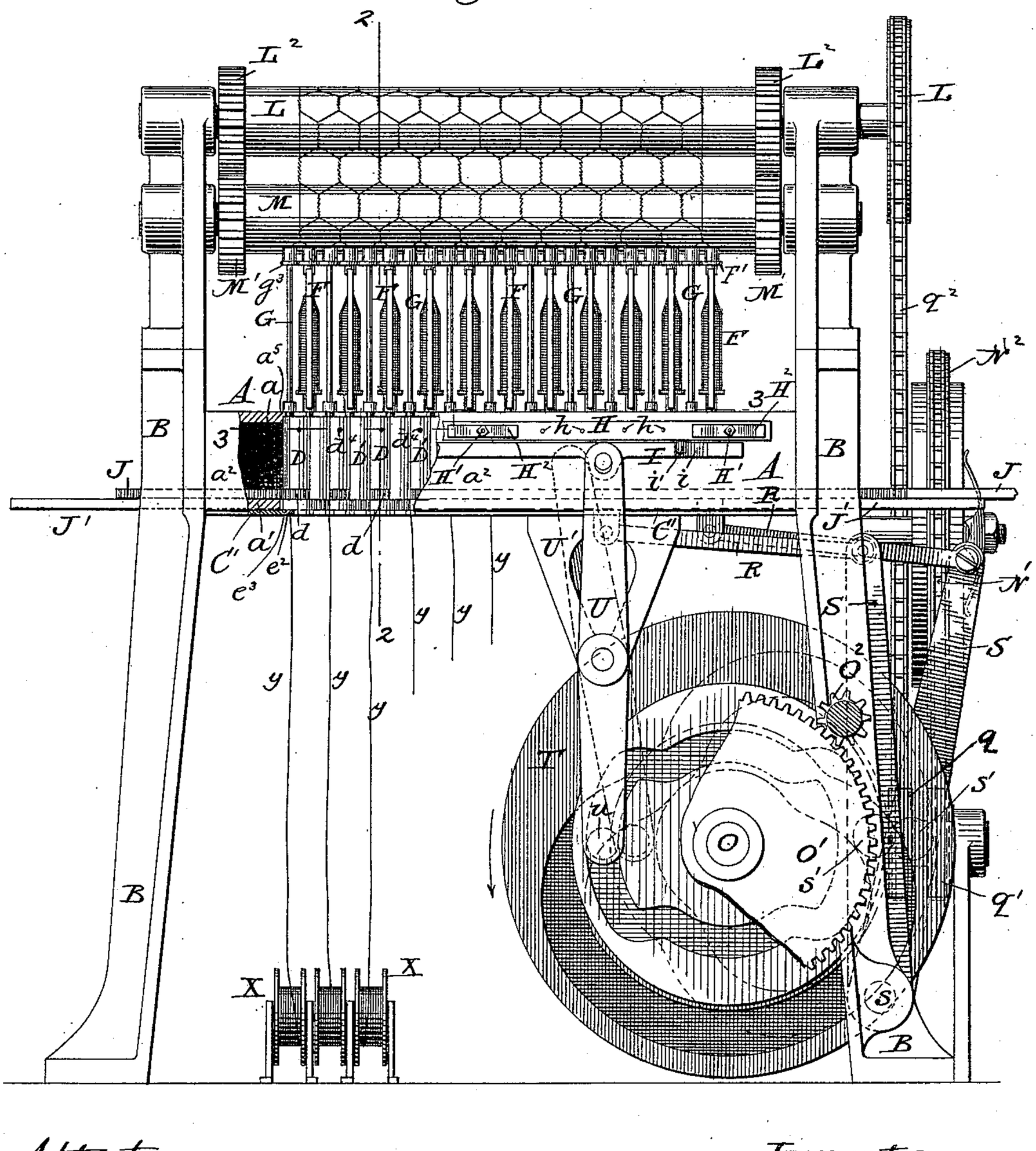
(No Model.) 4 Sheets—Sheet 1.

H. B. MORRIS.

WIRE NETTING MACHINE.

No. 441,437. Patented Nov. 25, 1890.

Fig. 1.



Attest.

Sidney P. Hollingsworth

Baltus De Long.

Inventor.

HENRY B. MORRIS

by his attorneys

Baldwin, Davidson & Wright.

(No Model.) 4 Sheets—Sheet 2.

H. B. MORRIS.

WIRE NETTING MACHINE.

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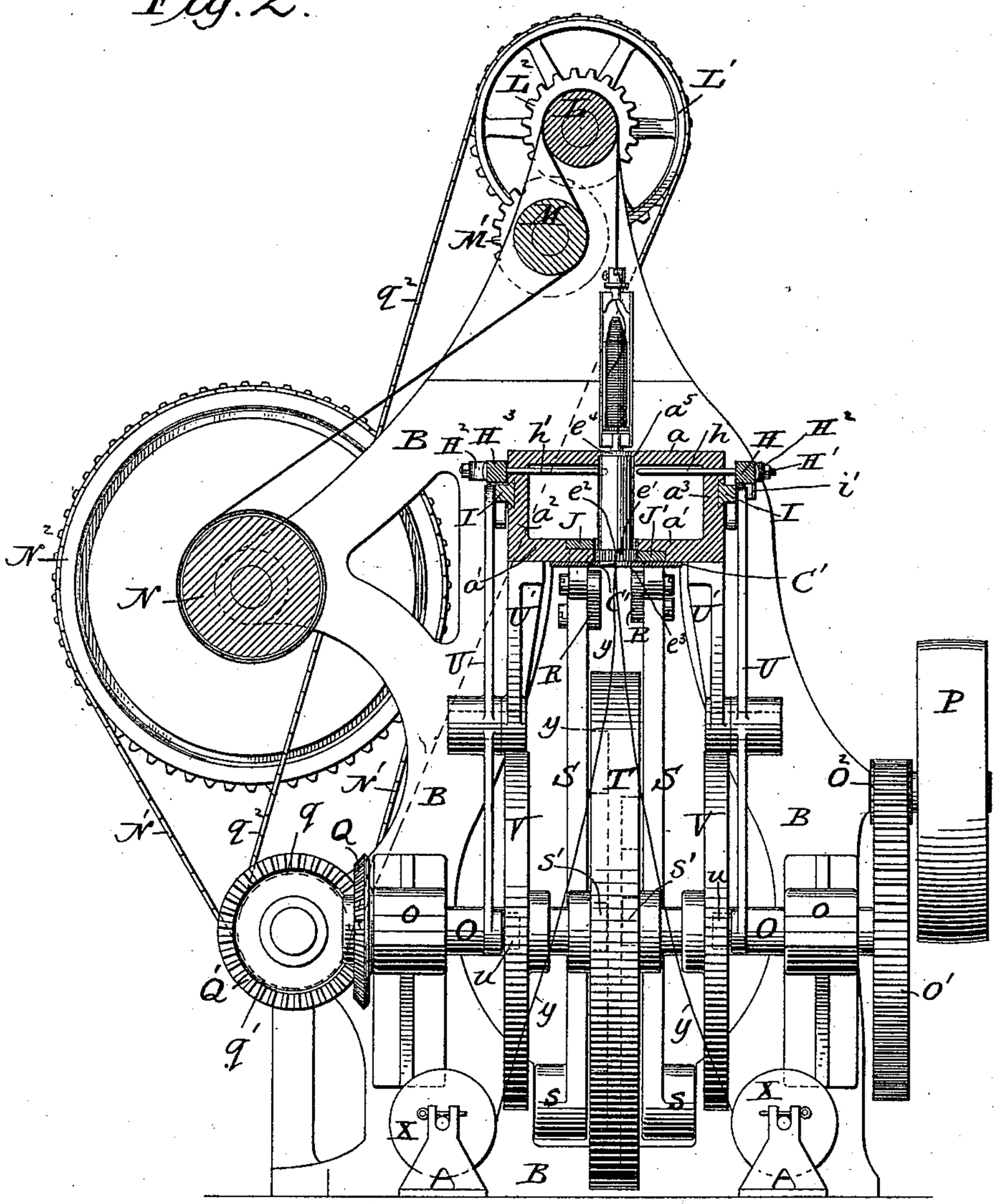
Fig. 2.



Attest.

Sidney P. Hollingsworth

Baltus D'Long.

Inventor

HENRY B. MORRIS

by his attorneys.

Baldwin, Davidson & Wright.

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H. B. MORRIS.

WIRE NETTING MACHINE.

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Fig. 3.

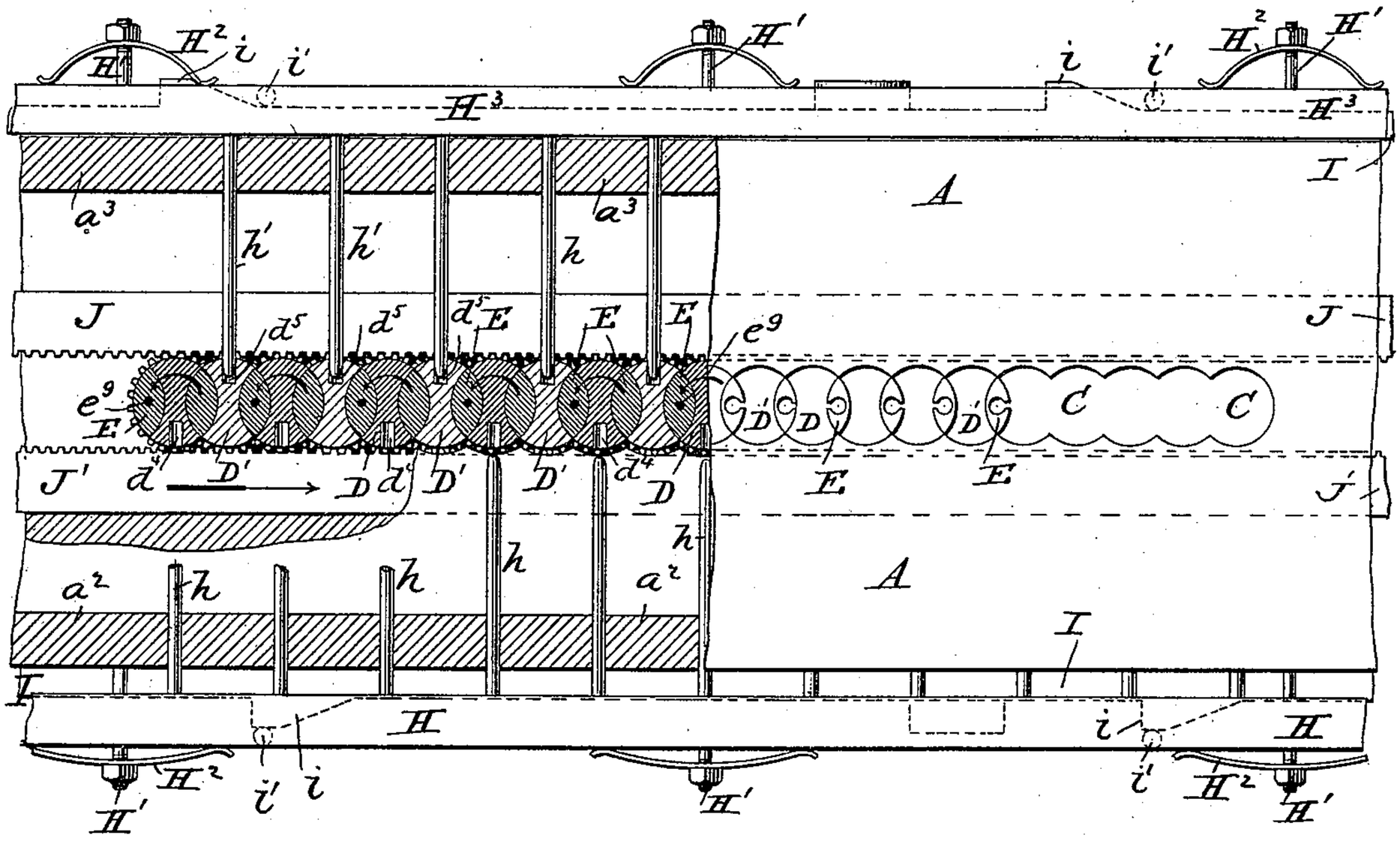


Fig. 4.

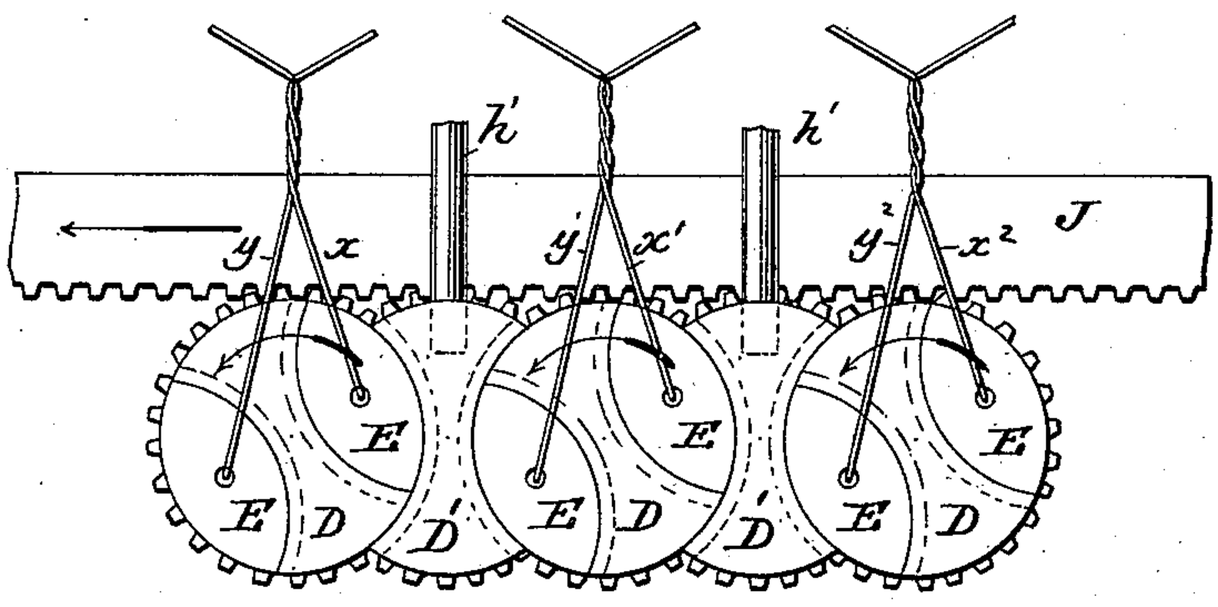
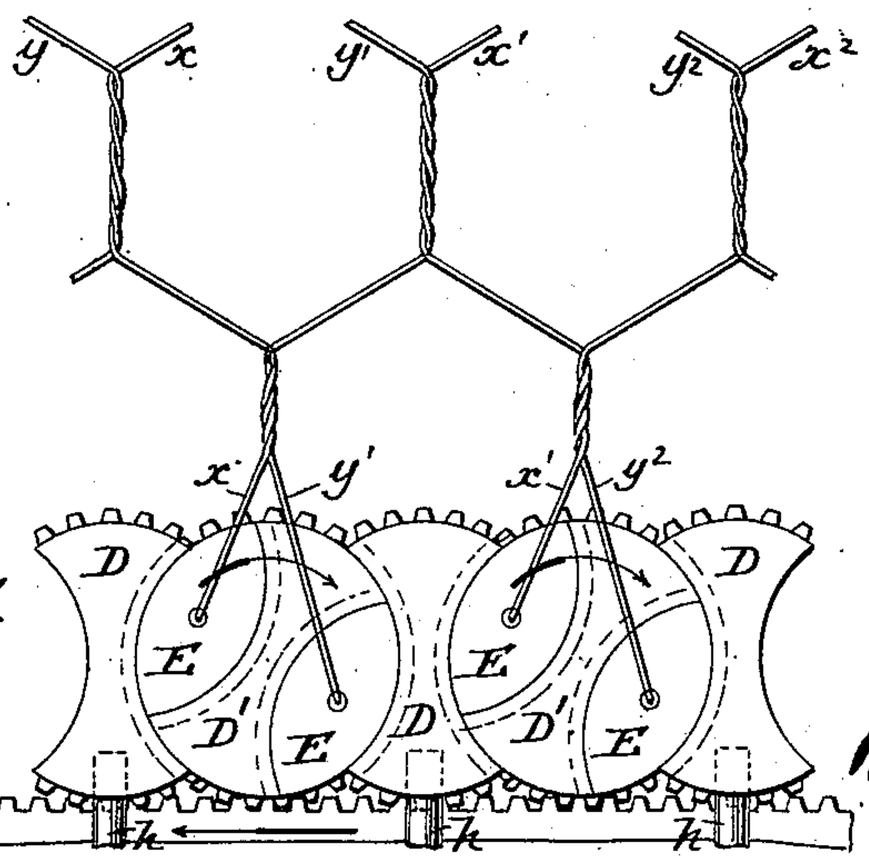


Fig. 5.



Attest.

Sidney P. Hollingsworth

Baltus D. Long.

Inventor

HENRY B. MORRIS

by his attorneys

Baldwin, Davidson & Wright.

(No Model.) 4 Sheets—Sheet 4.

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Fig. 6

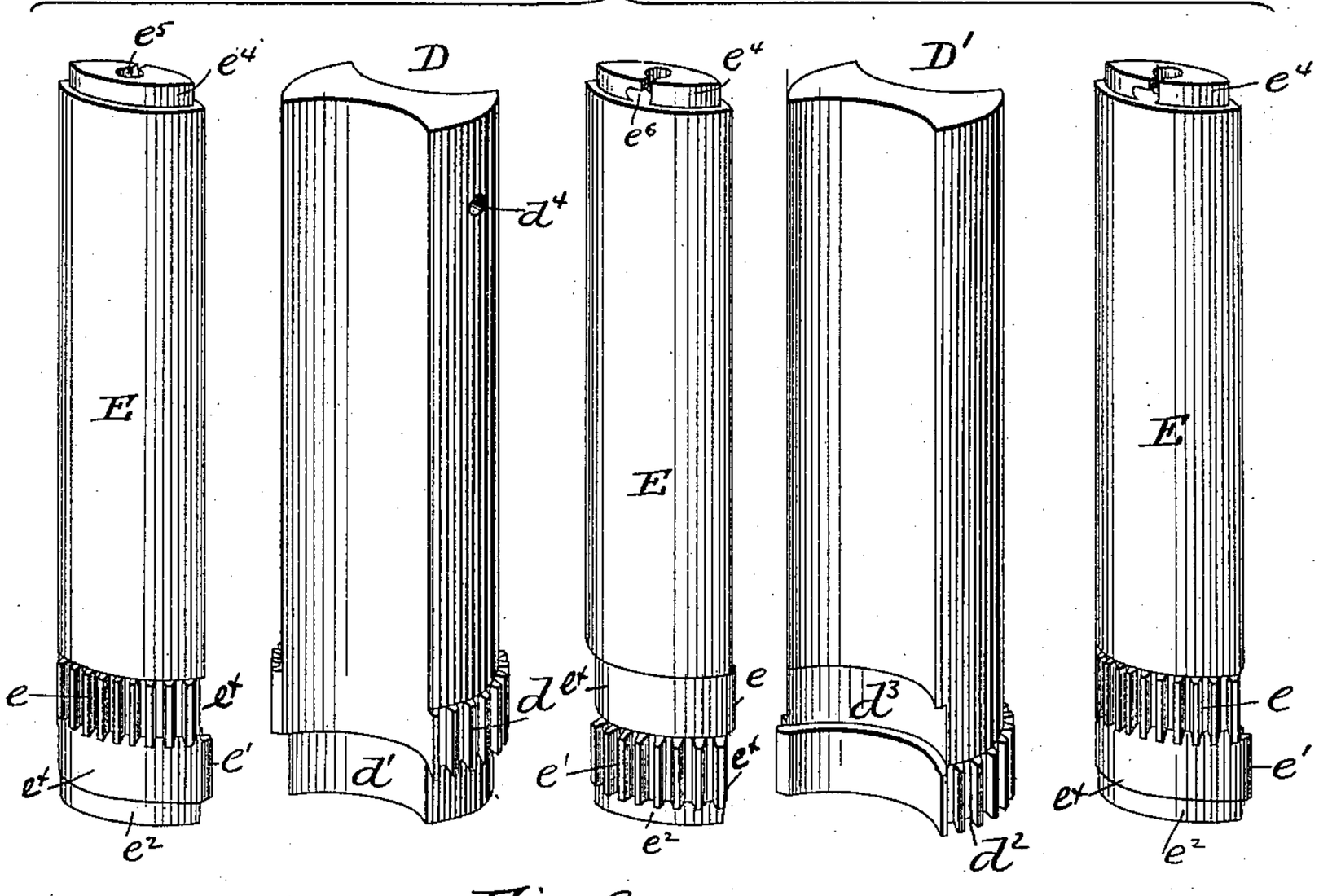


Fig. 8.

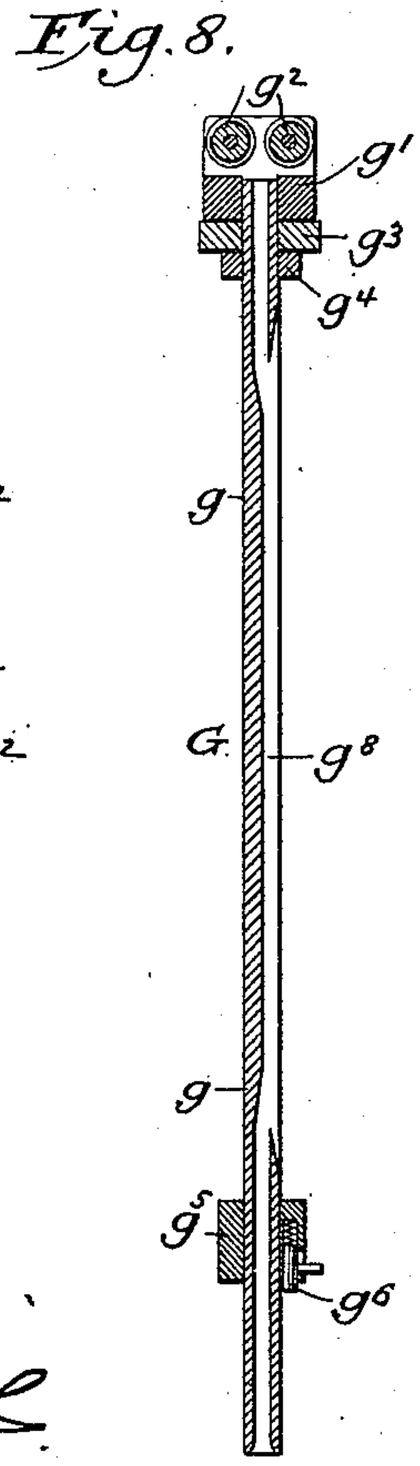


Fig. 7.

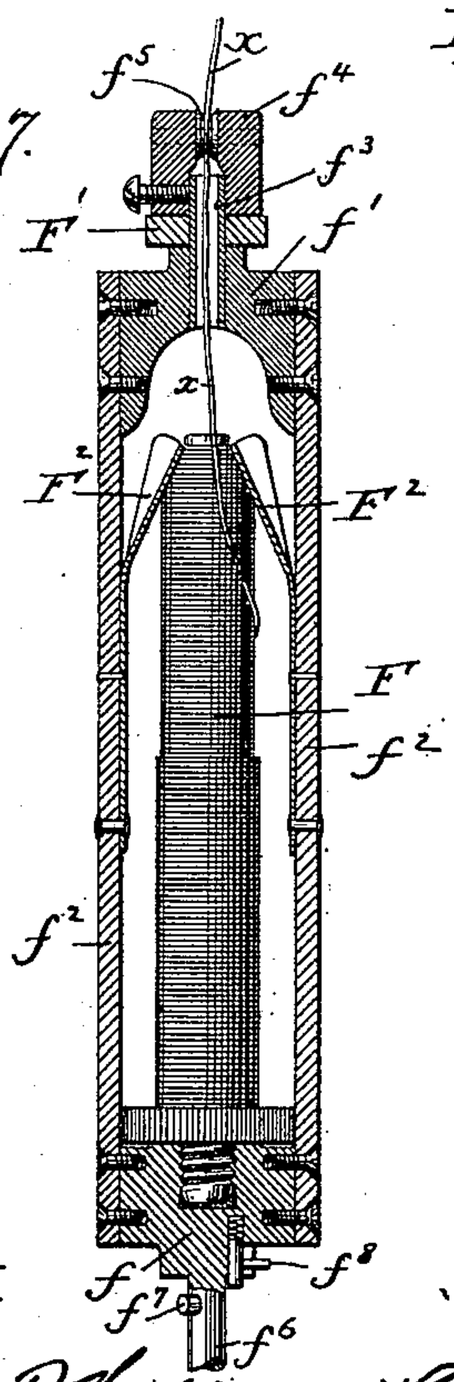


Fig. 9.

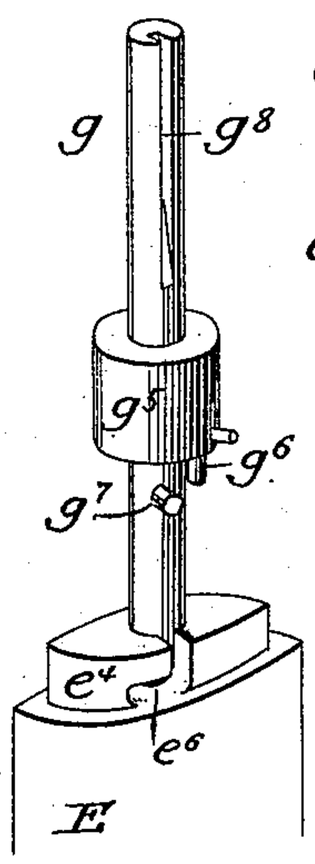
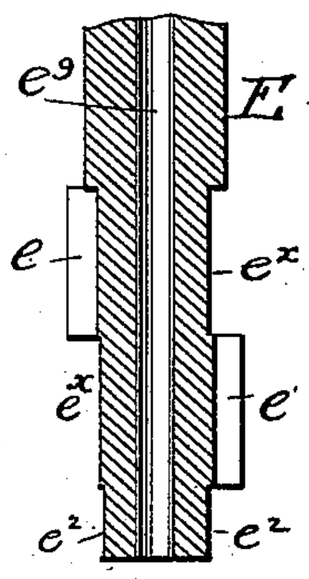


Fig. 10.



Attest.

Sidney P. Hollingsworth

Baltus D. Long.

Inventor:

HENRY B. MORRIS

by his attorneys

Baldwin, Davidson & Wright

UNITED STATES PATENT OFFICE.

HENRY B. MORRIS, OF GENEVA, ASSIGNOR OF SIXTY-FIVE ONE-HUNDREDTHS TO ALBERT M. PATTERSON, OF WATERLOO, NEW YORK.

WIRE-NETTING MACHINE.

SPECIFICATION forming part of Letters Patent No. 441,437, dated November 25, 1890.

Application filed September 5, 1890. Serial No. 364,030. (No model.)

To all whom it may concern:

Be it known that I, HENRY B. MORRIS, a citizen of the United States, residing at Geneva, in the county of Ontario and State of New York, have invented certain new and useful Improvements in Machines for the Manufacture of Wire-Netting, of which the following is a specification.

This invention relates chiefly to that class of wire-netting machines adapted to manufacture hexagonal mesh or poultry netting.

The object of my invention is to increase the speed and output of machines of this class and at the same time to construct and operate the machine at as small a cost as possible and to render it entirely reliable. Those machines which revolve pairs of cops around each other are defective because small cops only can be carried by the machine and must be constantly renewed. Machines which involve a double twist between each mesh lose time in reversing, as do also those machines in which the twisters are shifted laterally in forming the meshes. In carrying out my invention I provide a series of drivers, one half of which revolve while the other half remain stationary. Between the drivers are interposed twisters, which by reason of their peculiar shape will hereinafter be called "lunes." I call the twisters "lunes" because in cross-section they correspond to the definition of a geometrical lune, which is a figure formed by two arcs which inclose a space. Each alternate lune carries a wire cop and the others each carry a guide for a strand of wire drawn from a reel below the bed-plate of the machine. Each driver is recessed on opposite sides to receive a pair of lunes, and each driver, with its pair of lunes, is circular in cross-section. All the lunes, except those at the ends of the series, are completely inclosed in the adjoining recesses of the drivers, so that the interposed lune may be made to revolve with either of the adjacent drivers. Mechanism is provided for revolving the drivers and the lunes and for holding one set of drivers stationary while the other set is revolving. As the netting is completed it is drawn over rollers and finally wound up on a roller driven at the required speed to draw the wires from the twisters under suitable tension.

The general organization of the apparatus and details of construction will be hereinafter set forth.

The accompanying drawings represent so much of a wire-netting machine embodying all my improvements in the best way now known to me as is neccessary to illustrate the subject-matter herein claimed. Some of these improvements, however, may be used without the others, and in machines differing in details of construction from those herein shown.

As my invention contemplates the application of these improvements to the most highly organized machines of the present day, I do not confine myself to the details of construction and organization herein shown, but when specifying a particular construction or organization intend to include well-known equivalents therefor.

Figure 1 is a front elevation of my improved machine. Fig. 2 shows a transverse section on the line 2 2 of Fig. 1. Fig. 3 is a view, partly in plan and partly in section, on the line 3 3 of Fig. 1. Figs. 4 and 5 are diagram views illustrating the manner of twisting the wires to form hexagonal netting by my apparatus. Fig. 6 shows in detail the construction of the drivers and lunes. Fig. 7 is a view, principally in vertical central section, of one of the wire cops and its frame. Fig. 8 is vertical central section of one of the guides. Fig. 9 is a detail view, in perspective, showing the connection of a guide with a lune; and Fig. 10 is a detail view, in section. showing more clearly the formation of the lower end of a lune.

The bed-plate A is horizontally disposed and is supported on suitable standards B. The bed-plate, as shown, is hollow, having a top a, bottom a', and sides a^2 a^3. Circular apertures C extend vertically through the bed-plate and are arranged in a straight line from one end of the bed-plate to the other, and these apertures intersect, the intersecting arcs forming geometrical lunes between them. In the apertures are mounted drivers, the construction of which is shown on an enlarged scale in Fig. 6, and these drivers

have interposed between them the lunes, which are also shown in Fig. 6. Each driver is convex on two opposite sides, and on the two other sides is concave.

There are two sets of drivers D and D'. They differ only slightly in construction, as will be now described. The drivers D are provided with gear-teeth d on their opposite convex sides a distance above the lower ends of the drivers about equal to the length of the teeth. The concave sides of the drivers D, below the horizontal plane of the teeth d, are cut away or recessed at d' for a purpose hereinafter described. The drivers D' are similar to the drivers D, except that the teeth d^2 extend from the bottom of the drivers upwardly, and the recesses d^3 in the concave portions are above the plane of the teeth d^2.

The lunes E may all be of the same shape, and are of such a shape as to fill completely the adjoining recesses of adjacent drivers, as is clearly shown in Fig. 3, so that when the drivers and lunes are all in place the intersecting circles or apertures C in the bed-plate are completely filled.

The lunes E are provided with two series of gear-teeth $e\,e'$, corresponding with the teeth d and d^2 on the drivers—*i. e.*, the teeth e on one side of the lune are arranged a short distance above the lower ends of the lune, and the teeth e' are arranged on the opposite side nearer the lower edge. If the two drivers and the three lunes (shown in Fig. 6) were assembled, the teeth e' on the lunes would enter the recesses d' on opposite sides of the driver D, while the teeth e would coincide with the teeth d and complete a true gear-wheel. The teeth e on the central lune, and also on the lune at the right-hand side, would extend into the recesses d^3 of the driver D', the teeth e' coinciding with the teeth d^2 on the driver D' and completing a true gear-wheel. The lunes are recessed at $e^\times$ to allow the rack-bars, hereinafter described, to pass without turning them. The reduced portions e^2 of the lunes at their lower ends, below the teeth e', extend into apertures e^3 in a plate C', secured to the under side of the bed-plate. The apertures in the bottom a' of the bed-plate are slightly larger in diameter than those in the top to accommodate the projecting gear-teeth on the drivers and lunes. The apertures in the top plate a are undercut at a^5, the upper ends of the lunes being reduced at e^4 and prolonged to enter these openings, their upper ends being flush with the surface of the bed-plate. Each alternate lune in the series carries a wire cop or bobbin F, and the others carry wire guides G. The cop and its frame are shown in detail in Fig. 7. The frame is shown as consisting of a bottom piece f and a top piece f', connected by side pieces f^2. The cop F is secured to the bottom piece f, preferably by a screw-connection, as shown, and the top piece is perforated vertically to allow the wire x from the cop to pass through. The top piece has an upwardly-projecting tubular neck f^3, on which is mounted a friction-roller F', and above the roller is secured a head-block f^4, perforated vertically to permit the passage of the wire x, and carrying adjacent rollers f^5, mounted on horizontal axes. The bottom piece f is provided with a foot-piece f^6, which enters an opening or socket e^5 in the top of the corresponding lune. A laterally-projecting pin f^7 on the foot-piece f^6, in connection with an L-shaped slot e^6 in the lune, forms a bayonet-joint for connecting the cop and its frame to the lune. I also provide a spring-latch bolt f^8, moving vertically in the bottom piece f and entering the vertical portion of the L-shaped slot e^6. By this means the cop-frame is secured to the lune so that it cannot move either vertically or about its axis until the spring-latch bolt is raised positively. Spring-fingers F^2 bear on the upper end of the cop and hold it always in a true vertical position.

The guides G each consist of a spindle g, perforated vertically at its upper end and provided with a head-block g', carrying guide-rollers g^2, between which the wire y is fed. A friction-roller g^3 is interposed between the bottom of the block g' and a collar g^4 on the spindle. Near the lower end of the spindle is secured a foot-block g^5, which carries a spring-latch g^6 similar to the latch f^8 on the cop-frame. A laterally-projecting pin g^7 is secured to the lower tubular portion of the spindle below the foot-block g^5, and, in connection with the slot e^6 in the top of the lune, forms a bayonet-joint. The connection between the guide G and the lune is similar to that between the cop-frame and a lune, as previously described.

The spindle is formed with a longitudinal slit g^8 between the inner ends of the tubes at each end of the spindle, so that a continuous passage-way may be formed for the wire y. When the cop and guides are mounted, each alternate lune carries a cop and the others a guide. The cops and guides are thus arranged in close proximity to each other and should they tend to lean toward each other or get out of a true vertical position the rollers g^8 will bear against the rollers F' and prevent their interference.

The drivers D are formed with lateral apertures d^4 and the drivers D' with apertures d^5 on the opposite side. These apertures are adapted to receive the pins $h\,h'$, respectively, which extend horizontally through the sides of the bed-plate A. The pins h are secured to a side bar H, connected to the bed-plate by bolts H', on which they are free to slide. Springs H^2 normally hold the bar H against the side of the bed-plate. The pins h' are in like manner connected to a side bar H^3 which is secured and normally held against the side of the bed-plate by bolts and springs H' H^2. The bars H and H^3 are withdrawn from the bed-plate, so as to withdraw the pins from the holes in the drivers by means of reciprocating cam-bars I. These bars slide in

guide-grooves in the sides of the bed-plate and are provided with cams or inclines *i*, adapted to engage with pins *i'*, projecting downwardly from the pin-carrying bars H and H³. The mechanism for operating the cam-bars is such that when the pins are withdrawn from the drivers D they will be inserted into the drivers D', and vice versa. The drivers and lunes are revolved by rack-bars J J'. The rack-bar J is mounted in the bed-plate above the rack-bar J' and on the opposite side of the openings C. The bar J is adapted to engage with the teeth *e* on the lunes and the teeth *d* on the drivers, while the rack-bars J' are adapted to engage with the teeth *e'* on the lunes and the teeth d^2 on the drivers. The mechanism for reciprocating the rack-bars is such that while the bar J is being operated to revolve the drivers D and the lunes on opposite sides thereof the pins are withdrawn from the lateral apertures in said drivers, while the pins on the opposite side engage with the apertures in the drivers D' to hold them stationary.

Strands of wire *x* pass from the tops of the cops F and strands of wire *y* pass through apertures e^9 in the lunes and through the guides G from reels X below the bed-plate. The wires are fed or drawn from the twisting mechanism over feeding and pressure-rolls L and M and onto a receiving-roll N. The main operating-shaft O is journaled in suitable bearings *o* in the main frame and carries on one end a large cog-wheel O', which meshes with a pinion O^2 on the shaft of the driving-pulley P. On the opposite end of the driving-shaft is secured a crown-wheel Q, which meshes with a similar wheel Q', on the shaft of which are pulleys *q q'*. A sprocket-chain q^2 extends over the pulley *q* and over a sprocket-pulley L' on the shaft of the roller L. A cog L^2 on the shaft of the roller L gears with a cog M' on the shaft of the roller M. The receiving-roller N is driven by means of the sprocket-chain N', passing over the pulley *q'* and the large pulley N^2.

The operating-connections between the main driving-shaft and the twisting apparatus are as follows: The rack-bars J and J' are connected by means of rods R to rock-bars S, pivoted at their lower ends *s* to the main frame and carrying friction-rollers *s'*, engaging cam-grooves in opposite sides of a large cam-wheel T, revolving with the main shaft O. The cam-grooves are so formed and the connections are such that while the rack-bar J is being reciprocated the bar J' is stationary, and vice versa. The sliding bars I are pivotally connected with vertical rock-bars U, pivoted to brackets U' on the main frame, and carrying at their lower ends friction-rollers *u*, engaging cam-grooves in cam-wheels V, secured to the main shaft O. While one sliding or cam bar I is being reciprocated the other remains stationary.

Figs. 4 and 5 show diagrammatically the manner of forming the fabric. In Fig. 4 the drivers D are indicated as revolving and the drivers D' as stationary. Wires *x* and *y*, *x'* and *y'*, and x^2 and y^2, on opposite sides of the drivers D, are twisted together—that is, the wire *y* is twisted around the wire *x*, the wire *y'* around the wire *x'*, and the wire y^2 around the wire x^2. Fig. 5 illustrates the next operation. Here the drivers D are stationary and the drivers D' are supposed to be revolving. The wire *x* and the wire *y'* are then twisted together and the wire *x'* and the wire y^2 are twisted together. This illustrates the operation of the machine, which continues, by repetition of these operations, to form the fabric.

It will be observed that the twisting apparatus, consisting of the drivers and the lunes which they carry, is not moved laterally out of its seat or socket, but is confined to a rotary motion. By this construction complicated apparatus for shifting the twisters is avoided and increased speed is gained.

The apparatus herein shown and described is simple and efficient, and embodies my improvements in the most practical way now known to me; but obviously changes may be made in the general organization and in the details of construction without departing from the novel features of my invention.

I claim as of my own invention—

1. The combination, substantially as hereinbefore set forth, of the drivers, the lunes interposed between the drivers and entering recesses therein, means for feeding the wire, and mechanism for revolving the drivers and lunes.

2. The combination, substantially as hereinbefore set forth, of the drivers, the lunes interposed between the drivers and entering recesses therein, means for feeding the wire, mechanism for revolving one set of drivers and lunes, and devices for holding stationary the other set of drivers while the first set is revolving.

3. The combination, substantially as hereinbefore set forth, of a series of drivers having longitudinal recesses on opposite sides, the lunes interposed between the drivers and filling these recesses, wire-feeding devices carried by the lunes, mechanism for revolving each alternate driver and all the lunes, and devices for holding the other drivers stationary.

4. The combination, substantially as hereinbefore set forth, of a driver formed on opposite sides with recesses and a pair of lunes arranged in said recesses, the drivers and lunes together forming a support for strands of wire to be twisted and circular in cross-section, for the purpose specified.

5. The combination, substantially as hereinbefore set forth, of a driver formed on opposite sides with recesses and on its opposite convex sides with gear-teeth, and a pair of lunes fitting said recesses and provided with gear-teeth coinciding with the gear-teeth on the driver and forming therewith a gear-wheel.

6. The combination, substantially as hereinbefore set forth, of the bed-plate formed with a series of circular intersecting apertures, wire-feeding devices, revolving wire-twisters formed in sections and filling the apertures in the bed-plate and confined therein against straight lateral movement, and means for revolving the wire-twisters.

7. The combination, substantially as hereinbefore set forth, of the main frame, the bed-plate, the drivers, and lunes mounted therein, the rack-bars engaging gears on the drivers and lunes, means for actuating the rack-bars, the stop-pins engaging the drivers, means for actuating them, and mechanism for drawing strands of wire from the lunes.

8. The combination, substantially as hereinbefore set forth, of the main frame, wire-twisting devices comprising the drivers and lunes, the bed-plate in which said twisting devices are mounted, wire-reels mounted below the bed-plate, wire-cops mounted above it, mechanism for revolving the wire-twisting devices, and mechanism for drawing the twisted wire from the twisters.

9. The combination, substantially as hereinbefore set forth, of the bed-plate, the drivers mounted therein, lunes interposed between the drivers, the wire-cops, and guides carried by the lunes, mechanism for drawing the wire from the cops and guides, the stop-pins adapted to engage with the drivers, the reciprocating rack-bars engaging teeth on the drivers and lunes in different planes, mechanism for actuating the stop-pins, and mechanism for reciprocating the rack-bars.

10. In a machine for the manufacture of wire-netting, the combination of a series of wire-twisting devices arranged in pairs, confined against a straight movement, and means for rotating the twisters about axes located between each pair.

In testimony whereof I have hereunto subscribed my name.

HENRY B. MORRIS.

Witnesses:
LLOYD B. WIGHT,
C. M. BROOKE.