

No. 656,594.

Patented Aug. 21, 1900.

F. A. BRADFORD & M. A. HOLMES.
MACHINE FOR STRETCHING LEATHER.

(Application filed Sept. 16, 1899.)

(No Model.)

6 Sheets—Sheet 1.

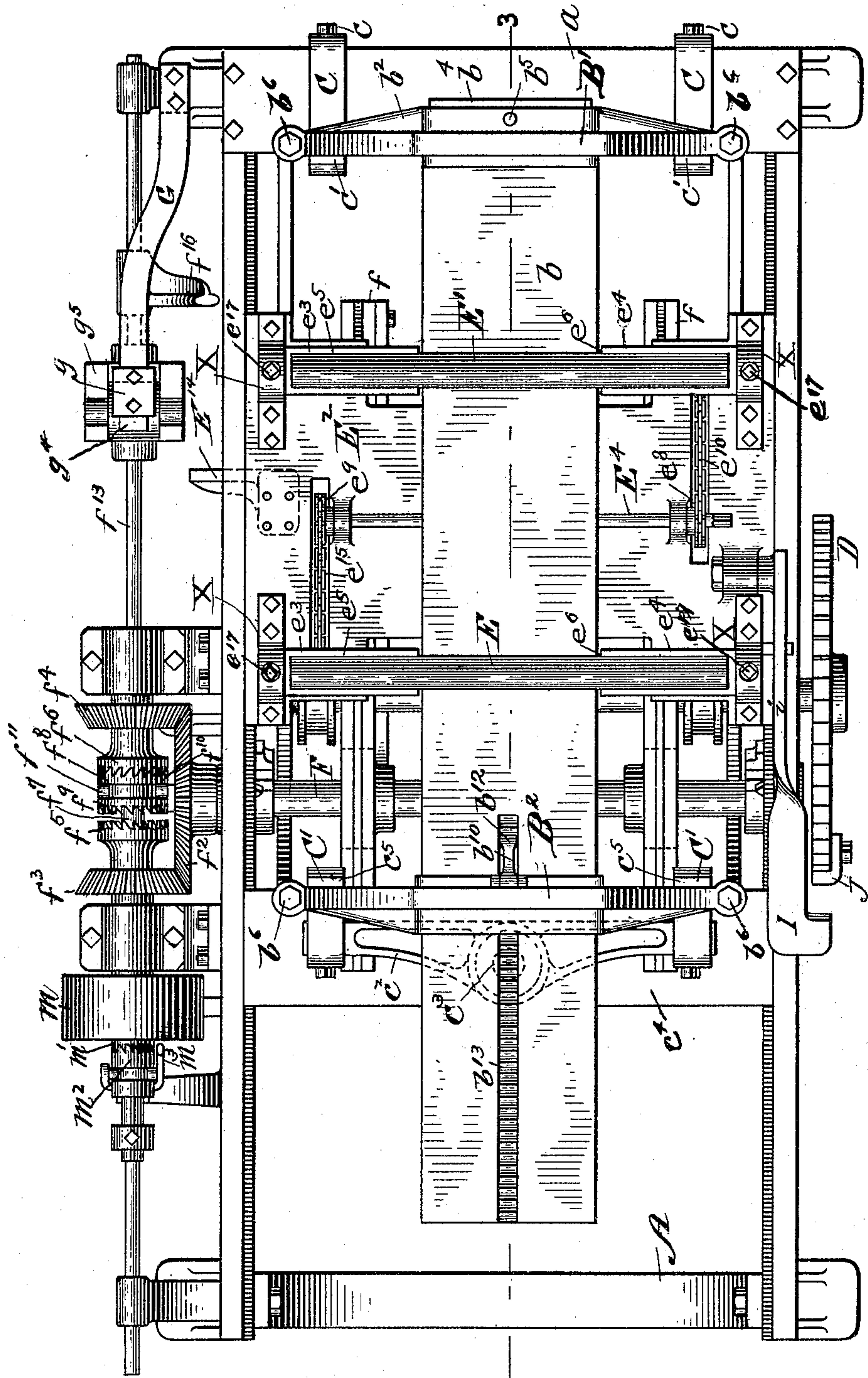


Fig. 1.

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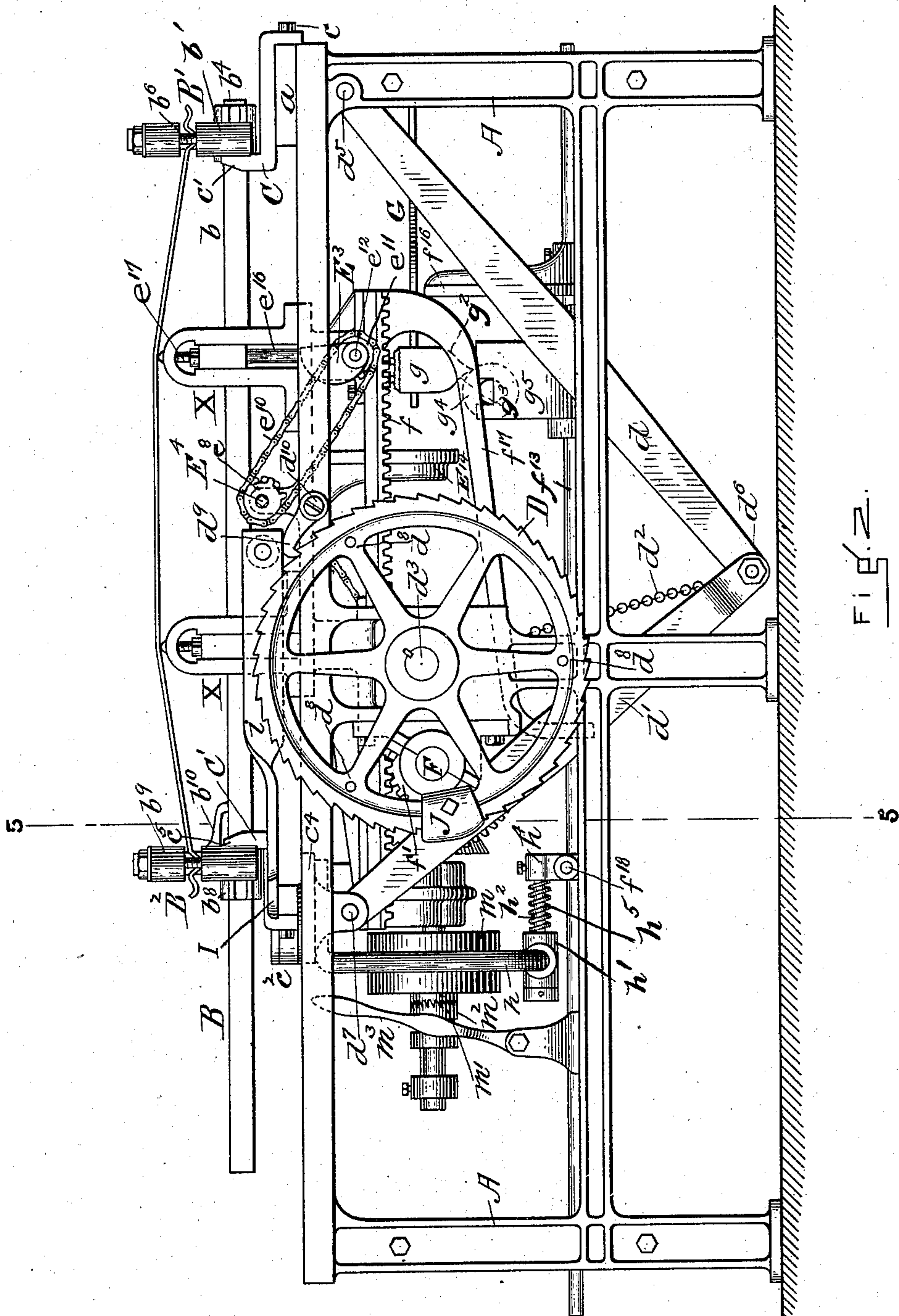
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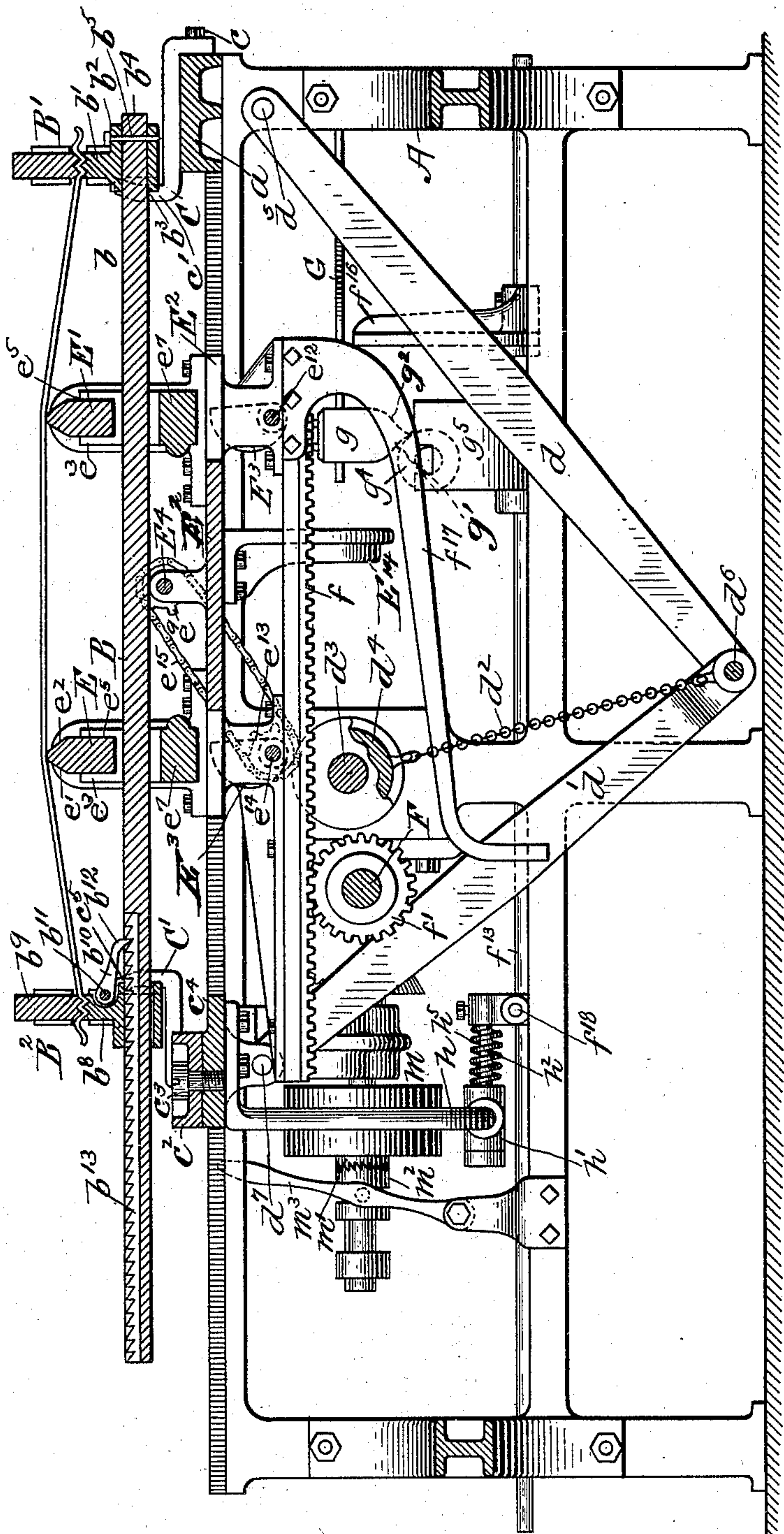


FIG. 5.

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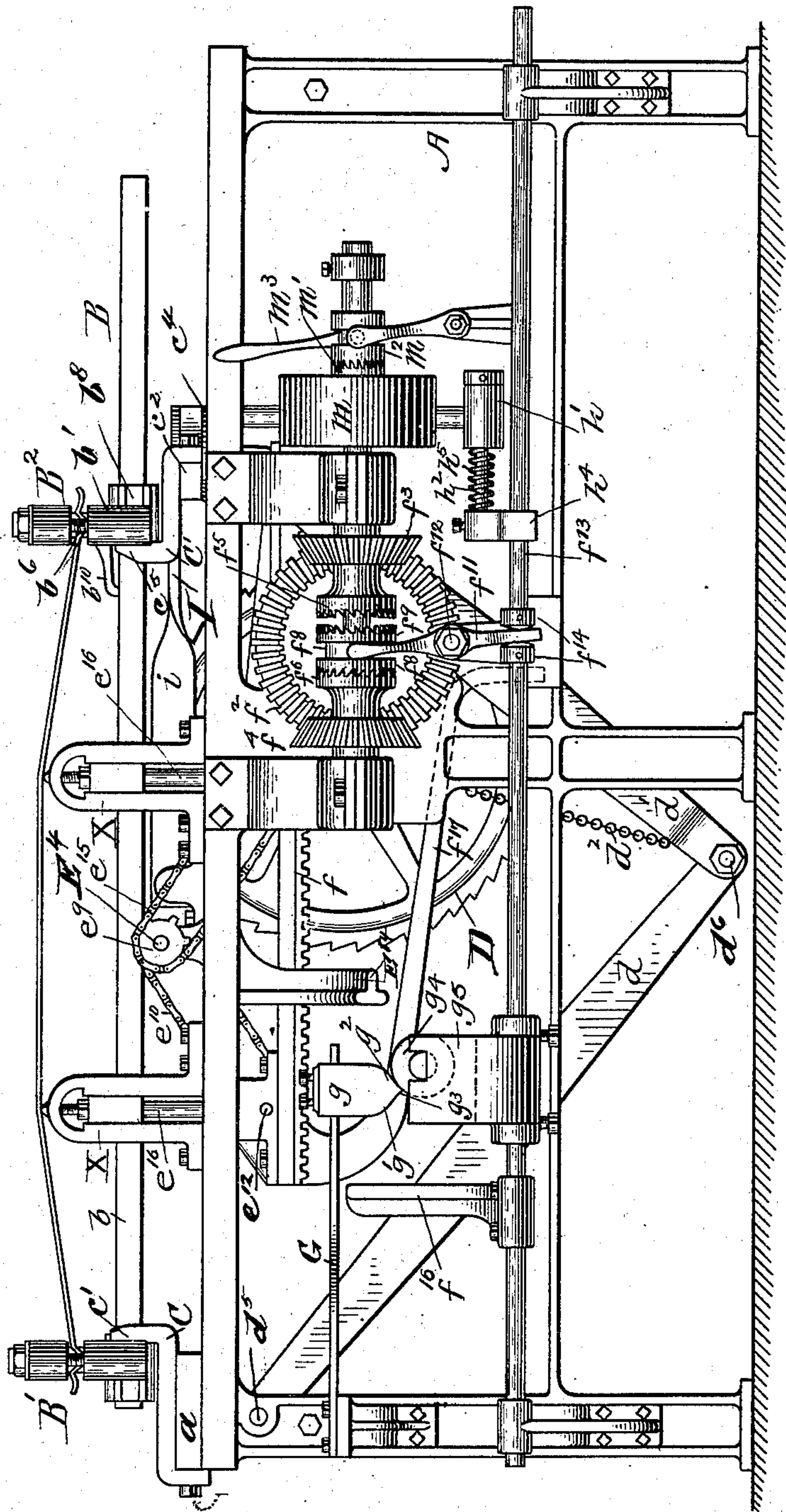


FIG. 4.

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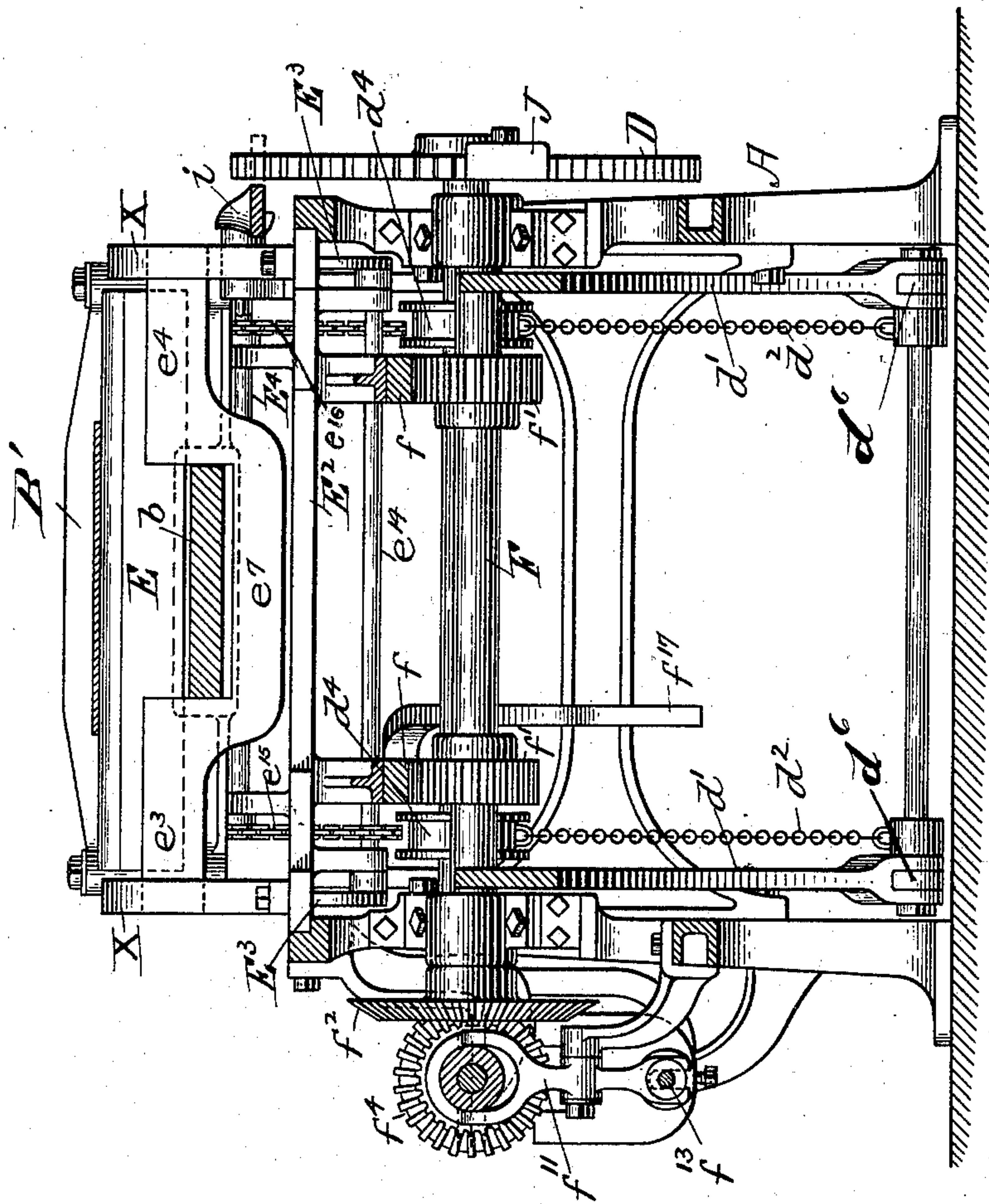


Fig. 5.

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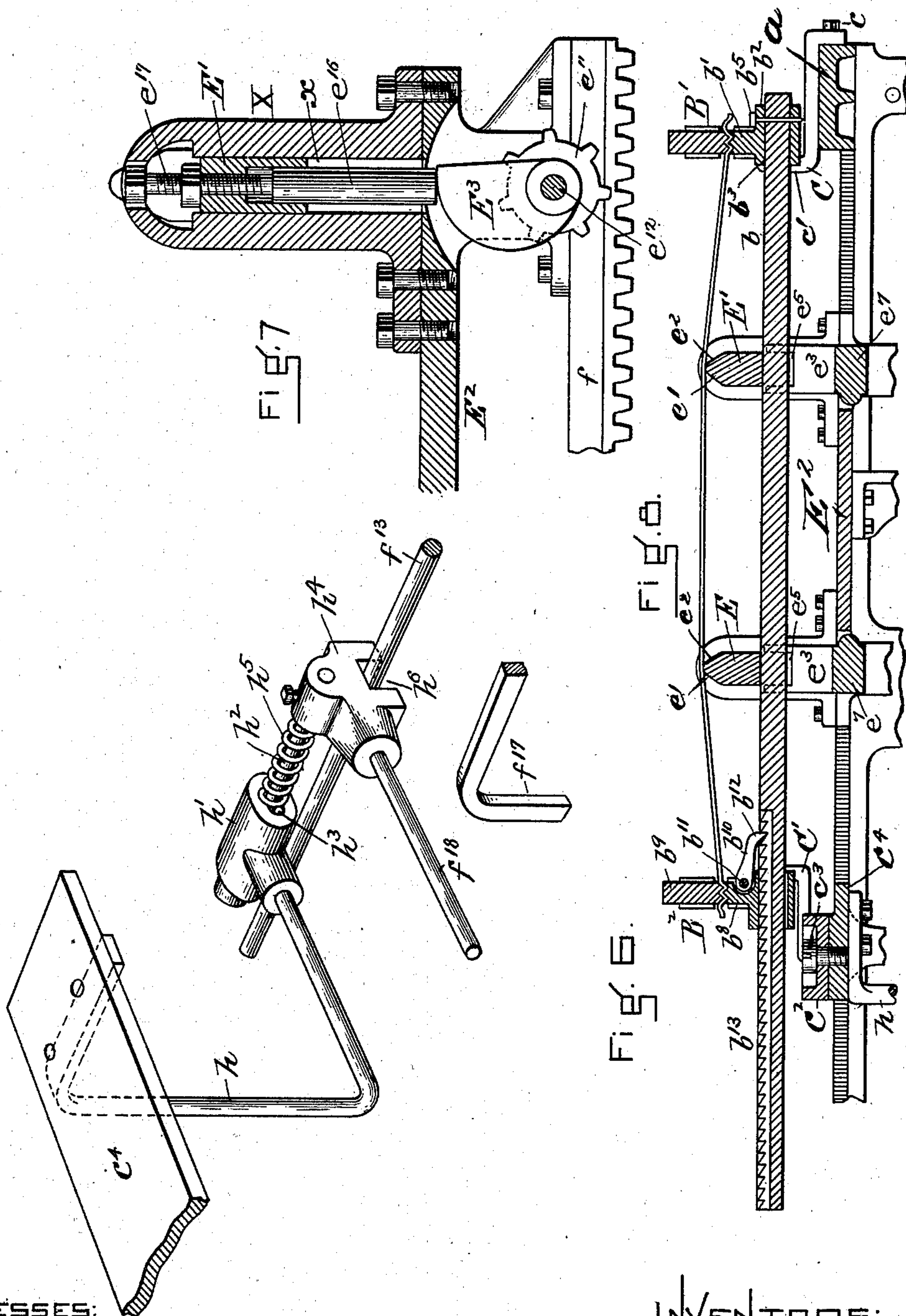
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(Application filed Sept. 16, 1899.)

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UNITED STATES PATENT OFFICE.

FRANK A. BRADFORD, OF BOSTON, AND MERTON A. HOLMES, OF NEWTON, MASSACHUSETTS, ASSIGNORS TO HARRIET E. HOLMES, LENA B. HOLMES, AND MERTON A. HOLMES, OF BOSTON, MASSACHUSETTS.

MACHINE FOR STRETCHING LEATHER.

SPECIFICATION forming part of Letters Patent No. 656,594, dated August 21, 1900.

Application filed September 16, 1899. Serial No. 730,760. (No model.)

To all whom it may concern:

Be it known that we, FRANK A. BRADFORD, of Boston, in the county of Suffolk, and MERTON A. HOLMES, of Newton, in the county of Middlesex, State of Massachusetts, citizens of the United States, have invented a new and useful Improvement in Leather-Stretching Machines, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part of this specification, in explaining its nature.

The invention relates to a leather-stretching machine which is adapted to stretch leather or other material either in the piece or independently of a removable stretching-frame or to stretch it in a removable stretching-frame which is adapted to hold the leather or material in a stretched condition after the machine had acted upon it and the stretching-frame is removed from the machine.

It also relates to means whereby the removable stretching-frame is mounted upon and removed from the machine.

It further relates to the rubbing-blades and manner of mounting them, of reciprocating them, and of using them in connection with a removable stretching-frame.

It also relates to means for removing slack from the material preparatory to the action of the rubbing-blades and to the hand adjustment of the rubbing-blades, also to means whereby the two clamps or holders for holding the leather or material stretched are automatically separated from each other, and to further means whereby the travel of the rubbing-blades is automatically increased in length as the clamps are separated and the material stretched, and which movement is controlled by the movement of a clamp.

It further relates to means whereby the stretching of the leather or material is automatically discontinued as well as the action of the means by which the increase in the throw of the rubbing-blades is obtained and without stopping the rubbing movement of said blades.

The invention further relates to various details of construction and organization, all of which will hereinafter be fully described.

In the drawings, Figure 1 is a view in plan of our improved machine. Fig. 2 is a view in front elevation thereof. Fig. 3 is a view in longitudinal vertical section upon the dotted line 3 3 of Fig. 1. Fig. 4 is a view in rear elevation thereof. Fig. 5 is a view in vertical cross-section upon the dotted line 5 5 of Fig. 2. Figs. 6, 7, and 8 are detail views to which reference will hereinafter be made.

The machine has mounted upon it means for moving the rubbing-blades vertically in their holders.

Before describing in detail the construction of the machine we will first describe the manner of mounting the leather or material in the clamps, the mounting of the holding and stretching frame in the machine, and the vertical adjustment of the rubbing-blades, horizontal adjustment of the movable clamp member by hand, and the subsequent automatic operation of the machine.

We will assume that the machine is to be operated in conjunction with removable holding and stretching frames. It will be understood that each movable holding and stretching frame also has its own rubbing-blades, which are removable with the stretched leather from the machine, the blades then being held between the leather and frame by the tautness of the leather, and subsequently the stretched leather is removed from the detached or removed stretching-frame, the rubbing-blades thereby released, and the stretching frame and blades may then be replaced in the machine to be again used in holding and stretching another piece of leather. To place the holding and stretching frame in the machine, its clamps are mounted upon the fixed and movable clamp-holders, the rubbing-blades placed over the plank or section of the frame upon which the clamps are mounted, with their ends located over their reciprocating holders, which are then stationary and in their lowest position. The piece of leather to be rubbed and stretched is then clamped by its ends in the clamps of the stretching-frame, and thus arranged extends over the rubber-blades with the rubbing-surface of which it is in contact, the said rub-

bing-surface of the rubbing-blades being above the level of the clamps, and the movable clamp of the stretching-frame is moved away from the stationary clamp by a hand movement of the stretching devices, whereby the leather is drawn upon the rubbing-blades as taut as possible by such operation. The rubbing-blade holders are then lifted by a lifting mechanism to be described, when they engage the ends of the rubbing-blades and by their continued upward movement lift the rubbing-blades from the plank or clamp connection of the stretching-frame, thus causing the blades to still further slightly strain the leather and at the same time locking them in a position to be moved from the plank and in the plane upon which they are reciprocated. The machine is then started and the rubbing-blades reciprocated between the two clamps against the leather, their stroke being automatically extended in the direction of the movable clamp, as the movable clamp is automatically caused by the action of the machine to take up the slack as it is made and hold the material stretched. The movement of the stretching-clamp may be stopped at any predetermined point and the stroke of the rubbing-blades then made constant or of the same length and continued, if desired, and the leather may be thus rubbed for any further period without subjecting it to further stretching action of the clamps, if so required. After the material has been sufficiently stretched and rubbed or rubbed alone the machine is stopped and the blade-holders lowered to their lowest position, thereby becoming disengaged from the ends of the blades and allowing the blades to move downward slightly upon the plank or other connections between the clamps of the stretching-frame, and the stretching-frame, with the stretched leather holding the rubbing-blades to the plank, is then removed from the machine by simply lifting it from the clamp-engaging holders.

Referring to the drawings, A represents the machine-frame.

B is the holding and stretching frame. It is represented as mounted in the machine. It carries at one end the fixed engaging clamp B' and at a suitable distance from the other end the movable engaging clamp B². The clamps are mounted upon a long wooden plank or support b, and they are similar in shape and clamping operation. The stationary clamp B' has a lower member b', which is considerably wider than the plank and is provided with a reinforcing-rib b² and a rectangular hole b³ for the reception of the end b⁴ of the plank, the member of the clamp being fastened to the plank by a pin b⁵. There is arranged to screw into each end of the member a clamping-screw b⁶, which extends through holes in the upper member b⁷ and which member is closed toward the lower member by turning the screws, the upper member being secured to the screws to be

lowered and raised with them. The movable clamp B² is similar in construction to the clamp B'. The plank extends through a rectangular hole in the lower member b⁸ thereof. The upper member b⁹ is moved toward and from the lower member in the same manner as the upper member of the stationary clamp B'. The movable clamp has in addition a dog b¹⁰, which is pivoted to the lower member at b¹¹, (see Fig. 3,) and the end b¹² of which is adapted to engage the teeth of the rack-bar b¹³, fastened in a rectangular recess in the plank b. (See Fig. 3.) This dog, in connection with the rack, serves to lock the movable clamp after each of its progressive stretching movements and also serves to hold the movable clamp locked away from the stationary clamp and with the leather held by them in a state of tension.

The leather holding and stretching frame B is held in the machine by the holders C C', which form parts of the machine. The holders C are stationary wrought-iron angular pieces and are rigidly attached to the frame of the machine. They rest upon the cross-bar a of the machine and have downward-extending ends through which fastening screws or bolts c, fastening them to the frame, extend, and upwardly-extending arms c', against which the inner side of the lower member b' of the stationary clamp B' bears near its outer ends. (See Figs. 1 and 2.) The holder C' for engaging the movable clamp B² of the stretching-frame is of similar construction; but instead of being attached to a fixed cross-bar of the machine it is secured to the ends of a movable equalizing-bar c², (see Fig. 1,) which is itself pivoted at c³, at the center of its length, to a sliding carriage c⁴, mounted on the machine-frame. It engages the lower member b⁸ of the movable clamp by its upwardly-extending ends c⁵ at or near its outer ends. It is mounted upon an equalizer-bar in order that the draft of the clamp upon the leather may be made as uniform throughout the width of the leather as possible. The movable clamp is provided with its straining movement by means of the carriage c⁴, the large ratchet-wheel D, the toggle-links d d', the chain d², the shaft d³, upon which the ratchet-wheel is mounted, and the winding drum or spool d⁴ on said shaft d³. The toggle-links d are jointed at d⁵ near each right-hand upper corner of the machine-frame and at their lower ends at d⁶ to the links d', and the links d' are pivoted at d⁷ to lugs extending downward from the slide c⁴. The chains d² connect with the links near the joint d⁶ and extend to the winding drums or spools d⁴. The drum or spool is turned by the ratchet-wheel D to wind up the chain, and the winding of the chain straightens the toggle and applies power to the slide c⁴. This power may be applied by hand before the machine is set in operation to give the latter some degree of tautness, and for this purpose the wheel D is provided with handles d⁸, and it is locked after such movement by the lock-

ing-dog d^9 , pivoted at d^{10} to the machine-frame, and the end of which is adapted to shut behind a ratchet-tooth on the wheel, and thus lock it from turning back. This locking-dog also serves to hold the ratchet-wheel, and consequently the slide c^4 and clamp B^2 , when the ratchet-wheel is turned by power instead of by hand, as will be hereinafter explained. $E E'$ are the rubbing-blades. They, preferably, are made of wood and are rectangular in section, with a working surface formed by the inclined or beveled upper faces $e' e^2$.

Each rubbing-blade is carried by a blade-holder, with which it has a detachable relation. Each blade-holder has the end sections $e^3 e^4$, in which are the recesses or cavities $e^5 e^6$, open at their tops and of a size to receive and hold the ends of the rubbing-blades. These end sections are connected with each other by the integral depressed part e^7 . The outer ends of the blade-holders are mounted in the vertical slideways x in the guide-stands X , which are bolted to the reciprocating carriage E^2 . Each blade-holder is vertically movable in its way by means of the cams E^3 , there being a cam beneath each end of each holder. These cams are also mounted upon the reciprocating carriage E^2 and reciprocate therewith, and they are adapted to be simultaneously turned by their common operating-shaft E^4 . This shaft is mounted upon the reciprocating carriage and has sprocket-wheels $e^8 e^9$, which are turned by it. The sprocket-wheel e^8 is connected by the sprocket-chain e^{10} with the sprocket-wheel e^{11} on the cam-shaft e^{12} , and the sprocket-wheel e^9 is connected with a sprocket-wheel e^{13} on the cam-shaft e^{14} by a sprocket-chain e^{15} . These cams E^3 are preferably shaped as represented in Fig. 2—that is, each is an edge cam having a lifting-surface. They impart vertical movement to the blade-holders by means of the studs or posts e^{16} , which are mounted in the ends of the blade-holders to extend downward, as represented in Fig. 7. The object of this construction of blade-holders and cams is to permit the blades to be readily engaged and disengaged by their holders and also to permit the stretching-clamp, with the blades thereon, to be readily placed in the machine and as readily removed from it. When the stretching-clamp and the blades are placed in the machine, the blade-holders are in their lowest position and out of contact with the ends of the blades. The ends of the blades are located over their holding-recesses in the blade-holders, and the blade-holders are then lifted from the position represented in Fig. 8 to cause their ends to engage the ends of the blades and then slightly lift the blades above the plank or to the position represented in Fig. 5. The blade-holders are simultaneously lifted to engage the blades, and the blades then with the blade-holders are simultaneously slightly additionally lifted by the turning of the shaft E^4 , which is turned

by hand by means of a wrench or in any other desired way before the machine is started. The adjusting-screws e^{17} regulate the height to which the holders may be lifted. These screws have threaded shanks which screw in threaded holes in the blade-holder ends, and they bear upon the lifting-studs e^{16} , and upon being turned they lift or lower the blade-holders with respect to the ends of the studs.

The carriage E^2 , the rubbing-blades, and their holders and lifting devices are reciprocated on the machine-frame by means of the racks f and the pinions f' , which engage them and which are mounted upon a shaft F , which is caused to be rotated by the power-shaft first in one direction and then in a reverse direction. Automatic shipping devices connect the main shaft with the shaft F , the time of operation being controlled by the movable clamp member B^2 . At the outer end of the shaft F there is a bevel gear-wheel f^2 , with which the bevel-gears $f^3 f^4$ are in constant engagement. The gear f^3 has a member f^5 of a clutch and the gear f^4 a member f^6 . Both the gears $f^3 f^4$ and their members are free on the power-shaft f^7 . Between the clutch members $f^5 f^6$ there is a clutch member f^8 , having a clutch-section f^9 adapted to engage the clutch member f^5 , and a clutch member f^{10} , adapted to engage the clutch member f^6 . This clutch member f^8 is made fast to the shaft f^7 by a fast feather upon which it slides, and it is moved at each end of the movement of the carriage E^2 to engage first the bevel-gear f^3 , by which the shaft F is turned in one direction, and then the bevel-gear f^4 , by which the shaft F is turned in a reverse direction and the carriage moved in a reverse direction. The shipping of the clutch-section f^8 is produced by the lever f^{11} , (see Fig. 4,) whose forked upper end engages the clutch-section f^8 by pins entering a groove therein, is pivoted at f^{12} , and the lower end of which straddles the dog-rod f^{13} , and with which it has operative relation by means of the collars f^{14} . The dog-rod is moved by the carriage near or at the end of each movement thereof and in one direction by the contact of the carriage-dog E^{14} (see Fig. 1) with the dog f^{16} , mounted on the dog-rod f^{13} , and the dog-rod is moved in the reverse direction by the dog f^{17} , attached to the carriage, and the adjustable dog f^{18} , adjustable on the dog-rod. The movement of the dog-rod by the carriage-dogs is sufficient to disengage the clutch-section f^8 from the members $f^5 f^6$ of the clutch; but as the blade-carriage moves slowly and has practically no momentum it would be liable to stop as soon as this clutch-section f^8 was disconnected from either of the members f^5 or f^6 , and we have therefore provided an auxiliary force which will independently move the dog-rod f^{13} after the release of the clutch members, which occurs at the end of each stroke of the carriage. This supplemental moving of the dog-rod engages a clutch member f^5 or f^6 for the return or reverse move-

ment of the carriage. Any desired means may be employed for this purpose, and we do not confine ourselves to the one which we are about to describe. This one consists of a
 5 spring-arm G, attached to the frame of the machine, extending horizontally and carrying at its free end a pusher g , the lower end of which has the inclined surfaces g' g^2 extending to a point g^3 . As the carriage E^2 ap-
 10 proaches the end of its movement in one direction or the other the pusher is caused to ride up the surface of a roll g^4 , which is mounted upon an arm g^5 , carried by the dog-rod f^{13} . (See Figs. 1 and 4.) By contact of the mov-
 15 ing dogs f^{17} and with the dog-rod dogs f^{18} and f^{16} the point of the pusher g is carried just beyond the center of the top of the roll, and the spring which has been compressed by the upward movement of the pusher then acts
 20 against the roll to push the dog-rod onward until the pusher has settled or moved downward to its lowest position upon the opposite side of the roll, and this additional movement imparted to the dog-rod f^{13} at each end of the
 25 movement of the sliding carriage gives the dog-rod that slight additional movement necessary for positively engaging the clutch-section f^8 alternately with the clutch members f^5 f^6 .

30 We have said that the clutch-dog f^{18} is adjustable, and we have also intimated that it is connected with the movable clamp B^2 of the leather-holding frame. In Fig. 6 we have represented it as so connected by means of
 35 the bent rod h , the lower end of which carries the dog-holder h' , consisting of a rod h^2 , movable laterally in a slotted hole h^3 in the holder h' , having at its outer end a grip h^4 , from which extends horizontally inward the dog
 40 f^{18} . The rod h^2 may also move longitudinally in the holder h' , and a spring h^5 surrounds it, bears against the holder, and also against the grip. The dog-rod f^{18} passes through a recess h^6 in the grip. The rod h^2 , having a lateral
 45 movement in the holder h' , permits the dog f^{18} to act as a lever and to turn the grip sufficiently to engage the dog-rod f^{13} . As the position of the movable clamp B^2 or clamp-holder is changed it likewise changes the po-
 50 sition of the grip h^4 upon the dog-rod, and consequently the travel of the rubbing-blade's carriage must be increased or decreased to effect a contact of the shipping-dog f^{17} with the shipping-dog f^{18} , according to the direc-
 55 tion in which the clamp B^2 is moved, and by this means the stroke of the rubbing-blades and their carriage is automatically varied and at one end only of their movement.

The slide c^4 and the movable clamp B^2 are
 60 automatically moved by means of the dog I at the end of a bar i , attached to the sliding carriage E^2 . (See Figs. 1 and 2.) This dog as the carriage E^2 approaches the end of its movement in one direction comes into con-
 65 tact with a tooth in the ratchet-wheel D and moves it slightly, thereby causing it to actuate the toggle and move the slide c^4 , and the

stop-dog d^9 automatically engages another tooth and holds the ratchet-wheel, toggle, slide, and movable clamp stationary after the
 70 dog I is disengaged from the ratchet-wheel during the reverse movement of the carriage and its backward movement preparatory to a fresh engagement of the dog with the ratchet-wheel, and this automatic movement of the
 75 carriage c^4 and movable clamp B^2 automatically varies step by step and in the same direction the position of the dog f^{18} , as above specified. The dog I, however, may be made inoperative by causing it to act against the
 80 cover J, which is attached to the rim of the ratchet-wheel D by a thumb-screw and which is adapted to be moved into line with the line of movement of the dog I and upon which the dog then rides and is thus held disengaged
 85 from contact with the ratchet-teeth during the interval in which it would otherwise act to turn the ratchet-wheel. When the ratchet-teeth cover is so employed, the slide c^4 and movable clamp B^2 become stationary, as does
 90 also the dog f^{18} , and the strokes of the rubbing-blades are then of the same length and do not automatically increase each stroke at one end. Power is communicated to the power-shaft through the belt-wheel m to
 95 freely turn thereon and has a clutch member m' and the clutch member m^2 , which is attached to the shaft by a fast feather and which is movable by the lever m^3 into and out of engagement with the belt-wheel clutch
 100 member.

It will be observed that the rubbing-surfaces of the rubbing-blades reciprocate in a straight line and are above the points of engagement of the ends of the material with
 105 the clamps, and this provides a very desirable stretching and finishing action.

The operation of the machine and its advantages have already been described and need not be further elaborated here. We
 110 would say that while we have described it as operating upon leather we would not be understood as limiting it to such use, but it may be employed upon any material of fabric requiring to be finished by a stretching
 115 and rubbing action.

It will be seen that the movable clamp acts to set the adjustable dog f^{18} in its initial position, and all subsequent movements of the clamp are also transferred to the dog, so that
 120 its position is automatically changed with that of the clamp in the subsequent step-by-step stretching of the material. This automatic preliminary setting of the dog establishes the extent of the initial stroke of the
 125 rubbing-blades, and its subsequent automatic step-by-step setting also automatically fixes and determines the length of stroke of the rubbing-blades, and it will thus be seen that the length of the material placed in the
 130 clamps automatically determines the length of the stroke or travel of the rubbing-blades' carriage and of the rubbing-blades and consequently that no adjustment of the said

stroke to the length of material to be rubbed other than that obtained during the clamping of the material in the clamps is necessary. By making the clamping and stretching frame removable from the machine the stretched leather or material may be held by it without losing any of the stretch gained and until the same is dry, after which it is generally found to be loose in the stretching-frame, so that all the stretching which was gained in the machine is retained in the material.

Having thus fully described our invention, we claim and desire to secure by Letters Patent of the United States—

1. In a machine of the character specified, holding and stretching clamps, hand means for separating them, reciprocating rubbing-blades each independently adjustable and movable vertically, and means for lifting each rubbing-blade to working position and for holding them lifted during their reciprocating movement, as set forth.

2. In a machine of the character specified, holding and stretching clamps, reciprocating rubbing-blades and means applied to each blade whereby it is lifted to a working position and is held lifted during their reciprocating movements, as set forth.

3. In a machine of the character specified, holding and stretching clamps, hand means for separating the clamps, devices for holding them separated, rubbing-blades, means for reciprocating them between the clamps and hand means applied to each blade separately for lifting it to working position and for holding it lifted during its rubbing operation, as set forth.

4. In a machine of the character specified, holding and stretching clamps, reciprocating rubbing-blades, means applied to each blade to lift it and bring its working edge to a working position above the level of the ends of the material held by the clamps and for holding it in said position during its reciprocating movement, as set forth.

5. In a machine of the character specified, a removable holding and stretching frame comprising a clamp-support, two clamps mounted thereon, adapted to be separated to stretch the material held by them, and means for locking them in their separated position, frame-holders to engage the clamps of the frame also separable in relation to each other, means for moving one of the holders to separate the clamps, the rubbing-blades, devices for lifting them and for holding them lifted and means for reciprocating them in their lifted position.

6. In a stretching and rubbing machine a removable holding and stretching frame comprising a clamp-support, two clamps mounted thereon adapted to be separated to stretch the material held by them and means for locking them in their separated position, frame-holders to engage the clamps of the frame, also separable in relation to each other, means

for moving one of the holders to separate the clamps, the detachable rubbing-blades extending across the clamp-support between it and the said material held by the clamps, holders upon each side of said support for holding the said blades by their ends, devices for lifting said holders to said blades and for then slightly lifting the blades and holding them lifted, and means for reciprocating the blade-holders and said blade-lifting devices.

7. In a machine of the character specified, a holding and stretching frame comprising a clamp-support, two clamps mounted thereon adapted to be separated step by step to stretch the material held by them, means for locking them apart as they are separated, frame-holders to engage the clamps of the frame also separable in relation to each other, means for moving one of the holders continuously by hand to separate the clamps and afterward by power with a step-by-step movement, the rubbing-blades, devices for holding and lifting them and for holding them lifted prior to their reciprocation, and means for reciprocating them in their lifted position.

8. In a machine of the character specified, a holding and stretching frame comprising a clamp-support, two clamps mounted thereon adapted to be separated to stretch the material held by them, means for locking them in their separated position, frame-holders to engage the clamps of the frame also separable in relation to each other, a device for moving one of said holders, the rubbing-blades, a reciprocating carriage upon which they are mounted and means connecting the carriage with the device for moving one of the frame-holders, whereby the said device is caused to be operated by the carriage.

9. In a machine of the character specified, a reciprocating carriage, blade-holders mounted thereon, rubbing-blades having their ends in said holders, means upon said carriage in line with said blade-holders adapted to be simultaneously operated to lift the blade-holders simultaneously.

10. In a machine of the character specified the combination of the blade-holders, the rubbing-blades carried thereby, cams for lifting the blade-holders and means for adjusting the height of the blade-holders in relation to the cams.

11. In a machine of the character specified, the combination of a holding and stretching device having two clamps adapted to be separated to stretch the material held by them, means for locking them in their separated position, holders to engage the clamps also separable in relation to each other and reciprocating rubbing-blades and means for varying automatically the length of stroke of said rubbing-blades as said material is stretched at one end.

12. In a machine of the character specified, holding and stretching clamps adapted to be separated to stretch the material held by them, means for locking them apart as they

are separated, holders to engage the clamps separable in relation to each other by a step-by-step movement, reciprocating rubbing-tools and means whereby a change in position of the clamps with relation to each changes the length of the stroke of the rubbing-tools automatically.

13. In a machine of the character specified, a holding and stretching frame comprising a clamp-support, two clamps mounted thereon adapted to be separated to stretch the material held by them, means for locking them in their separated position, frame-holders to engage the clamps of the frame also separable in relation to each other, means for moving one of the holders to separate the clamps comprising the ratchet-wheel *D*, its shaft, a winding-drum mounted thereon, the toggle-links *d*, *d'* pivoted together, one of which is also pivoted to the machine-frame and the other to the holder-slide, a winding-chain, connecting the toggles with the drum and a locking-dog to lock the ratchet-wheel.

14. In a machine of the character specified a holding and stretching frame comprising a clamp-support, two clamps mounted thereon, adapted to be separated to stretch the material held by them and adapted to be locked in their separated position, frame-holders also separable in relation to each other, means for moving one of the holders to separate the clamps by a step-by-step movement, comprising a ratchet-wheel *D*, its shaft, a winding-drum thereon, the toggle members *d*, *d'* connected with each other, the frame and the slide carrying the holder, a reciprocating dog *I* to engage the teeth of the ratchet-wheel near the end of a full reciprocation and a locking-dog to engage the teeth of the ratchet-wheel to hold it stationary while the reciprocating dog is out of engagement with its teeth.

15. In a machine of the character specified, a holding and stretching frame comprising a clamp-support, two clamps mounted thereon adapted to be separated to stretch the material held by them, means for locking them in their separated position, frame-holders to engage the clamps of the frame also separable in relation to each other, means for moving one of the holders to separate the clamps and devices for disconnecting said means from said holder in combination with reciprocating rubbing-blades.

16. In a machine of the character specified, holding and stretching clamps adapted to be separated to stretch the material held by them, means for locking them in their separated positions, frame-holders to engage the clamps also separable in relation to each other, a reciprocating carriage, rubbing-blades carried by said carriage, mechanism for moving the carriage, and fixed and variable reversing devices for reversing the movement of said mechanism, the variable reversing device being automatically controlled by the movable clamp.

17. In a machine of the character specified,

the combination of a movable clamp, a reciprocating carriage having a variable extent of movement, rubbing-tools mounted upon the carriage and means whereby the movement of the clamp controls the extent of movement of the said carriage.

18. In a machine of the character specified, a holding and stretching frame comprising a clamp-support, two clamps mounted thereon adapted to be separated to stretch the material held by them, and means for locking them in their separated position, frame-holders to engage the clamps of the frame also separable in relation to each other, and one of which is pivoted to move upon a horizontal arc.

19. In a machine of the character specified, holding and stretching clamps adapted to be separated to stretch the material held by them, means for locking them in their separated position, holders to engage the clamps also separable in relation to each other, a reciprocating carriage, rubbing-blades mounted thereon to be reciprocated thereby, the carriage-rack *f*, the gears *f'* meshing therewith mounted on the shaft *F*, the bevel-gear *f*² at the end of said shaft, the power-shaft *f*⁷, the bevel-gears *f*³, *f*⁴ and their respective clutch members *f*⁵, *f*⁶ mounted thereon to mesh with the teeth of the bevel-gear *f*², the clutch member *f*⁸ movable on the power-shaft *f*⁷, having the clutch-sections *f*⁹, *f*¹⁰, the clutch-lever *f*¹¹, the dog-rod *f*¹³, connected with said clutch-lever, the stationary dog *f*¹⁶, the automatically-movable dog *f*¹⁸ on said dog-rod and the reciprocating dogs mounted upon said carriage to engage respectively the stationary dog and the movable dog, and means for moving the movable dog adapted to be actuated by the movement of the clamp.

20. In a machine of the character specified, a carriage, rubbing-blades mounted thereon, means for reciprocating the carriage, the movement of which is adapted to be reversed, and reversing devices actuated by the carriage, in combination with independent means for also actuating said reversing devices, whereby the movement of said carriage in each direction is stopped and a reverse movement is given it, as set forth.

21. In a machine of the character specified, clamps for holding the material to be stretched, means for separating the clamps to stretch the material, devices for automatically governing the extent or duration of said stretching action, and reciprocating rubbing-blades.

22. In a machine of the character specified, clamps for holding the material, means for automatically separating the clamps, reciprocating rubbing-blades the length of the stroke of which is automatically increased, and automatic means for discontinuing during the operation of the machine the separation of the clamps and the increase in the length of the stroke of the rubbing-tools.

23. In a machine of the character specified,

a detachable stretching-frame comprising a support, clamps mounted thereon adapted to be separated from each other and held in their separated positions, and rubbing-blades held upon the support by the stretched material, the rubbing-surfaces of said blades being upon a level above that of the ends of the stretched material held by the clamps.

24. In a machine of the character specified, a stretching-frame consisting of a support and stretching-clamps mounted thereon, one of which is adapted to be moved with respect to the other and to be automatically locked to said support at the end of each movement, frame and clamp holders for holding the frame and engaging the clamps of said frame and for moving one of them, blades adapted to be mounted upon the support of the frame, blade-holders vertically movable first to engage the ends of the blades and then to lift the blades slightly above said frame-support and means for reciprocating the blades while removed and for moving the clamp.

25. In a machine of the character specified, a removable stretching-frame comprising a support and clamps separable with respect to each other, means for separating the clamps by hand and automatically and for locking the clamps apart, rubbing-blades above the support of said frame, blade-holders vertically movable before they are reciprocated to engage said blades and to slightly lift them above the frame-support, means for reciprocating the blades and for lengthening automatically the stroke thereof, as and for the purposes described.

26. In a machine of the character specified, holders for a stretching-frame which are

adapted to be automatically separated, holders for the rubbing-blades adapted to be moved vertically and to be horizontally reciprocated, said frame-holders and said blade-holders being constructed and located with respect to each other, as described, whereby engagement will be permitted between the material held by said stretching-frame and the blades carried by said holders, as and for the purposes set forth.

27. In a machine of the character specified, a blade-holder extending across the machine, having a depressed central section, also having recesses at or near each end open at their top for the reception of the blade, and a removable blade the ends of which are held in said recesses and the central portion of which extends over the depressed section of the holder, whereby a space is provided between its lower edge and the depressed section of the holder, as and for the purposes set forth.

28. The combination in a machine of the character specified of a stretching-frame, supports for holding it by its ends in a stationary position, a blade-holder having blade-holding recesses on each side of said frame, and a depressed connecting-section beneath said frame, a rubbing-blade extending over said frame, the ends of which are engaged by the said holder and held in its end recesses and means for lifting said blade-holder and for reciprocating the same.

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