

No. 731,087.

PATENTED JUNE 16, 1903.

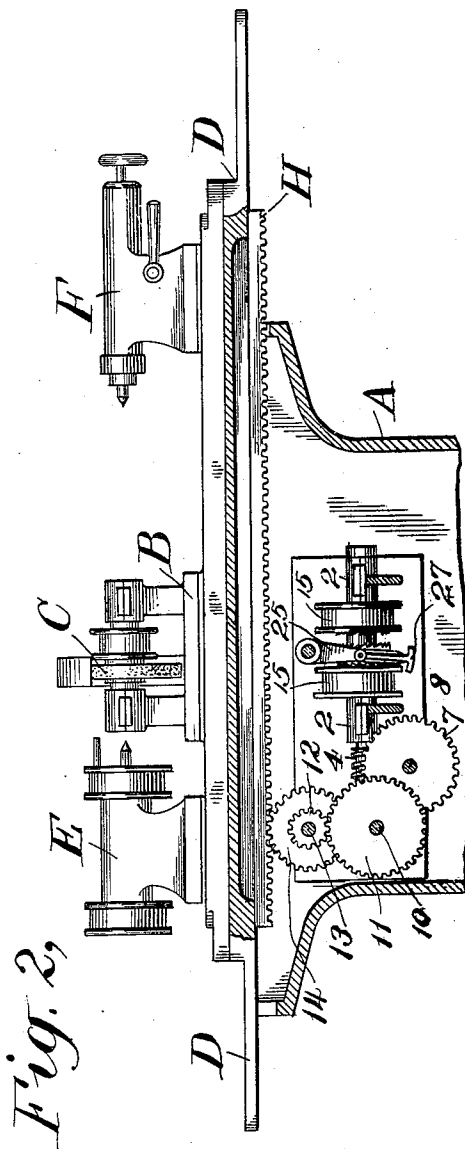
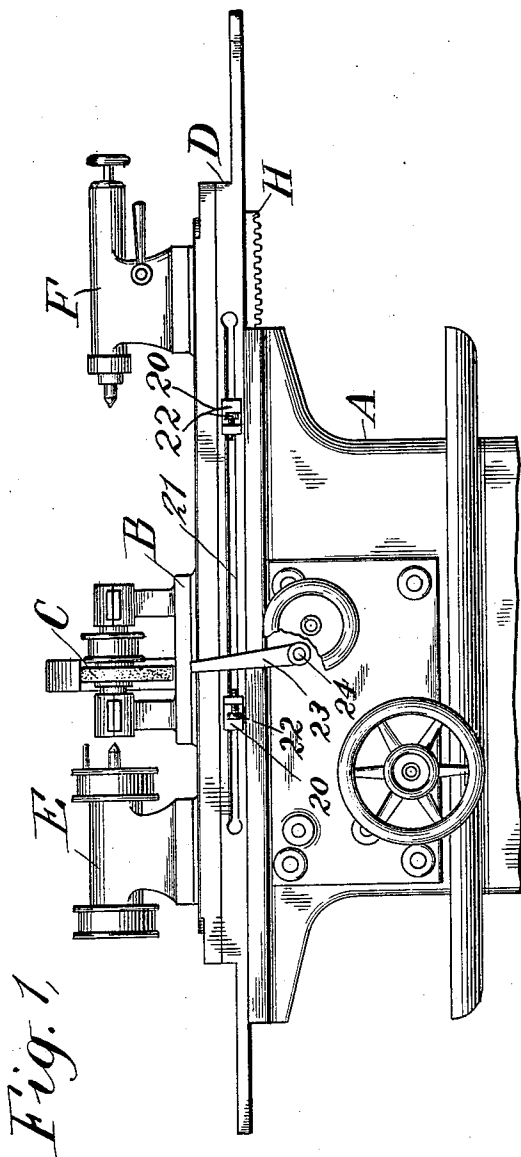
Z. R. TUCKER.

CARRIAGE REVERSING MECHANISM FOR GRINDING MACHINES.

APPLICATION FILED FEB. 20, 1902.

NO MODEL.

3 SHEETS—SHEET 1.



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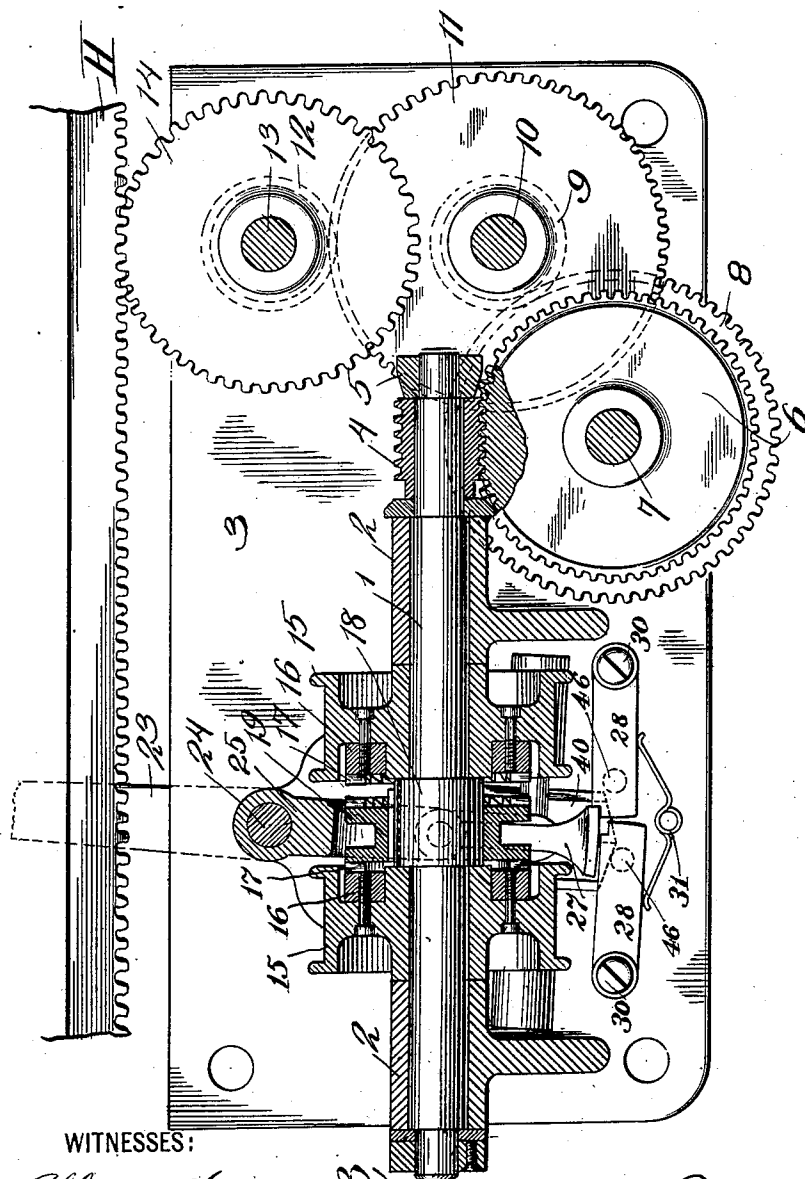
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3 SHEETS—SHEET 2.



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Fig. 3

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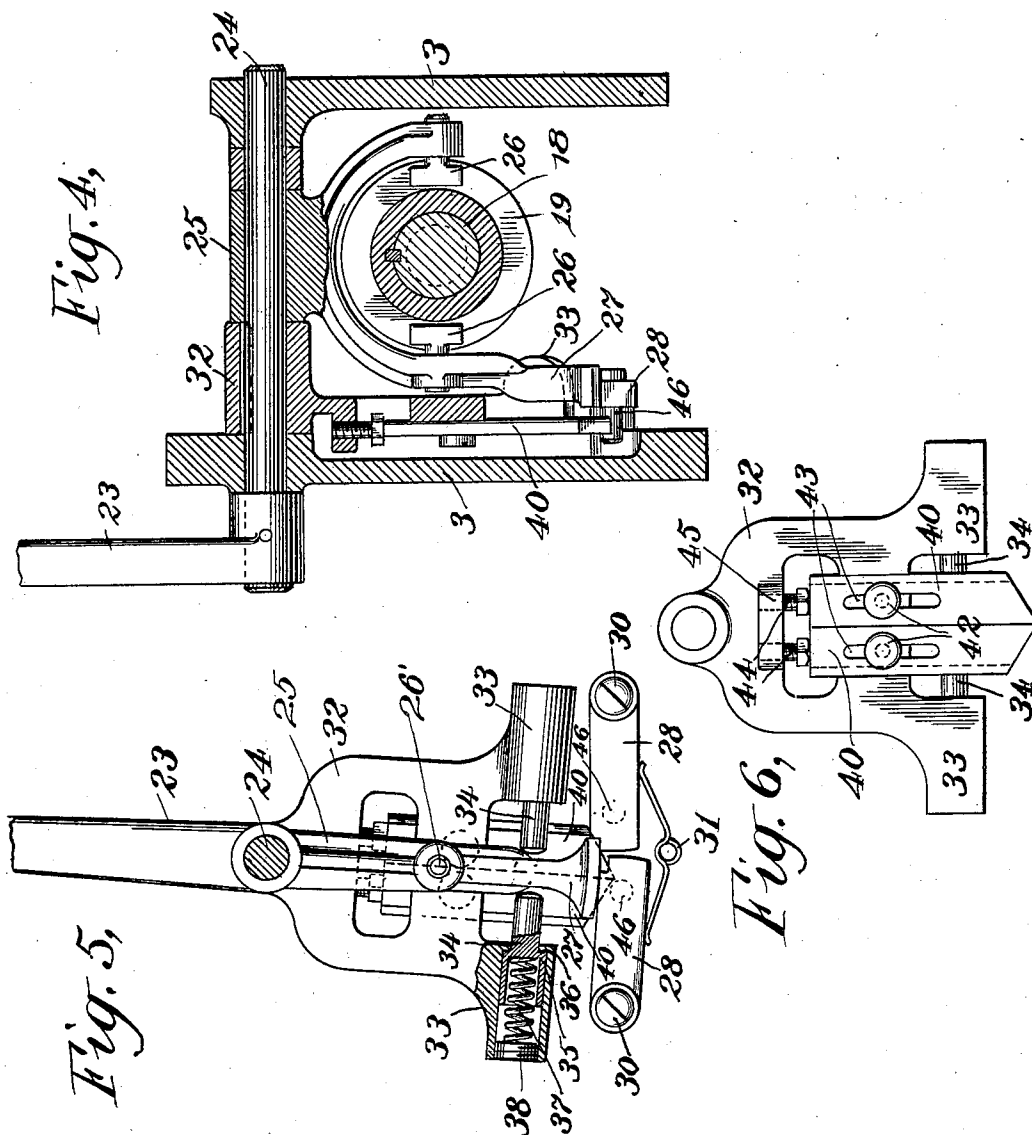
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CARRIAGE-REVERSING MECHANISM FOR GRINDING-MACHINES.

SPECIFICATION forming part of Letters Patent No. 731,087, dated June 16, 1903.

Application filed February 20, 1902. Serial No. 94,894. (No model.)

To all whom it may concern:

Be it known that I, ZECHARIAH RHODES TUCKER, residing at Providence, in the county of Providence and State of Rhode Island, have
5 invented certain new and useful Improvements in Carriage-Reversing Mechanisms for Grinding-Machines, &c., of which the following is a full, clear, and exact description, such as will enable others skilled in the art to which
10 it appertains to make and use the same.

The invention relates to a carriage-reversing mechanism; and its object is to provide such a mechanism which shall be quick and accurate in action and capable of very delicate
15 adjustment.

To these ends the invention consists in the features of construction, arrangement of parts, and combinations of elements which will be hereinafter more fully set forth, and the novel
20 features thereof pointed out in the claims at the end of this specification.

I have illustrated the invention in connection with the carriage of a grinding-machine; but it will be obvious that the invention as a
25 whole could be applied wherever it is desired to obtain a reciprocating motion and that various features thereof are of wide application in connection with different kinds of clutches.

The accompanying drawings illustrate a
30 specific embodiment of the invention, in which—

Figure 1 is a side elevation of a grinding-machine in connection with which my invention is utilized, the lower part of the frame
35 being broken away. Fig. 2 is a view, partly in section and partly in elevation, showing the connection between the carriage and the reversing-shaft. Fig. 3 is a view on an enlarged scale, partly in section and partly in
40 elevation, of the clutch-shaft, mechanism for throwing the clutch, and gearing connecting said shaft with the carriage. Fig. 4 is a transverse section of the clutch-shaft and clutch-reversing mechanism, certain parts being
45 omitted for the sake of clearness. Figs. 5 and 6 are details illustrating certain parts of the clutch-reversing mechanism.

Similar reference characters refer to similar parts throughout the several views.

50 As shown in Figs. 1 and 2, A is the frame

of a grinding-machine, upon which is suitably supported a wheel-head B, carrying a grinding-wheel C. A table or carriage D, which may be supported on suitable ways on the frame, so as to be reciprocable therealong, 55 carries a live-spindle E and a tail-stock F, all as in the usual construction. In the lower side of this table is a rack H, to which is geared the reversing mechanism, which will now be described.

As best shown in Fig. 3, a shaft 1 is supported in bearings 2 2 within housings formed by the two plates 3 3, which may be formed by the side walls of the frame of the machine or separate therefrom, but fastened therein. 65 At one end of this shaft is a worm 4, held thereon by a collar 5 and geared to a worm-wheel 6 on the short shaft 7, suitably journaled within the housings and carrying a gear 8, which meshes with a gear 9 on a second 70 similar transverse shaft 10, which also carries the gear 11, meshing with a gear 12 on a third transverse shaft 13, which carries gear 14 in mesh with the rack H upon the carriage. These gears are suitably proportioned to obtain 75 the desired speed. The carriage may be driven in either direction from the shaft 1 by means of the pulleys 15, which are loosely mounted upon said shaft and may be constantly driven in opposite directions from any 80 suitable source or sources of power by means of belts, one straight and the other crossed, from a suitable shaft in the base of the machine. To the inner face of each of these pulleys is rigidly attached, as by screws, the 85 annular clutch-blocks 16, having clutch-teeth 17. Between these pulleys on the shaft 1 is a collar 18, which may be integral therewith, as shown, or keyed thereto. Keyed to the collar 18, so as to rotate therewith, but be 90 reciprocable therealong, is the double-faced clutch 19, having clutch-teeth on its two faces, which engage the clutch-teeth on one or the other of the pulleys as the clutch is thrown to one side or the other, whereby shaft 1 is 95 driven with one of the pulleys, while the oppositely-driven pulley revolves loosely thereon.

The mechanism by which the clutch is thrown to reverse the direction of the carriage at the proper time is as follows: Dogs 100

20, which may be made adjustable along the slot 21 in the face of the carriage, carry adjusting-screws 22, which are adapted in the movement of the carriage to strike the reversing-lever 23, thereby swinging or moving it through a determined arc and rocking the rock-shaft 24, which has suitable bearings in the housing-plates 3 and to which the reversing-lever 23 is pinned. A fork 25 swings loosely on this rock-shaft and carries gudgeons 26, which run in a groove in the double clutch 19. One end of the clutch-fork 25 is extended downwardly to form an arm 27, with which is normally engaged one of the two pawls or detents 28 28, suitably pivoted at 30, so that the clutch 19, through the fork 25 and its arm 27, is held firmly in driving engagement with whichever pulley it is in contact and prevents it from being thrown until the pawl and arm are released from engagement one with the other. The squared ends of arm 27 engage with rabbets formed in the upper corners of the pawls 28, and the contacting surfaces are of hardened steel, so that the edges or corners thereof may be "knife-edged" down to any desired degree of fineness, and the surfaces which come in contact as the arm slips past either pawl may be polished, so as to be smooth and practically frictionless. A double leaf-spring 31 is positioned to normally throw both pawls up into the path of movement of the arm 27. The mechanism for releasing the arm 27 from the pawls or detents 28 and throwing said arm and the clutch therewith in order to reverse the carriage comprises a fork 32, which is keyed to the rock-shaft 24 and carries at its lower ends the housings 33, within which are mounted the plungers 34, having shoulders 35 thereon which rest upon shoulders 36 within the housings, the ends of the plungers being reduced in diameter and extending inwardly from the housings. It will be seen that these housings may be very simply constructed by boring holes in the ends of the spring-fork, reducing the diameter of the bore at the point where the shoulders 36 are to be formed. The plungers 34 are of such length within the housings that they may be thrown back therein to a suitable distance, and they are pressed normally forward with the shoulders 35 and 36 in contact by springs 37, the strength of which may be adjusted by means of the screw-plugs 38, closing the ends of the housings. Attached to the side of the fork 32 are the two adjustable plates 40 40, having oppositely-beveled ends, as shown. These plates are clamped to the fork by means of set-screws 42, passing through elongated slots 43 in the plates, so that they may be adjusted as desired, and they are held in the desired adjustment by means of set-screws 44, which are tapped into a lug 45, projecting from the fork and rest with their heads against the upper ends of plates 40. Pins 46 are carried by the pawls or detents 28, and these pins project into

the path of movement of the plates 40. The operation of these parts will now be clear. In the reciprocation of the carriage one of the adjustable dogs 20 will strike the lever 23 and rock-shaft 24, which carries with it spring-fork 32, keyed thereto. In the view shown in Fig. 5 the parts are in such position that this movement of the spring-fork would just be beginning toward the right. During such movement, however, the clutch-arm 27 will be held by the right-hand detent 28, and the plunger 34 at the left will be carried back against the pressure of its springs 37 by contact with said clutch-arm 27. The spring-plunger 34 at the right will be prevented from following out against the clutch-arm 27 because of the contacting shoulders 35 and 36, so that while power is being stored up in the spring-plunger on one side of the arm the plunger on the other side will be carried away therefrom, leaving the arm and clutch free to be thrown with the full force of the spring-plunger behind it at the moment when said arm is released from this detent, which will occur when the plate 40, carried with the fork 32, has struck the pin 46 and the beveled edge thereof has forced said pin and the corresponding pawl 28 down, so that it may be cleared by the arm 27. As soon as this is done the force of the spring-plunger will throw the clutch into engagement with the opposite driving-pulley 15, reversing the movement of the carriage. The office of the detent-pawls is simply to retain the clutch-fork in either position, and they do this without maintaining any pressure on any of the rotating parts, but merely prevent the clutch from disengaging from either one of the pulleys with which it is in engagement. The clutch having been once thrown will of course continue in engagement with its pulley until the carriage has reached the desired point, when the cycle of operations will be repeated in the reverse direction. Inasmuch as the contacting edges of the arm 27 and the detent-pawls 28 can be knife-edged to any degree of fineness and the beveled plates 40 can be adjusted to any desired degree with reference to the pins 46, it will be seen that the time of throw of the clutch, which will depend upon the slipping past each other or disengagement of two knife-edges and which will follow immediately upon such disengagement, can be accurately predetermined within an almost infinitesimal fraction of an inch. In other words, it may be said that the point of release is as accurate as the hardened-steel edges of the pawl and clutch-arm can be maintained up to a sharp corner, and to maintain the sharp corners on these parts is an easy matter, insuring the highest degree of accuracy. The desirability and importance of such a construction will be readily understood by those who are acquainted with the uses to which such a reversing mechanism may be put. In grinding a shaft having an axle thereon—as,

for instance, the shaft 1, having the collar 18 of Fig. 3—it is necessary that the work, if the work is the reciprocating member, should be brought up to the face of the grinding-wheel and then reversed each time at exactly the same spot, so as to form a true shoulder and a right angle at the point where the shaft is to be reduced in thickness. With constructions known in the art, where it is impossible to accurately predetermine the time of reversal, a roughly-finished shoulder will be left between the collar and the reduced portion of the shaft, which will have to be machined or trued off in some other way in order to produce a finished article. With the present construction of reversing mechanism, however, it is possible to grind such a shaft, leaving a collar thereon which shall be correctly finished at all points, thereby causing great saving in time and expense.

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

1. In an automatic carriage-reversing mechanism, carriage-driving gearing, a clutch for reversing said gearing and a stop restraining the movement of said clutch, said stop having a knife-edge adapted to contact with a knife-edge in connection with said clutch, whereby the time of throwing said clutch can be accurately predetermined.

2. In a carriage-reversing mechanism, a shaft, driving connections between the carriage and said shaft, and means for driving said shaft alternately in opposite directions, said means comprising a reversing-clutch, power-storing mechanism for throwing said clutch, and knife-edged releasing-stops for determining the point at which said power-storing mechanism shall become operative to throw the clutch.

3. In a reversing mechanism, in combination, a clutch, power-actuating mechanism for throwing the clutch, detents for regulating such power-actuating mechanism and a connection between said detents and said power-actuating mechanism including two engaging surfaces the releasing points of which are in the form of knife-edges.

4. In a device of the class described, a reciprocating mechanism, and means whereby the point of reversal of said reciprocating mechanism may be determined by the slipping past one another of two contacting knife-edges.

5. In a device of the class described, a carriage, a driving mechanism in connection therewith, and means for reversing said driving mechanism including two opposed knife-edged surfaces.

6. In a reversing mechanism, in combination, a clutch, a power-storing device whereby said clutch may be thrown, a detent acting in opposition to said power-storing device, and an adjustable means for releasing said detent.

7. In a carriage-reversing mechanism, in combination, a clutch, an arm connected to the moving member of said clutch, means acting upon said arm to restrain the movement of said member, and an adjustable releasing means acting upon said restraining means whereby said clutch may be thrown at any predetermined point.

8. In a carriage-reversing mechanism, in combination, the actuating-shaft, means for driving said shaft in opposite directions, means for throwing either of said driving means into operation, said means including a double clutch, a power device acting periodically to throw said clutch in opposite directions, an arm rigid with said clutch, detents one of which normally prevents the throwing of said arm and clutch, and means for releasing said detents.

9. In a carriage-reversing mechanism, in combination, the actuating-shaft, means for driving said shaft in opposite directions, means for throwing either of said driving means into operation, said means including a double clutch, a power device acting periodically to throw said clutch in opposite directions, an arm rigid with said clutch, detents one of which normally prevents the throwing of said arm and clutch, and means in connection with said power device for releasing said detents.

10. In a carriage-reversing mechanism, in combination, the actuating-shaft, means for driving said shaft in opposite directions, means for throwing either of said driving means into operation, said means including a double clutch, a power device acting periodically to throw said clutch in opposite directions, an arm rigid with said clutch, detents one of which normally prevents the throwing of said arm and clutch, means for releasing said detents, and means for adjusting said releasing means.

11. In a carriage-reversing mechanism, in combination, the actuating-shaft, means for driving said shaft in opposite directions, means for throwing either of said driving means into operation, said means including a double clutch, a power device in which power is stored by the movement of the carriage whereby said clutch may be thrown in either direction, an arm rigid with said clutch, detents acting successively upon said arm and clutch to prevent the throwing of said clutch, and means carried by said power-storing device for releasing said detents.

12. In a carriage-reversing mechanism, in combination, the actuating-shaft, means for driving said shaft in opposite directions, means for throwing either of said driving means into operation, said means including a double clutch, a power device in which power is stored up by the movement of the carriage whereby said clutch may be thrown in either direction, an arm rigid with said clutch, detents acting successively upon said

arm and clutch to prevent the throwing of said clutch, and adjustable means carried by said power-storing device for releasing said detents.

- 5 13. In a carriage-reversing mechanism, in combination, a driving-shaft, means for reversing said driving-shaft, said means including a clutch, means for periodically throwing said clutch in opposite directions, a restraining means acting to regulate said throwing means, and a single means whereby power is stored to actuate said throwing means when said restraining means is released.
- 10 14. In a carriage-reversing mechanism, in combination, a driving-shaft, means for reversing said shaft, said means including a clutch, means for periodically throwing said clutch in opposite directions, a restraining means acting to regulate said throwing means, and means whereby the movement of the carriage stores up power to actuate said throwing means and a releasing means by which said restraining means may be released at any predetermined point.
- 15 15. In a carriage-reversing mechanism, in combination with the actuating-shaft, the clutch for reversing such shaft, a device for throwing said clutch, a restraining and regulating device governing the time of throw of said clutch, means for releasing said restraining device at any predetermined point, and means for actuating said throwing device.
- 30 16. In a carriage-reversing mechanism, in combination with the actuating-shaft, the clutch for reversing such shaft, a power-storing device actuated by the movement of the carriage and tending to throw said clutch, and means whereby said power-storing device may be brought into action at any predetermined point.
- 40 17. In a carriage-reversing mechanism, in combination with the actuating-shaft and the clutch for reversing such shaft, restraining means normally preventing the throw of said clutch, means for storing up power whereby to throw said clutch, a releasing means for said restraining device, and means for bringing it into action at any desired point.
- 45 18. In a carriage-reversing mechanism, in combination with the actuating-shaft and the clutch for reversing said shaft, a device for throwing said clutch, a restraining and regulating device governing the time of throw of said clutch, means whereby during the movement of the carriage power is stored up to actuate said throwing device and a releasing means whereby said restraining device may be released at any desired point.
- 55 19. In a carriage-reversing mechanism, in combination with the actuating-shaft and the clutch for reversing such shaft, an arm rigid with said clutch, spring-pressed detents which stand successively in the path of said arm to prevent its movement in the unclutching direction, an actuating-lever by the movement of which power is stored tending to throw said clutch, and a part carried with said ac-
- 65

tuating-lever whereby the detent in the path of said arm may be released therefrom.

20. In a carriage-reversing mechanism, in combination with the actuating-shaft and the clutch for reversing such shaft, an arm rigid with said clutch, spring-pressed detents which stand successively in the path of said arm to prevent its movement in the unclutching direction, an actuating-lever by the movement of which power is stored tending to throw said clutch and an adjustable part carried with said actuating-lever whereby the detent in the path of said arm may be released therefrom at any predetermined point.

21. In a carriage-reversing mechanism, in combination with the actuating-shaft and the clutch for reversing such shaft, an arm rigid with said clutch, spring-pressed detents which stand successively in the path of said arm to prevent its movement in the unclutching direction, the opposing surfaces of said arm and said detents being knife-edged, means for releasing said arm from said detents, and means for throwing said clutch.

22. In a carriage-reversing mechanism, in combination with the actuating-shaft and the clutch for reversing such shaft, means for throwing said clutch alternately in opposite directions, detents for preventing the movement of said clutch except at predetermined intervals, the opposing contacting surfaces of said detent and said clutch by which said clutch is held being composed of substantially frictionless material having corresponding sharp corners so that the clutch will be held firmly by said detents up to a certain point and then instantly released.

23. In a carriage-reversing mechanism, a power-storing device actuated by the movement of the carriage whereby power is stored up tending to reverse the direction of movement of said carriage, and means for rendering said power device operative at a point which may be accurately predetermined.

24. In combination with the clutch-fork and arm 27 rigid therewith, the detents 28 in connection with said arm, the fork 32, the plungers carried with said fork and adapted to cooperate with said arm 27 to throw the clutch at certain intervals and the adjustable plates 40 carried with said fork and adapted to act upon said detents.

25. In a device of the class described, a clutch-arm, a fork and spring-pressed plungers carried by said fork one on each side of said arm, the construction and arrangement being such that during the movement of said fork power will be stored in one of said plungers tending to actuate said arm while the other of said plungers will be carried away from said arm.

In testimony whereof I affix my signature in the presence of two witnesses.

ZECHARIAH RHODES TUCKER.

Witnesses:

HENRY C. BABCOCK,
FREDERICK G. KENYON.