6 Sheets--Sheet 1.

W. O. GROVER.

Improvement in Sewing Machines.

No. 118,450. Patented Aug. 29, 1871,

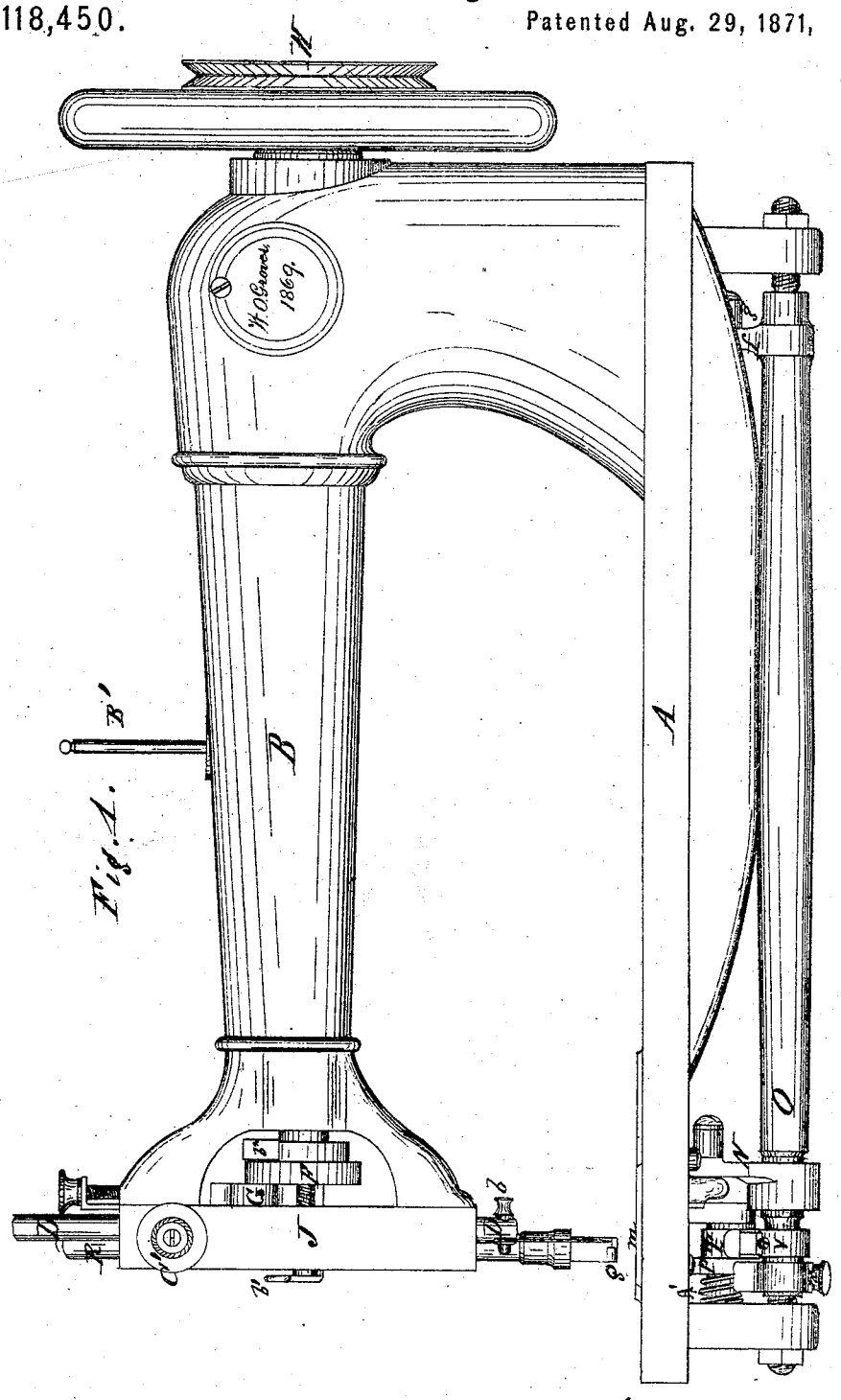


Fig. 1.

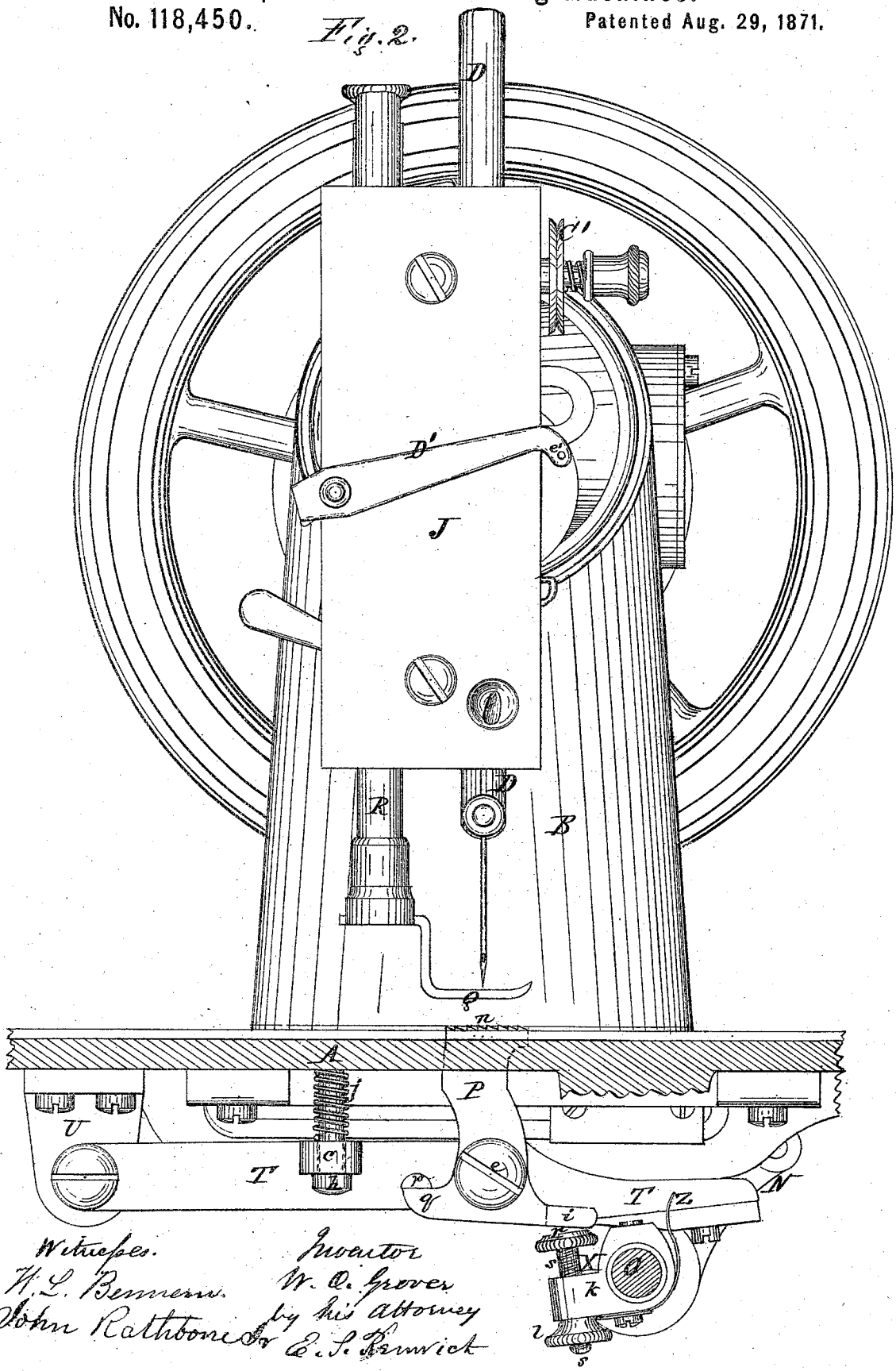
Witnesses
W. L. Bennett.
John Rathbone Jr

Inventor
W. O. Grover.
by his attorney
E. S. Renwick

W. O. GROVER.

Improvement in Sewing Machines.

No. 118,450. Fig. 2. Patented Aug. 29, 1871.



Witnesses.
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John Rathbone

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E. S. Renwick

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W. O. GROVER.

Improvement in Sewing Machines.

No. 118,450. Patented Aug. 29, 1871,

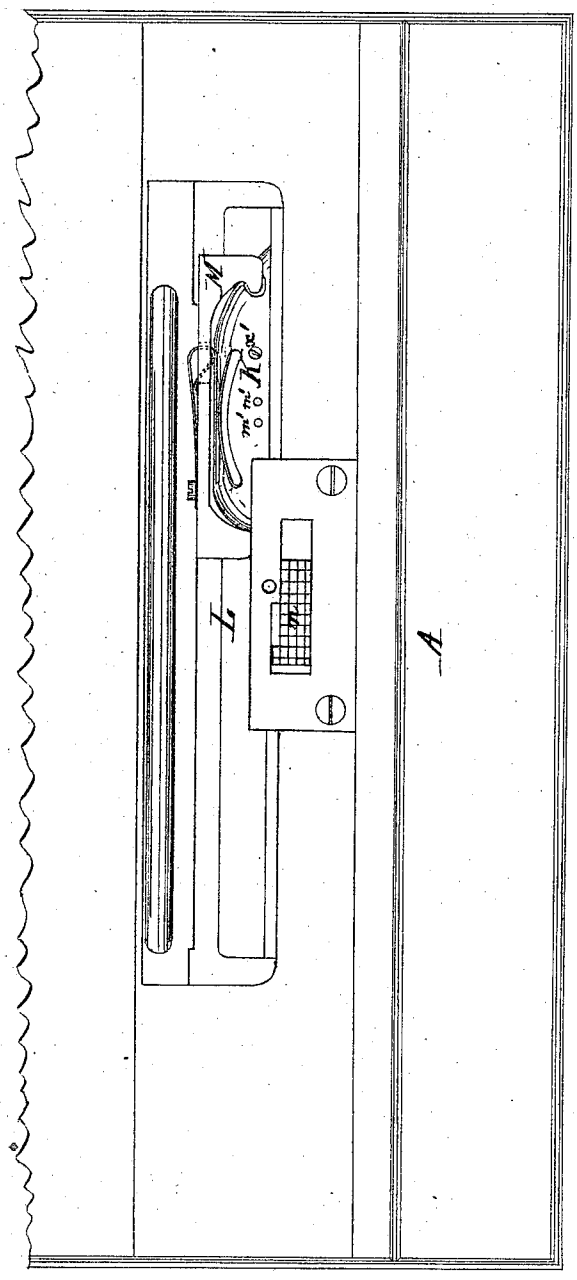

Fig. 3.

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No. 118,450. Patented Aug. 29, 1871.

Fig. 15.

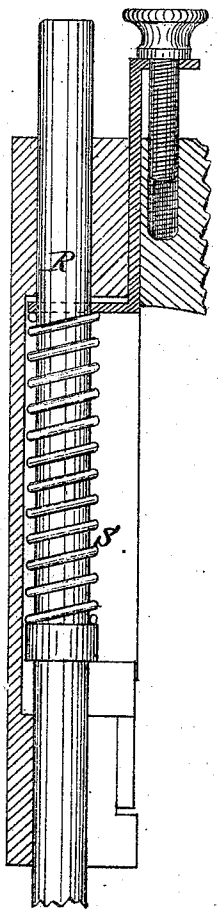
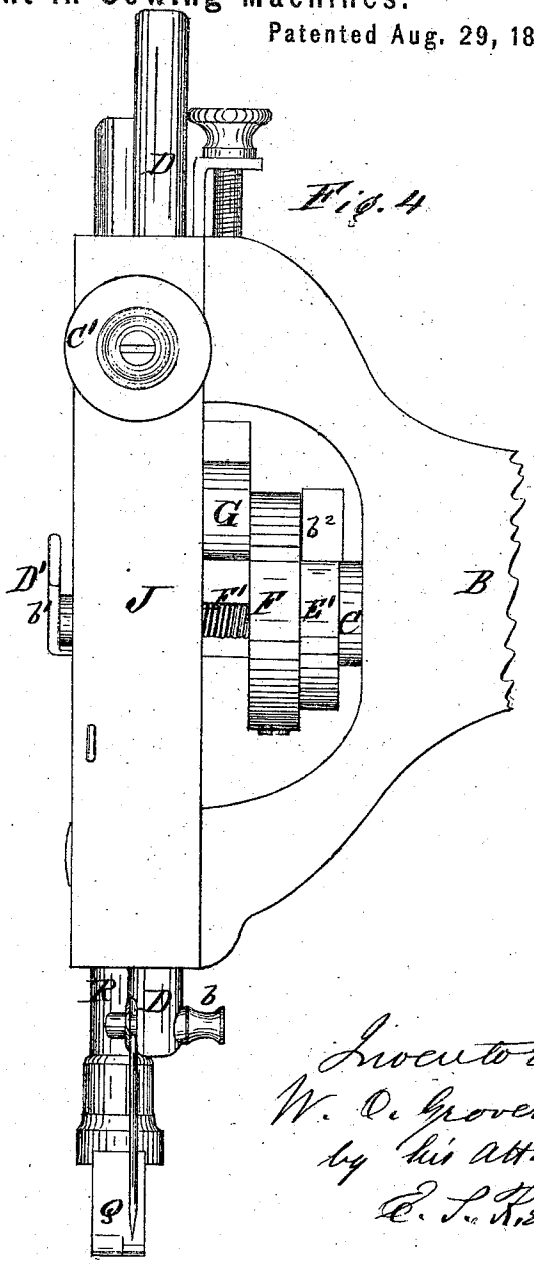


Fig. 4



Witnesses.
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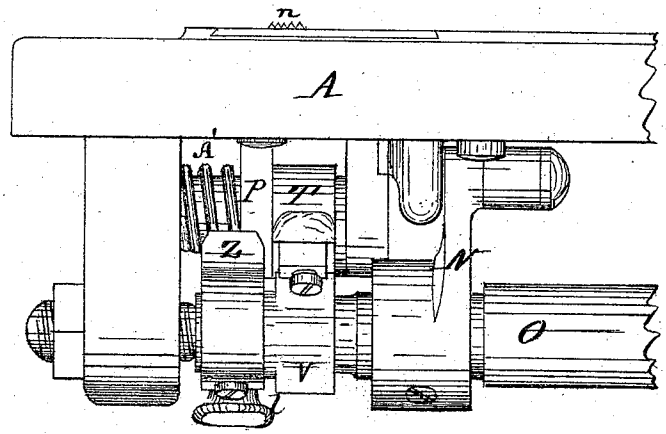

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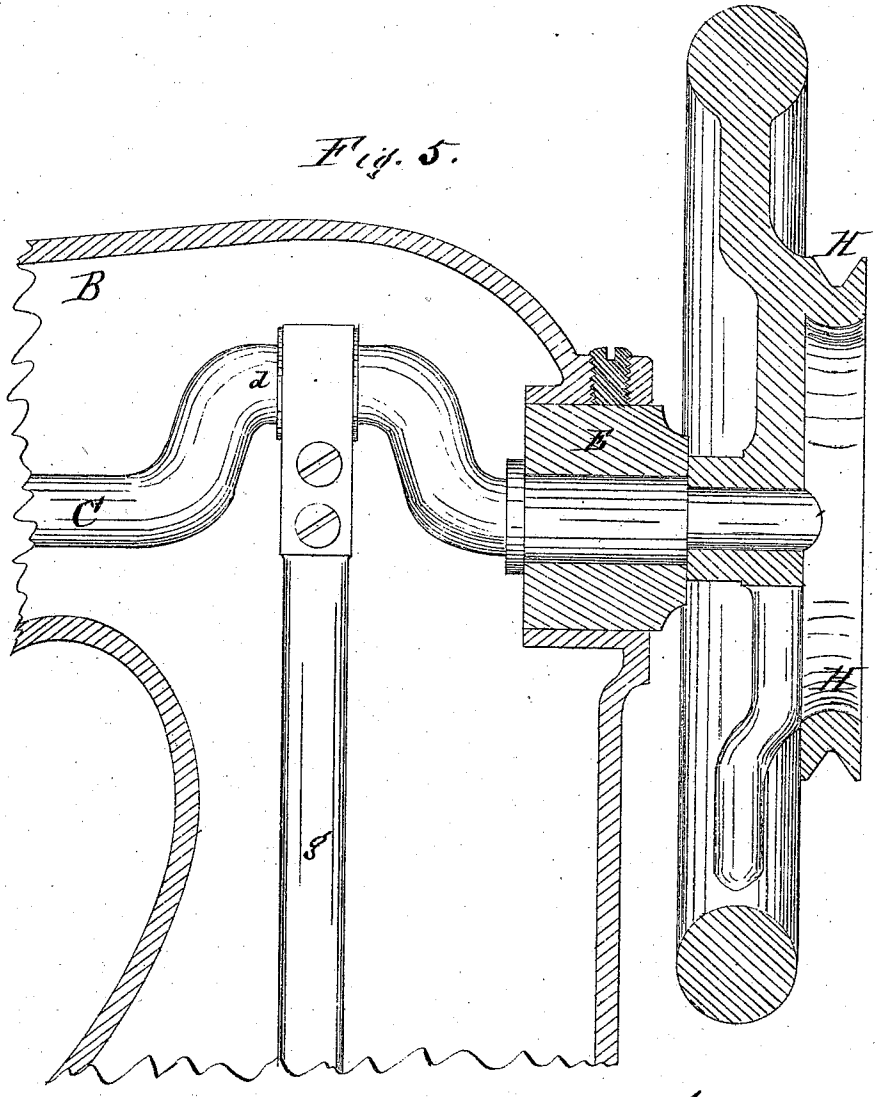
No. 118,450. Patented Aug. 29, 1871.

Fig. 5.

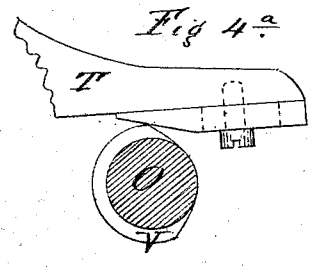


Witnesses.

W. L. Pennell.

John Rathbone Jr

Fig 4a.



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Improvement in Sewing Machines.

No. 118,450. Patented Aug. 29, 1871.

Fig. 6.

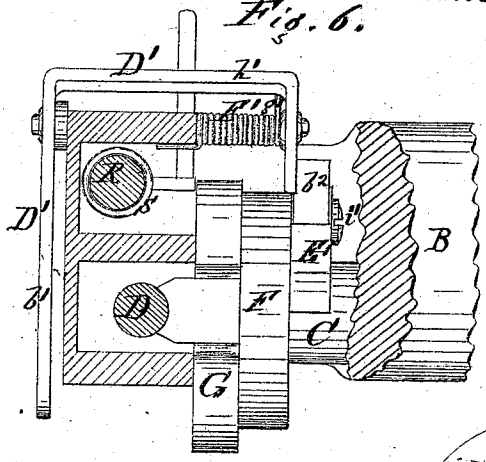


Fig. 10.

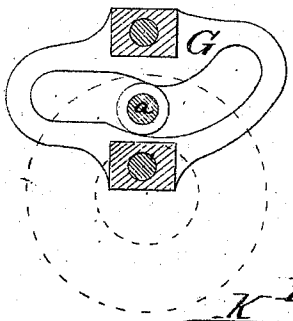


Fig. 9.

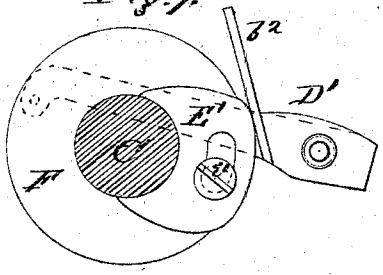


Fig. 11.

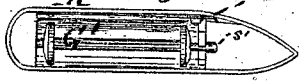


Fig. 13.

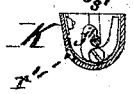


Fig. 14.

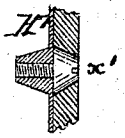


Fig. 12.

Fig. 7.

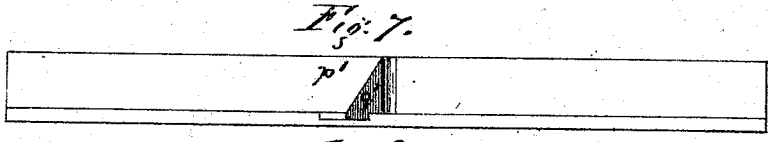
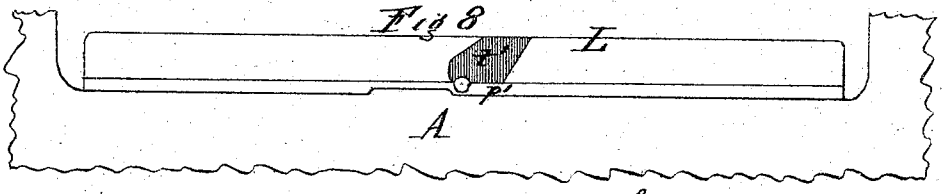


Fig. 8



Witnesses
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John Rathbone Jr

Inventor
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E. S. Renwick

UNITED STATES PATENT OFFICE.

WILLIAM O. GROVER, OF BOSTON, MASSACHUSETTS.

IMPROVEMENT IN SEWING-MACHINES.

Specification forming part of Letters Patent No. 118,450, dated August 29, 1871.

To all whom it may concern:

Be it known that I, WILLIAM O. GROVER, of Boston, in the State of Massachusetts, have invented certain new and useful Improvements in Sewing-Machines; and that the following is a full, clear, and exact description and specification of the same.

The improvements which constitute the subject-matter of this patent have reference to the following parts of a sewing-machine, viz., the feed mechanism and the shuttle and its appurtenances. All these improvements are specified in the claims at the close of this specification; and in order that they may be fully understood I have represented in the accompanying drawing a machine embodying them all, and I will proceed to describe the same. In said drawing—

Figure 1 represents a side elevation of the machine drawn of half the working dimensions. Fig. 2 represents an elevation of the end of the machine of full size with a portion of the bed-plate removed to exhibit parts beneath it. Fig. 3 represents a plan of a portion of the machine with the covers of the shuttle-race withdrawn. Fig. 4 represents a side elevation of certain parts of the machine. Fig. 5 represents a vertical longitudinal section of a part of the needle-arm and the adjacent parts. Figs. 6 to 14 represent views of detached parts of the machine, Figs. 11 to 14 representing views of the shuttle detached from the machine.

The machine is constructed with a strong bed-plate, A, whose upper surface forms the sewing-table upon which the article to be sewed is supported. This bed-plate is surmounted by the needle-arm B, which is hollow, and is traversed by the revolving driving-shaft C that operates the needle-bar D. The shaft is supported in bearings, one of which, E, is at the rear side of the needle-arm, and it is fitted at its front end with a crank-pin, *a*, projecting from the hub F, which enters into and operates a hollow oblong cam, G, secured to the needle-bar. The driving-shaft C is fitted with a pulley-wheel, H, to which the driving-belt is applied. The needle-bar slides vertically in guides formed in the head J of the needle-arm, and is fitted at its lower end with a screw-clamp, *b*, for holding the needle. The shuttle K of the machine is fitted to reciprocate in a shuttle-track, L, formed in the bed-plate and covered by two removable slides, *m*. This shuttle is caused to reciprocate by means of the shuttle-driver M, which is connected by a connecting-rod with an arm, N, that projects from the rock-shaft O beneath the bed-plate. This rock-shaft is supported in suitable bearings and is caused to rock by the revolution of the driving shaft C by the following means: The driving shaft is bent to form a crank, *d*, the wrist of which is connected with an arm, *f*, projecting from the rock-shaft by the connecting-rod *g*.

The feeding of the material is effected by the rocking feeder P, having a toothed feeding-surface, and operating in combination with the presser-foot Q, which is affixed to the lower end of a sliding stem, R, and is depressed by the action of a spring, S, coiled upon that stem. The rocking feeder P is pivoted to a bar, T, one end of which is connected by a pivot with a hanger, U, depending from the bed-plate, and which is caused to rise and permitted to drop by means of a cam, V, Fig. 4 and Fig. 4ª, secured to the rock-shaft O. The lowest position of the feeder is determined by a stop, *h*, whose stem is traversed by a perforated lug, *c*, projecting from the vibrating bar T, so that the head of the stop limits the descent of the bar. The descent of the feeder is insured by the action of a spring, *j*, which is coiled upon the stem of the stop *h*, and operates upon the upper side of the lug *c*. The form of the cam V is such that the bar with the feeder remains at rest in its lowest position beneath the surface of the table while the feeding-surface is moved backward. The toothed feeding-surface *n* is curved concentrically with the pivot *e*, upon which the feeder rocks, so that it has the form of a segment of a cylinder, and when this surface is rocked forward in contact with the material it has the same action upon the material as a feed-wheel. The feeding-surface is caused to advance or move forward in the direction for feeding by the rocking action of an adjustable tappet, X, secured to the rock-shaft O; the said tappet operating upon an arm, *i*, which extends over it from the shank of the feeder P. The acting-surface *r* of the tappet is made adjustable, so as to vary the extent of movement imparted to the feeder, and thus vary the distance to which the material is moved at every stitch. To this end it is connected with the body *k* of the tappet by being constructed

with a screw-shank, *s*, which is screwed through said body and is fitted with a jam-nut, *l*, by which it is secured in the desired position. When the feed is to be adjusted the jam-nut *l* is slacked, the adjustable piece *r* is turned to screw it toward or from the body of the tappet, and the jam-nut is screwed up to secure the parts in their positions. In order to rock the feeder P backward, preparatory to its advance, a reverse tappet, Z, is connected with the rock-shaft O in the proper position to operate upon the upper side of the arm *i* of the feeder when the rock-shaft O rocks backward and moves the adjustable tappet X from the under side of the said arm *i*. The distance to which the feeder is moved backward is regulated by a stop, *p*, which projects from the bar T in position to limit the movement of an arm, *q*, that projects from the shank of the feeder, and the reverse tappet is a spring-plate, so that any change in the positions of the parts due to improper adjustment or to the wear of the parts is compensated by the yielding of the spring-plate. Instead of making the reverse tappet a spring-plate, such tappet (or other instrument for imparting the positive backward movement) may be made rigid, and a spring may be applied to the part of the shank of the feeder upon which it acts, or may be arranged to intervene between the reverse tappet (or other instrument) and the feeder, which construction would be the equivalent of the spring-tappet in the combination. This combination of reverse tappet and stop insures the positive return of the feeder always to the same starting point, which is a great advantage in sewing-machines. Both tappets X and Z are not continuously in contact with the feeder; and, consequently, the latter might be moved too far during its advance by the rapid action of the advancing tappet; it might also move backward before the proper time. To prevent such improper movements a frictional spring, A′, is applied to the side of the feeder so as to produce sufficient friction between it and the side of the bar T to prevent improper movements of the feeder. This spring is by preference constructed of helical form, and is placed upon the shank of the pivot *e* of the feeder, the head of said pivot forming the bearing for the spring.

The needle-thread for the machine is drawn in the usual manner from a spool placed upon a spool-standard, B′, and is passed through a thread-tension, C′. This thread also, on its way to the needle, is passed through the eye *e′* of a take-up, D′, which is constructed to vibrate upon a pivot secured to the head J of the needle-arm, and has two arms, b^1 b^2, the former being fitted at its end with the eye through which the thread is passed, and the other arm, b^2, projecting over a cam, E′, secured to the driving-shaft C. The cam effects the upward movement of the take-up and controls its downward movement, which is insured by the action of a spring, F′. This spring, for economy, is made of helical form, and is arranged upon the pivot of the take-up, the movable end *g′* of the spring acting upon the body *h′* of the take-up. The cam E′ is secured to the hub F of the driving-shaft by means of a screw, *i′*, passing through a curved slot in the cam, so that the cam may be adjusted to vary the operation of the take-up according to the peculiarities of the sewing to be done. This mode of operating the take-up by means of a cam instead of, as usual, by the needle-bar, renders the take-up independent of the needle-bar and permits the motion of the take-up to be given and controlled in the manner best suited to produce good work, the form of the cam being, by preference, made, as represented in the drawing, so as to permit the take-up to commence its descent slowly and then to descend rapidly to its lowest point. The take-up mechanism also operates with little friction and with no material jar, and, as it is independent of the needle-carrier, the movement of the latter need not be stopped at any time for the purpose of permitting the take-up to rest during the passage of the shuttle through the loop of needle-thread; consequently the needle-carrier may have an almost continuous movement imparted to it, and the cam G, by which that movement is imparted, may have easier grades than has heretofore been customary in machines having the needle-bar driven in like manner. The shuttle K has, at the inner side of its butt, a socket to receive one of the journals of the spool G′. The inner side of the head of the shuttle is constructed with a groove, *s′*, to receive the other journal of the spool, the distance inward to which this groove is cut being such that the spool is in its right position when its journal rests against the bottom of the groove. The spool is held in the groove by means of a spring-catch, *j′*, whose hook-formed end overlaps the journal and prevents its movement outward from the shuttle-cavity. The spring-catch also operates as a friction-brake upon the journal of the spool, and produces tension upon the thread. The spring *r′*, by which the catch is operated, is secured to it, and bears against the side of the shuttle-cavity. In order that the tension of the shuttle-thread may be controlled, the side of the shuttle is perforated with holes *m′ m′*, Fig. 3, for the passage of the shuttle-thread, and a spring-thread tension, H′, Fig. 12, is arranged in the cavity of the shuttle to bear against the thread passed through the said holes. The amount of pressure which this spring-tension can exert is adjusted by means of a screw, *x′*, Figs. 3, 11, and 12, whose head is made conical, and is fitted to turn in a conical hole formed in the side of the shuttle, the shank of the screw being screwed into a boss formed upon the free end of the spring-thread tension; hence the screw can be readily turned by the application of a screw-driver from the outside of the shuttle, which is a great convenience; moreover the pressure of the spring-tension holds the screw-head in its bearing sufficiently firmly to prevent it from turning by the jar of the machine, and consequently the tension of the shuttle-thread is not liable to variation during sewing. In order to facilitate the passage of the thread through the tension-holes *m′ m′* of the shuttle the spring-

tension, instead of being constructed in the form of a straight-edged bar, is constructed with notches (see Fig. 12) opposite the tension-holes, so that the thread can be readily threaded through them without first moving the spring from before them. In this construction the sides of the toothed projections n' between the notches of the spring-tension afford the requisite surface for pressing upon the thread. In order that the needle-thread may have free play between the side of the shuttle-race and the shuttle, the upright side p', Figs. 7 and 8, of the race is cut away in the vicinity of the needle-track to form a recess, q', through which the needle-thread can pass freely, and the bottom of the race is cut away to form a recess, t', Fig. 8.

The driving-shaft C is constructed, by preference, in one piece with the crank d that operates the rock-shaft O. In order that the cranked driving-shaft may be inserted in its place the opening in the rear side of the needle-arm must be sufficiently large to admit it, and, on the other hand, that opening should be closed when the driving-shaft is in place. In order to effect these two objects at a low cost the opening is made, by preference, of circular form and of the necessary size, and the exterior of the bearing E of the rear journal of the driving-shaft is constructed in the form of a disk to fit and close that opening. This construction permits all the parts to be constructed at a low cost and of a neat appearance, and the bearing operates not only as a bearing for the shaft, but also as a cap to close the opening in the needle-arm. This bearing and cap may be held in its place by means of a screw inserted transversely through the rim of the opening in the arm, or it may be constructed with a flange to overlap the rim of the opening, and may be fastened by screws extending through the flange into that rim.

What is claimed as the invention to be secured by Letters Patent is—

1. The combination of the rocking feeder with an adjustable tappet for causing the feeding-surface to advance and for varying the extent of movement, the said devices being constructed to operate substantially as before set forth.

2. The combination of the rocking feeding instrument with a tappet for imparting a positive backward movement to it, substantially as before set forth.

3. The combination of the reciprocating feeding instrument of a sewing-machine with a stop to limit the extent of its backward movement and the spring-tappet to impart a positive but yielding backward movement to the feeding instrument, substantially as before set forth.

4. The combination of a shuttle, constructed with a groove in one of its ends, with a hook-formed catch pivoted in the interior of the shuttle-cavity, and controlled by a spring in such manner as to hook over the outer side of the spool-journal and hold it in said groove, as before set forth.

5. The combination of the tension-adjusting spring of the shuttle with an adjusting-screw, having its head constructed and arranged as described, so as to bear in a corresponding hole formed in the wall of the shuttle, and bearing outward therein, as before set forth.

6. The combination of the shuttle, constructed with tension-holes, with an adjustable-bar tension-spring constructed with notches opposite said tension-holes, and connected at both ends with the shuttle, as before set forth.

In testimony whereof I have hereunto set my hand this 16th day of October, A. D. 1869.

Witnesses: W. O. GROVER.

JAMES H. BROWN,
JAMES C. WADE.