No. 676,238. Patented June 11, 1901.

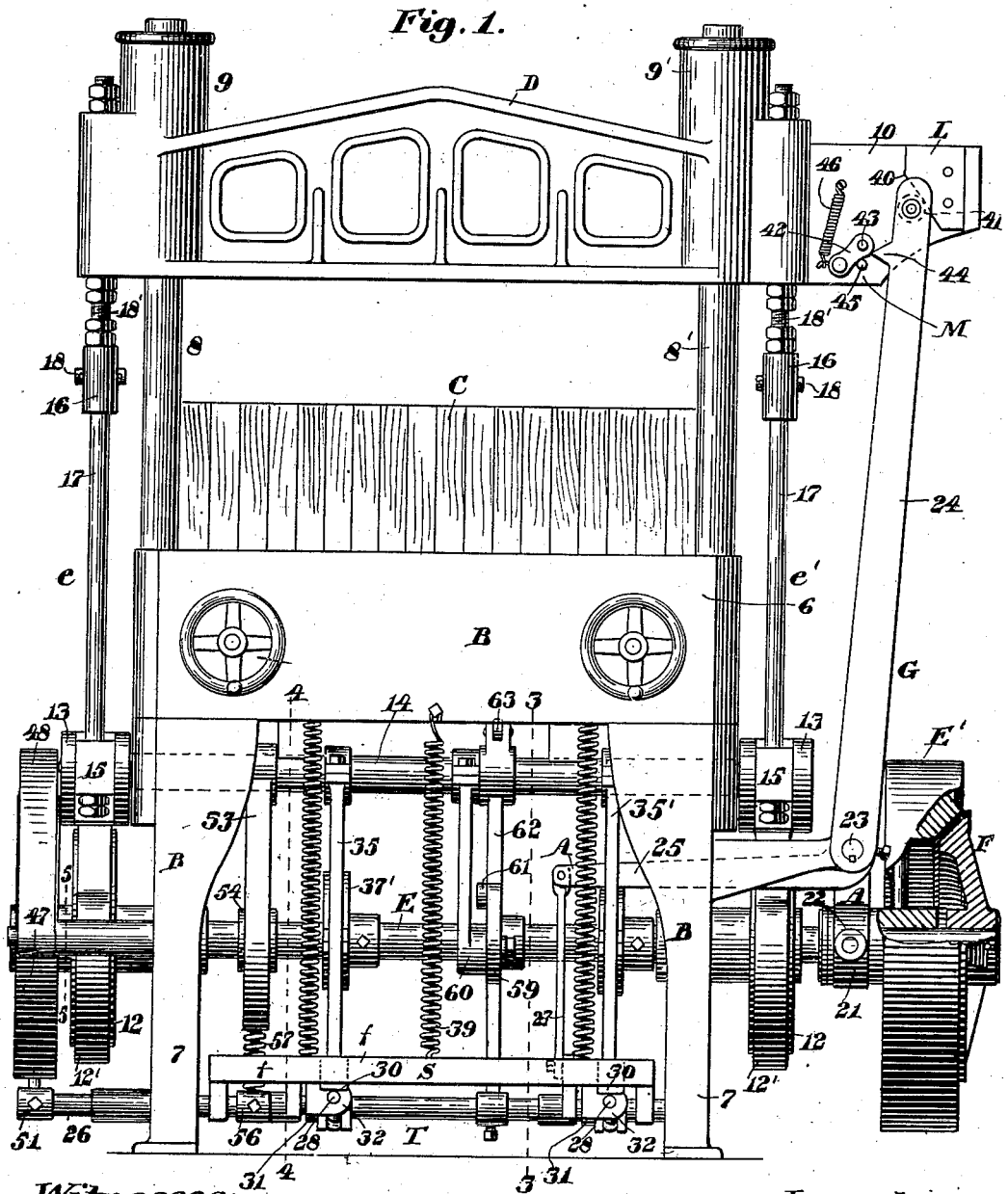
G. A. KNOX.

SOLE CUTTING MACHINE.

(Application filed July 12, 1900.)

(No Model.) 4 Sheets—Sheet 1.

Fig. 1.



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(No Model.) 4 Sheets—Sheet 2.

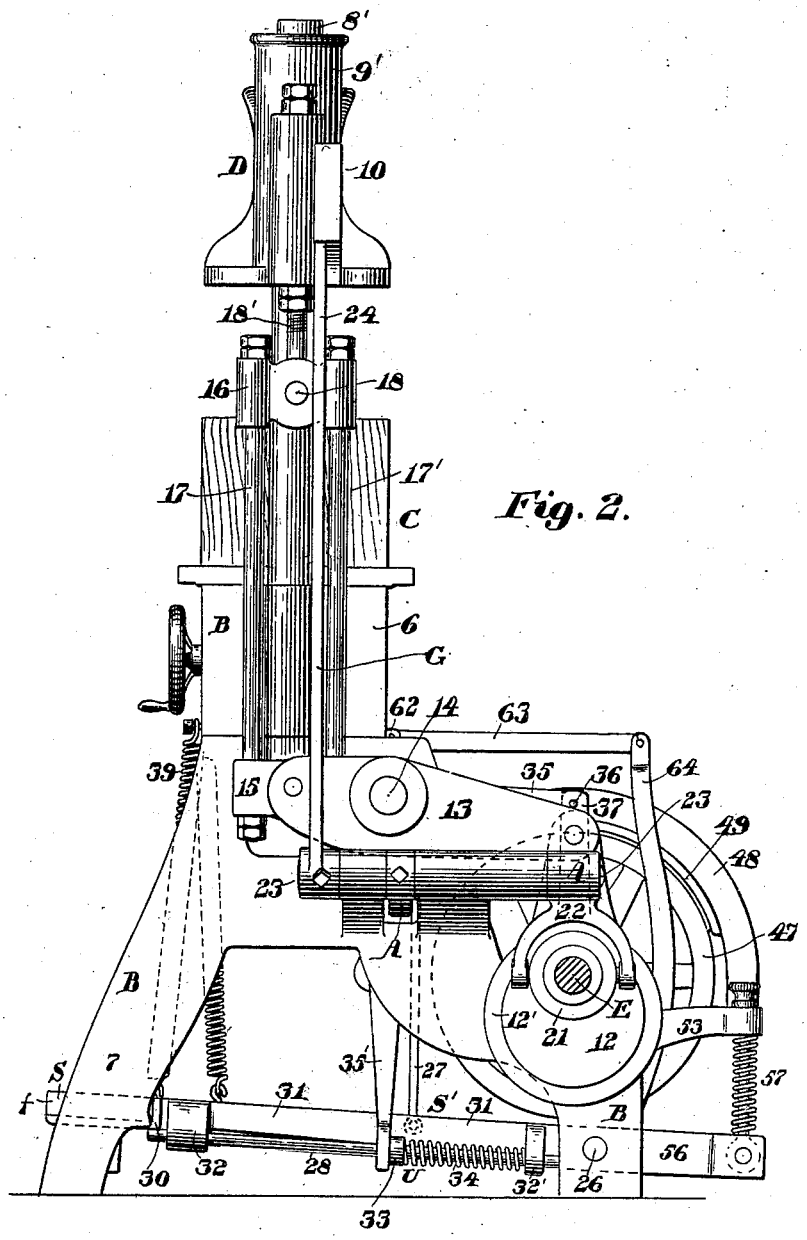

Fig. 2.

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(No Model.) 4 Sheets—Sheet 3.

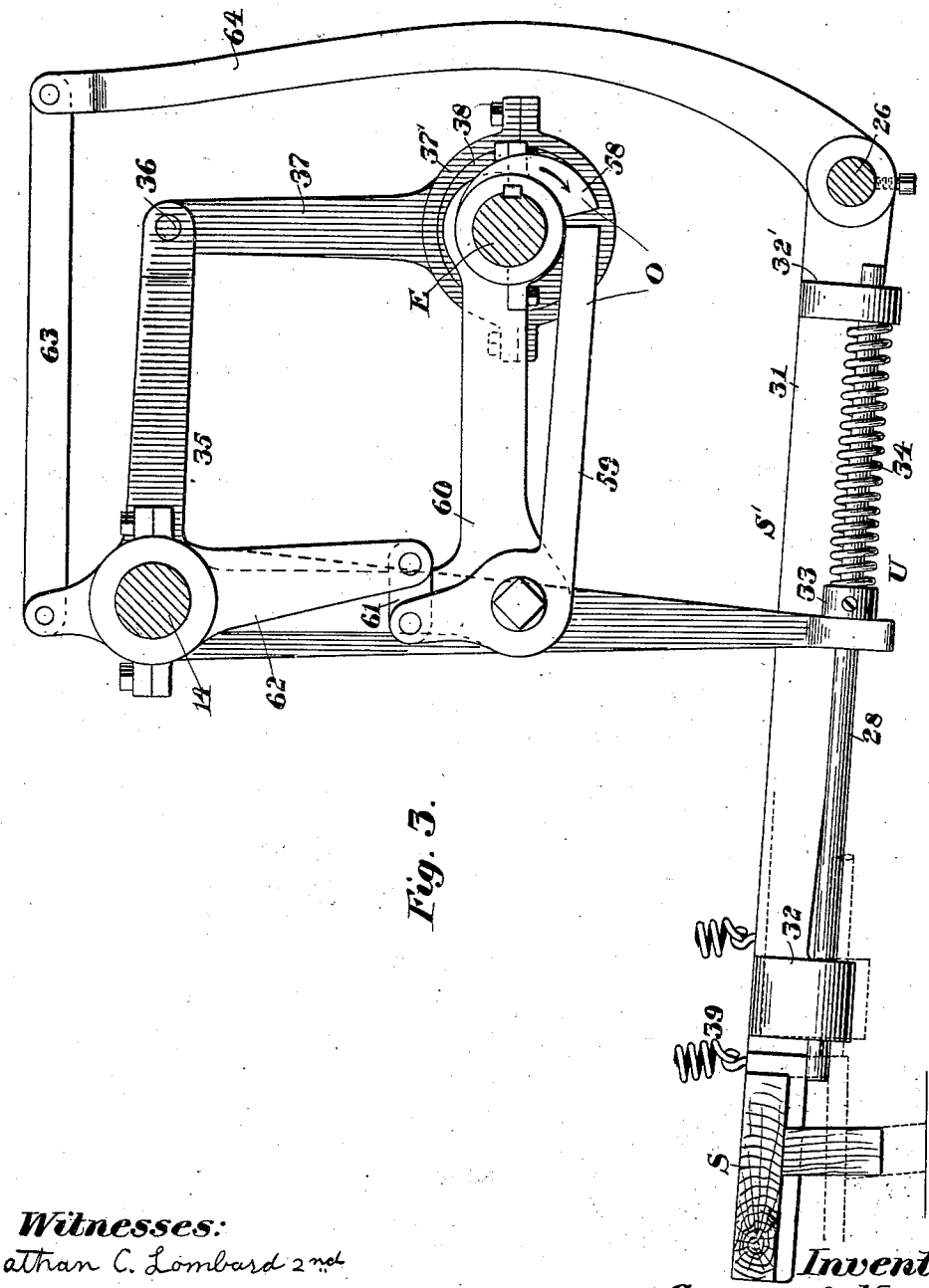

Fig. 3.

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(No Model.) 4 Sheets—Sheet 4.

Fig. 4.

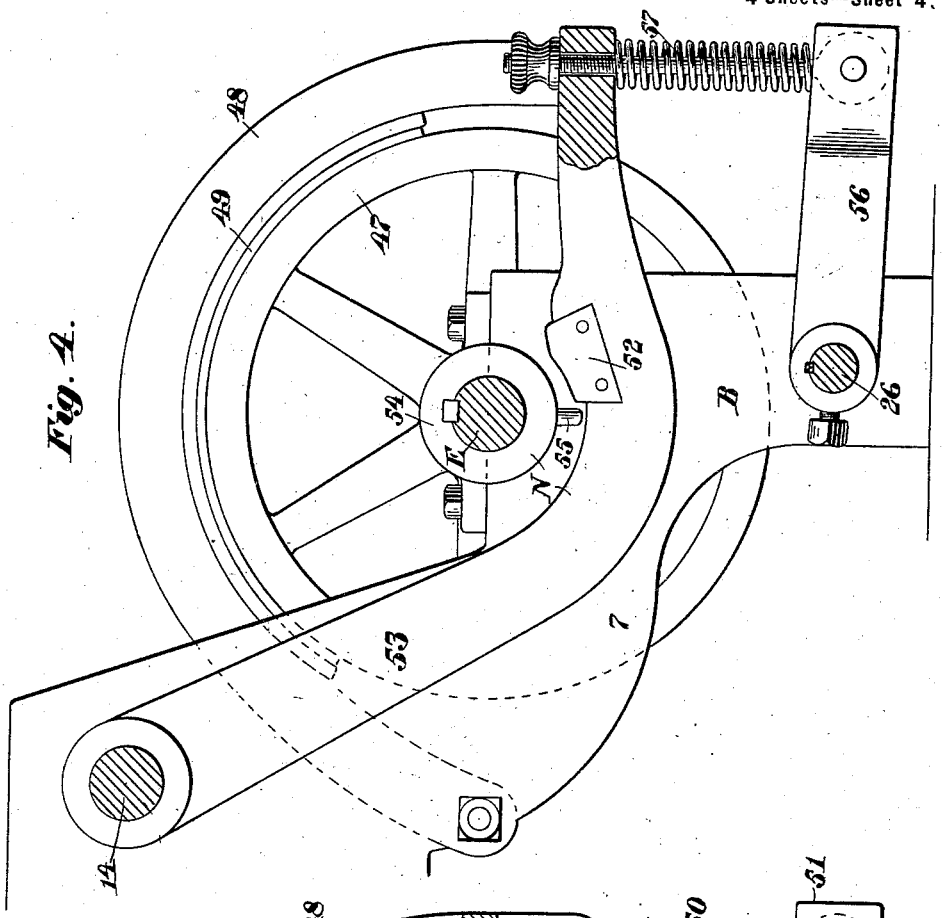
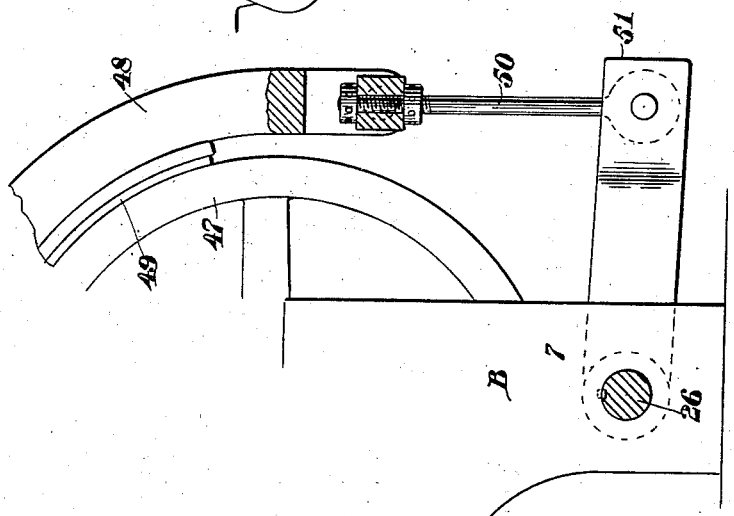


Fig. 5.



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UNITED STATES PATENT OFFICE.

GEORGE A. KNOX, OF LYNN, MASSACHUSETTS.

SOLE-CUTTING MACHINE.

SPECIFICATION forming part of Letters Patent No. 676,238, dated June 11, 1901.

Application filed July 12, 1900. Serial No. 23,338. (No model.)

To all whom it may concern:

Be it known that I, GEORGE A. KNOX, a citizen of the United States of America, and a resident of the city of Lynn, in the county of Essex and State of Massachusetts, have invented certain new and useful Improvements in Sole-Cutting Machines, of which the following is a specification.

This invention has special reference to that class of machines generally termed "sole-cutting" machines, and relates in a general way to all machines of that character particularly adapted for use in cutting, pressing, or operating upon leather or in like manner upon other materials and in which is employed a reciprocatory member, such as a beam, and rotary actuating means in connection therewith.

One object of the present invention is to produce as a concrete mechanism an improved, simplified, durable, and efficient machine of the character specified embodying novel coöperative devices and instrumentalities adapted for rendering the machine automatic in its operations, and which devices will further positively obviate the possibility of accidents incidental to the premature descent of the beam by accidental starting of the beam-actuating means, which frequently occurs in operating machines of known construction.

A further object of the invention is to provide either in a machine of the character specified or as attachments to such machines improved automatically-operative devices or instrumentalities controlled in their operations by the beam and beam-actuating means for automatically arresting and positively locking the actuating mechanism against accidental movement at the completion of each cycle of movements thereof and at a predetermined point in the retractive movement of the beam.

With these and other objects in view the invention resides in a machine of the character specified embodying certain novel devices singly or collectively and in the coöperative organization and special combination of these devices and also resides in certain novel devices adapted separately to be applied as attachments to such machines and in the novel construction, combination, and organization of the several parts of said devices, all substantially as hereinafter described, and more particularly pointed out in the claims.

In the drawings accompanying and forming part of this specification, Figure 1 is a front elevation, partly in section, of one form of machine embodying the present invention, the parts thereof being shown in their normal or starting position, the beam being at the end of its upstroke. Fig. 2 is a side elevation, partly in vertical section, of the machine as seen from the right in Fig. 1, a portion of the clutch mechanism being broken away. Fig. 3 is an enlarged vertical section of a portion of the machine, taken on a line corresponding with the dotted line 3 3 in Fig. 1 and showing the duplex treadle mechanism at the left of said line and one of the safety devices—the stop device—in connection with the beam-actuating shaft and treadle mechanism. Fig. 4 is an enlarged vertical section of a portion of the machine, taken on a line corresponding with the dotted line 4 4 in Fig. 1 and showing another safety device—the brake mechanism—at the left of said line, which operates to arrest the momentum of the beam-actuating shaft concurrently with the release of said shaft from its continuously-rotating driver; and Fig. 5 is a vertical sectional detail of a portion of the machine, taken on a line corresponding with the dotted line 5 5 in Fig. 1 and showing a portion of the brake mechanism at the left of said line.

Similar characters indicate like parts in all the figures of the drawings.

In the drawings I have shown my improvements as embodied in one form of sole-cutting machine, but it is distinctly to be understood that the present invention is not limited to the specific construction and organization of mechanism illustrated in said drawings, as the novel features constituting the subject-matter of the present invention are applicable to almost any form of machine embodying a beam, die-carrier, knife-carrier, or analogous reciprocatory device and mechanism for imparting reciprocatory movements to said device.

The machine illustrated in the accompanying drawings comprises in part and exclusive of the improved instrumentalities involved in the present invention the following devices and parts, which may be of any

well known or desired construction and organization, to wit: a suitable framework designated in a general way by B, a cutting block or bed C, which will usually be adjustable vertically in the usual manner, a beam or carrier or other analogous member D, supported on suitable guides for reciprocatory movements toward and away from the cutting block or bed C, and beam-actuating means including an intermittently-rotative actuator or driven shaft E, actuating-connectors *e* and *e'* between the actuator E and beam D, and a continuously-rotative actuator or driver E' in normal ineffective connection with the actuator or driven shaft E.

The improved specific attachments or instrumentalities involved in the subject-matter of the present invention and shown in the accompanying drawings in connection with the instrumentalities mentioned in the next preceding paragraph comprise means for arbitrarily establishing an effective engagement between the two actuators E and E', which means may include a clutch F between the two beam-actuators E and E', a clutch-actuator G and a duplex treadle mechanism, (designated in a general way by T,) one member of which is connected to the clutch-actuator, a safety device or locking means L in connection with the beam and effective for locking the treadle mechanism in a depressed position or against effective operation throughout the major portion of one cycle of movement of the beam-actuating means, means (designated by M) in connection with the beam and effective at a predetermined point in the movement of said beam for releasing the treadle mechanism and concurrently imparting a clutch-releasing movement to the clutch-actuator, another safety device or brake mechanism (designated in a general way by N) in operative connection with the intermittently-rotative beam-actuating shaft and effective on the release of the clutch device for arresting the momentum of said shaft, and another safety device or positive stop (designated in a general way by O) and controlled in its operations by the beam-actuating shaft and treadle mechanism and effective at the completion of each cycle of movements of the beam-actuating means and at the end of the ascending movement of the treadle mechanism for positively stopping the beam-actuating means.

The framework B, which, as before stated, may be of any suitable or well-known construction adapted for supporting the operative parts of the machine, comprises the base 6, having suitable supporting-legs 7, and the two vertical guides 8 and 8' for guiding the beam in its reciprocation, which beam is shown having guide-bearings 9 and 9' at opposite ends thereof, which fit the guides 8 and 8'. This beam is shown having at one end thereof an extension 10, on which are mounted the devices which control the clutch-actuator G.

The intermittently-rotative actuator E is shown as a horizontally-disposed shaft journaled in suitable bearings on the framework below the bed 6 and is operatively connected with the beam by the two actuating-connectors *e* and *e'*, which are of duplicate construction and each of which in the form thereof shown consists of an eccentric 12, secured to the shaft E and having an eccentric-strap 12' pivotally connected at its upper end to a rocking beam 13, mounted for oscillation upon a horizontal shaft 14, supported at its ends in the framework, and which rocking beam is pivotally connected at its opposite end to a cross-head 15, which is connected to another cross-head 16 by means of tie-rods 17 and 17', and which latter cross-head 16 is pivotally connected at 18 to an eyebolt 18', secured to the beam, as shown most clearly in Fig. 2 of the drawings.

It will be obvious that the construction and organization of the framework, beam, and actuating-connectors may be variously modified within the purview of this invention.

The clutch F, which may be of any desired construction, is shown as a rotative friction-clutch splined to the end of the shaft E and having a tapered bearing-face coöperative with a corresponding bearing-face on the driver E', which is supported for rotative movement with relation to the shaft E, this clutch having a circumferentially-grooved collar 21, which is engaged by a fork 22, fixed at its upper end to a clutch-actuator shaft 23, journaled in a horizontal bearing on a side wall of the framework.

The clutch-actuator G *per se*, in the form thereof shown in the accompanying drawings, consists of a vertically-disposed arm 24, fixed at its lower end to the clutch-actuator shaft 23, and a horizontally-disposed arm 25, also fixed to said shaft, the upper end of the arm 24 of the clutch-actuator terminating in operative relation with the extension 10 of the beam B, as shown most clearly in Figs. 1 and 2.

The duplex treadle mechanism T, which constitutes a means for shifting the clutch-actuator in one direction, comprises two independently-supported treadle devices, (designated in a general way by S and S', respectively,) the one, S, of which constitutes the main treadle and is loosely mounted at one end thereof on a horizontally-disposed treadle-shaft 26, journaled in suitable bearings on the framework, and is pivotally connected to the inner end of the horizontally-disposed arm 25 of the clutch-actuator by means of an eyebar 27, as shown in Fig. 1, and the other, S', of which is fixedly connected at its inner end to the treadle-shaft and is provided with a reactionary lock-bolt 28 in normal locked engagement with the treadle S.

The treadle S may be constructed in any well-known manner, it preferably consisting of two side bars connected together by a foot-board *f*, said foot-board being provided with wear-plates, (shown as L-irons 30,) which

form bearing-faces for the reactionary bolt 28 of the treadle S'.

The treadle device S' preferably consists of two side bars or levers, each of which is designated by 31 and is fixedly secured at its inner end to the treadle-shaft 26 and having two bolt-supporting bearings 32 and 32', near opposite ends thereof; a lock-bolt supported for reciprocatory movements in said bearings; a collar 33, fixed to said lock-bolt intermediate said bearings; a bolt-advancing spring 34, mounted on said bolt intermediate of the bearings, as 32', and the collar 33, and a bolt-actuating device consisting of two bell-crank levers 35 and 35', each of which is pivotally supported intermediate its ends on the rocking-beam shaft 14 and has a vertically-disposed arm in bearing engagement at its lower end with the collar 33 on a lock-bolt, and has a horizontally-disposed arm in pivotal connection, as at 36, with the end of a projecting arm 37 on an eccentric-strap 37', surrounding an eccentric 38, secured to the beam-actuating shaft E.

Each treadle S and S' is provided at its outer free end with lifting-springs 39 and 39', respectively, which are secured at their lower ends to said treadle and at their upper ends to the framework in a usual manner.

The treadle devices S and S' are so constructed and organized and the eccentric 38 of the lock-bolt actuator is so timed in its movement that as the treadle S is depressed to impart a clutch-shifting movement to the clutch-actuator to start the shaft E the treadle S' will be carried downward with the treadle S until the eccentric 38, by the rotation of the shaft E, imparts a retractive movement to the bolt 28 through the medium of the bolt-actuating bell-crank lever 35, when the treadle S will be released from locked engagement with the treadle S' and will be free to continue its descending movement, the bolt 28 being held in a retracted position until the treadle S has been returned to its normal elevated position and the beam-actuating shaft E has made approximately a complete rotation.

As a means for holding the treadle S against effective movement or against a second starting operation until the completion of one cycle of movements of the beam-actuating means, there is provided, in connection with the beam, a safety device L, hereinbefore referred to, which in the form shown is in the nature of a cam, secured to the extension 10 of the beam, having a working face 40, disposed to engage a roller 41 at the upper end of the arm 24 of the clutch-actuator G, this working face 40 being so disposed as to complete the clutch-engaging movement of the actuator G on the release of the bolt 28, which locks the two treadle devices S and S' together, and said cam holds said actuator in its advanced position and the treadle device S in a depressed position throughout the entire downstroke and the major portion of the upstroke of the beam.

For the purpose of releasing the clutch and nullifying the effective relation between the clutch-actuating shaft E and the continuously-rotating driver E' at a predetermined point in the ascending movement of the beam the extension 10 of said beam is provided with a reactionary by-pass device, (designated in a general way by M,) which in the form shown consists of a link 42, pivotally supported at one end on the beam and having an abutment pin or projection 43 at the free end thereof disposed to engage a cam-like projection 44 near the upper end of the arm 24 of the clutch-actuator G, whereby to impart a clutch-releasing movement to the actuator at a predetermined point in the ascending movement of the beam, a stop 45 being provided to limit the downward movement of the by-pass and a spring 46 being provided for holding the free end of the by-pass normally in engagement with said stop.

From the foregoing it will be seen that the clutch-actuator G is shifted in one direction to start the beam-actuating shaft by the treadle mechanism and that it is shifted in another opposite direction to release said shaft from its driver near the completion of the upstroke of the beam by the by-pass M, and that concurrently with this clutch-releasing movement of the actuator the treadle S is returned to its normal elevated position, at which time the lock-bolt of the treadle mechanism is advanced to its treadle-locking position through its actuator.

For the purpose of arresting the acquired momentum of the beam-actuating shaft immediately succeeding the nullification of the effective relation between said shaft and its driver by the shifting of the clutch to an inoperative position through the medium of the by-pass device on the beam there is provided, in connection with the beam-actuating means, (it being shown in connection with the shaft E,) another safety device—*i. e.*, a brake device N—which, in the form shown most clearly in Figs. 4 and 5, consists of a brake-wheel 47, keyed to one end of the shaft E; a segmental brake-shoe 48, preferably surrounding the upper portion of the wheel, which shoe is fixed at one end to the framework in any well-known manner and at its opposite end to a rod 50, pivotally connected at its lower end to an arm or bar 51, keyed to the treadle-shaft 26, and a brake-shoe actuator consisting, preferably, of a cam 52, secured to the upper face of a curved lever 53, pivotally supported at its upper end on the rocking-beam shaft 14 and having its lower free end extended underneath the main shaft E, between this shaft and the treadle-shaft 26, and terminating considerably in the rear of said shaft; a collar 54, keyed to the shaft E and having a pin or projection 55, disposed to engage the working face of the cam 52, whereby at a prede-

termined point in the rotation of said shaft to depress said lever; a lever or arm 56, fixed to the treadle-shaft 26 in vertical alinement with the lever 53, and a yielding connection 57, between the free ends of the levers 53 and 56, said connection preferably consisting of a rod pivotally secured at its lower end to the lever 56 and extending through an opening in the free end of the lever 53, a spiral spring surrounding said rod and bearing at opposite ends against adjacent faces of levers 53 and 56, and an adjustable tension device (shown as a nut) in threaded connection with the upper end of said rod and bearing against the upper face of the lever 53.

From the foregoing it will be seen that at a predetermined point in the rotation of the shaft E the projection 55 will strike the working face of the cam 52 on the lever 53, depress said lever, and, through the medium of the resilient connection 57, depress the end of the rod 56, which will impart a brake-shoe-actuating movement to the lever 51. This resilient connection 57 normally retains the cam 52 in working position with respect to the projection 55, irrespective of the position of the treadle-shaft.

As a convenient means for positively stopping the beam-actuating shaft at the completion of each rotation thereof, there is provided, in connection with said shaft and with the supplemental treadle device S', another safety device, (designated in a general way by O,) which in the form shown consists of a cam-like stop 58, fixed to the shaft E, a stop-abutment 59, shown as a bell-crank lever, pivotally supported intermediate its ends on a bracket 60 and having a horizontally-disposed arm whose outer free end is located normally (or when the parts are in the position shown in Figs. 1 and 2) in the path of the working face of the stop, and having a vertically-disposed short arm connected by a link 61 to the lower end of a lever 62, pivotally supported near its upper end on the rocking-beam shaft 14 and having its extreme upper end pivotally connected by a horizontally-disposed link 63 to the upper end of an actuating-lever 64, which is fixed at its lower end to the treadle-shaft 26, as will be readily understood by reference to Fig. 3 of the drawings. The operation of this safety device or positive-locking device O is as follows: On the depression of the treadle mechanism to start the machine the stop-abutment 59 will, through the operative connections described between it and the treadle-shaft 26, be thrown out of the path of the working face of the stop 58 and will be held in this position until the shaft E approximates a complete rotation, it being returned to an operative position with relation to said stop on an ascent of the treadle mechanism, as will be readily understood.

It is desired to say in the above connection that the invention is not limited to the specific construction and organization of treadle mechanism and safety devices shown in the accompanying drawings and as hereinbefore described, as such mechanism and devices may be variously modified without departure from this invention.

It will be understood that any suitable attachments, as cutting-dies, compressing devices, and analogous devices, (not shown,) may, if desired, be used in connection with the beam and that the term "beam" as herein employed signifies any reciprocatory member such as is generally employed in machines of this character.

The general operation of the machine will, from the foregoing description in connection with the drawings, be readily understood by any one familiar with the art to which this invention appertains, and therefore need not be more fully described herein.

I claim—

1. A machine of the character specified embodying a reciprocatory beam; beam-operating means including a primary actuator and a secondary actuator, the latter of which is in operative connection with the beam; means including treadle mechanism for establishing a driving connection between the primary and secondary actuators; and means including a reactionary device pivotally supported on the beam and operative at a predetermined point in the retractive movement thereof for establishing an ineffective relation between the primary and secondary actuators.

2. In a machine of the character specified a beam supported for reciprocatory movements; beam-actuating means including an intermittently-operative actuator in connection with the beam and a continuously-operative actuator in normal ineffective connection with the intermittently-operative actuator; arbitrarily-operative means including a clutch and treadle mechanism for establishing an effective connection between the two actuators; and means including a spring-retracted by-pass device pivotally supported on the beam, and automatically operative at a predetermined point in the return movement thereof, for releasing the clutch to nullify the effective connection between the two actuators.

3. A machine of the character specified embodying a beam; beam-actuating means in connection therewith; treadle mechanism for starting the beam-actuating means; means directly operated by the beam and operative on its advancing movement for locking the treadle mechanism against retractive movement; and means including a reactionary by-pass device pivotally supported on the beam and operative near the end of the retractive movement of said beam for returning the treadle to its normal position.

4. A machine of the character specified embodying a reciprocatory beam; reciprocating mechanism in connection with said beam; a clutch for controlling the operation of the reciprocating mechanism; an oscillatory

clutch-actuator in connection with the clutch; treadle mechanism in connection with one end of the clutch-actuator and effective for operating the same to start the beam-reciprocating mechanism; means on the beam for locking the actuator against a clutch-releasing movement and the treadle mechanism against a return movement during the descent of the beam; and a device carried on the beam and operative at a predetermined point in the retractive movement thereof for directly imparting a clutch-releasing movement to the clutch-actuator.

5. A machine of the class specified embodying a beam; beam-actuating means including a continuously-operative primary actuator and an intermittently-operative secondary actuator, the latter of which is in operative connection with the beam; a clutch for intermittently establishing a driving connection between the the primary and secondary actuators; a clutch-actuator; treadle mechanism imparting a clutch-engaging movement to the clutch-actuator; and means including a reactionary by-pass device pivotally mounted on the beam, and automatically operative at a predetermined point in the retractive movement thereof, for imparting a clutch-releasing movement to the clutch-actuator.

6. A machine of the class specified embodying a beam; beam-actuating means including a continuously-operating primary actuator and an intermittently-operative secondary actuator, the latter of which is in operative connection with the beam; a clutch for intermittently establishing a driving connection between the primary and secondary actuators; a clutch-actuator; treadle mechanism for imparting a clutch-engaging movement to the clutch-actuator; means carried on the beam and automatically operative on the descent thereof for locking the clutch-actuator in its effective position and for holding the treadle mechanism in its depressed position; and a reactionary by-pass device pivotally mounted on the beam and automatically operative at a predetermined point in the retractive movement thereof for imparting a clutch-releasing movement to the clutch-actuator and for returning the treadle mechanism to its normal position.

7. A machine of the character specified embodying a reciprocating beam; rotative beam-actuating means; a duplex treadle device for starting the beam-actuating means and including two independent treadles one of which is operated by the other through the first portion of the descending movement thereof; a spring-pressed bolt holding the two treadles locked against relative movement when in an elevated position; means operated by the beam-actuating means for retracting the bolt and thus releasing one treadle from locked engagement with the other; and means controlled by one treadle for stopping the beam-actuating means at a predetermined point in the ascending movement of said beam.

8. In a machine of the character specified, the combination with the beam and beam-actuating means, of two independent treadle devices, one of which is operative in one direction by the other, and one of which on the descent thereof controls the starting of the beam-actuating means, and the other of which on the ascent thereof automatically controls the stopping of the beam-actuating means; a locking device carried by one treadle device and holding the two treadle devices against relative movement when in their normal elevated positions; and means operated by the beam-actuating means for operating the locking device to release the treadles from locked engagement.

9. A machine of the character specified including a reciprocatory beam; beam-reciprocating means including a clutch; a clutch-actuator; means including treadle mechanism for operating the clutch-actuator in one direction to start the beam-reciprocating mechanism; and automatically and sequentially operative devices controlled directly by the beam; beam-reciprocating means, and treadle mechanism for gradually arresting the movements of, and then positively stopping, the beam-reciprocating mechanism, and one of which devices is mounted on the beam and is automatically operative at a predetermined point in the ascending movement of said beam for operating the clutch-actuator in another direction and for returning the treadle mechanism to its normal position.

10. In a machine of the character specified, the combination with a reciprocatory beam, an intermittently-operative actuator in connection with said beam, and a continuously-rotating actuator in normal effective connection with said intermittently-operative actuator, of arbitrarily-operable means including a treadle, clutch, and clutch-actuator for establishing an operative relation between the intermittently and continuously operated actuators; an automatically-operative by-pass device carried on the beam and effective at a predetermined point in the ascending movement of said beam for shifting the clutch-actuator to nullify the operative relation between the intermittently and continuously operative actuators; automatically-operative brake mechanism controlled by one actuator for arresting the rotation of said actuator immediately after the nullification of the operative relation between the two actuators; and an automatically-operative stop device controlled by the treadle mechanism and effective for positively stopping the rotative movement of said actuator during or immediately succeeding the operation of the brake mechanism.

11. A machine of the class specified embodying a reciprocatory beam; rotative beam-reciprocating means, a clutch controlling the operation of the beam-reciprocating means; a clutch-actuator; a treadle in connection with and adapted for imparting a clutch-en-

gaging movement to the actuator; a cam on the beam for locking the actuator in its clutch-engaging position during the descent of the beam; and a reactionary by-pass device pivotally mounted on the beam and automatically operative near the end of the upstroke of the beam for imparting a clutch-releasing movement to said actuator.

12. In a machine of the class specified, the combination with a beam and with beam-reciprocating means including a clutch, of a clutch-actuator; a treadle for shifting the clutch-actuator in one direction to start the beam-reciprocating mechanism; a cam carried by the beam and operative throughout the descending and a portion of the ascending movement of said beam for holding the clutch-actuator in the position it was left by the treadle; and a spring-retracted by-pass device mounted on the beam for shifting the clutch-actuator in an opposite direction at a predetermined point in the ascending movement of the beam.

13. In a machine of the character specified, the combination with a reciprocatory beam and with beam-actuating means including a clutch, of means including a treadle and a clutch-actuator for starting the beam-actuating means; and two independent automatically-operative devices on the beam, one of which is disposed to coöperate with the clutch-actuator, on the descent and a portion of the ascent of the beam for locking the treadle in its lowest position, and the other of which is disposed to coöperate with said clutch-actuator at a predetermined point in the ascending movement of the beam for releasing the treadle and for simultaneously imparting a clutch-releasing movement to the actuator.

14. In a machine of the character specified the combination with a reciprocating beam and actuating means therefor, of the duplex treadle mechanism including two treadles; a spring-advanced lock-bolt carried by one treadle and effective, normally, for locking the two treadles against relative movement in their elevated positions; and means operated by the beam-actuated means for imparting an unlocking movement to the lock-bolt at a predetermined point in the descent of the reciprocatory beam.

15. The combination with the framework, a driven shaft journaled on said framework, and a driver for said shaft, of a treadle-shaft; two treadle devices, one of which is loosely mounted at one end on the treadle-shaft and the other of which is fixed at one end to this same treadle-shaft; means carried by one treadle device and effective for locking the two treadle devices against relative movements when in elevated positions; and means operated by the driven shaft for actuating the locking means to release one treadle from the other at a predetermined point in the rotation of said driven shaft.

16. A machine of the character specified including a reciprocatory beam; a beam-actuating shaft; actuating-connectors between said beam and shaft; a continuously-rotative driver in normal ineffective connection with said shaft; means including treadle mechanism and a clutch for establishing an effective relation between the driver and shaft; means including, a reactionary by-pass device pivotally supported on the beam, automatically operative on the upstroke of said beam for nullifying the effective relation between the driver and shaft; an automatically-operative means for stopping the beam-actuating shaft at the end of the upstroke of the beam and for holding the same against movement until another depression of the treadle mechanism.

17. A machine of the character specified having a vertically-reciprocatory beam; an intermittently-rotative beam-actuating shaft in operative connection with said beam; driving means in connection with said shaft; treadle mechanism for establishing an effective relation between the driving means and shaft; means, including a reactionary device on the beam automatically effective near the end of the upstroke of said beam for nullifying the effective relation between the driving means and shaft; and automatically-operative devices controlled by the beam for blocking the treadle mechanism against another effective operation until one cycle of operations is complete, and for locking the beam-actuating shaft against movement at the end of each upstroke of the beam.

18. The combination with the beam-actuating shaft and with a treadle-shaft, of a main treadle pivotally mounted upon the treadle-shaft; a supplemental treadle fixed to said shaft and having a reactionary lock-bolt in normal locked engagement with the main treadle; means controlled by a treadle, on the downstroke thereof, for starting the rotation of said beam-actuating shaft; and automatically-operative means in connection with this shaft and treadle, and operative on the upstroke of said treadle, for stopping the beam-actuating shaft at the end of each complete rotation thereof.

19. The combination of a beam-actuating shaft; treadle mechanism; means controlled by the treadle mechanism on the descent thereof for starting the beam-actuating shaft; automatically-operative means for blocking the ascending movement of the treadle mechanism until the beam-actuating shaft has approximated a complete rotation; automatically-operative means, including a reactionary device pivotally supported on the beam, for effecting an ascending movement of the treadle mechanism near the end of one complete rotation of the beam-actuating shaft; and automatically-operative means in connection with the treadle mechanism and beam-actuating shaft for positively stopping said shaft at the end of each complete rotation thereof.

20. The combination with a reciprocatory beam, of beam-actuating means including an

intermittently-rotative driven member in operative connection with the beam; a continuously-rotative driving member; a clutch carried by one member and shiftable into engagement with the other member; a pivotally-supported clutch-actuator; treadle mechanism in connection with the clutch-actuator and effective for shifting the same in one direction to start the intermittently-rotative shaft; automatically-operative clutch-actuator-locking means carried by the beam and effective for holding the clutch-actuator against a clutch-releasing movement until an approximate complete reciprocation of the beam; and a by-pass device independent of the clutch-locking means, carried on the beam and automatically effective near the end of the upstroke of said beam for imparting a clutch-releasing movement to the clutch-actuator.

21. The combination with a reciprocatory beam and with actuating means therefor including a clutch of arbitrarily-operative means for shifting the clutch and starting the beam-actuating means; and two independently and automatically operative devices carried by the beam and effective one for holding the arbitrarily-operative clutch-shifting means against a second operation and the other for automatically imparting a releasing movement to the clutch and for arresting the movement of the beam-actuating means.

22. In a machine of the character specified the combination with a reciprocatory beam and with an intermittently-rotative actuating-shaft in connection therewith; a continuously-rotating driver; means including a treadle mechanism for intermittently establishing an operative connection between the driver and shaft; automatically-operative means controlled by the beam for nullifying the operative connection between the driver and shaft at a predetermined point in the upstroke of the beam; a brake-wheel fixed to the shaft; a brake-shoe in operative relation with the brake-wheel; a brake-shoe actuator pivotally supported at one end on the shaft; means in connection with the treadle mechanism and free end of the brake-shoe actuator for effecting the initial movement of the said actuator at the end of the upstroke of the pedal mechanism; and independent means on said shaft coöperative with the brake-shoe actuator near the end of one complete rotation of said shaft for completing the working stroke of said actuator.

23. In a machine of the character specified the combination with a reciprocatory beam and with an intermittently-rotative actuating-shaft in connection therewith; a continuously-rotating driver; means including a treadle mechanism for intermittently establishing an operating connection between the driver and shaft; automatically-operative means controlled by the beam for nullifying the operative connection between the driver and shaft at a predetermined point in the upstroke of the beam; a brake-wheel fixed to the shaft; a brake-shoe in operative relation with the brake-wheel; a brake-shoe actuator carried by the shaft and operative near the end of each complete rotation of said shaft for arresting the movement thereof, the brake-shoe actuator being so timed in its movement with respect to the movements of the beam as to be effective near the end of the upstroke of the beam; and a stop fixed to said shaft; and a stop-abutment operated by the treadle mechanism and shiftable into the path of the stop on the ascent of said mechanism whereby to positively stop the shaft at the end of each complete rotation thereof.

24. In a machine of the character specified the combination with a reciprocatory beam and with beam-actuating mechanism including a driven shaft, a driver, and a clutch to intermittently establish an operative engagement between the driver and shaft; of treadle mechanism; means in connection with the treadle mechanism and effective for operating the clutch in one direction to inaugurate the rotative movement of the shaft; a reactionary by-pass device carried on the beam, operative on the ascent thereof, for shifting the clutch-actuator in an opposite direction to permit the stopping of the shaft; and a plurality of safety devices, one on the beam and operative in connection with the clutch-actuator for locking the treadle mechanism in its lower position, another in connection with the shaft and effective for interrupting or retarding the movement of the shaft near the end of one complete rotation thereof, and another in connection with the shaft and treadle mechanism and effective for positively stopping the shaft at the end of each complete rotation.

Signed by me at Boston, Massachusetts, this 11th day of July, 1900.

GEORGE A. KNOX.

Witnesses:

WALTER E. LOMBARD,

NATHAN C. LOMBARD, 2nd.