(No Model.) 3 Sheets—Sheet 1.

L. B. MILLER.

NEEDLE GROOVING MACHINE.

No. 386,841. Patented July 31, 1888.

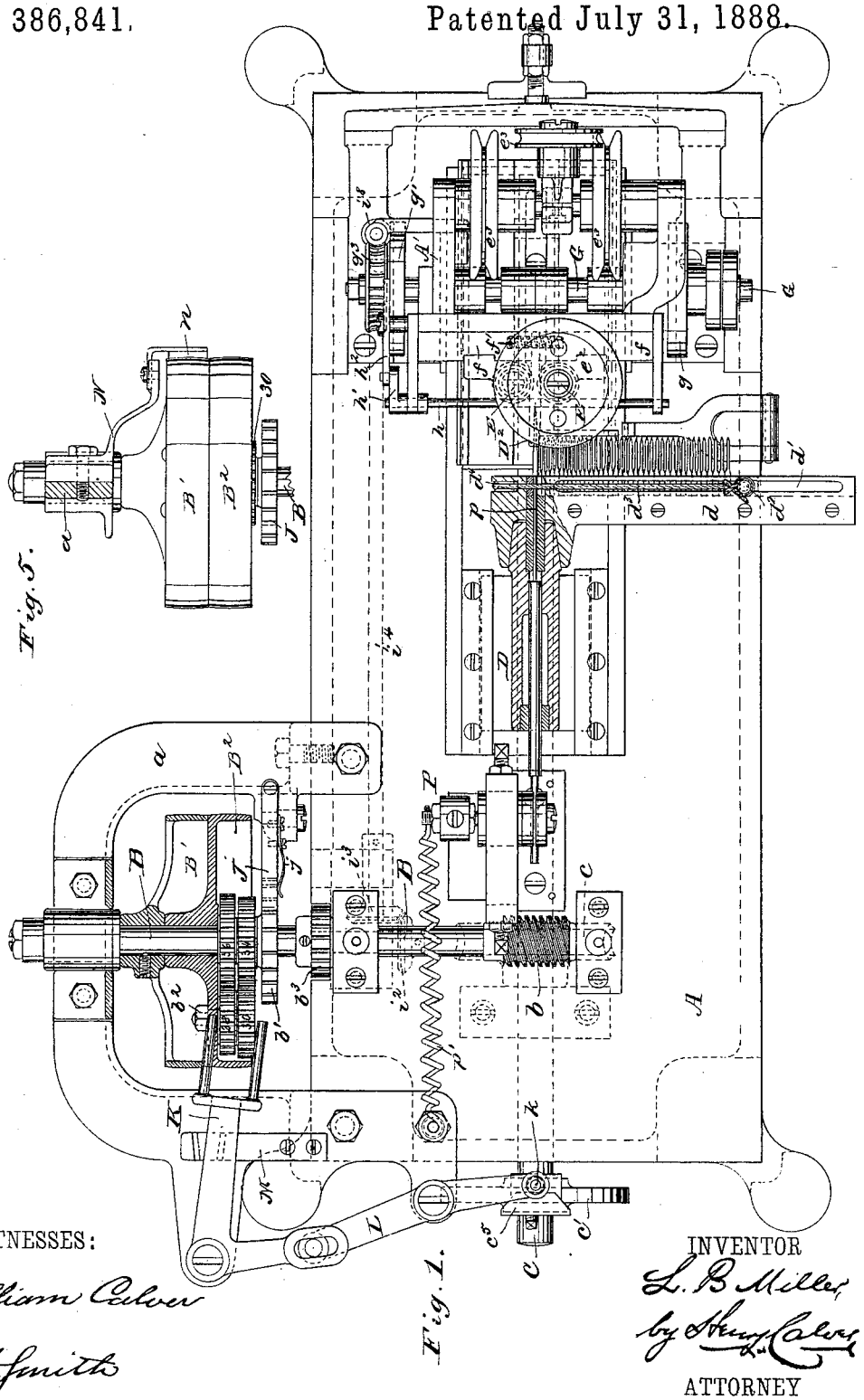

Fig. 5.

Fig. 1.

WITNESSES:

William Culver

E. D. Smith

INVENTOR

L. B. Miller,

by Henry Culver

ATTORNEY

(No Model.) 3 Sheets—Sheet 2.

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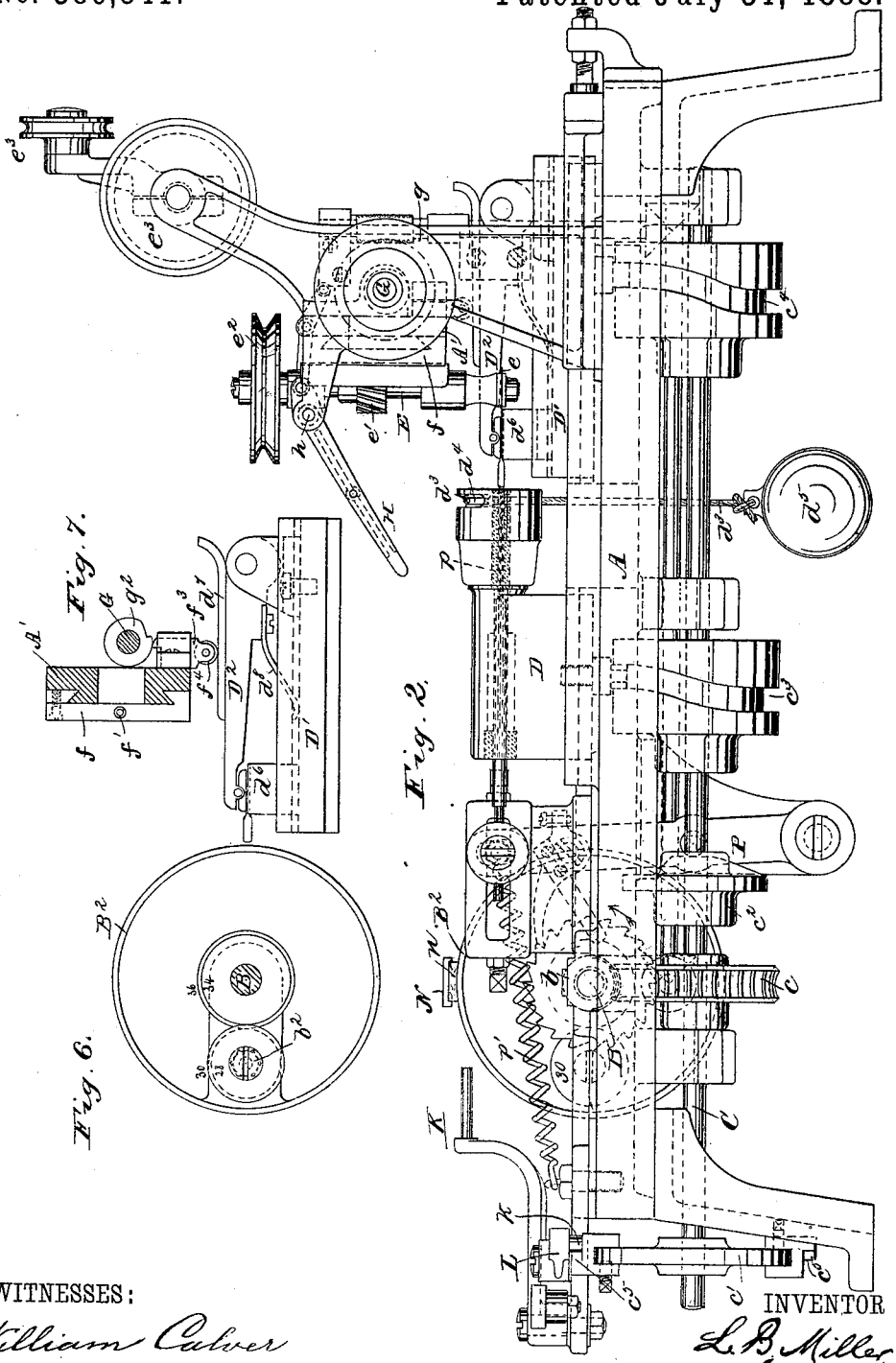

Fig. 1.

Fig. 2.

Fig. 6.

WITNESSES:

William Culver

E. B. Smith

INVENTOR

L. B. Miller

BY Henry Culver

ATTORNEY

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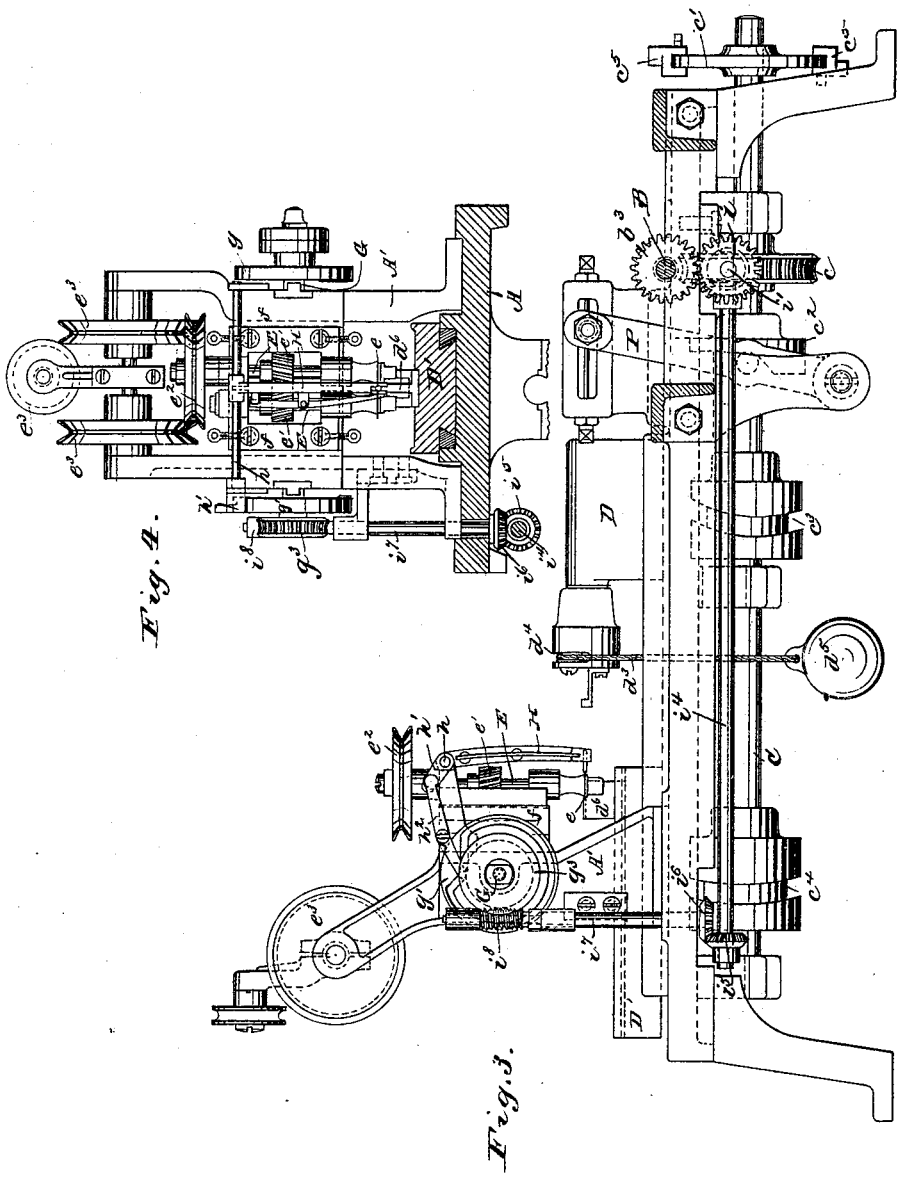

Fig. 4.

Fig. 5.

WITNESSES:

William Calver

Edd Smith

INVENTOR

L. B. Miller

BY Henry Calver

ATTORNEY

UNITED STATES PATENT OFFICE.

LEBBEUS B. MILLER, OF ELIZABETH, NEW JERSEY, ASSIGNOR TO THE SINGER MANUFACTURING COMPANY OF NEW JERSEY.

NEEDLE-GROOVING MACHINE.

SPECIFICATION forming part of Letters Patent No. 386,841, dated July 31, 1888.

Application filed January 24, 1888. Serial No. 261,752. (No model.)

To all whom it may concern:

Be it known that I, LEBBEUS B. MILLER, a citizen of the United States, residing at Elizabeth, in the county of Union and State of New Jersey, have invented certain new and useful Improvements in Needle-Grooving Machines, of which the following is a specification, reference being had therein to the accompanying drawings.

The object of my invention is to provide a needle-grooving machine which will work more rapidly than similar machines heretofore in use. This object I accomplish by providing an automatically-operating mechanism whereby a grooved needle is quickly removed from the clamps by which it is held during the grooving operation, and whereby the devices which feed a needle forward while it is being grooved are also quickly returned to their first positions in readiness for a new operation, these operations being the only ones which can properly be expedited in this class of machines, owing to the fact that the grooving cannot be speeded up beyond a certain limit without resulting in imperfect or unsatisfactory work.

In the drawings, Figure 1 is a plan view, partly in horizontal section, of a needle-grooving machine embodying my invention. Fig. 2 is a side elevation of the same. Fig. 3 is a view of the same from the side opposite that seen in Fig. 2, with the driving-shaft and the bracket or support for one end thereof in section. Fig. 4 is a partial cross-section of the machine with the needle-grooving mechanism in elevation. Fig. 5 is a detail view of the driving-pulleys and friction pad or brake. Fig. 6 is an inside view of the loose driving-pulley to illustrate the gearing. Fig. 7 is a detail view of the needle-carriage and clamping mechanism.

A denotes the frame of the machine, and B the driving-shaft, which is partly supported by the bracket *a*, extending laterally from the frame A, the said shaft carrying a worm, *b*, meshing with a worm-wheel, *c*, on the cam-shaft C, extending lengthwise of the machine and carrying the disks or cams c', c^2, c^3, and c^4.

D and D′ are the needle-carriages sliding in ways on the frame A, and havings pins or roller-studs extending downward into the grooves of the cams c^3 and c^4, the said cams thus serving to impart positive back and forth feeding movements to the said carriages. The carriage D has a laterally-extending arm, *d*, which is adapted to serve as a needle holder or magazine by being provided with a suitable groove (indicated by the dotted line, Fig. 1) to receive the shanks of a row of needles, which are arranged therein as shown in Fig. 1. The said arm has another groove, d', which intersects the needle holding groove, and in which is placed a follower, d^2, to which is attached a cord, d^3, running over a pulley, d^4, and provided with a weight, d^5, to hold the follower against the needles, so that they will be fed up automatically to come into line with the feeding-pin *p*, which forces them into the clamp of the needle-carriage D′.

The needle-grooving cutters *e* are carried by vertical shafts E, connected together by gears e', one of the said shafts having a driving-pulley, e^2, to receive a belt which passes over guide-pulleys e^3 in running to and from the pulley e^2, and which is extended to a suitable driving-pulley, preferably on an overhead power-shaft. The cutters are thus rapidly rotated by mechanism which is independent of the driving-shaft B.

The shafts E have vertical bearings in sliding blocks *f*, guided in uprights A′ of the frame A. These blocks are normally pressed apart by a spring, f', placed between them, and are forced toward each other at the proper times by face-cams on the disks *g* and g', carried by the shaft G, the said cams engaging suitable projections, f^2, on the blocks *f*, and being of proper form to cause a short groove to be made in one side of the needle and a longer groove in the other side thereof, as is common with sewing-machine needles.

While a needle is being grooved by the cutters *e*, it is firmly clamped between a block or anvil, d^6, on the carriage D′, and a clamping-foot carried by a lever, D^2, hinged at its rear end to said carriage or to a block or standard thereon. This lever is forced downward to clamp a needle by a cam, g^2, (see Fig. 7,) on the shaft G, said cam operating against a vertically-guided follower, f^3, carrying a roll, f^4, which runs on a bar or plate, d^7, on the lever D^2, the said lever being raised at proper intervals by the lifting-spring d^8 to permit a grooved needle to be removed and another inserted. The needles are removed from the clamp and dropped into a proper receptacle (not shown)

by a nipper-arm, H, carried by a small rock-shaft, h, the said shaft having a second arm, h', connected to a lever, h^2, having a pin extending into a cam-groove in the disk g' on the shaft G to operate the said rock-shaft and its needle-removing arm at the proper times.

The shaft G is operated from the driving-shaft B through the gear b^3 on the said driving-shaft, gear i, shaft i', bevel-gears i^2 i^3, (see dotted lines, Fig. 1,) shaft i^4, bevel-gears i^5 i^6, vertical shaft i^7, worm i^8, and worm-wheel g^3 on the said shaft G. Thus the movements of the shaft G and the parts operated thereby will be in unison with the movements of the driving-shaft and will be slow or rapid, according to the movements of the latter.

In the operation of this machine the needle-carriage D moves forward or to the right, Figs. 1 and 2, and presents a needle to the clamp of the carriage D′ when the latter is in the rearward position shown in Fig. 2. The carriage D′ then moves forward and feeds the needle held by its clamp past the grooving-cutters, which are operated by the mechanism above described to form the long and short grooves in the needle, and when this has been done the needle is unclamped and is removed by the nipper-arm H.

The mechanism thus far described is not of my invention, but has been in use for some years; but, owing to the fact that if the needles while being grooved are fed forward beyond a certain limit of speed, which is necessarily a slow one, the grooving will be imperfectly done. These machines as heretofore constructed did not work with the desired rapidity; but as it is only such movements of the machines as occur when the grooving operation is being performed that are necessarily slow, I have devised a mechanism by which, as soon as the grooving of a needle is finished, a rapid movement is given to the driving-shaft B and to the mechanism operated therefrom, so that the grooved needle is quickly removed and the needle-feeding mechanism is quickly operated to bring the carriage D′ again into its initial grooving position with the needle in its clamp, and by thus expediting the movements of the machine during the times when the cutters are not performing their grooving operations I am enabled to more than double the capacity of the machine for work, so that without an appreciable increase of power one machine, without adding to the cost of its attendance, will do more work than has heretofore been accomplished by two. To this end I provide the driving-shaft B with a fast pulley, B′, and a loose pulley, B^2. The driving-belt which runs on these pulleys (and which in practice preferably comes from an overhead shaft) runs on the fast pulley B′ when the rapid movements are to be imparted to the mechanisms operated from the driving-shaft B, (the said belt being properly speeded for this purpose,) but is shifted to the loose pulley B^2 when the slow movements of the driving-shaft and its connected mechanisms are to occur, the said loose pulley being connected with the said shaft by the differential reducing-gears 28, 30, 34, and 36. The gears 28 and 30 (which have twenty-eight and thirty teeth, respectively, and which are connected together so that they rotate coincidently) are journaled on a pin or bolt, b^2, secured to the disk of the pulley B^2, and are therefore what may be termed "planetary gears," as they revolve bodily with said pulley. The gear 28 meshes with the gear 36, which is fast on the shaft B and which has thirty-six teeth. The gear 30 meshes with the gear 34, having thirty-four teeth. Said gear 34 is loose on the shaft B, and is rigidly connected with a ratchet-wheel, b', also loose on the said shaft.

J is a pawl pivoted to the machine-frame and arranged to co operate with the ratchet-wheel b', the said pawl being provided with a friction pad or spring, j, bearing against the side of the said wheel. When the belt is on the fast pulley B′, the ratchet-wheel will be rotated in the direction indicated by the arrow, Fig. 2, by reason of its connection with the driving-shaft through the gears 34, 30, 28, and 36. To avoid the clicking noise and friction which would otherwise result by the contact of the pawl with the ratchet-wheel when the latter is in rotation, the said pawl is lifted from the said wheel by the friction-spring j, above referred to, the said spring serving, also, to bring the said pawl quickly into engagement with the said wheel when the belt is run onto the loose pulley B^2, at which time the ratchet-wheel would otherwise run backward. Owing to the fact, however, that the pawl will thus hold the ratchet-wheel b' and the gear-wheel 34, connected with said ratchet-wheel, stationary, a slow rotary movement will be imparted to the driving-shaft from the rapidly-rotating loose pulley through the gear 30, meshing with the said gear 34, the gear 28, rigid with the said gear 30, and the gear 36, fast on the driving-shaft and meshing with the said gear 28 in a well-known manner. The stationary gear 34 thus becomes, in a sense, the driver, causing the fast gear-wheel 36 and the shaft B to be slowly rotated by the planetary gears carried around the said gear 34 by the pulley B^2. If it were not for the resistance offered by the pawl I to hold the ratchet-wheel and the gear 34 stationary, the whole mechanism would be free to run around loosely and idly on the shaft B. The driving-belt is shifted from one driving-pulley to the other by the belt-shipper K, the shorter arm of which is connected with a lever, L, operated positively in both directions by cam dogs or blocks c^5, attached to the cam-disk c' on the cam-shaft C, the said lever having a pin, k, which is engaged to operate the said lever by the oppositely-inclined faces of the said cam-blocks, and the said blocks being adjustably secured to said disk at any desired points to get the proper timing, but being shown in the present instance as located diametrically opposite to each other, or nearly so. A suitable spring or friction device, M,

may be provided to bear against the belt-shipper to hold it in either of its positions until positively moved by the lever L. When the belt is shifted from the fast pulley to the loose one, it is desirable to check the momentum of the driving-shaft to prevent overrunning and at once reduce the speed of said shaft to that of the motion imparted thereto by the loose pulley. To this end I provide a friction pad or brake, *n*, which bears lightly on the said pulley, and which is secured to an arm or bracket, N, attached to the bracket *a*, the friction of the said pad not being, however, sufficient to interfere with the proper operation of the machine or to require an appreciable increase of power to drive the same.

The needle-feeding pin or plunger *p* and its operating mechanism, consisting of the lever P, receiving its movement from the cam c^2, and the retracting-spring *p'*, herein incidentally shown, are not my invention, but are embraced by the application of Emory S. Parsons, filed simultaneously herewith.

I do not wish to be understood as limiting my invention to the details of the mechanism herein shown, as variations may, if desired, be made in the above-described proportions of the gears for connecting the loose pulley with the driving-shaft, and the details of the invention may be otherwise varied within the province of mechanical skill without departing from the essential features of my invention.

Having thus described my invention, I claim and desire to secure by Letters Patent—

1. In a needle-grooving machine, the combination, with the needle-grooving and needle-feeding appliances and a cam shaft having cams to operate the latter, of a driving-shaft for the said cam-shaft, fast and loose pulleys on the said driving-shaft, a train of reducing-gears indirectly connecting the said loose pulley with the said driving-shaft, and a belt-shipper to shift the belt onto the said fast and loose pulleys alternately, whereby the needle-feeding appliances will be moved slowly when the grooving-cutters are operating and more rapidly at other times, substantially as set forth.

2. In a needle-grooving machine, the combination, with the needle-grooving and needle-feeding appliances and a cam-shaft having cams to operate the latter, of a driving-shaft for the said cam-shaft, fast and loose pulleys on the said driving-shaft, gears and a ratchet-wheel and pawl to connect the said loose pulley with the said driving-shaft, a belt-shipper, and an automatically-operating mechanism to cause the said belt-shipper to shift the driving-belt onto the fast and loose pulleys alternately, substantially as set forth.

3. In a needle-grooving machine, the combination, with the needle-grooving and needle-feeding appliances and a cam-shaft having cams to operate the latter, of a driving-shaft for the said cam-shaft, fast and loose pulleys on the said driving shaft, gears and a ratchet-wheel and pawl to connect the said loose pulley with the said driving-shaft, a belt-shipper mechanism to shift the driving-belt onto the fast and loose pulleys alternately, and a friction-pad to bear on the said fast pulley and prevent the said driving-shaft from overrunning when the speed thereof is changed from fast to slow, substantially as set forth.

4. In a needle-grooving machine, the combination, with the driving and cam shafts and the needle feeding and removing mechanisms operated therefrom, of a belt-shipping mechanism, fast and loose pulleys on the said driving-shaft, gears and a ratchet-wheel and pawl to connect the said loose pulley with the said driving-shaft, and a friction pad or spring attached to said pawl and bearing against the side of the said ratchet-wheel, whereby the pawl is lifted when the belt is on the fast pulley and the ratchet-wheel rotates, and whereby the said pawl is brought into instant engagement with the said wheel when the belt is shifted to the loose pulley to prevent the ratchet-wheel from running backward, substantially as set forth.

5. In a needle-grooving machine, the combination, with the needle-carriages and the cam-shaft from which they are operated, of a driving-shaft for the said cam-shaft, a needle-removing mechanism operated from the said driving-shaft, needle-grooving cutters operoted independently of the said driving-shaft, fast and loose pulleys on the said driving-shaft, a train of reducing gears to indirectly connect the said loose pulley with its shaft, and a belt-shipper to shift the belt onto the said fast and loose pulleys alternately, whereby the grooving-cutters can be operated at a uniform speed and the other mechanisms of the machine at alternate fast and slow speeds, substantially as set forth.

6. The combination, with the driving shaft B, the fast and loose pulleys B' and B^2, a belt-shipping mechanism, a train of gears, a ratchet-wheel, *b'*, loose on said shaft and having a rigid connection with one of said gears, and the pawl J, having the friction-spring *j*, bearing against the side of the said wheel, to operate substantially as set forth.

7. The combination, with the driving-shaft B, the cam-shaft C, and the needle feeding, grooving, and removing devices, of the fast and loose pulleys B' and B^2, the planetary gears 28 and 30, carried by the said loose pulley, the fast and loose gears 36 and 34 on the said driving-shaft, the ratchet-wheel *b'*, loose on the said shaft, but rigidly connected with the said loose gear 34, the pawl J, the belt-shipper K, the lever L, and the disk *c'*, having cam blocks or dogs for operating said lever, substantially as set forth.

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

LEBBEUS B. MILLER.

Witnesses:

JAMES G. GREENE,

L. L. BURRITT.