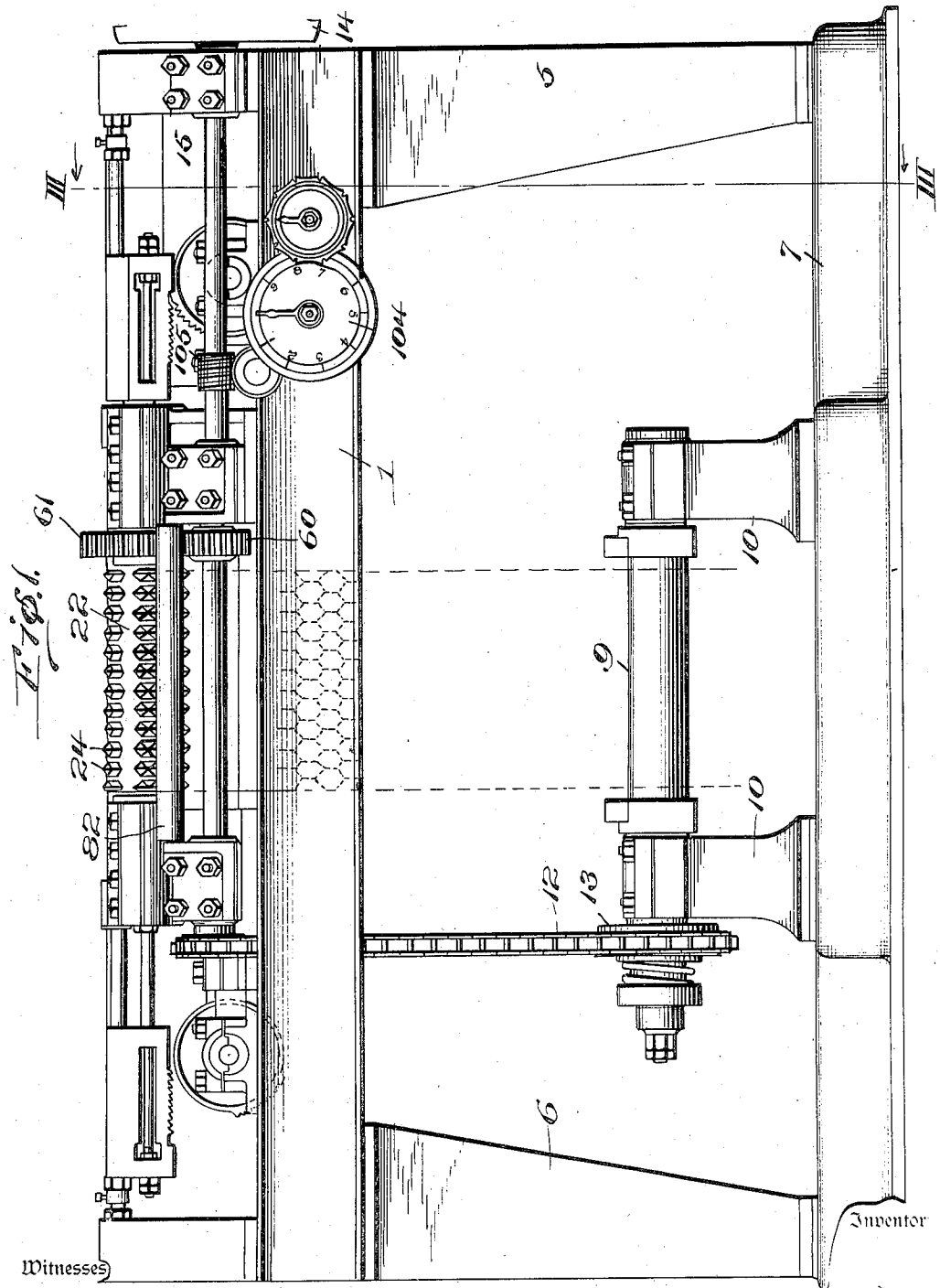
H. A. DEUEL.

MACHINE FOR MAKING WIRE NETTING.

APPLICATION FILED MAR. 3, 1911.

1,020,805. **Patented Mar. 19, 1912.**

8 SHEETS—SHEET 1.



Witnesses

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Charles N. Murray.

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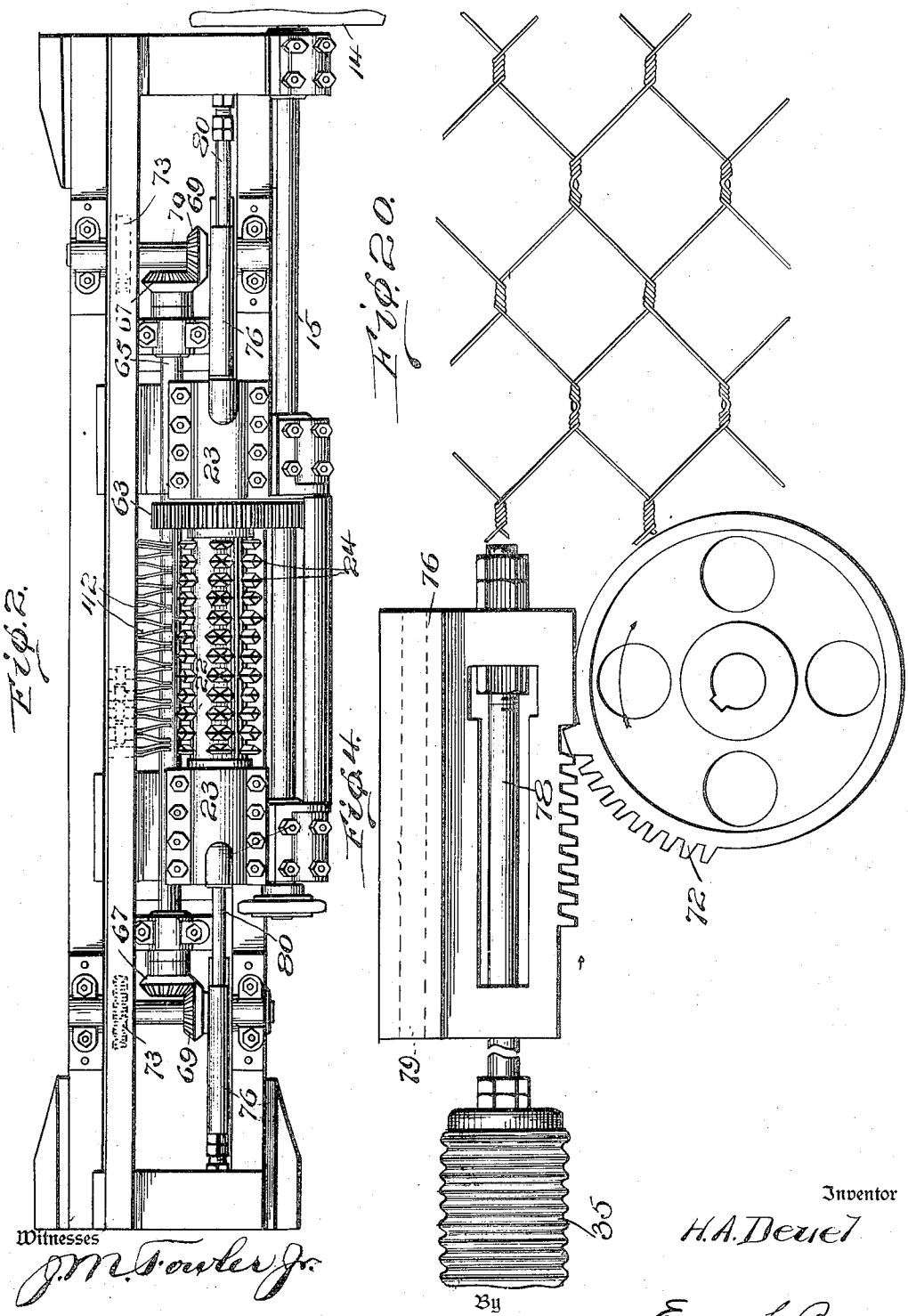

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8 SHEETS—SHEET 3.

Fig. 3

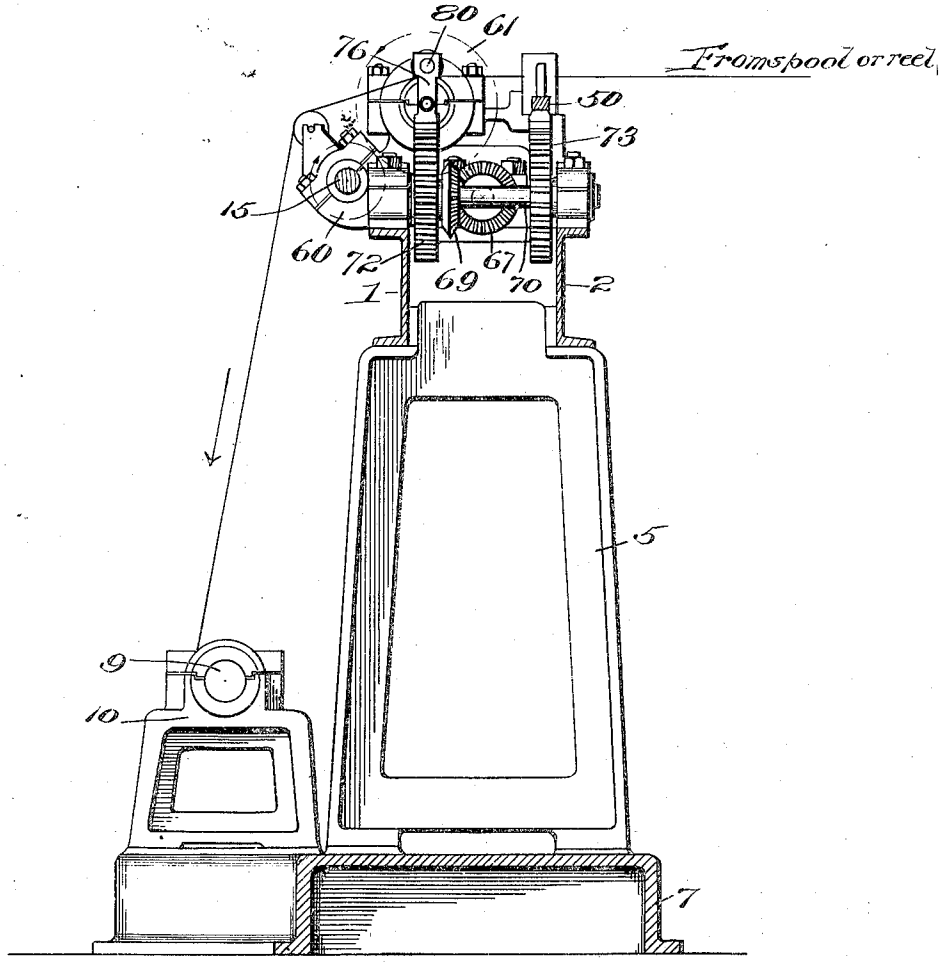


Fig. 6.

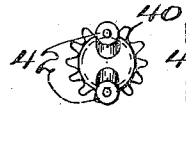
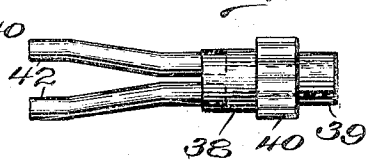


Fig. 5



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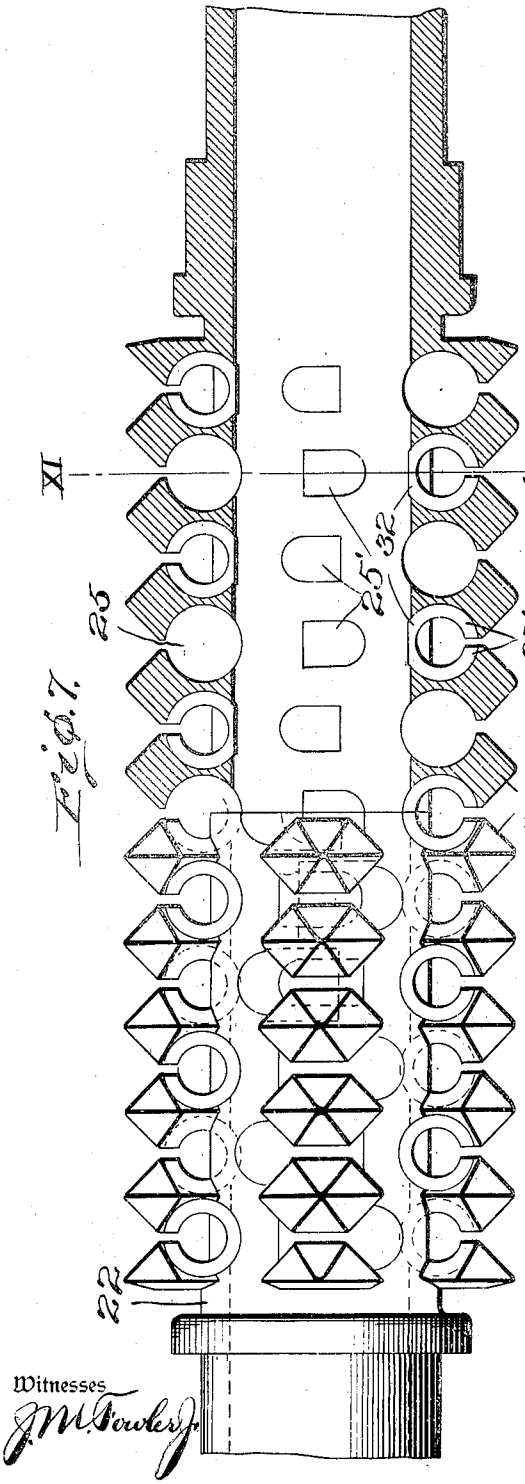


Fig. 7.

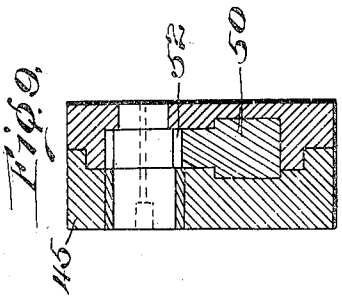


Fig. 8.

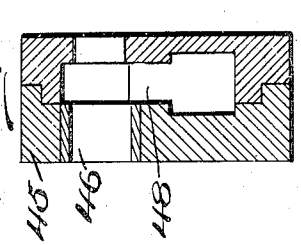
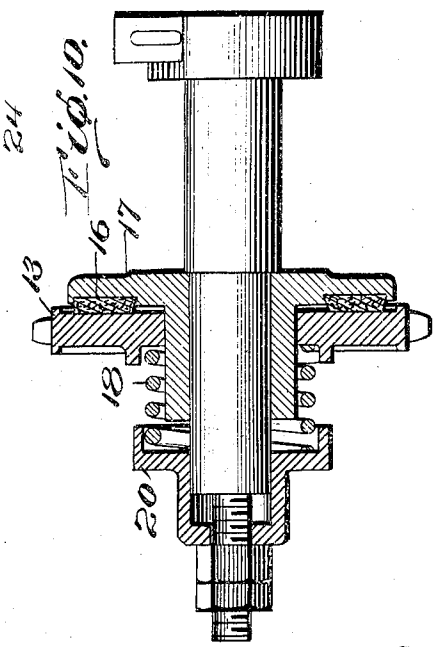


Fig. 10.



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8 SHEETS—SHEET 5.

Fig. 12.

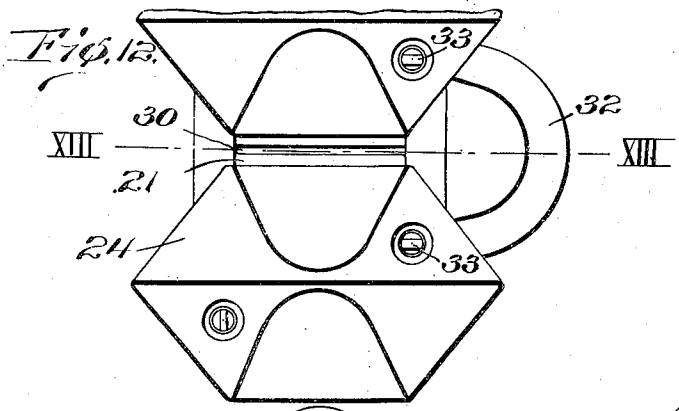

Fig. 13.

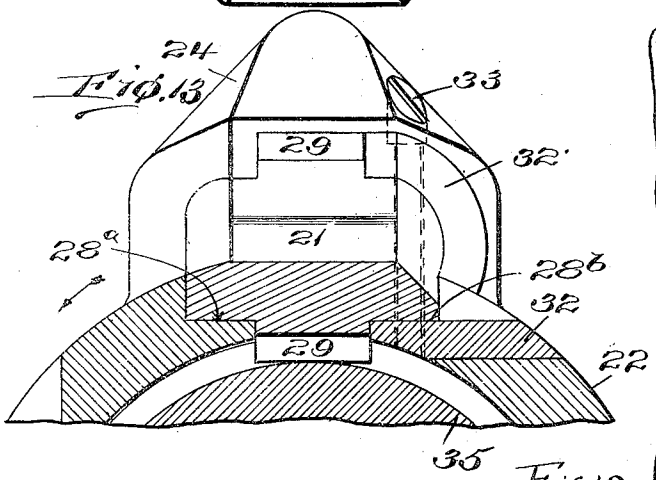

Fig. 14.

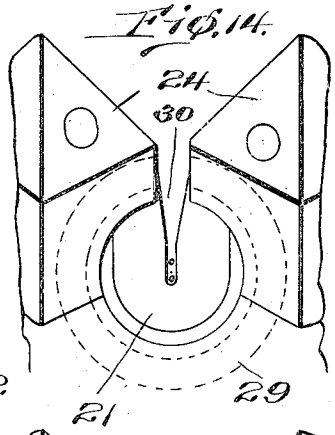

Fig. 18.

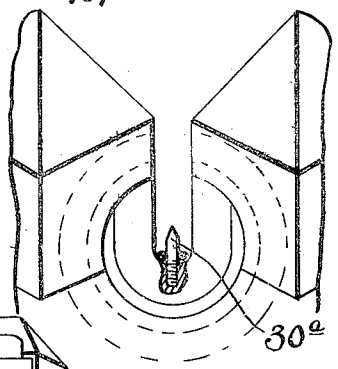

Fig. 11.

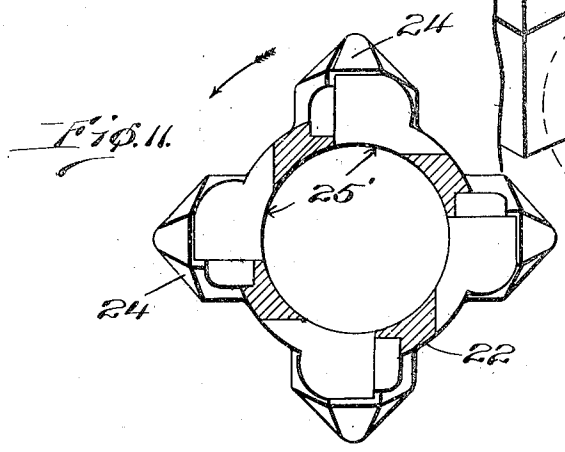

Fig. 19.

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8 SHEETS—SHEET 6.

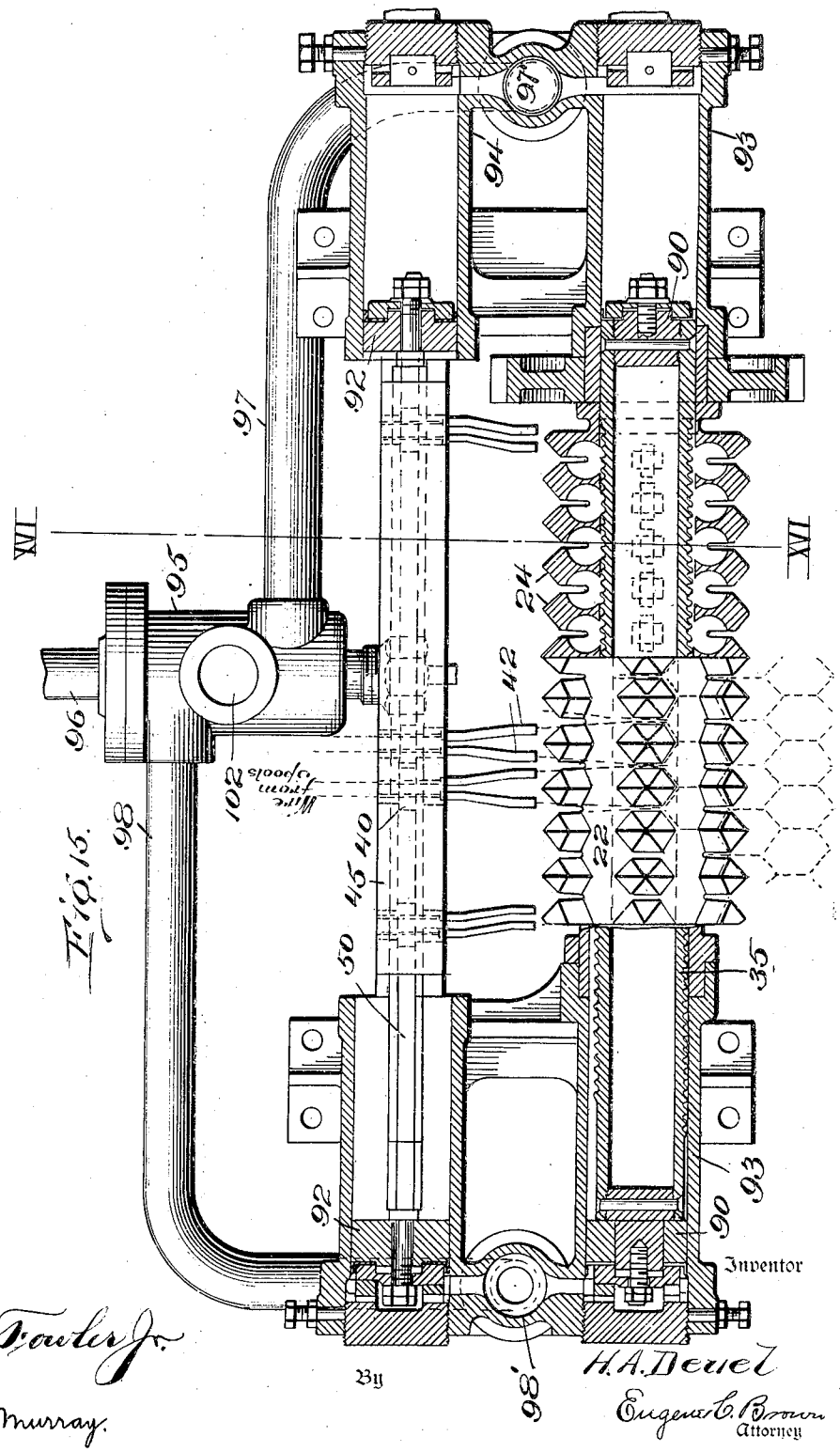

Fig. 15.

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8 SHEETS—SHEET 7.

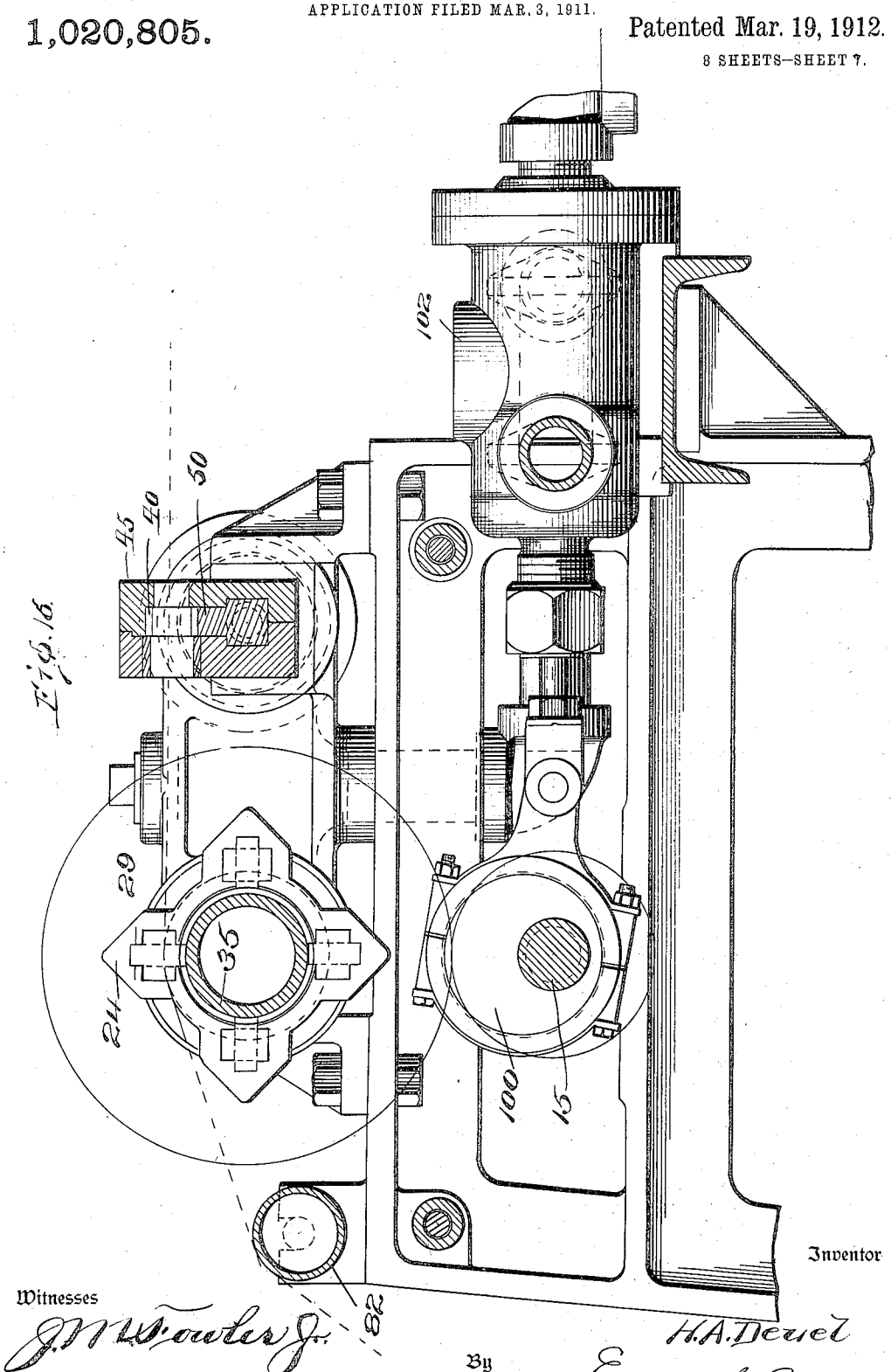

Fig. 16.

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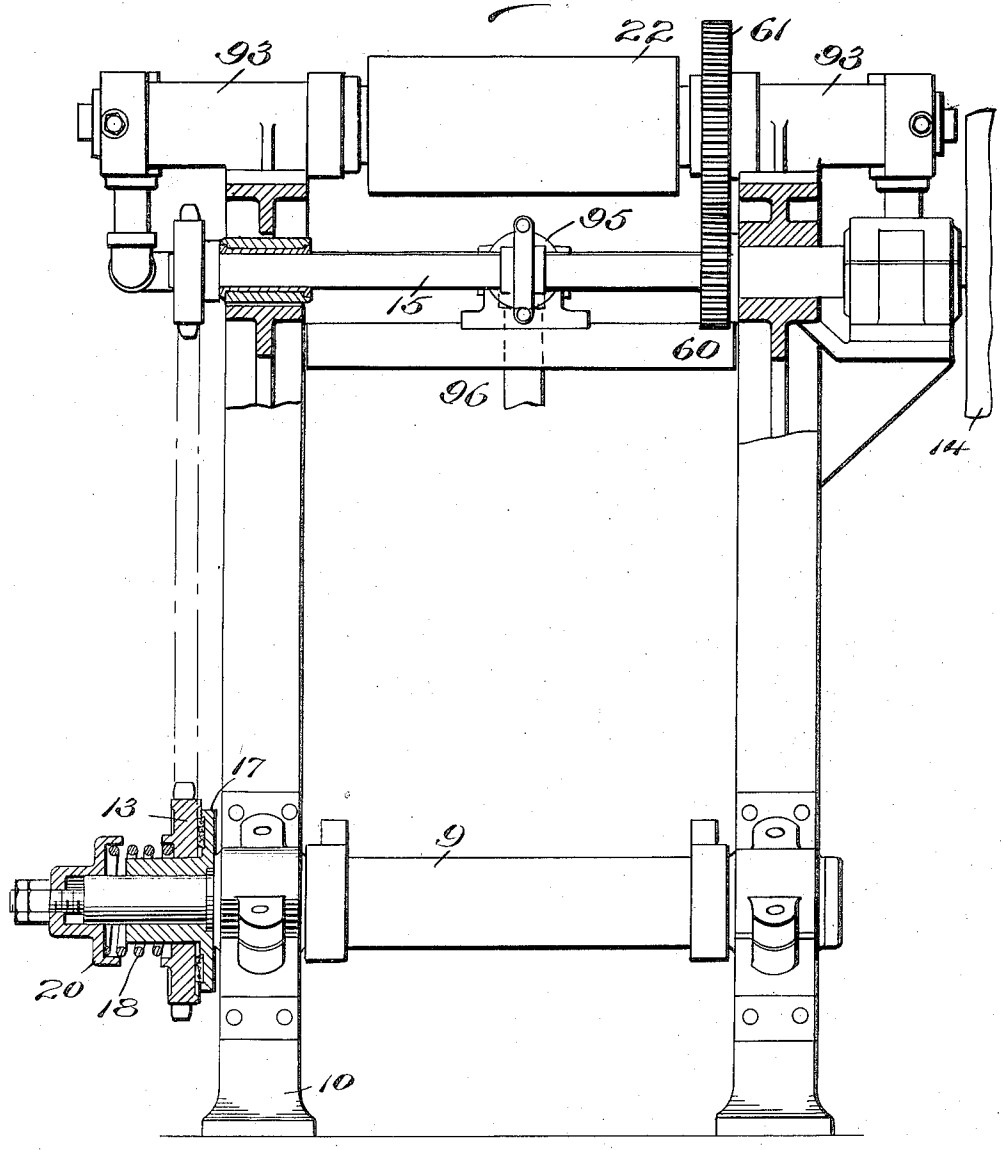
8 SHEETS—SHEET 8.

Fig. 17



Witnesses

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UNITED STATES PATENT OFFICE.

HARRY A. DEUEL, OF PUEBLO, COLORADO.

MACHINE FOR MAKING WIRE-NETTING.

1,020,805. Specification of Letters Patent. Patented Mar. 19, 1912.

Application filed March 3, 1911. Serial No. 612,064.

To all whom it may concern:

Be it known that I, HARRY A. DEUEL, a citizen of the United States, residing at Pueblo, in the county of Pueblo and State of Colorado, have invented new and useful Improvements in Machines for Making Wire-Netting, of which the following is a specification.

This invention relates to machines for the manufacture of wire mesh netting, and especially to a wire fabric machine in which the wires of the fabric are united to form, preferably, a polygonal mesh, such as is usually termed diamond mesh netting.

The main object of my present invention is to provide a machine which will weave the netting continuously, forming two rows of knots simultaneously across the fabric, the knots of the different rows being in staggered relation and being formed as the fabric is continuously advanced. I am thus enabled to greatly increase the output of the machine over those in which a single line of knots is formed at one time or in which the wire is advanced intermittently.

The forward line of knots is constructed by a row of coilers carried by a continuously revolving drum or rotary weaving head, which is provided with a plurality of sets of coilers, brought successively into operative position. The rear row of knots is formed by a bank of twisters carried by a stationary head and are operated simultaneously with the coilers. The twisters are staggered with relation to the coilers, and are provided with hollow guiding fingers which are so positioned that the wires issuing from one finger of each pair of adjacent twisters pass into the same coiler in advance.

The rear of the two lines of meshes will be formed by the grooved coiler heads or coilers which engage the bends or angles of adjacent meshes and coil them over and under one another to form lock twists. The completed fabric will be formed of alternate transverse lines of ordinary twists and locking coils or knots, each of which styles of knots or twists furthermore alternate between right-hand twists and left-hand twists, with the result that the meshes will be prevented from slipping longitudinally with the consequent narrowing of the fabric when subjected to longitudinal strain.

Other objects of my invention will be apparent from the following description, while the scope thereof will be pointed out in the claims.

In the accompanying drawings; Figure 1 is a side elevation of a complete machine embodying my invention; Fig. 2 is a top plan view of the same; Fig. 3 is a vertical section on the line III—III of Fig. 1; Fig. 4 is an enlarged detail of the rack and driving gear to intermittently actuate the coiler rack-bar; Figs. 5 and 6 are side and end views of one of the twisters; Fig. 7 is a longitudinal view, partly in section, of the rotary weaving head; Figs. 8 and 9 are vertical sections through the stationary cross-head carrying the twisters; Fig. 10 is an enlarged longitudinal section of the friction drive or clutch connected with the shaft of the take-up or winding drum; Fig. 11 is a vertical section of the rotary weaving head or drum on the line XI—XI of Fig. 7; Figs. 12, 13, and 14, are enlarged detail views showing the construction of the diamond guides on the weaving head and the manner in which the coilers are carried thereby, Fig. 13 being a vertical section on the line XIII—XIII of Fig. 12; Fig. 15 is a top plan view of my machine with another form of driving mechanism; Fig. 16 is a vertical cross-section on the line XVI—XVI of Fig. 15; Fig. 17 is an end elevation of the machine shown in Fig. 15; Figs. 18 and 19 show a modified form of coiler and the knot made thereby, and Fig. 20 shows a section of one form of wire fabric adapted to be made on my machine.

The machine herein illustrated is carried by longitudinal channel bars 1, 2, supported upon end frame members 5, 6, which rest upon a bed plate 7. A winding drum 9, journaled in bearings carried by the standards 10, carried by the bed plate, receives the finished fabric and is driven by means of a chain 12 and sprocket 13 from the main drive-shaft 15. In order that the take-up or winding drum may maintain the proper pull or tension upon the fabric, at the same time allowing for the differential due to the increasing size of the roll, the sprocket 13 is loosely journaled upon the shaft of the drum and frictionally engages a clutch surface 16, carried by a boss 17 on the shaft, as shown in Fig. 10. The proper frictional engagement between the sprocket and clutch surface is maintained by the spring 18 which is adjustably held by the cap 20.

The forward row of knots or locking coils is formed by the coilers 21 carried by the rotary weaving head or drum 22, journaled in bearings 23. I have shown four rows of coilers, but the drum may be provided with any desired number of rows evenly distributed about its periphery, depending upon the dimensions of the mesh. The bearings and housings for the coilers are formed within the diamond guides 24, which are preferably cast integral with the drum. Circular recesses 25 are bored upon opposite sides of the diamond guides, cutting through the inside wall of the drum as shown at 25′, adjacent recesses being cut from opposite sides in order that the shell of the drum may not be weakened along the line of the holes. Each of these bored recesses forms a housing and the bearings for a coiler 21, which is provided with bearing surfaces 28^a, and 28^b, and a central hub having spur teeth 29 which project through an opening 25, to engage a rack which reciprocates within the drum. The hub is provided with a deep longitudinal slot 30, having a flaring mouth normally in alinement with the passage between the pair of diamond guides forming the housing. The open end of the coiler recess is closed by a bushing 32, which is shaped externally to conform to the adjoining surfaces of the diamond guides and the drum and is held in position by screw bolts 33. The upper portion of this bushing is in the form of a yoke, the arms 32′ of which arch over the coiler and bear against the hub thereof, while the intervening space between the arms conforms to the slot 30.

In Fig. 14, the slot in the coiler is narrow, so that the mesh wires will rest one above the other. In Fig. 18, I have shown a wider slot divided by a central pin 30^a, which separates the wires and forms a knot of the form shown in Fig. 19. A cylindrical rack 35, is mounted to reciprocate with the rotary weaving drum, the teeth of which engage the spur teeth of all of the coilers of the several sets, and the travel of the rack is sufficient to cause the coilers to make two complete rotations for each stroke thereof. The twisters which operate simultaneously with the coilers to form the rear row of knots or twists of the mesh, are of the body twister type and, as shown in Figs. 5 and 6, comprise a tubular body 38, carrying spur gear teeth 40, and having a reduced rear bearing portion 39, with forwardly extending tubular guiding fingers 42. The bank of twisters is mounted in a stationary two-part cross-head 45, shown in cross-section in Figs. 8 and 9, having transverse sleeved apertures 46 to receive the body portion of the twisters, and a longitudinally extending slot or bore 48, which serves as a guide-way for the reciprocation of a driving rack-bar 50 having teeth 52 which mesh with the spur gears of the twisters and cause them to make two complete rotations for each stroke of the rack-bar. Power to operate the machine is transmitted through a pulley 14 to the main drive shaft 15 operating through gears 60 and 61, to rotate the weaving drum 22, and through gear 63 to rotate the shaft 65. The latter carries gears 67 upon either end, which engage gears 69 upon the transverse shafts 70, carrying mutilated gears 72 and 73, which operate to reciprocate the racks 35 and 50, respectively, and thereby periodically actuate the coilers and twisters. The gears 73 mesh with teeth on the lower sides of the ends of the rack-bars 50, while the gears 72 engage separate auxiliary racks 76, which are bolted to bars 78, shown in detail in Fig. 4, fastened in the ends of the cylindrical racks 35, the auxiliary racks having a longitudinal bore 79 which slides over the guide bar 80. The mutilated gears are so proportioned that they move the racks 35 and 50, alternately four times during each revolution of the weaving drum, that is, once for each row of coilers, and, as previously stated, the coilers and twisters make two revolutions for each stroke of the rack-bars.

The operation of the machine in weaving the fabric will be understood from the foregoing description of the parts. The wire strands coming from the reels or spools, pass through the bores of the twisters and through the tubular guide fingers across the weaving drum 22, the wires from adjacent fingers of adjacent twisters passing in pairs between the diamond guides 24, and into the narrow slots 30 of the uppermost row of coilers, one wire over the other, and from thence pass over the guide roller 82 to the take-up or winding drum 9. At the instant the succeeding rows of coilers reach the vertical position, the racks 35 and 50 are shifted by their mutilated gears, thus causing each coiler and each twister to make two complete revolutions, the coilers and twisters being alternately rotated in opposite directions. The pairs of wires being firmly held in the slots of the coilers will be coiled over and under one another twice to form a row of locking coils or knots, and simultaneously one wire from each of the adjacent pairs will be carried bodily over and under one another twice by the twisters to form a twist or knot in the rear row of knots which are in staggered relation with the front row, two rows of knots in the fabric being thus tied simultaneously. Each twister brings together a pair of wires from adjacent coilers and twists them together about a diamond guide, thus forming the diamond mesh of the fabric. As the next set of diamond guides moves upwardly, the forward angles

of the guides engage the rear of the row of knots formed by the twisters, and the wires are guided by the fingers and the sloping sides of the guides into the slots of the corresponding coilers, another double row of knots being formed in the manner previously described, but twisted in the opposite direction, as soon as the coilers reach the vertical position. The weaving drum rotates continuously, and two rows of knots are tied four times during each revolution of the drum.

In Figs. 15, 16, and 17, I have shown the rack-bars 35 and 50, which actuate the pinions on the coilers and twisters, connected directly to pistons 90 and 92, which reciprocate in cylinders 93 and 94, and are actuated by fluid pressure, preferably compressed air. Compressed air from any suitable source enters the valve chamber 95, through the inlet pipe 96, and passes through pipes 97, 98, to the delivery chambers 97′, 98′, and from thence to the cylinders. The valve chamber 95 may be provided with a three-way piston valve of the usual locomotive type, actuated by an eccentric 100, mounted upon the main driveshaft. The strokes of the valve must be so timed that pistons attached to the rack-bars will make four strokes for one revolution of the weaving drum, each stroke occurring as the coilers reach the vertical position. The pipes 97 and 98 serve alternately as supply and exhaust channels, the exhaust passing out at 102. Suitable recording mechanism 104, may be connected to a worm 105 on the drive shaft.

It is obvious that various changes may be made in the construction and arrangement of parts of my machine, and I do not wish to be confined to the details therein shown, as the broad object which I have in view is to manufacture a wire fabric on a weaving head which is rotated continuously when the machine parts are in operation, for interlocking, inter-connecting, or twisting together a series of wires which are suitably fed to said moving weaving head or drum, and which are suitably connected or twisted during the movement of the drum without stopping or starting the same after once being set in motion, and to have two rows of twists or knots formed simultaneously, the knots of one row being staggered with relation to those of the other row to form diamond meshes.

In the following claims, I do not wish to be understood as limiting myself to the details of construction of the individual elements which go to make up the several parts or combinations of the machine herein illustrated and described, as I regard the invention as of a character to admit of variations of these details within considerable limits without departing from its spirit and scope.

I claim:—

1. A machine for weaving wire mesh fabric, comprising a rotary weaving head or drum, a plurality of longitudinal rows of coilers carried by said drum and equally spaced about the periphery thereof, a stationary cross-head parallel with the axis of said drum, twister heads mounted in bearings in said cross-head in staggered relation with said coilers, each twister having a pair of diverging tubular guide fingers which feed wire strands to the adjacent coiler upon either side, means for rotating said drum at a uniform rate, and means for simultaneously rotating said coilers and said twister heads upon their axes intermittently.

2. A machine for weaving wire mesh fabric, comprising a rotary weaving head or drum, a plurality of longitudinal rows of coilers carried by said drum and equally spaced about the periphery thereof, a stationary cross-head parallel with the axis of said drum, twister heads mounted in bearings in said cross-head in staggered relation with said coilers, each twister having a pair of diverging tubular guide fingers which feed wire strands to the adjacent coiler upon either side, said coilers and said twisters being provided with pinions, means for rotating said drum at a uniform rate, rack-bars reciprocable within said drum and said cross-head respectively and in mesh with said pinions, and means for intermittently operating said rack-bars in unison.

3. A machine for weaving wire netting or fabric, comprising a plurality of twisters carried by a stationary cross-head, a plurality of slotted coilers located in advance of the twisters, means for intermittently and simultaneously rotating the twisters and the coilers upon their axes, and means for continuously advancing the fabric at a uniform rate.

4. A machine for weaving wire netting or fabric, comprising a plurality of twisters carried by a stationary cross-head, a plurality of slotted coilers located in advance of the twisters and in staggered relation thereto, means for axially rotating the twisters, means for axially rotating the coilers simultaneously with the twisters, and means for continuously advancing the fabric at a uniform rate.

5. A machine for weaving wire netting or fabric, comprising a plurality of twisters, a plurality of slotted coilers located in advance of the twisters, a stationary cross-head for mounting the twisters, a revoluble weaving head carrying the coilers, separate means for axially rotating the twisters and the coilers in unison, and means for continuously advancing the fabric at a uniform rate.

6. A machine for weaving wire netting or fabric, comprising a bank of twisters, a sta-

tionary cross-head in which said twisters are revolubly mounted, a weaving head or drum revolubly mounted in advance of said cross-head and having a plurality of longitudinal rows of polygonal formers or guides equally spaced upon its periphery, a slotted coiler located between each two guides, the adjacent guides having a recess therein to constitute a housing and bearings for the interposed coiler, means for rotating said drum at a uniform rate, and means for axially rotating said twisters and said coilers simultaneously as each row of guides is brought into coöperative relation with the bank of twisters.

7. In a machine for weaving wire netting or fabric, a hollow rotary weaving head or drum having a plurality of rows of polygonal mesh formers or guides uniformly disposed upon its periphery, a tangential recess formed in adjacent sides of adjacent formers of each row, and a rotary slotted coiler mounted in each of said recesses.

8. In a machine for weaving wire netting or fabric, a hollow rotary weaving head or drum having a plurality of rows of polygonal mesh formers or guides uniformly disposed upon its periphery, a tangential recess formed in adjacent sides of adjacent formers of each row, a rotary slotted coiler mounted in each of said recesses, a stationary cross-head in the rear of said drum, and a series of revoluble twister-heads journaled in said cross-head.

9. In a machine for weaving wire netting or fabric, a hollow rotary weaving head or drum having a plurality of rows of polygonal mesh formers or guides uniformly disposed upon its periphery, a tangential recess formed in adjacent sides of adjacent formers of each row, a rotary slotted coiler mounted in each of said recesses, a stationary cross-head in the rear of said drum, a series of revoluble twister-heads journaled in said cross-head, said coilers and said twister-heads having peripheral gear-teeth, and rack-bars reciprocable within said drum and said cross-head respectively and in mesh with said gear-teeth.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

HARRY A. DEUEL.

Witnesses:
J. B. McKUNAN,
F. E. PARKS.