No. 615,752. Patented Dec. 13, 1898.

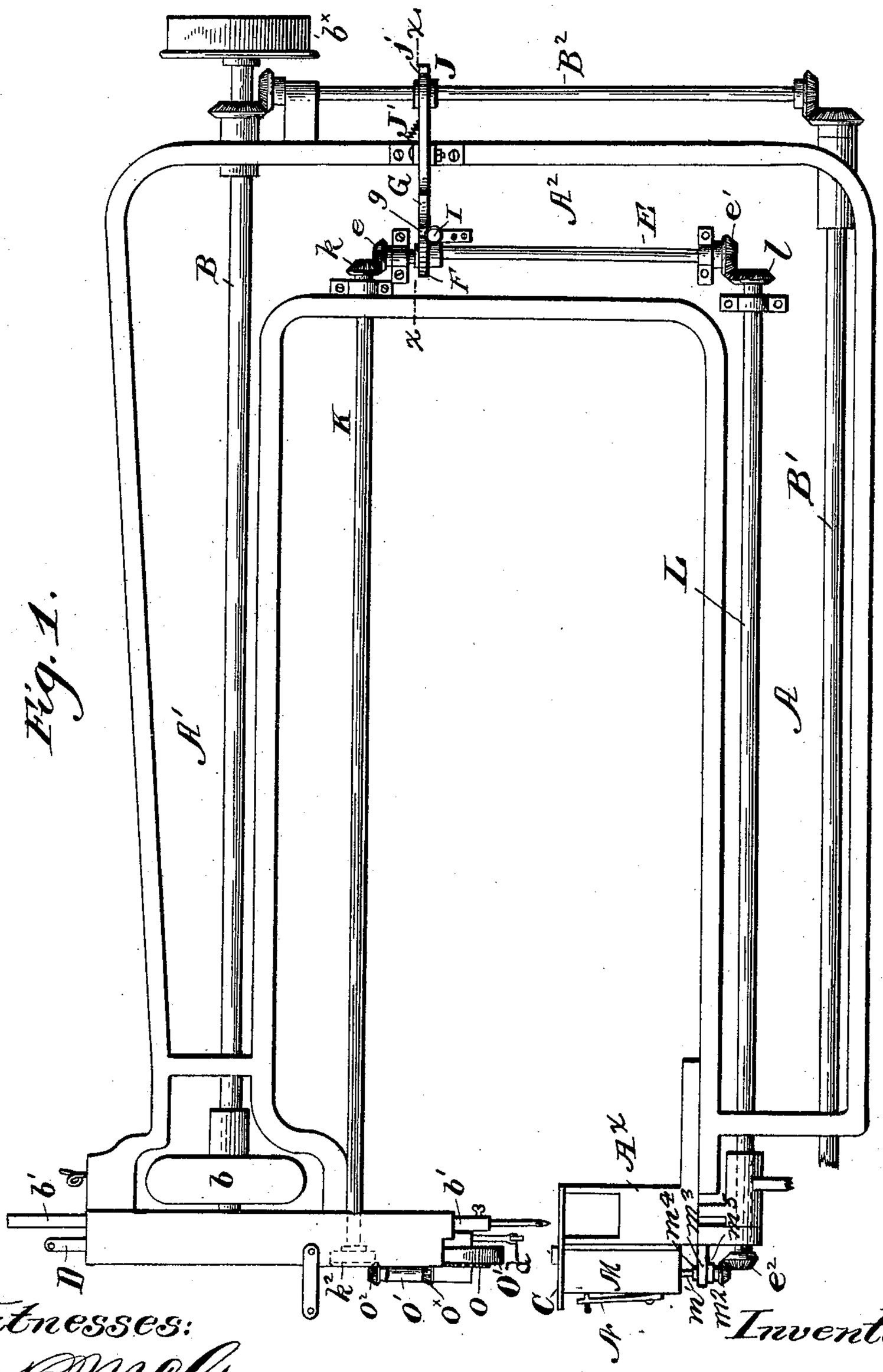
J. A. SANFORD.

SEWING MACHINE.

(Application filed Apr. 1, 1896.)

(No Model.) 3 Sheets—Sheet 1.

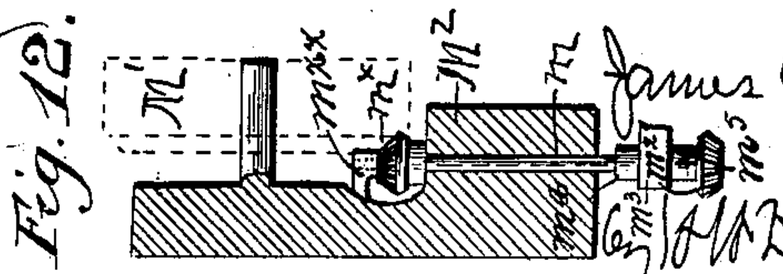
Fig. 1.



Witnesses:
J. B. McGirr.
J. P. Appleman.

Inventor.
James A Sanford
by F. P. Dumbeday atty.

Fig. 12.



No. 615,752. Patented Dec. 13, 1898.

J. A. SANFORD.

SEWING MACHINE.

(Application filed Apr. 1, 1898.)

(No Model.) 3 Sheets—Sheet 2.

Fig. 5.

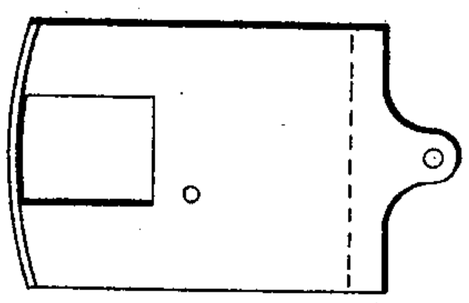


Fig. 8

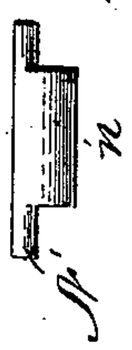


Fig. 10.

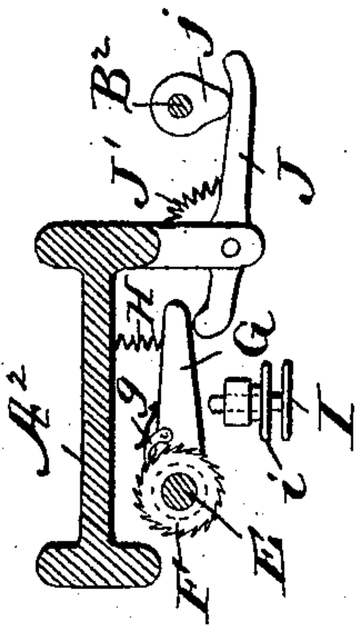


Fig. 4.

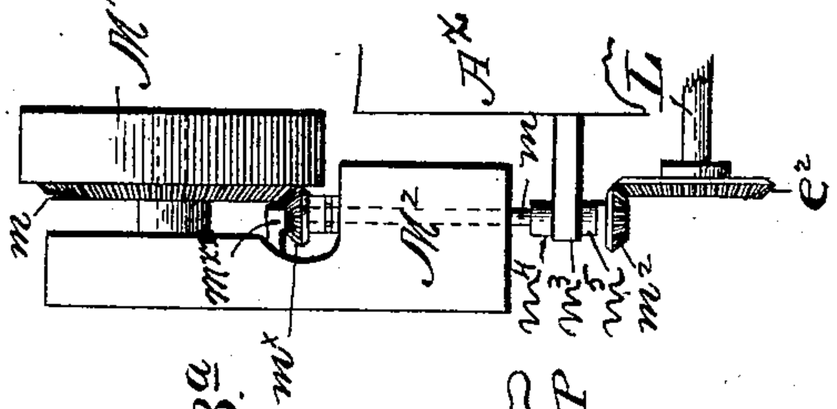


Fig. 3.

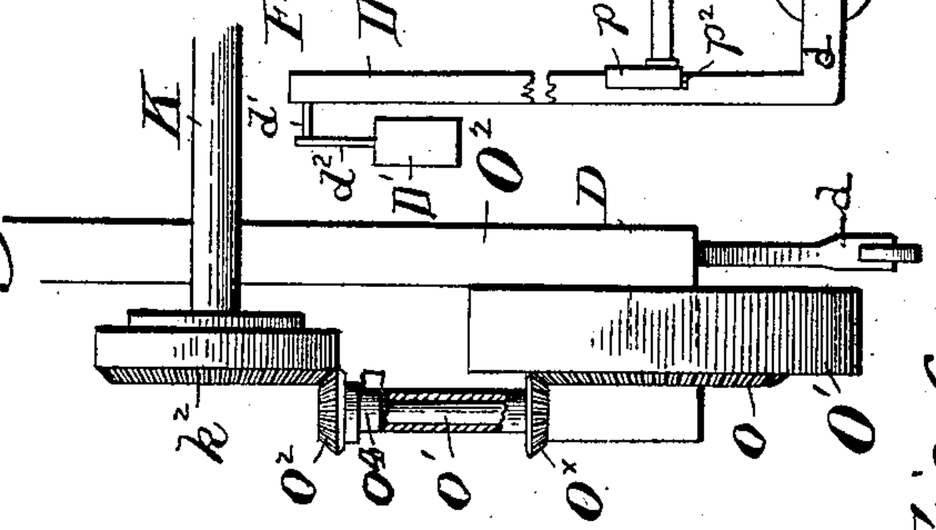


Fig. 7

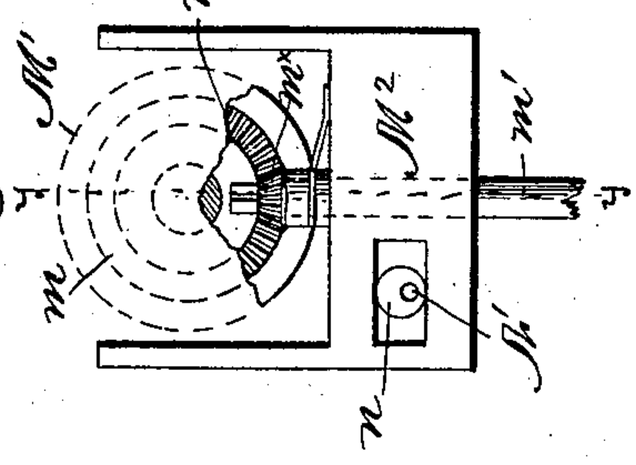


Fig. 6.

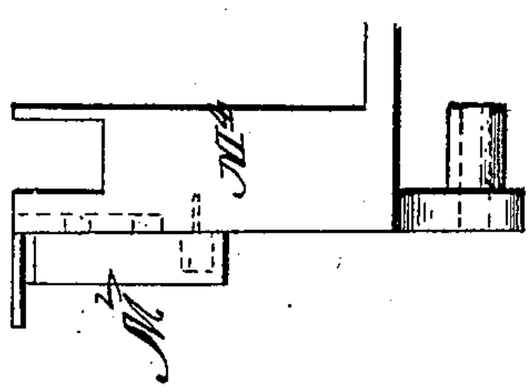
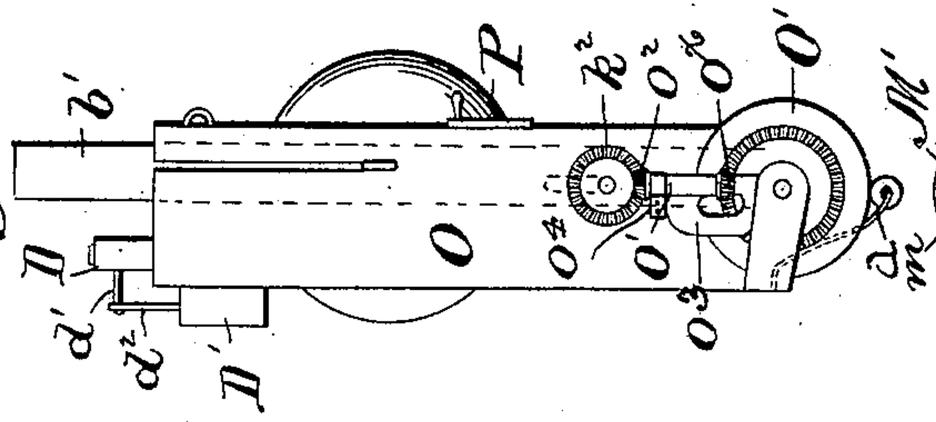


Fig. 2.



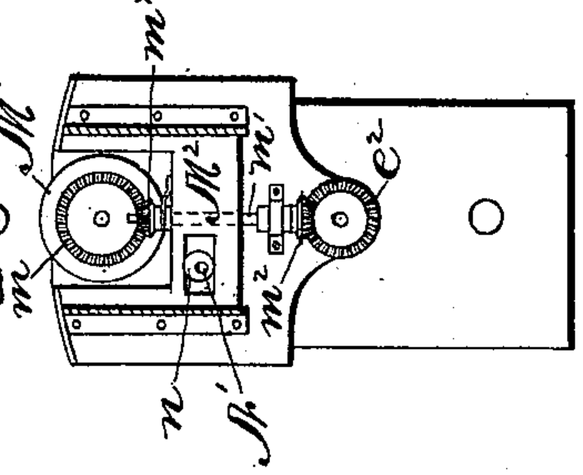
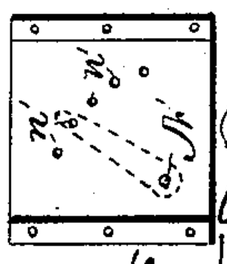


Fig. 11.



Witnesses:

J. B. McGirr.

J. P. Appleman.

Inventor:

James A Sanford

by H. H. Dunbeam Atty.

No. 615,752. Patented Dec. 13, 1898.

J. A. SANFORD.

SEWING MACHINE.

(Application filed Apr. 1, 1896.)

(No Model.) 3 Sheets—Sheet 3.

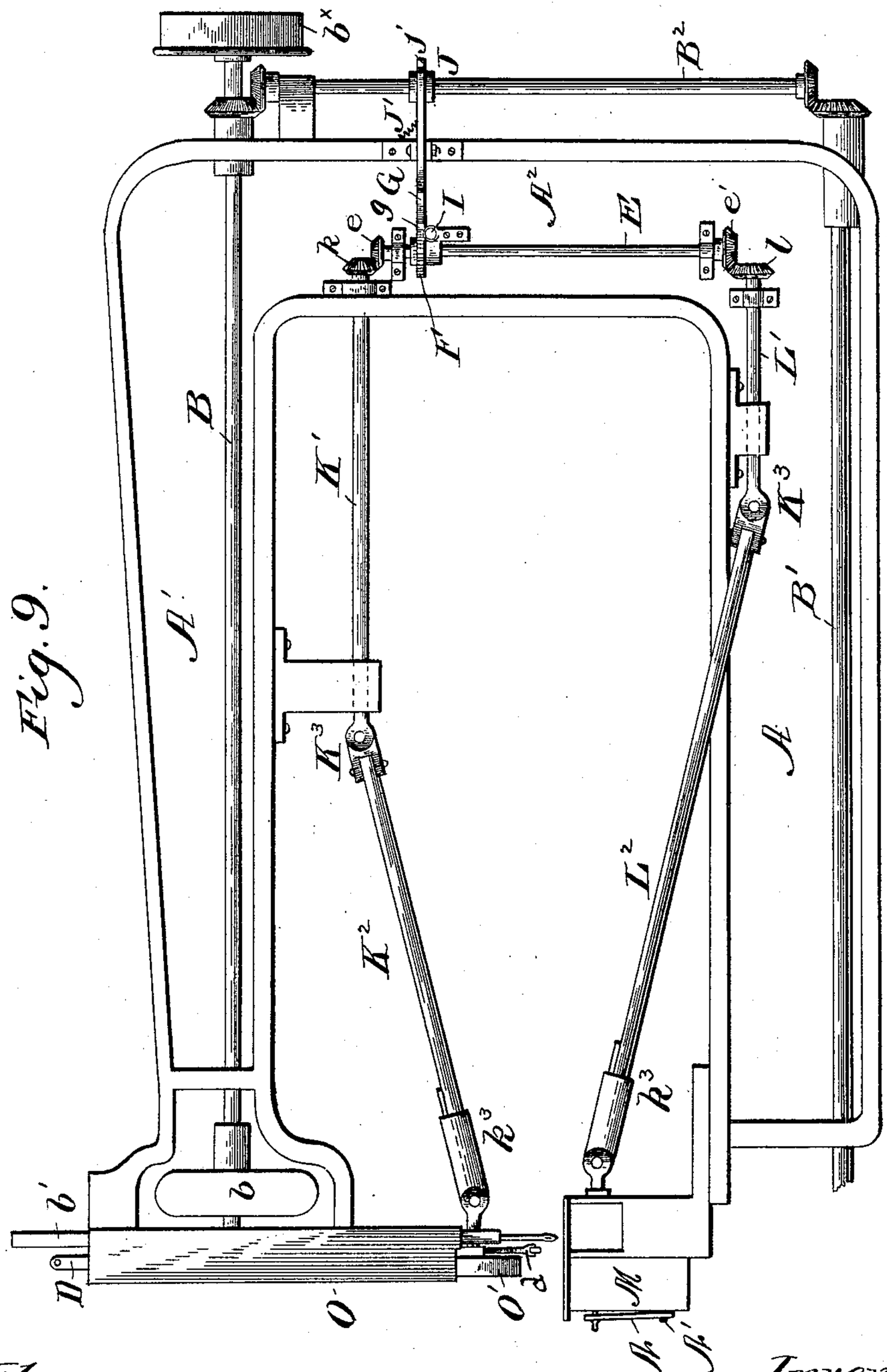


Fig. 9.

Witnesses:
J. B. McGirr.
J. P. Appleman.

Inventor:
James A. Sanford
by H. P. Dorbecker, atty.

UNITED STATES PATENT OFFICE.

JAMES A. SANFORD, OF JACKSON, MICHIGAN.

SEWING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 615,752, dated December 13, 1898.

Application filed April 1, 1896. Serial No. 585,771. (No model.)

To all whom it may concern:

Be it known that I, JAMES A. SANFORD, a citizen of the United States, residing at Jackson, in the county of Jackson and State of Michigan, have invented certain new and useful Improvements in Sewing-Machines, of which the following is a specification, reference being had therein to the accompanying drawings.

Figure 1 is a side view. Fig. 2 is an end view, partly broken away. Fig. 3 is a view, enlarged, of the upper feed-wheel and part of its driving mechanism, looking in the direction of the arrow, Fig. 2. Fig. 3ª is an enlarged view of the presser-bar, its lifting-lever, and cam. Fig. 4 is a similar view of the lower feed-wheel and part of its driving mechanism. Figs. 5, 6, 7, and 8 are details, enlarged. Fig. 9 is a side elevation of a modification. Fig. 10 is a horizontal section taken on line $x\,x$, Fig. 1, looking down. Fig. 11 is the front wall of a casing seen from the inside. Fig. 12 is a vertical section on line $y\,y$, Fig. 7.

Like reference-letters indicate similar parts wherever used.

Referring particularly to Figs. 1 to 8, A indicates the base, A′ the arm, and A^2 the post or upright of the frame, of a sewing-machine.

B is the needle-operating shaft, b the crank-wheel, and $b^\times$ a driving-pulley.

B′ is the shuttle-shaft, and B^2 an upright shaft geared to shafts B and B′, preferably by miter-gears, in such manner that those shafts shall rotate in unison.

b' is the needle-bar, reciprocated by the wheel b and vibrating in a vertical path.

C is the needle-plate.

D is the presser-bar, and d is the presser-foot; but as these parts may be of any usual or approved construction which is adapted to have my improvements applied thereto no detailed description of their construction need be given further than to say that some usual or approved device for lifting the presser-foot and feed-wheel should be used—such, for instance, as a rocking shaft and a cam or arm thereon.

I usually prefer to combine with the needle-bar or with the devices which reciprocate it some form of connection with the presser-bar, so that the presser-foot shall be lifted slightly whenever the needle goes up to facilitate feeding the material forward; but as such contrivances are well known they need not be illustrated. So, also, I employ a lever for lifting the presser-bar and presser-foot and holding them in their elevated position for such time as may be found desirable, and to insure that neither the bar D nor the presser-foot shall be thrust down too violently I combine with the said bar D a device preferably in the form of an air-cushion, a convenient construction of which is as follows:

Referring particularly to Figs. 2 and 3ª, D′ is an air-cylinder supported with its open end upward upon some part of the frame of the machine. d' is a shank or stem connecting the presser-bar with the air-piston d^2, the relation of parts being such that when the bar D descends the piston compresses the air within the air-cylinder and prevents any hammering of the parts upon the needle-plate or upon the material upon said plate, as the case may be. Of course the extent of the air-cushioning must be so regulated as to not interfere with a proper pressure of the foot upon the material being sewed.

I will next describe that part of my invention which relates to the feeding devices.

E is the upright feed-shaft, mounted upon the post A^2 of the frame.

F is a ratchet-wheel fixed on shaft E.

G is a pawl-lever vibrating about shaft E as a center.

g is a spring-pawl carried by lever G and engaging with the ratchet-wheel F.

H is a returning-spring with one end acting upon said lever.

I is an adjusting-screw mounted on the frame with its end in the path of the lever G, with a jam-nut i.

J is a lever pivoted to the frame with one end disposed in the path of the pawl-lever and its opposite end in the path of a cam j, which is carried by the upright shaft B^2, so that said cam engages with the lever J at each reciprocation of the needle.

J′ is a returning-spring which moves the lever J back to its normal position after the cam passes.

K is the upper feed-shaft. L is the lower feed-shaft. Both these shafts are mounted at their rear ends upon the post A^2 and at their front ends upon some convenient sup-

port, as will be explained. Both these shafts are at their rear ends connected to the upright feed-shaft E, preferably by means of miter-gears *e k e' l*. (See Fig. 1.) Both feed-shafts lie in planes which are at right angles to the path of the needle, and as the lower one is disposed below the upper surface of the bed-plate and the upper one lies just below the lower face of the arm A' and is at its rear end mounted in the post of the frame it is apparent that practically the entire space which is inclosed by the frame is left free and unobstructed for the reception and manipulation of the material being sewed—an important feature of construction, particularly when such an article as a carriage-dash is being stitched. These feed-shafts carry at their front ends bevel-gears e^2 k^2.

M is a casing in front of the vertical support or standard of the needle-plate and preferably attached thereto. Within this casing is mounted the lower feed-wheel M' on a vertically-sliding plate or block M^2, and *m* is a bevel-gear rotating with the feed-wheel M' and preferably cast integral therewith.

m' is a short vertical shaft.

$m^\times$ is a bevel-gear splined to the upper end of shaft *m'* and meshing with bevel-gear *m* on the feed-wheel. The gear $m^\times$ is supported both above and below by the plate and bearing $m^{\times\times}$, carried by the plate, so that it rises and falls with the feed-wheel without disturbing its meshing with gear *m*, sliding freely up and down on its shaft *m'* for that purpose.

By an examination of the drawings it will be readily understood that the casing serves, in combination with the standard $A^\times$, to support the sliding plate or block M^2 and the feed-wheel carried thereon against undue lateral movement relative to the needle-plate at $a^\times$, while permitting those parts to rise and fall within the desired limits.

A bevel-gear m^2 on the lower end of shaft *m'* meshes with bevel-gear e^2, and as the weight of the shaft *m'* is or may be supported by a collar m^4 on the shaft resting on a bearing m^3, which is attached to the standard $A^\times$, with another collar m^5 between the said bearing and the bevel-gear m^2, the lower feed-wheel, its attached bevel-gear, and its driving bevel-pinion $m^\times$ can be moved up and down by devices which will be next described without disturbing the meshing of the bevel-gears e^2 m^2, because the lower end of shaft *m'* and gear m^2 are supported against vertical movement by the bearings m^3 and collars m^4 m^5. Thus as the machine is operated the lower feed-wheel is rotated with a step-by-step movement, the extent of its rotation at each reciprocation of the needle being regulated by means of the adjusting-screw I, as will be readily understood without further explanation.

In order to facilitate the moving of the material being sewed forward between the feed-wheel and the needle under the varying conditions as regards the thickness of said material as a whole and its irregularities in thickness at different points, I provide means for adjusting the feed-wheel longitudinally of its driving-shaft *m'*, and thereby insure a proper pressure of the upper feed-wheel on the material notwithstanding its varying thickness.

N is a lever mounted on the front end of a horizontal shaft N', which projects through the front wall of the casing M, the rear end of the said shaft being mounted in the casting back of the casing. *n* is a lip or spur projecting from shaft N' and engaging with the sliding plate or block M^2, so that by swinging the free end of the lever the lower feed-wheel can be raised and lowered at will. Thus it will be seen that this feed-wheel-driving mechanism comprises a horizontal driving-shaft, a vertical shaft geared thereto and disposed by the side of a feed-wheel, the bevel-gears which connect the vertical shaft with the feed-wheel being adjustable up and down with the feed-wheel relative to the needle-plate upon which the material to be sewed is supported, and therefore the said adjustment of the feed-wheel does not disturb the working relation of any of the gearing. The free end of lever N carries on its inner face a point which will enter successively the holes *n' n'*, and thus hold the feed-wheel M' in its respective positions.

O is a vertical face-plate constituting practically a part of the frame of the machine and supporting the needle-bar, the presser-bar, and the upper feed-wheel O', which latter is mounted on a sliding plate or block O^2, attached to or formed integral with the lower end of the presser-bar D, so that when the said bar is lifted by the lever P, the rock-shaft, and its arm or cam it carries with it the presser-foot and the upper feed-wheel.

o is a bevel-gear rotating with the feed-wheel O' and preferably cast integral therewith.

o' is a short vertical shaft.

$o^\times$ is a bevel-gear splined to the lower end of shaft *o'* and meshing with bevel-gear *o* on the feed-wheel O'. The gear $o^\times$ is supported both above and below by a bearing o^3, attached to bar D, so that it rises and falls with the feed-wheel O' without disturbing its meshing with gear *o*, sliding freely up and down on its shaft *o'* for that purpose. A bevel-gear o^2 on the upper end of shaft *o'* meshes with bevel-gear k^2 and rests upon a bearing o^4, which connects the shaft *o'* with plate O. Thus the rotation of the vertical shaft B^2 and cam J advances the feed-wheel O' by a step-by-step movement, the extent of rotation of said feed-wheel being regulated by means of the adjusting-screw I, and from an examination of the drawings, in connection with the above description of parts, it will be seen that the movements of both feed-wheels will during their ordinary operations be exactly alike, as regards advancing the material being

sewed, whether the wheels are as close as is possible to each other or as far apart as their limits of adjustment will permit.

It will be seen that both feed-wheels are disposed to rotate in planes which are parallel with the path of the needle instead of planes which are at right angles to the needle-path, as do the feed-wheels of some prior glove-sewing machines, for instance; and it will be observed that there is combined with each feed-wheel a multipart connection between such feed-wheel and a wheel which rotates it, of which connection one part is movable relatively to another part without disturbing the relation of meshing gears, it being apparent that no up-and-down movement of either or both feed-wheels will disturb the mesh of any gears in the trains of gear which connect those feed-wheels with their common driving-shaft E, from which they initially receive their motion.

The speed of rotation of both shafts K L being constant and uniform under any particular adjustment of screw I it follows that if from any cause it should be found desirable to change the relative size of either feed-wheel a corresponding change should be made in the relative sizes of the bevel-gears which connect that feed-wheel with its horizontal driving-shaft.

In the modification shown in Fig. 9 I dispense with the short vertical shafts *m o*, the bevel-gears l^2 k^2 $m^\times$ *m'* m^2 $o^\times$ *o'* o^2, and substitute for the long shafts K L short shafts K' K^2, coupled together by a universal joint at K^3, the socket k^3 of one member being preferably splined to its shaft, so as to permit said shaft to slide endwise in the said socket and permit the opposite end of shaft-section K^3 to rise and fall with the feed-wheel O', to which it is attached, without cramping any of the parts. I prefer to mount that feed-wheel on the front end of that shaft-section, that end of the shaft being mounted in a suitable bearing formed in or attached to the face-plate O of the frame. L' L^2 are shaft-sections similarly connected by a universal joint with a splined socket at K^3 k^3 for driving the lower feed-wheel M' and permitting its vertical adjustments without cramping the devices. In this modification, also, there is combined with each feed-wheel and a wheel which rotates it a multipart connection having substantially the same capabilities as regards permitting movement of the wheel without disturbing the mesh of its driving-gears, as has been explained with reference to the construction illustrated in the other form of my invention. In the modification there is also practically the same open space within the frame of the machine for the handling of the material being sewed as there is in Fig. 1. P is a lever mounted on the end of a cam-shaft, which projects through the face-plate O of the frame and engages with the vertically-sliding plate or block which carries the upper feed-wheel, as is customary in sewing-machines, for the purpose of raising said wheel, a point on one face of that lever taking successively into a series of holes to hold the weeel at any desired height from the needle-plate or "throat-plate," as it is sometimes called.

In both constructions there is combined with each feed-wheel a driving-shaft mechanism which comprises a shaft-section which is mounted at one end in a stationary bearing and another shaft-section which is mounted at one end in a movable bearing which rises and falls with the feed-wheel and with which there is combined means for moving it positively and for locking it away from the plane traversed by the material when being sewed. Again, in my invention the lower feed-wheel is further combined with a needle-plate which supports the material against downward thrust, the locking means for that wheel being capable of withdrawing said wheel below the supporting-face of the needle-plate.

While I have explained the best mode now known to me for carrying my invention into effect, I do not desire to be limited to the precise details of construction or arrangement herein illustrated, because many modifications will suggest themselves to any person skilled in the art without departing from or going outside of the spirit of my improvement.

What I claim is—

1. In a sewing-machine, the combination of a needle-bar, a shaft disposed in a plane parallel with the path of the bar, a feed-wheel mounted near the end of said shaft on an axis at right angles to the shaft and movable longitudinally thereof, gearing connecting the shaft and the wheel, and means for imparting a step-by-step movement to the shaft and feed-wheel, substantially as set forth.

2. In a sewing-machine, the combination of a needle-bar, a shaft disposed in a plane parallel with the needle-bar, a feed-wheel mounted near the end of said shaft on an axis at right angles to the shaft and movable longitudinally thereof, gearing connecting the shaft and the wheel, means for imparting a step-by-step movement to the shaft and feed-wheel, and means for adjusting the feed-wheel longitudinally of its driving-shaft *m'*, to facilitate moving the material being sewed between the wheel and the needle, substantially as set forth.

3. In a sewing-machine, the combination of a needle-bar, a needle-plate, a feed-wheel above the needle-plate and a feed-wheel below the needle-plate, both mounted to rotate in a plane parallel to the path of the needle-bar, shafts mounted to rotate each in a plane parallel to the plane of the adjacent feed-wheel and bevel-geared to its respective feed-wheel, a shaft mounted at a right angle to each of said bevel-geared shafts and geared thereto at one end and at its opposite end

connected to means for imparting a step-by-step movement to both feed-wheels in unison, substantially as set forth.

4. In a sewing-machine the combination of a needle-bar mounted at one end of the bed-plate and at right angles thereto, a feed-wheel mounted to slide vertically near the upper end of a shaft below the needle-plate and geared to said shaft, a stationary bearing for the lower end of said shaft, a horizontal shaft mounted at one end in the stationary bearing and at its opposite end in another bearing, a feed-wheel above the needle-plate, a parallel shaft disposed at the upper part of the machine for driving said last-mentioned feed-wheel, and a step-by-step rotating shaft geared to one end of each of the parallel shafts, substantially as set forth.

5. In a sewing-machine, the combination with the continuously-rotating needle-shaft and parallel shuttle-shaft and two feed-wheels, of two substantially parallel step-by-step rotating shafts, one for each feed-wheel, and a transverse shaft geared to both of the latter-named parallel shafts, substantially as set forth.

6. In a sewing-machine, the combination with the continuously-rotating needle-shaft and parallel shuttle-shaft and two feed-wheels disposed to rotate in a plane transverse to the horizontal plane of the bed of the machine, two driving-shafts one for each feed-wheel, and which are parallel to the bed of the machine, and a step-by-step rotating transverse shaft geared to both the said driving-shafts and having a step-by-step rotation, substantially as set forth.

7. In a sewing-machine, the combination with the continuously-rotating needle-shaft and parallel shuttle-shaft and two feed-wheels, of a step-by-step rotating driving-shaft at the opposite end of the machine disposed in a plane parallel with the plane of rotation of the feed-wheels, gearing disposed between said driving-shaft and feed-wheels, and a multipart connection between each feed-wheel and said driving-shaft, of which connection one part is movable relatively to another part without disturbing the relation of intermeshing gears, substantially as set forth.

8. In a sewing-machine, the combination with the needle-plate, of a standard below the plate, a vertical slidable block attached to the standard, a feed-wheel carried by the block, a step-by-step driving-shaft mechanism comprising two shaft-sections for actuating said feed-wheel, and of which shaft-sections one is disposed below the bed, the other shaft-section being connected with the feed-wheel and supported in the sliding block, substantially as set forth.

9. In a sewing-machine, the combination with the standard below the needle-plate, of the casing, the feed-wheel and its driving bevel-gears mounted on the sliding plate within the casing, said plate engaging with the walls of the casing, and means for raising and lowering the feed-wheel and said plate, substantially as set forth.

10. In a sewing-machine, the combination with the standard, the casing, the feed-wheel, and its driving bevel-gears, of the cam-lever mounted on the casing and standard and adapted for raising and lowering the feed-wheel and its driving bevel-gears, and means for locking the same in its adjusted position, substantially as set forth.

11. In a sewing-machine, the combination with the face-plate O of the frame, of the needle-bar, the continuously-rotating needle-shaft, the feed-wheel rotating in a plane parallel with the path of the needle, a step-by-step rotating driving-shaft, mechanism comprising two shaft-sections for actuating said feed-wheel and of which shaft-sections one is disposed above the bed but below the needle-shaft and parallel with it, the other shaft-section being connected at one end with the feed-wheel, substantially as set forth.

12. In a sewing-machine, the combination with the face-plate O of the frame, of the continuously-rotating needle-shaft, the sliding block, the feed-wheel and its attached bevel-gear carried by the block, the vertical shaft geared at one end by a slidable bevel-gear to the feed-wheel, the upper step-by-step rotating feed-shaft mounted at one end in the bar, O, and means for raising the said feed-wheel and its intermeshing gears, substantially as set forth.

13. In a sewing-machine, the combination with a feed-wheel, of a horizontal driving-shaft, a vertical shaft geared thereto and disposed by the side of the feed-wheel, and vertically-adjustable gearing connecting said wheel with the vertical shaft, substantially as set forth.

14. In a sewing-machine, the combination with the presser-bar, of an air-cushion, for supporting the presser-foot when said foot is descending, substantially as set forth.

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

JAMES A. SANFORD.

Witnesses:
D. G. PALMER,
J. H. EMMONS.