocable member longitudinally, at the zero position thereof, and stop mechanism for the machine controlled by the longitudinal movement of said rotatable and reciprocable member.

6. In a registering mechanism, a plurality of rotatable members, a driving means therefor including a differential adapted to drive in succession said rotatable members from a set to a zero position to register in units and fractions thereof, and means for setting said rotatable members for a predetermined number of revolutions.

7. In a registering mechanism, a plurality of rotatable members, driving means therefor including a differential for driving in succession said rotatable members from a set to a zero position to register in units and fractions thereof, means associated with one of said rotatable members and operated after a predetermined movement thereof to shift the drive of said differential to said other rotatable member, and means for setting said rotatable members for a predetermined number of revolutions.

8. In a registering mechanism, a plurality of rotatable members, driving means therefor including a differential for driving in succession said rotatable members from a set to a zero position to register in units and fractions thereof, one of said rotatable members carried thereby and rotated to a predetermined position, means associated with said rotatable member and operated at the completion of a predetermined movement thereof to shift the drive of said differential to said other rotatable member, and means for setting said rotatable members for a predetermined number of revolutions.

9. In a mechanism for controlling the operation of a machine at the completion of a predetermined number of revolutions or reciprocations, the combination with the machine of a registering mechanism adapted to be operated thereby including a rotatable member and a rotatable and reciprocable member adapted to be successively rotated from a set to a zero or let-off position in the operation of the mechanism to register in units and fractions thereof the number of revolutions or reciprocations of the machine, means for moving said rotatable and reciprocable member longitudinally at the zero position thereof, and stop mechanism for the machine controlled by the longitudinal movement of said rotatable and reciprocable member.

10. In a mechanism for controlling the operation of a machine at the completion of a predetermined number of revolutions or reciprocations, the combination with the machine of a registering mechanism adapted to be operated thereby including a plurality of rotatable members adapted to be successively rotated at different speeds from a set to a zero or let-off position in the operation of the mechanism to register in units and fractions thereof the number of revolutions or reciprocations, means for setting said members for the predetermined number of units and fractions thereof representing thousands, hundreds and fractions of hundreds the number of revolutions or reciprocations of the machine, and a stop member released by said rotatable members in the zero or let-off position of the registering mechanism to control the stopping of the machine.

11. In a mechanism for controlling the operation of a machine at the completion of a predetermined number of revolutions or reciprocations, the combination with the machine of a registering mechanism adapted to be operated thereby including a rotatable member and a rotatable and reciprocable member adapted to be successively rotated from a set to a zero or let-off position in the operation of the mechanism to register in units and fractions thereof the number of revolutions or reciprocations of the machine, means for setting said members for the predetermined number of units and fractions thereof representing thousands, hundreds and fractions of hundreds the number of revolutions or reciprocations of the machine, and means for moving said rotatable and reciprocable member longitudinally at the zero position thereof, and stop mechanism for the machine controlled by the longitudinal movement of said rotatable and reciprocable member.

12. In a mechanism for controlling the operation of a machine at the completion of a predetermined number of revolutions or reciprocations, the combination with the machine of a registering mechanism adapted to be operated thereby including a rotatable member and a rotatable and reciprocable member adapted to be successively rotated at different speeds from a set to a zero or let-off position in the operation of the mechanism to register in units and fractions thereof the number of revolutions or reciprocations of the machine, means for automatically shifting the drive from one of

said rotatable membes to the other at the end of a predetermined movement thereof, means for setting said members for the predetermined number of units or fractions thereof representing thousands, hundreds and fractions of hundreds the number of revolutions or reciprocations of the machine, and means for moving said rotatable and reciprocable member longitudinally at the zero position thereof, a stop member, and means under the joint control of said rotatable members in their zero positions for controlling the operation of said stop member.

In witness whereof, we hereunto subscribe our names this 30th day of March, A. D., 1920.

HELMER J. BOE.
BENJAMIN J. EGERT.