

No. 641,699.

Patented Jan. 23, 1900.

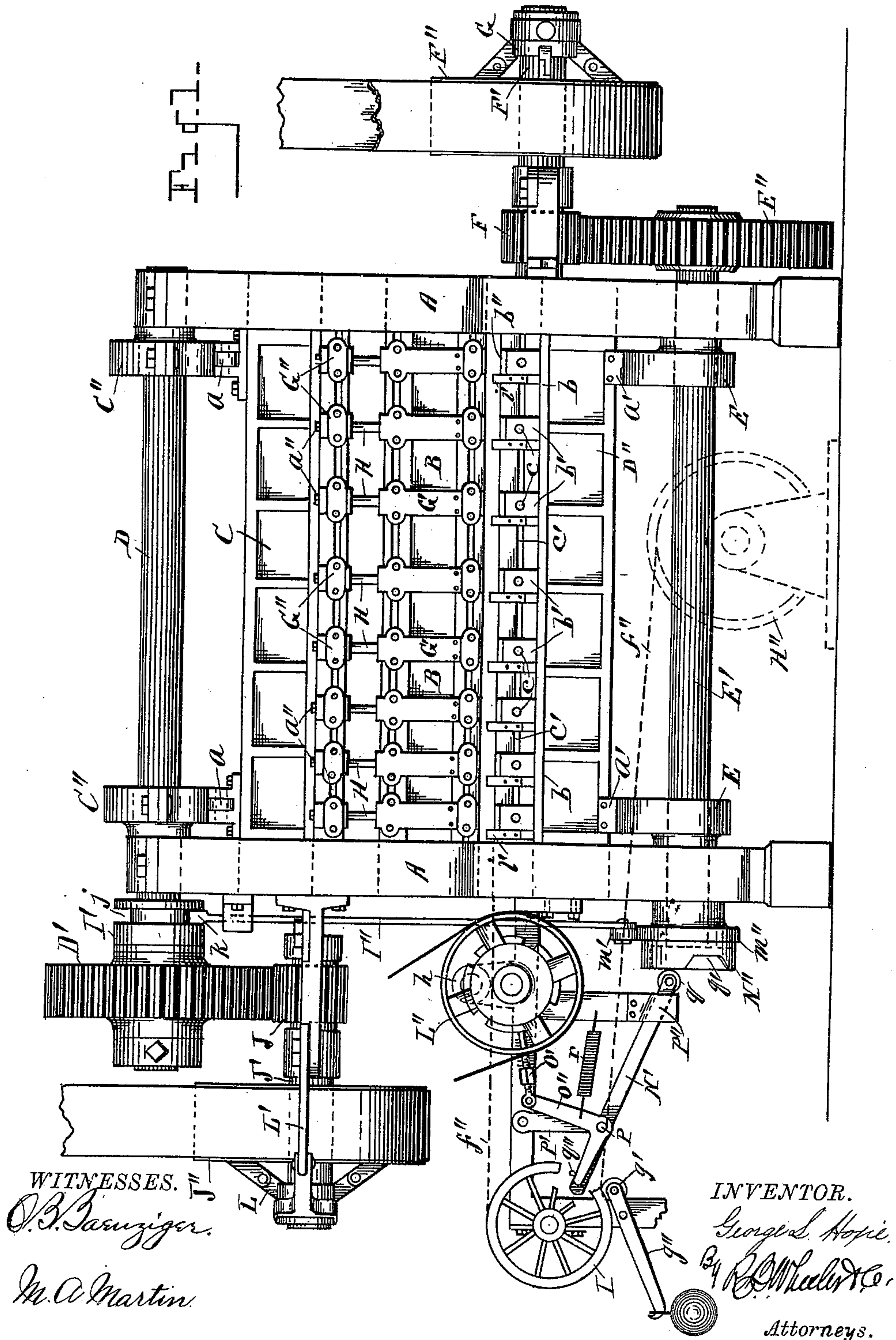
G. L. HOXIE.

MACHINE FOR FORMING WIRE FABRICS.

(Application filed Apr. 29, 1899.)

(No Model.)

4 Sheets—Sheet 1.



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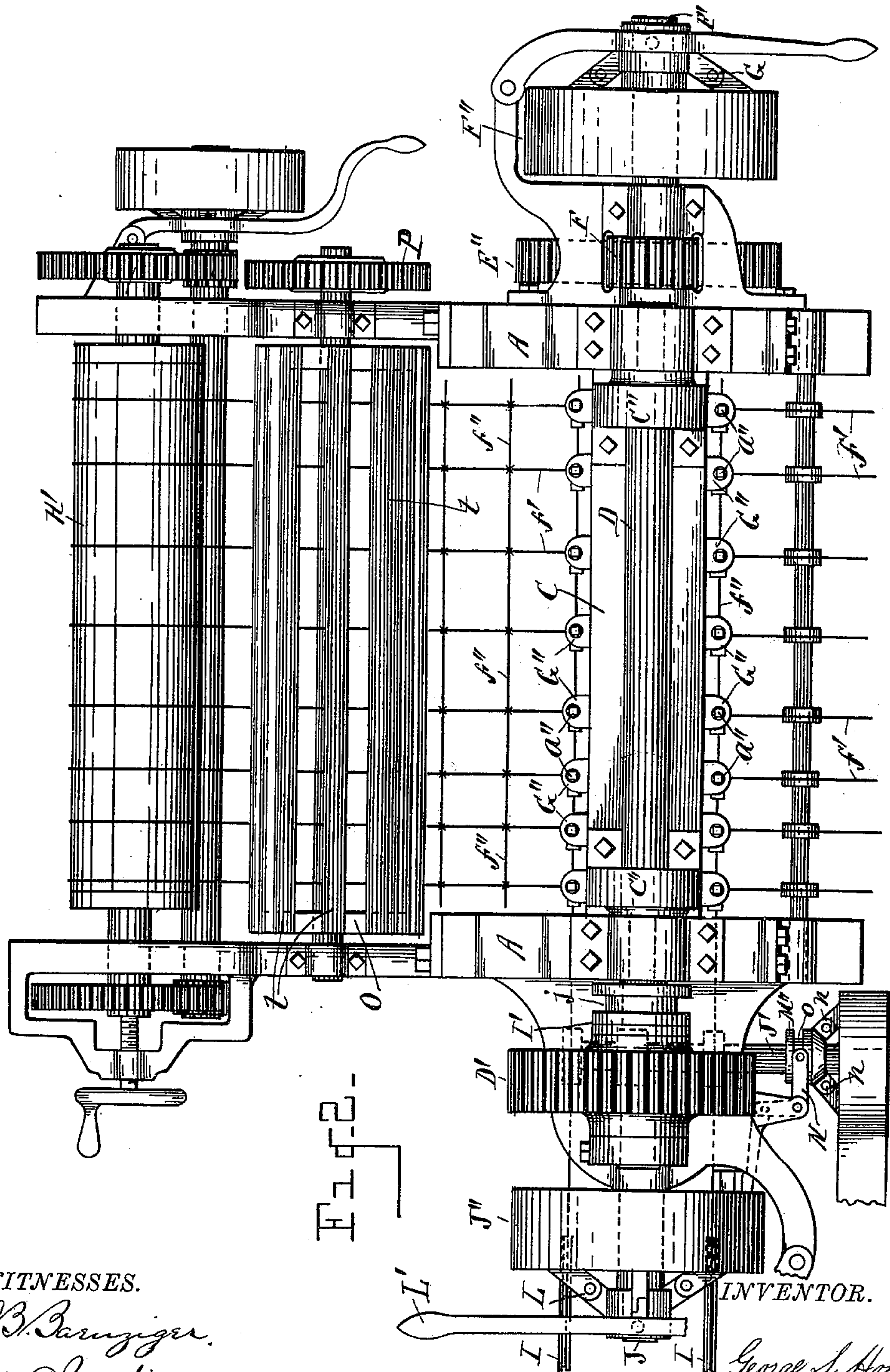
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WITNESSES.

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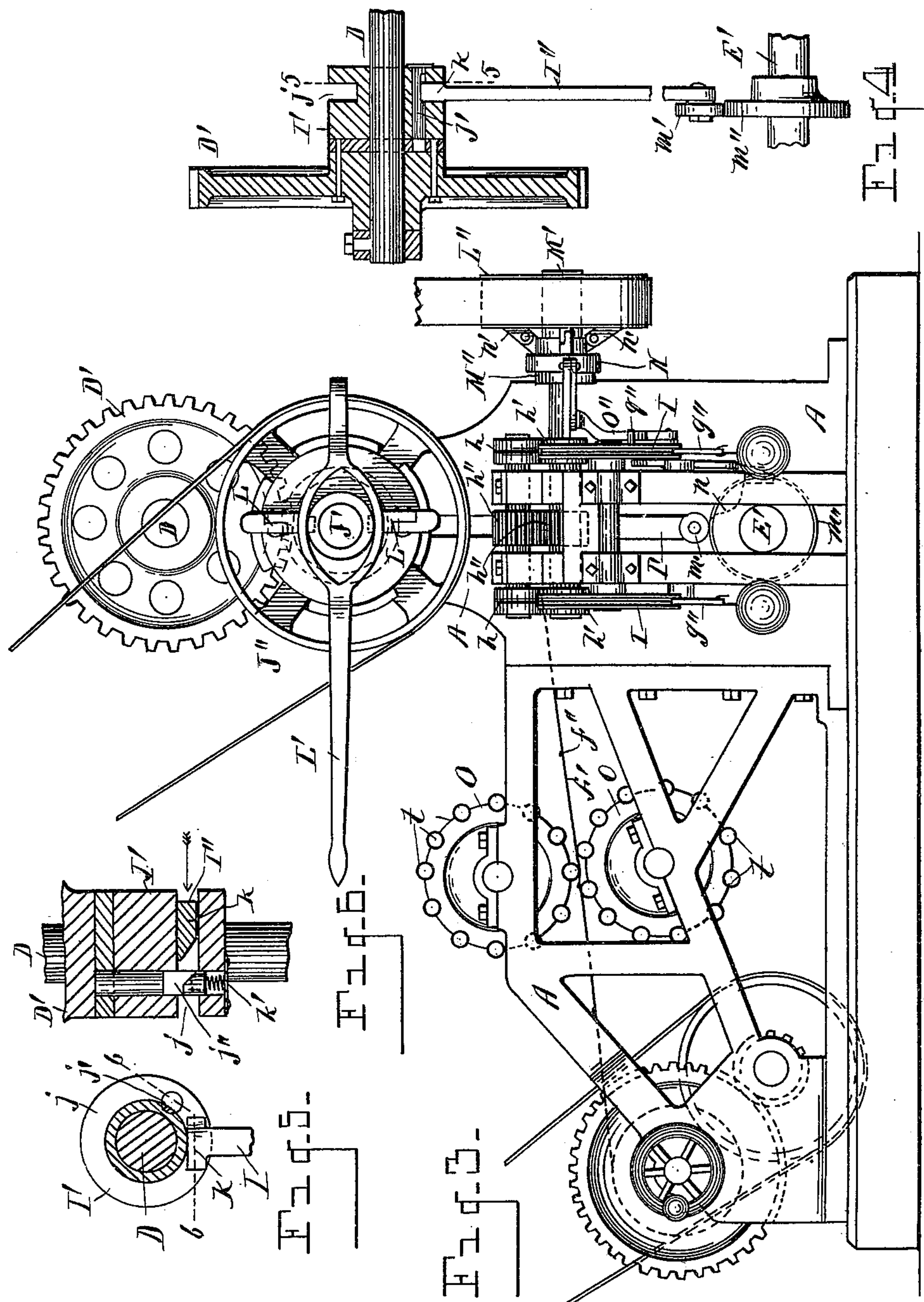
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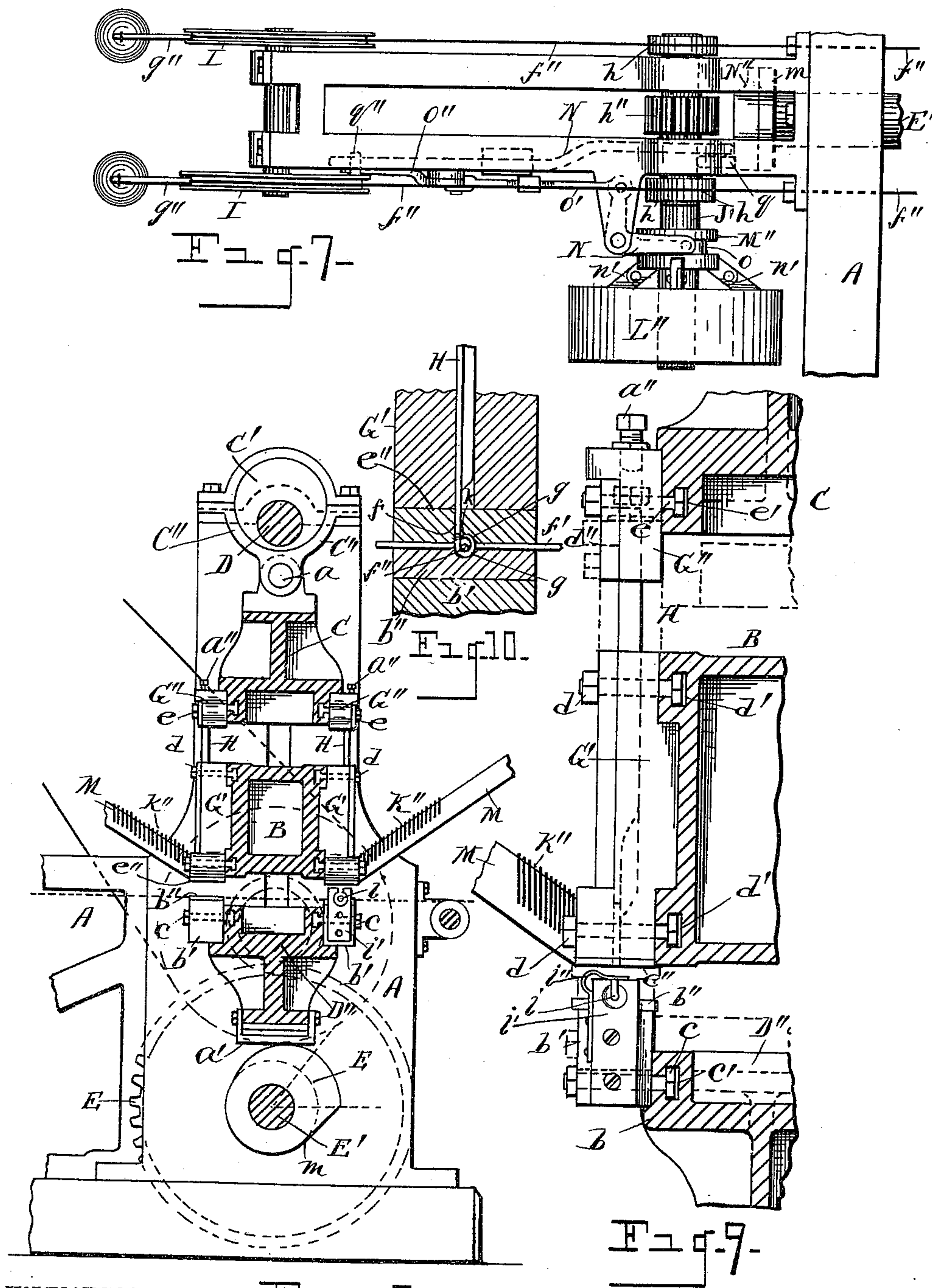
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4 Sheets—Sheet 4.



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UNITED STATES PATENT OFFICE.

GEORGE L. HOXIE, OF ADRIAN, MICHIGAN, ASSIGNOR OF FOUR-FIFTHS TO
DELOS M. BAKER, DAVID METCALF, WILLIAM H. SHEARSON, AND IRA
WATERMAN, OF SAME PLACE.

MACHINE FOR FORMING WIRE FABRICS.

SPECIFICATION forming part of Letters Patent No. 641,699, dated January 23, 1900.

Application filed April 29, 1899. Serial No. 714,931. (No model.)

To all whom it may concern:

Be it known that I, GEORGE L. HOXIE, a citizen of the United States, residing at Adrian, in the county of Lenawee, State of Michigan, have invented certain new and useful Improvements in Machines for Forming Wire Fabrics; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to machines for weaving wire fabrics; and it consists in the construction and arrangement of parts hereinafter fully set forth, and pointed out particularly in the claims.

The object of the invention is to provide means for automatically carrying the warp or longitudinal wires of the fabric through the machine and placing the woof or cross wires thereon at proper intervals, severing said cross-wires, and uniting the woof-wires to the warp-wires at their points of junction by means of tying-staples which are clenched around said intersecting wires, enabling one or more rows of said staples to be secured to the intersecting wires across the entire width of the fabric by a single operation. This object is attained by the mechanism illustrated in the accompanying drawings, in which—

Figure 1 is an end elevation of the machine embodying my invention. Fig. 2 is a plan view of said machine. Fig. 3 is a side elevation looking from the left of Figs. 1 and 2. Fig. 4 is a view, partly in section, of a clutch device employed in the operation of the machine. Fig. 5 is a sectional view on line 5 5 of Fig. 4. Fig. 6 is a sectional view on line 6 6 of Fig. 5. Fig. 7 is a plan view of the mechanism for feeding the woof-wires into the machine. Fig. 8 is a vertical transverse section through the central portion of the machine, showing the upper and lower cross-heads adapted to reciprocate vertically the stationary cross-beam interposed between said cross-heads and the inclines adapted to

feed the tying-staples downwardly into the paths of the reciprocatory plungers. Fig. 9 is a like sectional view, somewhat enlarged, of a portion only of the machine, showing more clearly the construction of said parts in detail, as well as their relative position. Fig. 10 is a sectional view through the dies with their faces together, showing the crossed wires between them and the tying-staple forced around said intersecting wires by the vertically-movable plunger.

Referring to the letters of reference, A designates the main frame of the machine, which may be of any suitable construction to support the operative mechanism. Crossing between the opposite sides of the main frame is a rigid beam B, which is preferably hollow and rectangular in cross-section. This beam not only serves to firmly unite the sides of the machine, but carries as well a portion of the operative mechanism.

Extending transversely between the sides of the machine and adapted to move vertically in suitable ways therein is the upper cross-head C. This upper cross-head C is adapted to be driven by means of eccentrics C', whose straps C'' are pivoted at *a* to said cross-head. Said eccentrics C' are mounted upon the shaft D, journaled in the upper portion of the frame and adapted to be driven through the medium of the gear-wheel D'.

D'' designates the lower cross-head, adapted to move vertically in suitable ways in the frame of the machine and having upon its under face near each end a bearing-plate *a'*, against which the cams E that operate said cross-head bear, said cams being mounted on the lower transverse shaft E', journaled in the frame of the machine and adapted to be driven through the medium of the gear-wheel E'', mounted on said shaft and meshing with a pinion F on a stub-shaft F', adapted to be driven by the pulley F'' through the medium of a suitable clutch mechanism G.

This machine is designed to secure two woof-wires to the warp-wires by a single operation, and the movable cross-heads and cross-beam are provided on opposite sides with duplicates of the same operative parts.

In describing the construction and operation of said parts, therefore, reference will only be had to one series or set.

The lower cross-head D'' is provided with a ledge b , upon which rests a series of blocks b' , supporting the lower dies b'' . (Shown more clearly in Fig. 10.) These blocks are secured in place by bolts c , which pass into said blocks from the cross-head, the heads of said bolts lying in a T-shaped channel c' , (see Fig. 9,) whereby said blocks and dies are made laterally adjustable.

The cross-beam B carries a series of guides G' , comprising two opposed plates with a guideway between them adapted to receive a vertically-movable plunger. These guides are secured in place to the cross-beam by bolts d , passing therethrough from said beam, the heads of said bolts being confined in the T-shaped slots d' in the cross-beam, whereby said guides are made adjustable laterally, so that they at all times may be made to register with the dies b'' below. Attached to the under faces of the blocks forming the guides G' is a series of upper dies e'' . These dies are adapted to register with the lower dies b'' , each of the upper dies having a vertical channel f therethrough which registers with the guideway in the guides G' .

To the upper cross-head C is attached a series of head-blocks G'' , having channels therein in which the upper ends of the plungers H are adapted to lie, said plungers being securely clamped in said head-blocks by a number of outer plates d'' , which are drawn firmly against said plungers by means of the bolts e , which project from said cross-head and pass through said head-blocks and plates. The heads of the bolts e lie in a T-shaped way e' in said cross-head, whereby provision is made for the lateral adjustment of said head-blocks, so that said plungers H may be made to register perfectly with the ways in the guides G' , in which their lower ends are confined and adapted to reciprocate vertically. Screwing into the head-blocks against the upper ends of said plungers are the set-screws a'' , by means of which the length of said plungers may be regulated, so as to extend their lower ends into proper relation with the lower die to perform the work required.

The warp-wires f' of the fabric pass longitudinally through the machine, being fed from suitable reels (not shown) and caused to pass between the upper and lower dies. The woof or cross wires f'' of the fabric are fed into the machine from the side thereof at right angles to the warp-wires and are so positioned as to cross said warp-wires between the opposed faces of the dies, which are channeled at right angles to receive said crossed wires, as clearly shown in Fig. 10, while said dies are provided in their opposed faces with suitable concavities g , wherein the legs of the tying-staple are directed around said strands of wire to unite them at their juncture in a manner well understood in the art. The fab-

ric formed by uniting the longitudinal and transverse strands of wire by the tying-staples is passed rearwardly through the machine and wound upon the reel H' at the tail thereof, which is driven by suitable gearing to wind the woven fabric thereon.

The lateral or cross wires f'' are fed into the machine two strands at a time, so that two of said cross-strands are attached to the longitudinal wires by a single operation. As the mechanism for feeding the two cross-strands at a time is merely a duplication of parts a description of the operation of feeding one strand will suffice for both. The lateral or cross wire is fed from a continuous reel of wire, as shown by dotted lines H'' in Fig. 1, said wire being passed around a grooved feed-wheel I , with which it is firmly held in contact by means of an idle roller g' in the end of a weighted lever g'' . The wire f'' after passing around the feed-wheel I , passes between the feed-rollers h h' , which are mounted upon separate shafts geared together by the meshing pinions h'' . The end of the cross-wire after passing through the feed-rollers is directed into the slotted opening i in the guide-plates i' , which are secured to the blocks b' , carrying the lower dies, whereby said transverse wire is strung across the longitudinal wires adjacent to the face of the lower dies b'' , across which the longitudinal wires extend at right angles to said lateral wire. When a proper length of wire to form the cross-wire has been fed into the machine, said wire is severed by any suitable means (not shown) during the operation of uniting it to the longitudinal wires, so that after the formed fabric has been carried out of the machine to form the succeeding transverse wire of the fabric, and so on as the fabric is formed the strands are successively fed across the machine and united to the longitudinal wires. After the operation of attaching the cross-wire to the longitudinal wires by forcing the staples around said wires through the action of the plungers H the lower cross-head D'' descends, carrying downward the lower dies b'' and causing the cross-wire to pass out of the open slots i in the guide-plates i' , the springs i'' , covering the open slots in said guide-plates, permitting the cross-wire to slip past them out of said slots as the lower cross-head moves downward, said springs, however, serving to prevent the cross-wire escaping from said slotted openings when being fed into the machine.

As before stated, the upper cross-head C is actuated through the medium of eccentrics C' upon the upper shaft D , said shaft being driven through the medium of gear D' . This gear D' is loose upon said shaft and is confined between two fixed collars thereon. One of said collars I' is provided with a circumferential channel j , crossing which is a spring-actuated pin j' , which extends through said collar and is adapted to enter an aperture in

the hub of the gear D', whereby said gear is made fast to said collar and caused to drive the shaft D while in said position. Formed in the side of said pin j' is a way j'' , having a beveled side, which is adapted to be engaged by the beveled point k on the upper end of the vertical bar I'', which projects into the way j , so that as said collar is revolved said pin is engaged by the upper end of said bar and withdrawn from the hub of the gear-wheel, thereby disconnecting the gear from said collar and stopping the rotation of the shaft D. As the end of the bar I'' is withdrawn from the path of the pin j' the spring k' forces said pin inward, so that when the rotation of said gear again brings the aperture in its hub in line with the pin j' said pin will enter said aperture and again lock the gear to said collar and rotate the shaft. Provision is made for withdrawing the end of the bar I'' from the path of said pin j' to regulate or time the intermittent rotation of the shaft D, as and for the purpose hereinafter stated. The gear D' is driven through the medium of a pinion J, carried upon a shaft J', upon which is a loosely-mounted pulley J'', which is driven continuously from any suitable source of power and is adapted to drive the shaft J', when desired, by a suitable clutch mechanism L, operated by a hand-lever L' in a manner well understood in the art.

In the operation of this machine when the cross-wires have been fed into place across the longitudinal wires and between the dies the operation of the cams E will raise the lower cross-head, carrying upward the lower dies, so as to bring them in contact with the upper dies with the wires of the fabric crossed between them. The high points of the cams E being concentric with the shaft E' for a portion of their arc, said cams hold the lower cross-head in this raised position while the upper cross-head is descending with the plungers H, so that said plungers are caused to descend while the dies are held in contact and drive the staples k'' , which are fed down suitable inclines M into the path of said plungers astride said intersecting strands of wire within said dies and clench said staples around said strands to firmly unite them at their point of crossing. After the descent of the plungers and the clenching of the staples around the wires within the dies the lower points m of the cams E permit said cross-head D'' to drop quickly out of the way, so that the cross-wires may be again fed into the machine and the longitudinal wires moved along in position for a succeeding operation. To time the movement of the upper cross-head so that its plungers H will be caused to descend while the lower cross-head is holding the dies together, the vertical bar I'' is provided at its lower end with a roller m' , which is adapted to ride on the periphery of a cam-ring m'' , (see Figs. 1 and 3,) which is fast to the shaft E'. Said cam-ring is provided in its periphery with a depression n , (see dotted

lines in Fig. 3,) into which said roller is adapted to drop, so as to withdraw the upper end k of the vertical bar I'' from engagement with the slotted pin j in the groove of the collar I', when said pin will immediately lock said collar to the gear-wheel D' and drive the shaft D to actuate the upper cross-head, as described. After releasing the pin j' the roller m' rides out of the depression in the cam m'' , thereby projecting the upper end of the bar I'' into the slot j in the collar I', so that upon the completion of the revolution of said collar the upper end of the rod I'' again encounters said pin and disengages it from the hub of the gear-wheel D', thereby arresting the rotation of the shaft D at a time when the cross-head C is raised, in which position said cross-head remains until the bar I'' again releases the pin j' .

To provide for feeding the cross-wire into the machine at proper intervals, the feed-rollers are driven through the medium of a clutch mechanism consisting of the pivoted arms n' , carrying the friction-shoes, (not shown,) adapted to engage the rim of the pulley L'', mounted loosely upon the shaft M', carrying the feed-rollers h' , said arms n' being pivoted to the collar M'', splined upon said shaft, whereby by sliding said collar upon said shaft the clutch mechanism is thrown into and out of gear in a manner well understood in the art. The pulley L'' is driven continuously, but is only made to drive the shaft M' through the operation of said clutch mechanism.

N designates a bell-crank lever having at one end a yoke which embraces said collar M'' and is provided with pins which lie in the peripheral channel o of said collar, (see Fig. 7,) the opposite end of said lever being pivoted to a rod o' , whose opposite end is pivoted to one end of an angle-lever o'' . This angle-lever o'' is in turn pivoted at its angle p to an inclined bar N', depending from an arm p' , pivoted to the frame, said bar being supported at its lower end in a guide p'' and carrying a roller q , adapted to bear against the face of a disk N'', secured to the end of the shaft E'. In the face of said disk N'' is a depression q' , into which said roller q is adapted to drop. Projecting from the face of the wheel I is a pin q'' , which extends into the path of the angle-lever o'' . Attached to said angle-lever and to the frame of the machine is a retracting-spring r . It will now be understood that while the roller q is bearing against the face of the disk N'' the end of the angle-lever o'' will be engaged by the pin q'' on the wheel I as said wheel revolves and will be actuated to draw upon the rod o' to operate the bell-crank lever N and slide the collar M'' to disengage the clutch mechanism from the pulley L'', thereby stopping the operation of the feed-rollers and arresting the feeding of the cross-wire into the machine. As the shaft E' revolves, the roller q upon the bar N' encounters the depression q' in the

disk N'' and is caused to enter said depression by the spring *r*, thereby moving said bar longitudinally and withdrawing the end of the angle-lever *o''*, pivoted thereon, from the path of the pin *q''*, carried by the wheel I, thereby releasing said lever and permitting the spring *r* to throw the upper end thereof inwardly and operate the bell-crank lever N through the rod *o'* to throw the clutch mechanism into gear, thereby driving the shaft J' and turning the feed-rollers so as to feed the cross-wire *f''* into the machine. As the wire is carried into the machine by the feed-rollers it is drawn over the feed-wheel I. It will be understood that immediately the end of the angle-lever *o''* is withdrawn from the path of the pin *q''* the roller *q* rides out of the depression in the disk N'', thereby moving the bar N' longitudinally to carry the end of the angle-lever *o* again into the path of the pin *q''* on the gear-wheel, so that when a sufficient length of wire has been fed into the machine to make the desired length of cross-wire said pin *q''* will again engage the angle-lever *o''* and operate it to disengage the clutch from the drive-pulley L'' and stop the feed-rollers, thereby arresting the feeding of the cross-wire into the machine until said wire has been severed and attached to the series of cross-wires and the fabric has been carried along to a position to receive a succeeding strand of said cross-wire, at which point the roller *q* drops into the depression in the disk N'', relieving the angle-lever from engagement with the pin of the gear-wheel and again starting the feeding mechanism.

It will now be understood that by the operation of this machine the cross-wires are fed into the machine from a continuous reel of wire, severed when a proper length of wire has been fed therein, and secured to the longitudinal wires at the point of crossing of said wires by the tying-staples through the operation of the dies and plungers, when the fabric is carried along and wound upon the reel, said fabric being moved through the machine such distance as to properly space the succeeding cross-wires from those previously attached, the operation of the various parts of the machine being so timed with respect to one another that their several functions are performed in harmony and with punctillious exactness. By means of the adjustability of the dies and the plungers and their guideways the longitudinal wires may be arranged any desired distance apart, so that in the weaving of wire fences the longitudinal wires may be spaced to meet any requirement in that respect, while the feeding of the cross-wires into the machine from a continuous reel of wire and the severing and attaching of said cross-wires to the longitudinal wires in the manner described greatly facilitates the manufacture of the fabric and obviates any undue waste of material.

At the rear of the machine and journaled at their ends in the frame thereof are two reels

o, between which the wire fabric is adapted to pass before being wound upon the reel *h'*. These reels are composed of longitudinal bars *t*, mounted in the heads of the reels and so arranged as to form open spaces between them. The reels are geared together by the gearing P and are so set as to cause the bars of said reel to mesh as they revolve, whereby a slight crimping of the longitudinal wires of the fabric is caused as the wire passes between said reels, the purpose of which is to provide for longitudinal elasticity in the fabric, especially where it is designed to be used for fence purposes.

Having thus fully set forth this invention, what I claim is—

1. In a machine for forming wire fabric, the combination with the main frame, the movable cross-head carrying one member of the dies, the fixed cross-beam carrying the other member of the dies, means for feeding the cross-wire into the machine between said dies and across the longitudinal wires of the fabric, and the reciprocal plungers standing in line with said dies adapted to drive the tying-staples around the intersecting strands of wire within said dies.

2. In a machine for forming wire fabric, the combination with the main frame, the vertically-movable cross-head carrying the lower dies, the fixed cross-beam carrying the upper dies, a series of guides upon said cross-beam in line with said dies, the upper cross-head adapted to move vertically, the plungers carried by said upper cross-head supported in the guideways in the cross-beam in line with said dies, and means for actuating said cross-heads.

3. In a machine for forming wire fabric, the combination with the main frame, the vertically-movable cross-head carrying the lower dies, the fixed cross-beam carrying the upper dies, a series of guides upon said cross-beam in line with said dies, the upper cross-head adapted to move vertically, the plungers carried by said upper cross-head supported in the guideways in the cross-beam in line with said dies, means for feeding the cross-wire intermittently into the machine between the faces of said dies and across the longitudinal wires, and means for actuating said cross-heads.

4. In a wire-fabric machine, the combination with the main frame, the vertically-movable cross-head, the laterally-adjustable dies mounted on said cross-head, the cross-beam, the laterally-adjustable guides mounted on said cross-beam, the upper cross-head adapted to move vertically, laterally-adjustable head-blocks mounted on said upper cross-head, and vertical plungers carried by said head-blocks and adapted to reciprocate in said guides.

5. In a wire-fabric machine, the combination with the main frame, the lower cross-head adapted to move vertically, the dies carried by said cross-head, the upper cross-head adapted to move vertically, the plungers carried by

said upper cross-head, the upper dies mounted on the frame in line with the lower dies, guides to direct said plungers in line with said dies, the lower shaft having cams adapted to
 5 actuate the lower cross-head, an upper shaft having eccentrics adapted to actuate the upper cross-head, and means connecting the upper shaft with the lower shaft to impart an intermittent movement to said upper shaft.
 10 6. In a wire-fabric machine, the combination with the main frame, the movable cross-heads carrying the dies and plungers, said cross-heads having an intermittent movement, means for feeding the longitudinal wires
 15 through the machine over said dies, mechanism for feeding the cross-wire into the machine adjacent to said dies and over the longitudinal wires, the lower shaft for actuating the lower cross-head, and means connected
 20 with said shaft for imparting an intermittent movement to the mechanism for feeding the cross-wire.

7. In a machine for weaving wire fabric, the combination with the main frame of the
 25 machine, means for feeding the longitudinal wires through said machine, means for intermittently feeding the woof-wires into the ma-

chine across said longitudinal wires, dies for embracing said wires at their junction, said dies having direct channels in their opposed
 30 faces, and means for forcing a tying-staple around said wires within said dies at the point of crossing of said wires.

8. In a machine for the purpose set forth, the combination with the main frame, movable dies adapted to receive the wires and
 35 tying-staples, means for feeding the longitudinal wires intermittently through the machine, a drive-shaft for actuating said movable dies, vertically-movable plungers in line
 40 with said dies, mechanism for feeding the cross-wire into the machine in line with said dies and plungers, means for feeding staples astride of the crossed wires within said dies, and means connected with said drive-shaft
 45 for imparting an intermittent movement to the mechanism for feeding the cross-wires.

In testimony whereof I sign this specification in the presence of two witnesses.

GEORGE L. HOXIE.

Witnesses:

DORIS VAN DORAN,
 LOUISE LADD.