(No Model.)

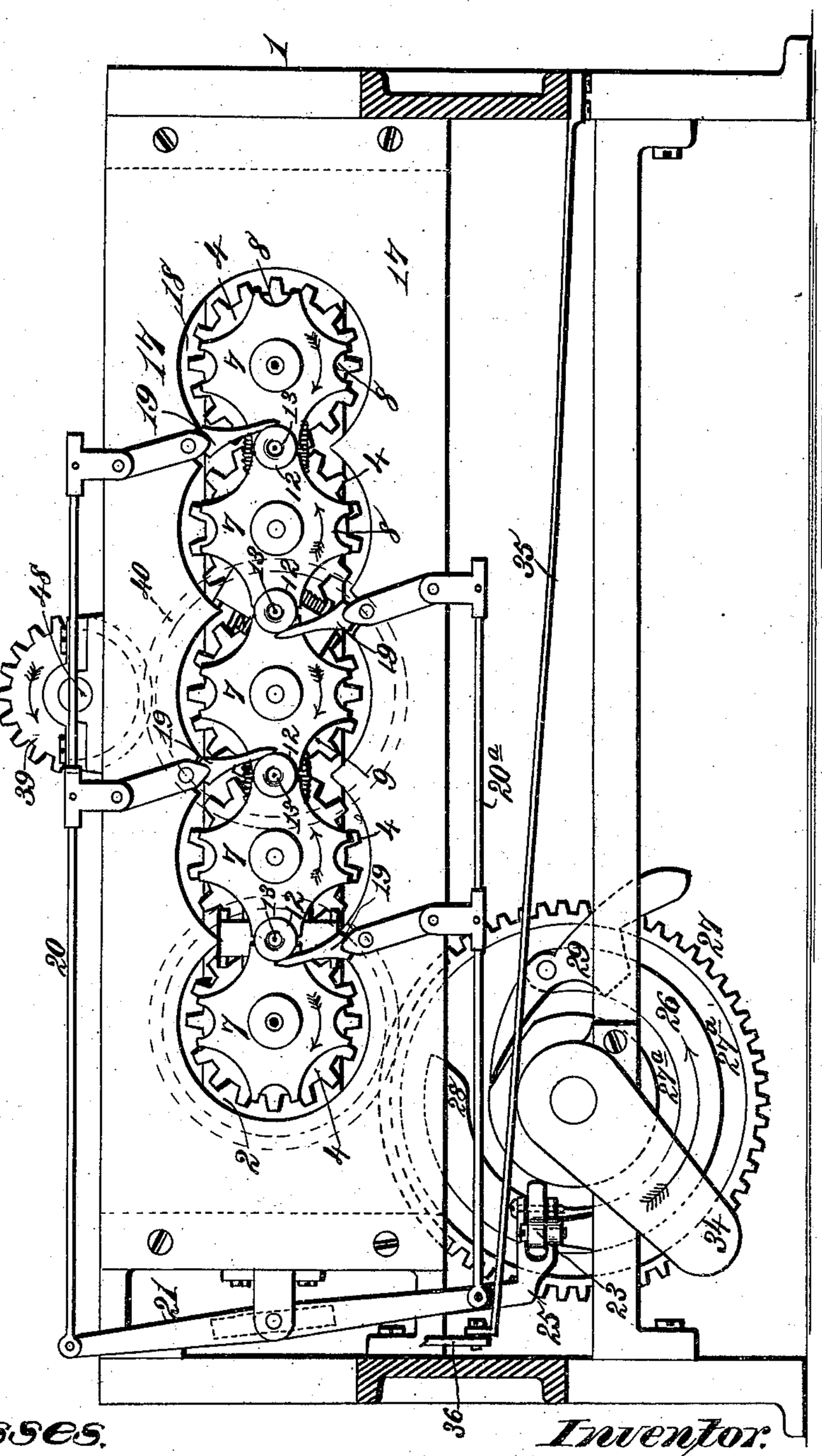
4 Sheets—Sheet 1.

T. M. CONNER.

MACHINE FOR FORMING NETTED WIRE FABRICS.

No. 357,067. Patented Feb. 1, 1887.

Fig. 1.



Witnesses.
Robt Everett.
J. A. Rutherford

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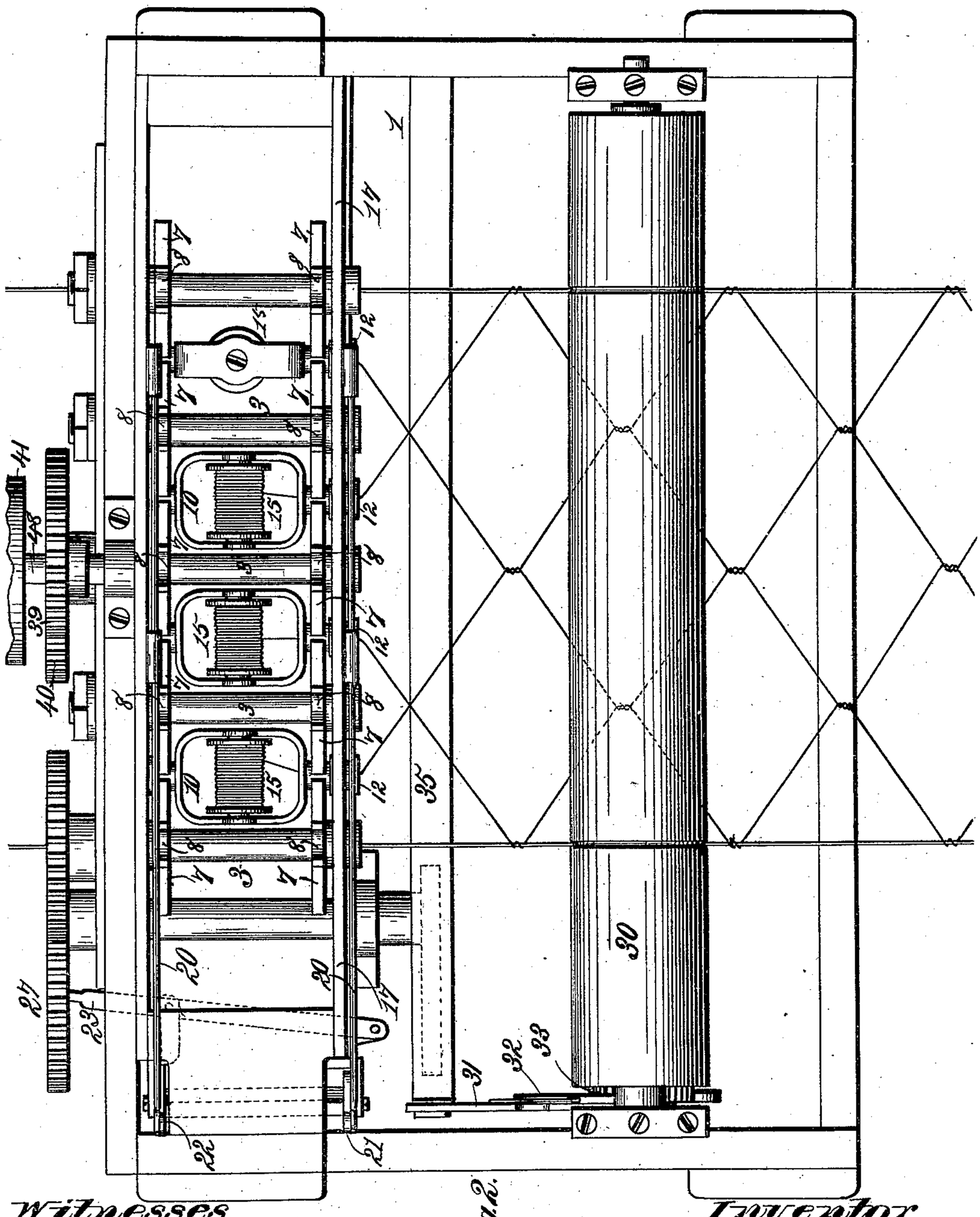

Fig. 2.

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(No Model.) 4 Sheets—Sheet 3.

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Fig. 3.

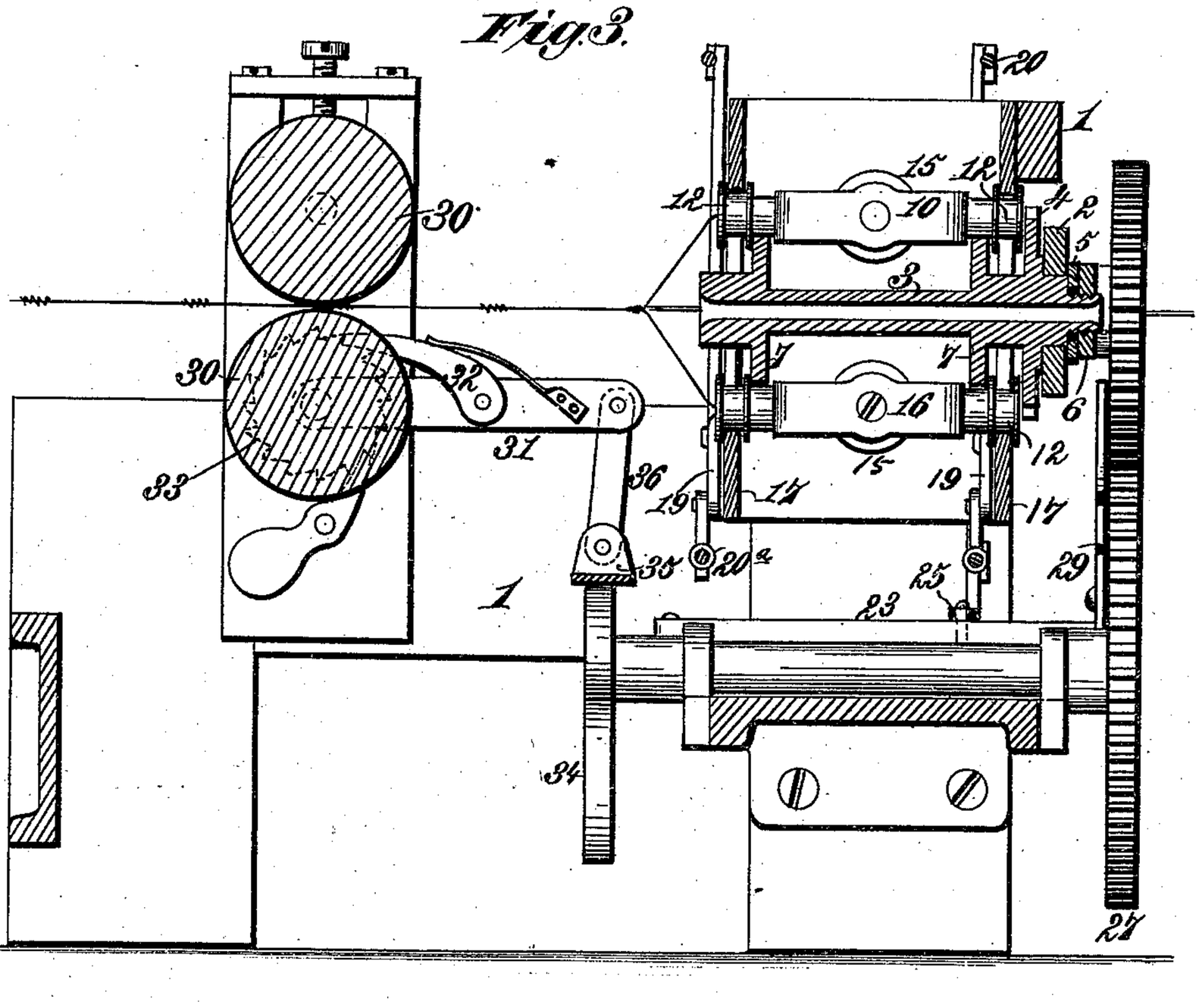

Fig. 4.

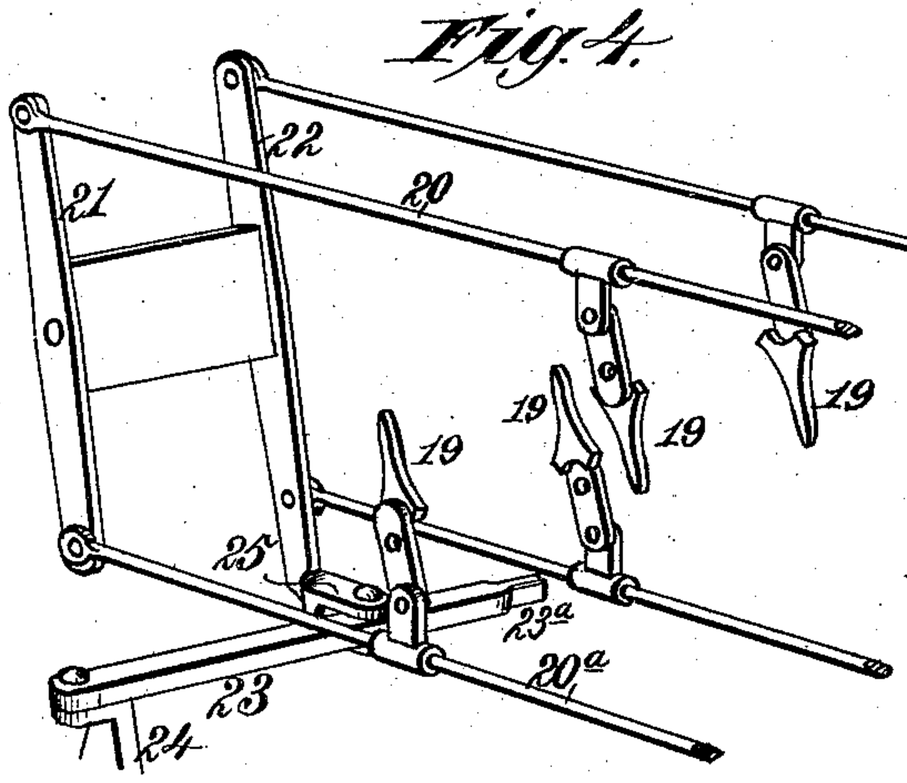

Fig. 5.

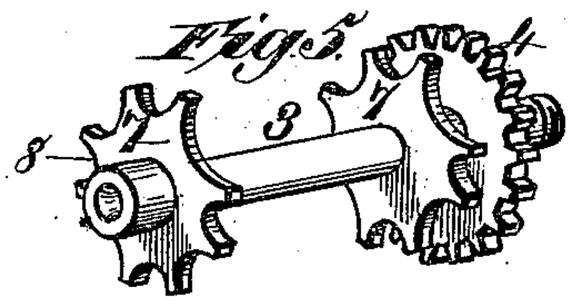

Fig. 6.

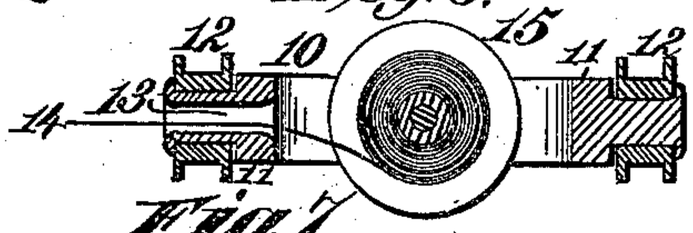

Fig. 7.

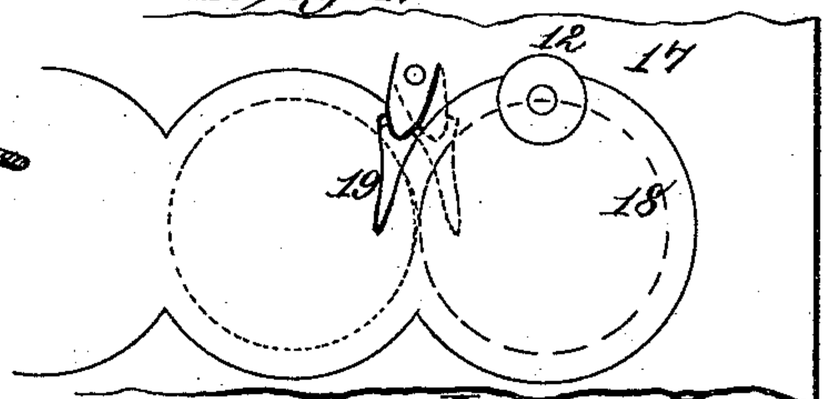

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Fig. 8.

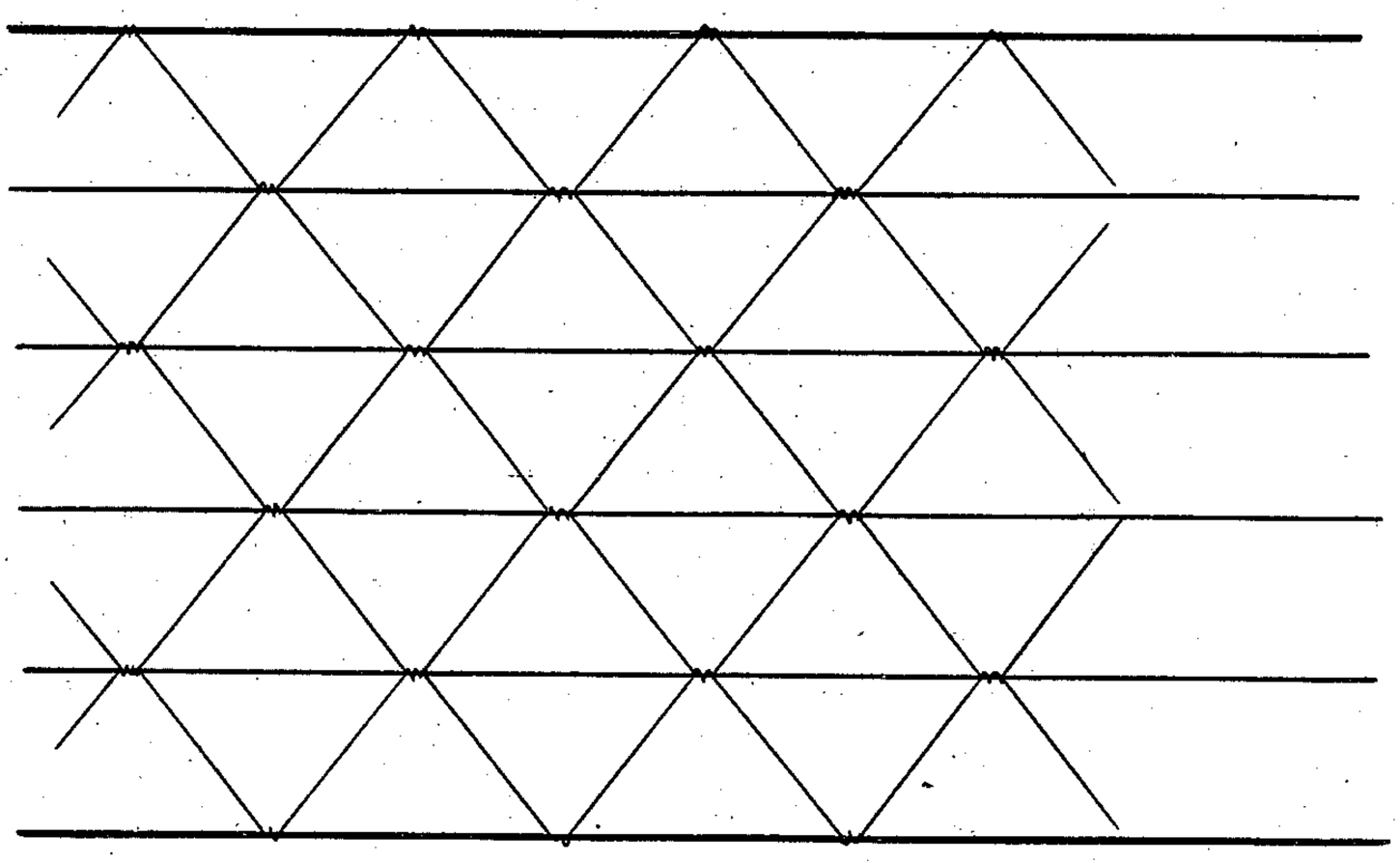
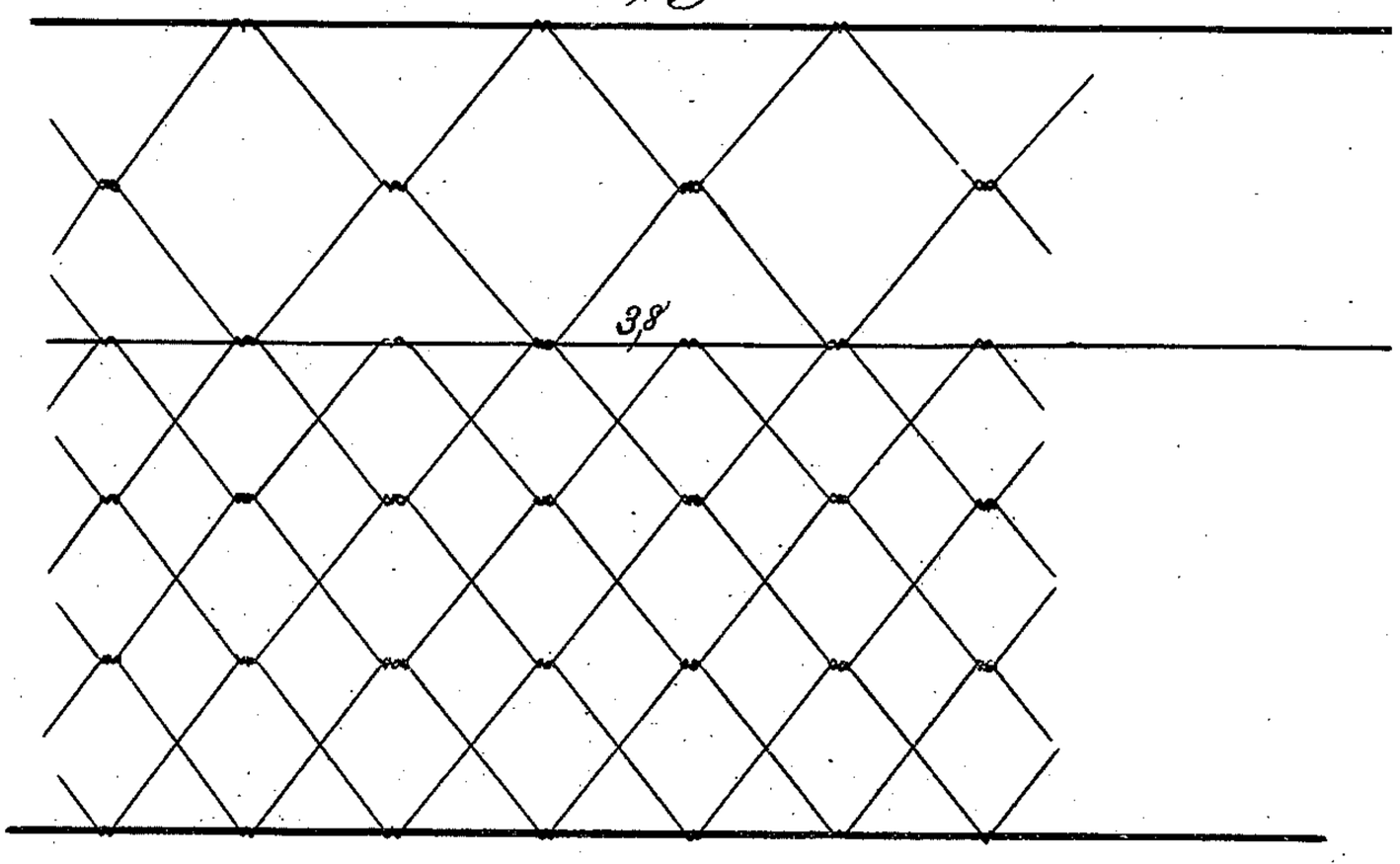


Fig. 9.



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UNITED STATES PATENT OFFICE.

THEODORE M. CONNER, OF RICHMOND, INDIANA, ASSIGNOR OF PART TO THOMPSON M. CONNER AND JOHN B. DOUGAN, BOTH OF SAME PLACE.

MACHINE FOR FORMING NETTED WIRE FABRICS.

SPECIFICATION forming part of Letters Patent No. 357,067, dated February 1, 1887.

Application filed October 23, 1886. Serial No. 217,080. (No model.)

To all whom it may concern:

Be it known that I, THEODORE M. CONNER, a citizen of the United States, residing at Richmond, in the county of Wayne and State of Indiana, have invented new and useful Improvements in Machines for Forming Netted Wire Fabrics, of which the following is a specification.

My invention relates to mechanism for producing netted wire fabric; and the purpose thereof is to provide an apparatus having continuous positive movement in which the marginal wires may be introduced at different points to form netting of varying width, and in which the wires forming the netting pass from the spools in parallel lines, and are intersected by the travel of the spool-carriers, thereby forming the successive reticulations without the employment of other mechanism than the traveling spool-carriers.

It is also the purpose of my invention to so construct and organize said apparatus that it may be used in the formation of two distinct series of reticulations, the intersections of the one being intermediate of those of the other, thereby producing a double net with parallel filaments.

It is my further purpose to combine with the netting apparatus mechanism whereby the formed web may be advanced successively, the rate of speed being adjustable, whereby the size and relative form of the net-spaces may be varied to adapt the fabric to special uses.

My invention consists in the several novel features of construction and combinations of parts hereinafter fully set forth, and definitely pointed out in the claims following this specification.

Referring to the drawings forming part of this application, Figure 1 is a section taken transversely to the line of feed of the machine. Fig. 2 is a plan view. Fig. 3 is a vertical section taken in the line of feed of the machine. Fig. 4 is a detail perspective showing the switch-actuating devices. Fig. 5 is a detail perspective of one of the spool-carriers. Fig. 6 is a detail section of one of the spool-carriers with the spool in place. Fig. 7 is a diagram showing the course of the spool in the process of forming the net. Fig. 8 is a view of one form of netting produced by this machine. Fig. 9 is a view of a form of net produced by the same mechanism,

In the said drawings, the reference-numeral 1 denotes the frame of the machine, within which the operative parts are journaled. Within a strong plate, 2, mounted upon the frame and extending from side to side thereof, are mounted a series of hollow shafts, 3, each having an equal gear, 4, intermeshing with the adjacent gears upon each side. The shafts 3 are mounted within the plate by means of washers 5 and nuts 6, lying outside the support, while the gears 4 lie upon the inner face of the plate 2, each shaft having support at one end only. Near the gear 4, upon each shaft, are mounted rigidly two spool-carrying disks, 7, having notches or semicircular seats 8, as shown in Figs. 1 and 5, one of said disks being placed near the free or unsupported end of the shaft and the other near the opposite end. The entire train of gears is driven by a master-gear, 9, mounted upon a prolongation of one of the shafts 3, and revolved by power from any suitable source. The number of the shafts 3 may be practically without special limit, though I have shown in the drawings five only.

The numeral 10 denotes what may be termed a "spool" or "bobbin" frame, consisting of an oblong frame having at each end cylindrical bearings 11, adapted by their size to lie within the seats 8 of the disks 7. Each frame is also provided with flanged friction-rolls 12, mounted just outside the bearings 11, and through the journal at one end of the carrier-frame is formed an eye or opening, 13, within which the wire 14 lies as it passes from a spool, 15, mounted in bearings 16 upon the sides of the spool or bobbin frames.

Upon the frame of the machine, in the same vertical planes with the friction-rolls 12, are rigidly mounted guide-plates 17, parallel with each other and having intersecting circular openings 18, which are concentric with and of somewhat greater diameter than the notched disks 7. As the latter revolve, the spool-frames 10, lying in the notches or seats 8, are supported

by the curved edges of said plates, as shown in Figs. 1 and 3. Upon the face of each plate are pivotally mounted switches 19, by the action of which the spool or bobbin frames are at intervals withdrawn from the seats 8 in the one pair of disks and lodged in the seats or notches of the adjacent and oppositely-revolving disks, whereby the spools are caused to traverse a path which corresponds to the form of a figure 8. These switches are thrown by connecting-rods 20, operated by a centrally-pivoted lever, 21, to which the switch-rods are connected at or near their ends. The plates 17 are each provided with switches having similar arrangement and action, each consisting of a metallic point resembling a spear-head pivoted at the intersection of the circular openings in the plates 17, two of said switches being placed above and two below in alternate order. The lever 21 actuates the switches on one plate, and a similar lever, 22, rigidly connected to it, operates those upon the other plate, the upper switches being moved by the connecting-rods 20, and the lower ones by similar rods, 20^a, pivoted to the lower extremities of the levers. Automatic action is produced by means of a lever, 23, pivoted to a rigid support, 24, and coupled by a fork, 25, to the lower end of the lever 21. The free end 23^a of this lever runs in a ring-cam, 26, (see Fig. 1,) driven by a gear, 27, operated by one of the train of gears 4. The ring-cam is double, or, in other words, consists of an outer and an inner cam, 27^a and 27^b. Upon the extremity of the lune 28, which composes the cam-surfaces, is pivoted a dog, 29, by which, as the lune revolves, the free end 23^a of the lever 23 is carried alternately from the inner to the outer surface of the lune, and vice versa, thereby imparting vibration at regular intervals to the lever 23 and reciprocating the switch-rods.

In front of the plates 19, and separated from them by a suitable interval, are feed-rolls 30, one of which receives at each revolution of the power-shaft a partial revolution. This feed is given by a lever, 31, pivoted upon the journal of the roll, and carrying a pawl, 32, which takes into the teeth of a ratchet, 33, rigid on the roll-shaft. This lever 31 is vibrated by a cam-foot, 34, which rises against and lifts a lever, 35, pivotally mounted at one end on the frame, and linked at the other end to the lever 31 by a connection, 36. The marginal wires of the net pass between these rolls, as shown in Fig. 2, and are advanced at regular intervals a distance necessary for the formation of the web. The operation of the mechanism thus described is as follows: The spools 15, being filled with wire of proper caliber, are placed within the spool-frames 10, and the ends of the wires are drawn through the openings 13, as shown in Fig. 6. The spool-frames are then placed in the seats 8 of the disks 7, substantially in the manner shown in Fig. 1. The marginal wires 37 are then inserted within the hollow shafts 3, preferably in the shafts at the two ends of the train of gears, as shown in Fig. 2, although this arrangement may be varied and the marginal wires inserted in the shafts next to the outer ones, and thereby used to form a netting of less width. The ends of the wires are drawn through far enough to permit their introduction between the feed-rolls 30, and the apparatus is then set in motion. The spool-frames 10 are by the revolution of the disks 7 carried around the circle described by the seats 8 in the said disks, and after a given number of revolutions each frame is withdrawn from the disk in which it rests, and lodged in the seats of the adjacent and oppositely-revolving disks, by which it is caused to describe a similar number of revolutions, after which it is returned to the original position. This gives to each spool-carrier a travel in the path of a figure 8, the adjacent disks crossing each other's path at each revolution, and thereby forming the net or loop in the wire, and afterward producing a twist at such point, having as many turns as the spools make distinct revolutions after the wires cross. The path of the spool is clearly shown in Fig. 7, the broken line showing the initial movement by which the wire is looped around the marginal wire, which is fed through the hollow shaft on which the spool at the right hand of Fig. 7 is carried. The dotted line in the adjacent disk shows the path taken by the spool after the switch has been operated to bring it into the position shown by dotted lines, thereby transferring said spool to the next disk.

Wires similar to or of less caliber than the marginal wires may be introduced into the shafts of the intermediate carriers, thereby producing a fabric similar to that shown in Fig. 8; or any number of such wires may be used less than the whole number of intermediates. For example, a single straight intermediate wire may be used, as shown at 38, Fig. 9.

Again, additional spool-frames may be introduced in the revolving disks in the vacant seats 8, and these will work out a distinct series of reticulations, which will intersect the series shown in Fig. 8 or in the upper part of Fig. 9. By variations in the arrangement of these parts, and in the number of straight intermediate wires employed, a variety of patterns may be produced on the same machine.

It will be seen that as the disks 7 revolve, the flanged friction-wheels 12 engage with the concentric curved edges of the guide-plates and retain the frames in the seats of the disks.

At each revolution of the gear carrying the ring-cam 27 and 27^a the feed-rolls 30 are revolved a distance which may be varied according to the throw of the cam 34 acting upon the lever 35. By obvious changes the machine may be geared up to give a greater or less number of twists in the net intersections between each feed.

As already indicated, the width of the net

may be varied indefinitely by either extending the train of gears or by introducing the marginal wires in the intermediate hollow shafts, instead of at the ends of the series. When this is done, the spools should be removed from the disks outside the marginal wires.

The machine is driven from a power-shaft, 48, Fig. 1, upon which is a gear, 39, meshing with a gear, 40, upon one of the shafts 3. A pulley, 41, may be mounted upon the power-shaft 48, as shown in Fig. 2. The gear 39 and its shaft appear in Figs. 1 and 2, but have not been shown in the other figures.

What I claim is—

1. In mechanism for forming netted wire fabric, the combination, with a train of oppositely-rotating spool-carrying disks carried in pairs upon shafts arranged in line, each disk having notches or seats 8, of spool or bobbin frames having journals resting in said notches, friction-rolls mounted upon the prolonged ends of said journals, guide-plates having intersecting openings, with the edges of which said friction-rolls engage, and automatic switches by which the frames are at intervals withdrawn from the notches of one pair of disks and carried into those of the adjacent oppositely-rotating disks, substantially as described.

2. The combination, with a train of intermeshing gears arranged in line, each gear having a hollow shaft, of notched spool-carrier disks mounted on said hollow shafts, bobbin-frames mounted in said notched disks, and automatic switches by which the bobbin-frames are simultaneously withdrawn from the notches of those disks having similar rotation and lodged in the notches of the adjacent oppositely-revolving disks, substantially as described.

3. The combination, with a train of intermeshing gears of equal diameter, mounted on prolonged hollow shafts arranged in line, of a corresponding series of spool-carriers mounted on said hollow shafts and having notched disks, bobbin-frames having journals lying in the notches of said disks, and switches by which the bobbin-frames are each withdrawn from the notches in one pair of disks and lodged in the notches of the adjacent oppositely-revolving pair of disks, substantially as described.

4. The combination, with a series of carriers driven by a train of intermeshing gears and a series of bobbin-frames actuated by the same, of switches operated automatically by means of a double ring-cam, a lever having a dog running in said cam, and a shifter pivoted at the mouth of the ring to throw the dog from the inner to the outer cam-surface, substantially as described.

5. The combination, with a train of notched spool-carrying disks arranged in pairs, driven by intermeshing gears, of bobbin-frames having journals resting in the notches of said disks, plates having curved edges lying near the path of each of said journals as the carriers revolve, and switches which withdraw the bobbin-frames from the notches of one pair of disks and lodge them in the notches of the adjacent oppositely-revolving disks, said notches being thrown by connecting-rods operated by levers 21 and 22, the latter having connection with a lever running in the cam-race of a wheel, 27, substantially as described.

6. The combination, with a series of hollow shafts arranged at regular intervals and in parallelism, of notched spool-carrying disks arranged in pairs upon each shaft, bobbin-frames having journals which lie in the notches of said disks and are pierced to permit the passage of the wires from the bobbins, a series of switches to withdraw the journals of said frames from the notches of the alternate disks and lodge them in the notches of the adjacent and oppositely-revolving disks, and a series of intermeshing gears driving said hollow shafts, substantially as described.

7. The combination, with a series of revolving spool-carrying disks driven by intermeshing gears, of a series of spool or bobbin frames having journals or supports lying in seats in said disks, friction-rolls mounted on the projecting ends of the spool-frames, guide-plates having intersecting openings concentric with the path of revolution of the spool-carriers, and switches acting upon the friction-rolls of said carriers to transfer the latter from one pair of disks to the adjacent and oppositely-revolving pair, substantially as described.

8. The combination, with the spool-frames 10, having bearings 11, and provided with an eye or opening, 13, in one of its bearings, of the friction-rolls 12, the disks 7, having seats 8, the hollow shaft 3, plates 17, having openings 18, and a driving-gear, substantially as described.

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

THEODORE M. CONNER.

Witnesses:
RICHARD A. JACKSON,
JNO. R. HALL.