(No Model.) 5 Sheets—Sheet 1.

C. KEHR.

MACHINE FOR WEAVING COILED WIRE FABRIC.

No. 464,939. Patented Dec. 8, 1891.

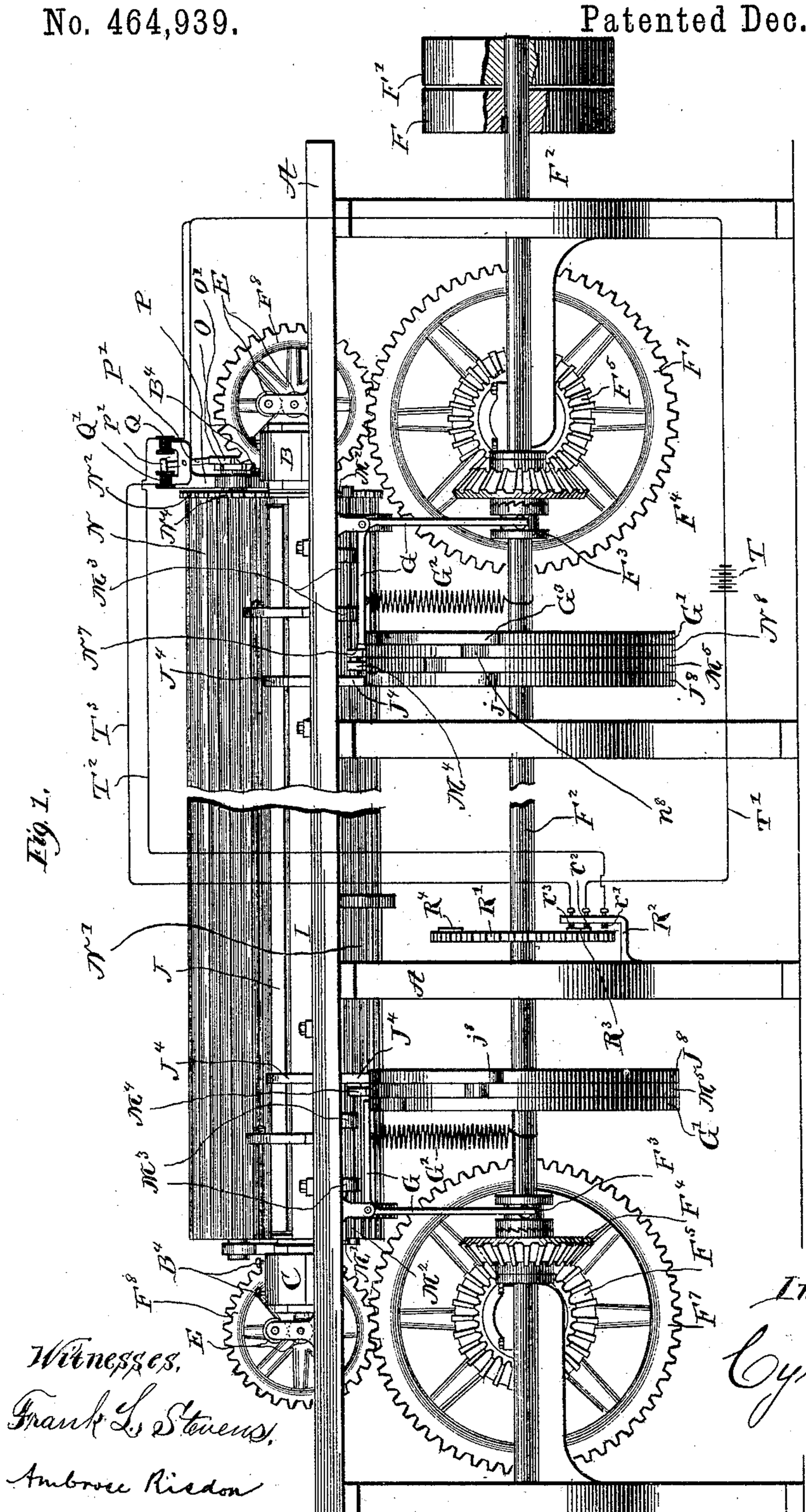


Fig. 1.

Witnesses,
Frank L. Stevens.
Ambrose Ridon

Inventor.
Cyrus Kehr.

(No Model.) 5 Sheets—Sheet 2.

C. KEHR.

MACHINE FOR WEAVING COILED WIRE FABRIC.

No. 464,939. Patented Dec. 8, 1891.

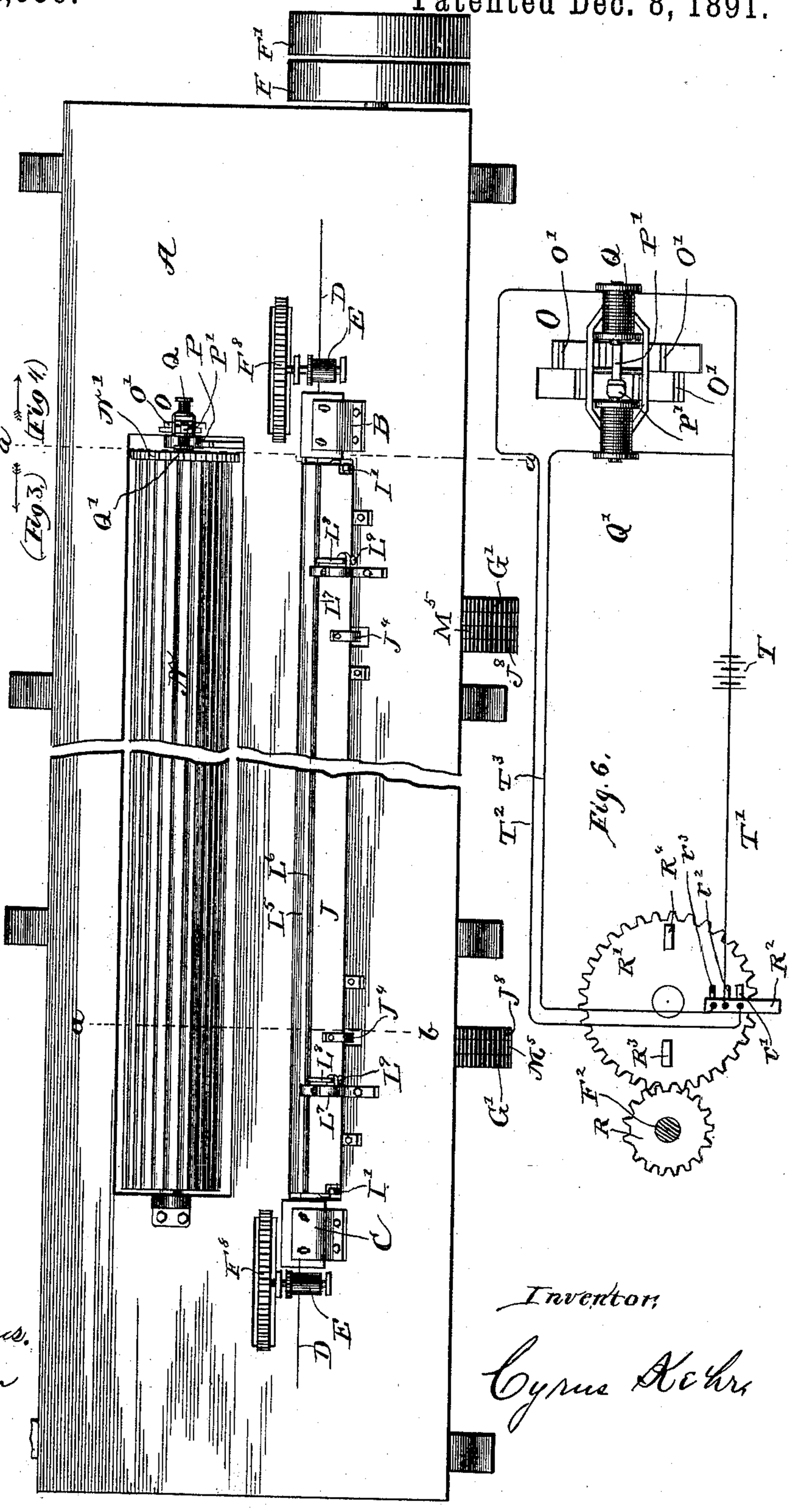


Fig. 2.

Fig. 6.

Witnesses,
Frank L. Stevens.
Ambrose Risdon

Inventor,
Cyrus Kehr

(No Model.) 5 Sheets—Sheet 3.

C. KEHR.

MACHINE FOR WEAVING COILED WIRE FABRIC.

No. 464,939. Patented Dec. 8, 1891.

Fig. 5.

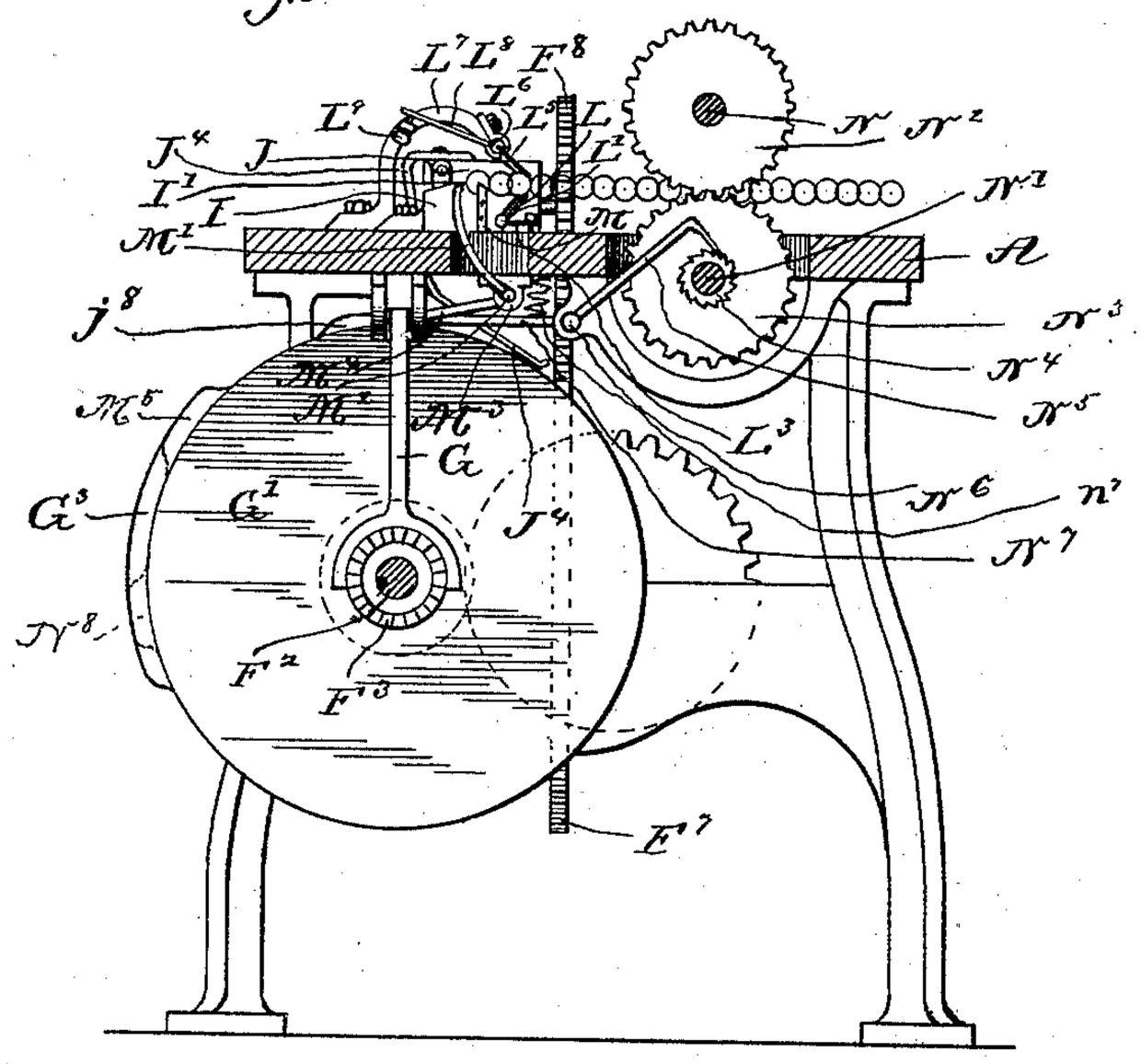
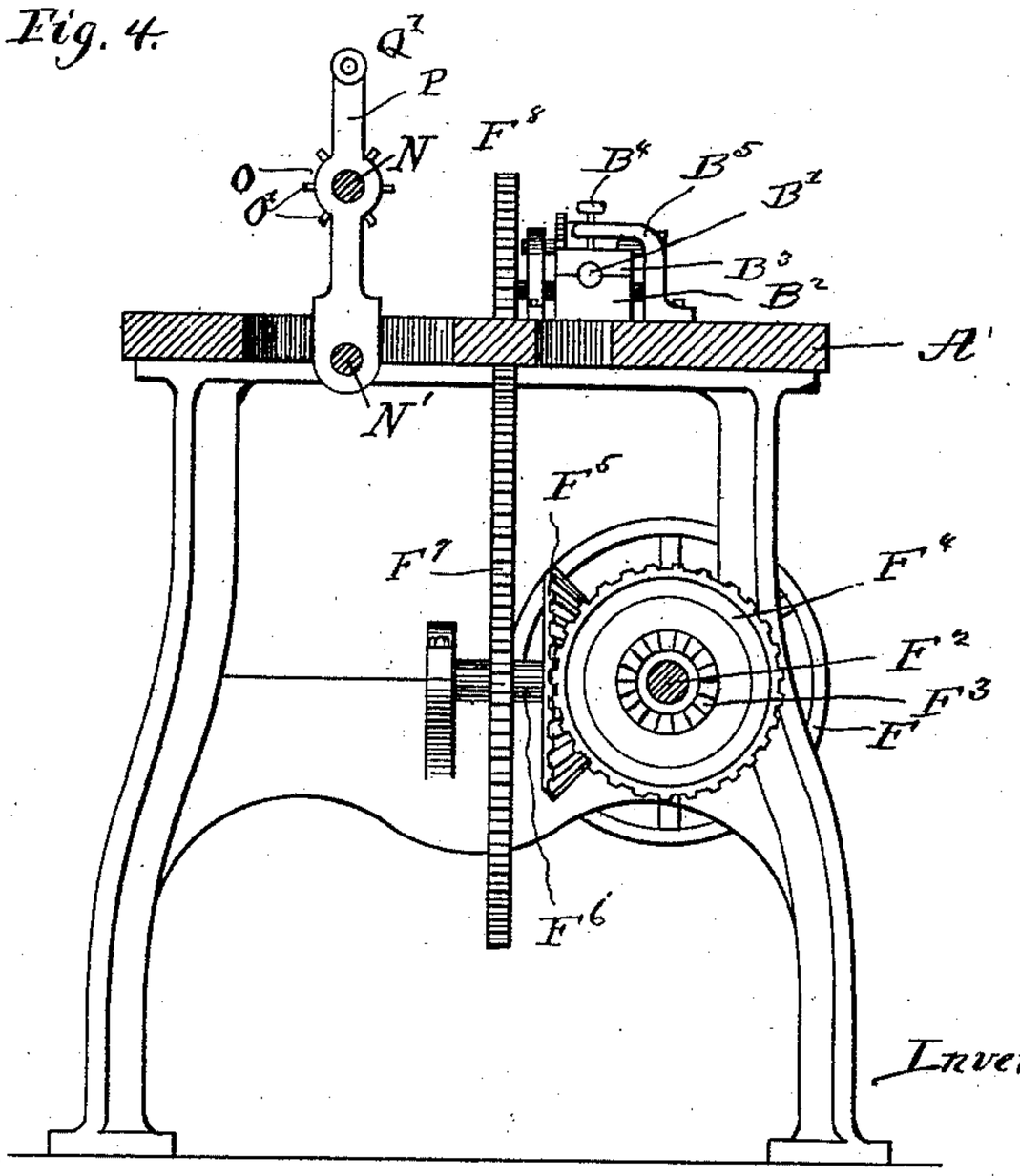


Fig. 4.



Witnesses.
Frank L. Sevens,
Ambrose Riedon

Inventor.
Cyrus Kehr,

(No Model.) 5 Sheets—Sheet 4.

C. KEHR.

MACHINE FOR WEAVING COILED WIRE FABRIC.

No. 464,939. Patented Dec. 8, 1891.

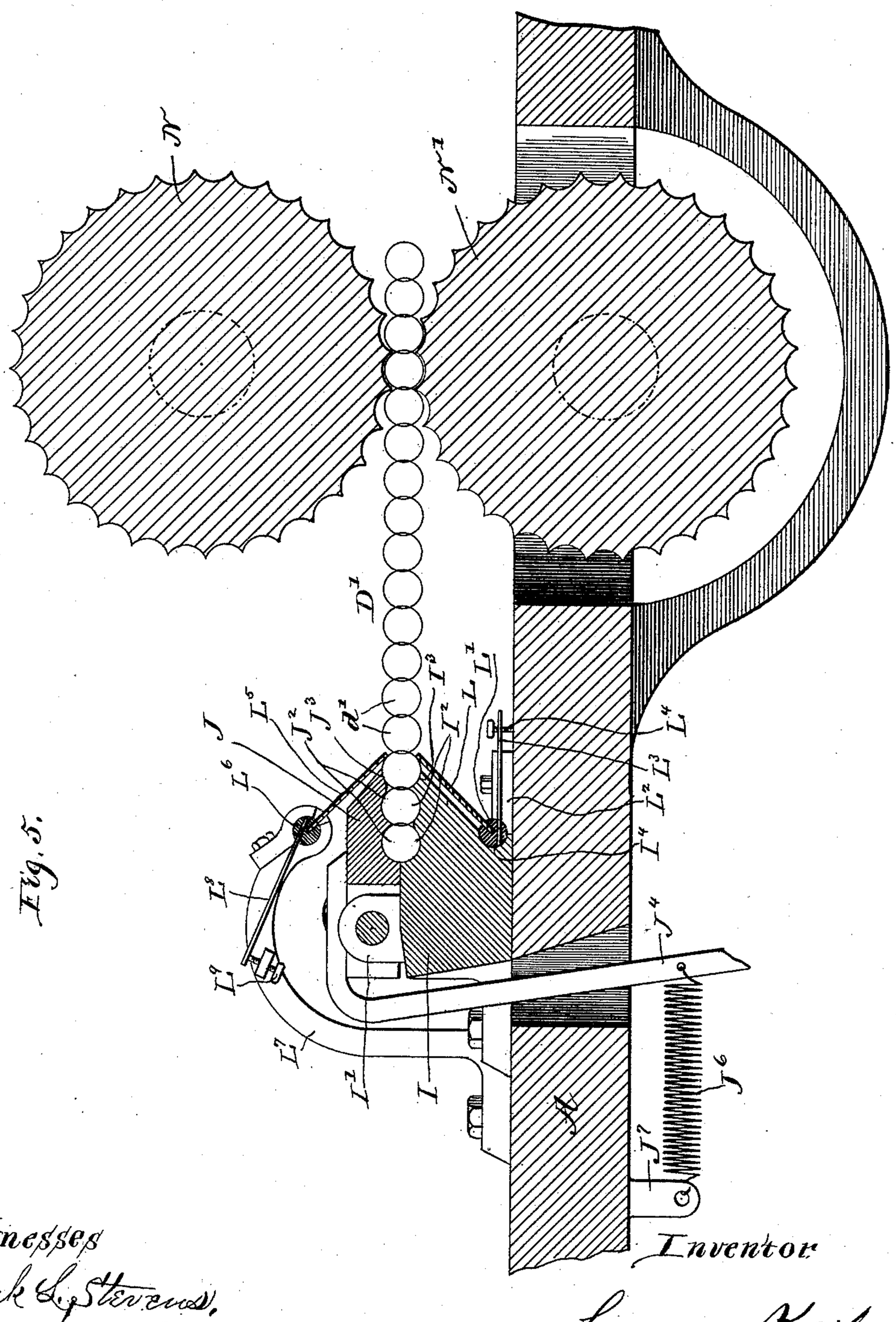


Fig. 5.

Witnesses
Frank L. Stevens.
Ambrose Riddon

Inventor
Cyrus Kehr,

(No Model.) 5 Sheets—Sheet 5.

C. KEHR.

MACHINE FOR WEAVING COILED WIRE FABRIC.

No. 464,939. Patented Dec. 8, 1891.

Fig. 7.

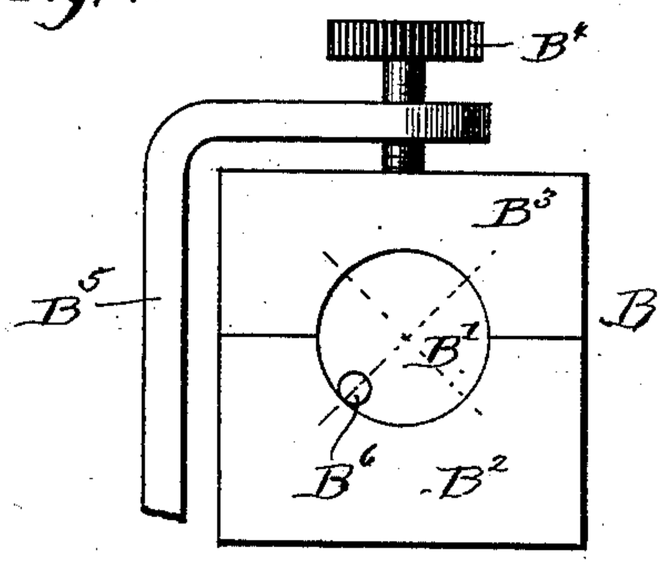


Fig. 8.

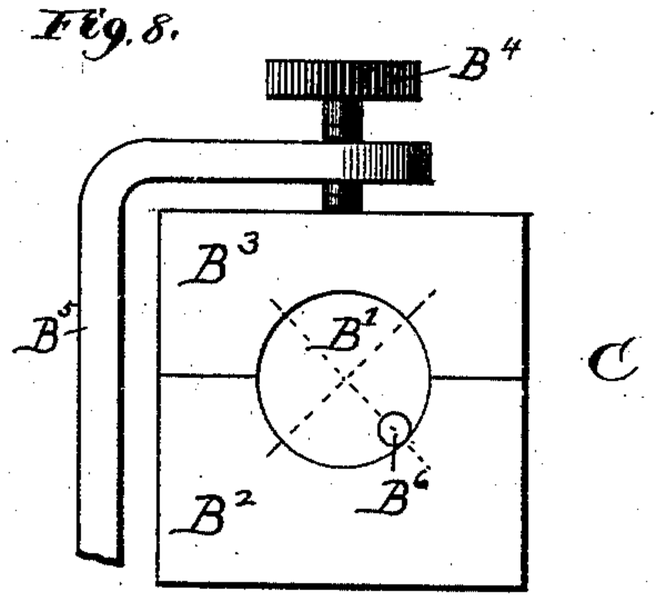


Fig. 9.

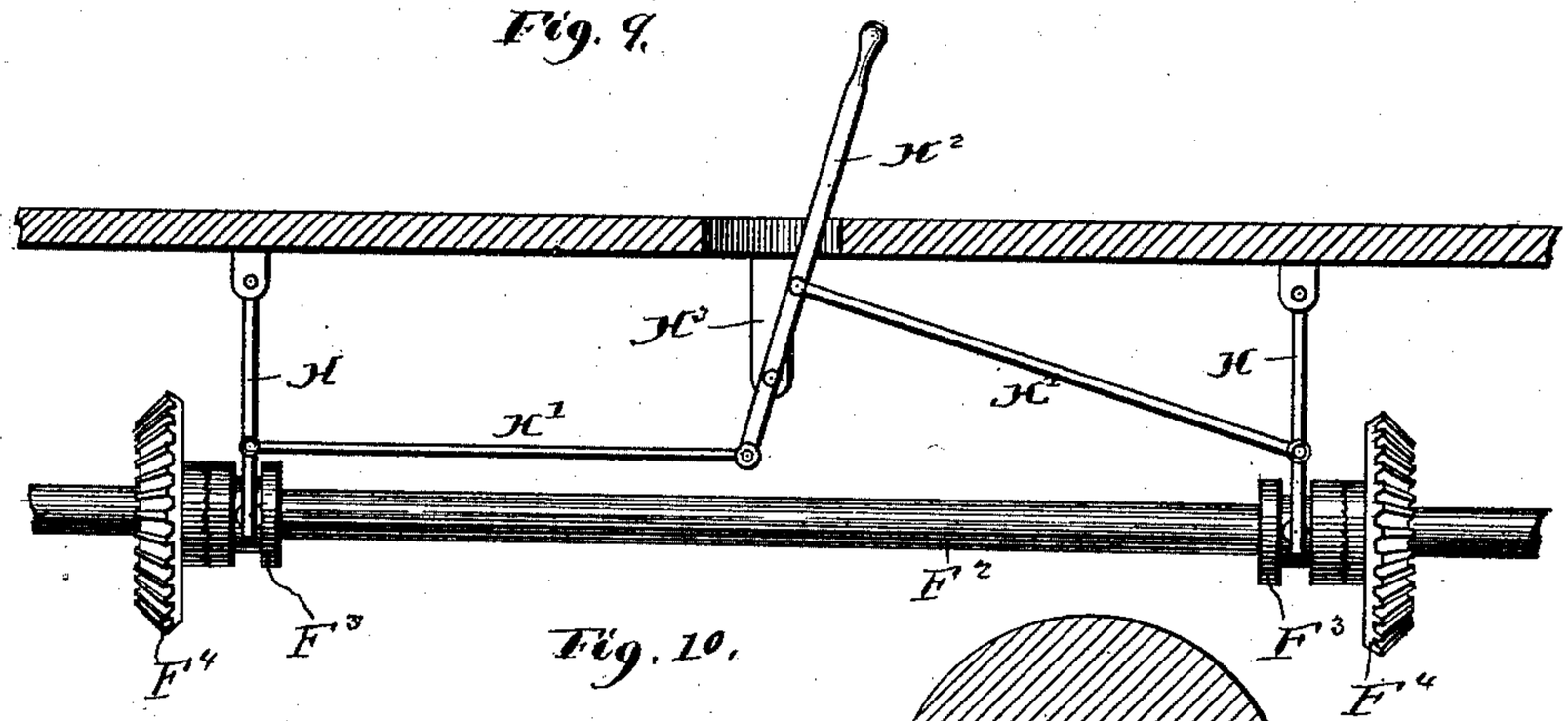


Fig. 10.

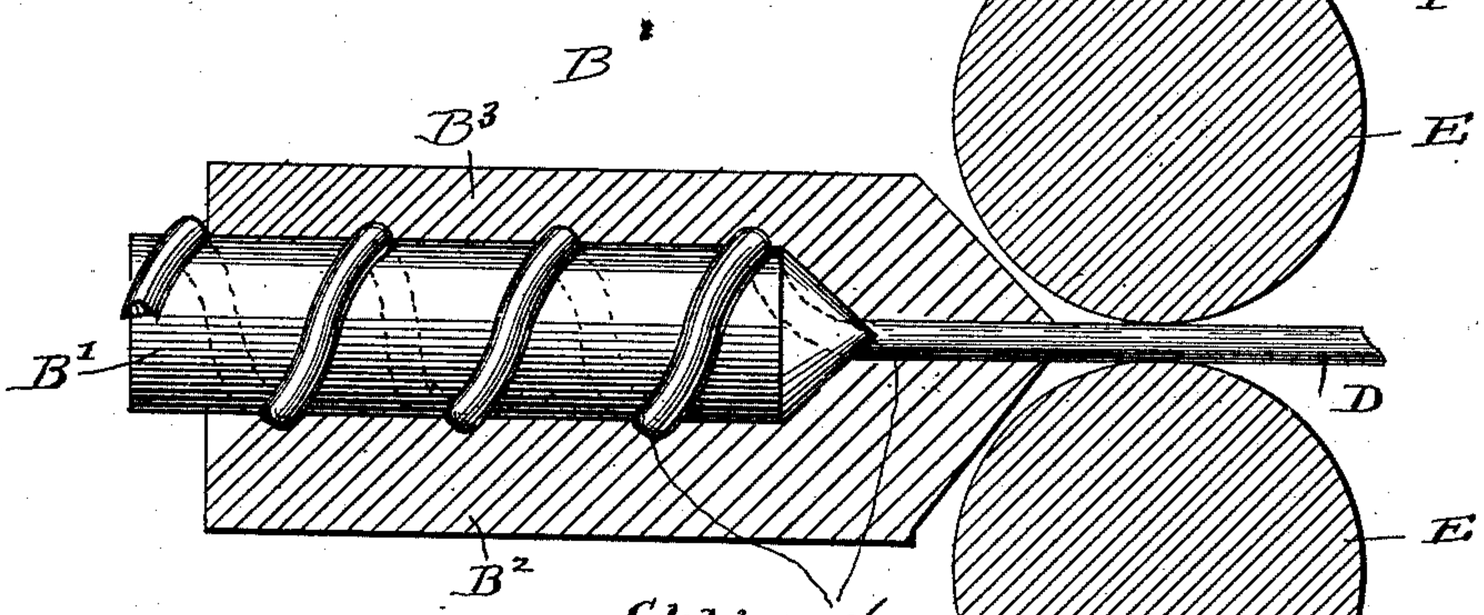
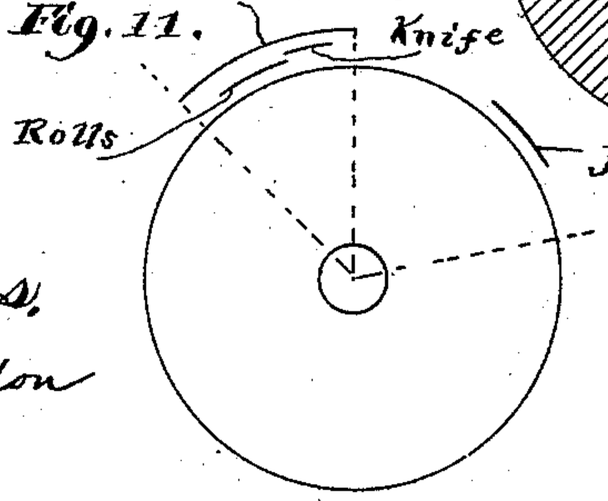


Fig. 11.



Witnesses.
Frank L. Stevens.
Ambrose Risdon

Inventor.
Cyrus Kehr.

UNITED STATES PATENT OFFICE.

CYRUS KEHR, OF LAKESIDE, ILLINOIS.

MACHINE FOR WEAVING COILED-WIRE FABRIC.

SPECIFICATION forming part of Letters Patent No. 464,939, dated December 8, 1891.

Application filed February 18, 1891. Serial No. 381,949. (No model.)

To all whom it may concern:

Be it known that I, CYRUS KEHR, a citizen of the United States, residing at Lakeside, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Weaving Coiled-Wire Fabric; and I do hereby 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 letters of reference marked thereon, which form a part of this specification.

This invention relates particularly to the weaving of coiled-wire fabric for bed-bottoms and similar purposes, such fabric consisting of parallel, longitudinal, and interlinked spiral wire coils.

One of the objects of my invention is to render unnecessary the longitudinal shifting of the fabric after each new coil has been made. Heretofore it has been the custom to shift, either manually or mechanically, as much of the fabric as has been woven longitudinally toward the coiling-machine a distance equal to the distance traversed by the wire of the coils in making a half-turn, and after the completion of the next coil to shift the entire fabric away from the coiler the same distance. The coiling-machine is usually arranged at one end of a table and the fabric formed upon such table by projecting the coils from the machine horizontally over said table, each new coil being made to intertwine at each turn with the last preceding coil, the coils already made being shifted back and forth by the hand of the operator. In a few machines devised by others the table or equivalent part supporting the fabric is arranged to be shifted back and forth toward and from the coiler by automatic mechanism. Such a table or supporting apparatus must necessarily be as long as or longer than the fabric, which is usually six feet, and such table and the mechanism thereto connected and the fabric form a heavy and awkward load to reciprocate. In my improved apparatus the weaving-machine is itself of such construction as to avoid the necessity for this longitudinal reciprocation of the fabric.

In another application for Letters Patent of the United States, filed by me February 16, 1891, Serial No. 381,630, I describe a machine in which the necessity for the longitudinal shifting of the last-finished coil is obviated by changing the radial relation between the last-finished coil and the coiler after the completion of a coil.

A further object of my invention is to produce a machine which shall weave wire more rapidly than has been heretofore done. To this end I have arranged two coilers in the same machine, each of which forms a coil simultaneously with the other. In this way the machine becomes duplex and forms fabric twice as fast as other automatic machines heretofore devised. In this class of machines the wire is coiled by being forced through a spiral die or passage, and such passage is made so accurate that the wire projected therefrom travels continuously forward in the same path, so that if sufficient wire for one length of coil of the fabric is projected from said coiler and the coiler stopped and the wire cut at the proper length and the coiler again started the new coil of wire now driven forward will move in exactly the path traversed by the wire just cut off, so that it cannot proceed over the length of the fabric without at every turn meeting the wire of the last coil, notwithstanding the fact that the last coil has been shifted laterally. The work can progress only by so shifting the finished coil longitudinally as to bring every portion of it out of the path in which it was formed. If the coil is merely shifted laterally away from the coiling-axis a sufficient distance to allow for the intertwining of the next succeeding coil, the coil so shifted will at every turn cut or almost cut through the path in which it was formed. The foregoing is the condition because there is only one coiler and the path through which the coil from said coiler is projected is constant as to location. In my improved machine herein described there are two coilers, which weave the alternate coils of the fabric, and the paths through which the coilers project the coils differ in radial relation to the coiling-axes, so that the coil with which a coil being formed intertwines is never in the path of the coil being formed.

In the accompanying drawings, Figure 1 is

a side elevation of a machine embodying my improvement. Fig. 2 is a plan of the same. Fig. 3 is a vertical transverse section in the line *a a* of Fig. 2, looking toward the left. Fig. 4 is a section in the same line, looking toward the right. Fig. 5 is an enlarged detail section in the line *a b* of Fig. 2, looking toward the left. Fig. 6 is a detail of the locking mechanism for the fabric-supporting rolls. Figs. 7, 8, and 10 are details of the coilers. Fig. 9 is a detail of alternative mechanism for starting and stopping the coilers. Fig. 11 is a detail showing the spacing of the extensions on the cams.

A is a table rising to a suitable height and of proper width and length to support the operating mechanism. The portion of the table at the right in Figs. 1 and 2 is called the "head" of the table, and the portion at the left in said figures is called the "foot" of the table, and the corresponding ends are also called the "head" and the "foot" of the machine.

B is a coiler located at the head of the machine, and C is a coiler located at the foot of the machine. Both are located upon the table and are in the same plane and have their coiling-axes parallel to each other and separated a little less than the diameter of one coil, so that the coils simultaneously projected from these coilers will pass each other and intertwine. These coilers may be of any suitable construction.

The drawings show them both composed of similar parts, and a description of the coiler B will therefore be sufficient for both.

B′ is a spindle lying between blocks B^2 and B^3, the former resting upon the table and the latter being clamped upon said spindle by bolts B^4, located in an arched standard B^5, rising from the table A. At the right there is an opening B^6 of proper size to allow the passage of the wire D, and said passage leads to the spindle B′, and thence spirally forward around the latter.

Combined with the blocks B^2 and B^3 and the spindle B′ is a pair of rolls E, arranged at the head of said spindle and embracing the extended axis of said spindle and the wire to form the coil and geared to feed such wire forward into and through the passage B^6. By examining Figs. 7 and 10 it will be seen that any particular portion of the passage B^6 of the coiler stands in a certain radius of the axis of the spindle B′ of the coiling-axis. Suppose now that the spindle B′, with its spiral passage B^6, be bodily rotated about a quarter of a full rotation. Then all portions of said passage will stand in new radii of the coiling-axis. In other words, said passages will then sustain new radial relations to the coiling-axis. In construction the coilers B and C are so made that the radial relation of one of the coilers to its coiling-axis will differ from the radial relation of the other coiler to its coiling-axis. This difference is indicated in Figs. 7 and 8 as being about one-fourth of a circle. By this arrangement and by the arrangement of the coilers with non-coincident or parallel axes separated a little less than the diameter of said coils, the two coils will have paths which pass and intertwine, but never meet or intersect. It will be seen that if lines be produced from the passages B^6, conforming in pitch and diameter of spiral to said passages, said lines will intertwine and be non-concentric to a common axis.

F and F′ are band-wheels seated upon a shaft F^2, extending longitudinally beneath the table A, the wheel F being keyed to said shaft and the wheel F′ being loose thereon. When a belt is placed upon the wheel F, the shaft F^2 is rotated continuously, and when it is desired to stop the rotation of said shaft the belt is shifted to the loose wheel F′. F^3 is a clutch surrounding said shaft F^2 and feathered thereon, so that it may be shifted longitudinally, but must rotate with the shaft F^2. F^4 is a bevel-gear loosely surrounding said shaft F^2, but designed to be at times engaged with the clutch F^3, and during such engagement said wheel F^4 is forced to rotate with said shaft F^2. The said bevel-wheel F^4 engages with another bevel-wheel F^5, located upon a horizontal transverse shaft F^6, and the latter shaft supports a large spur-wheel F^7, which latter meshes into a smaller spur-wheel F^8, fixed upon the shaft of one of the rolls E. By this train of mechanism the rolls are driven so as to feed the wire D forward through the coiler B. A similar train of mechanism is located at the foot of the machine and similarly connected with the shaft F^2 to drive the coiler C.

The clutch F^3 may be shifted into and out of engagement by hand by means of mechanism similar to that shown in Fig. 9, in which H H are levers pivoted by their upper ends to the table A and joined by their lower ends to the clutches, and H^2 is a hand-lever rising through the table A and pivoted to a bracket H^3, extending downward from the table and joined to the levers H by links H′, and the one link H′ coming from the head lever H being joined to the lever H^2 above the pivot of the latter and the other link H′ being joined to said lever H^2 below the pivot of said lever. When the upper end of said lever H^2 is thrown toward the head of the machine, both clutches are forced into engagement with the bevel-wheels F^4 and the coilers are started, and when said lever is thrown toward the left or foot of the machine both clutches are drawn out of engagement with the bevels F^4 and the two coilers are stopped. Hand-levers may be otherwise arranged to simultaneously shift the two clutches. It is, however, preferable to control said clutches automatically, and in Figs. 1 and 3 I show such automatic mechanism. In said figures, G is a bell-crank, pivoted at its elbow to a stationary part of the table and having its vertical arm joined to the clutch F^3 and having the end of its horizontal arm resting over a cam G′ and normally drawn into

contact with the latter by a spring G^2. The cam G′ is seated upon the shaft F^2, and has upon its periphery an extension G^3 sufficient to raise the horizontal arm of the bell-crank G when said extension passes over said arm. The raising of said horizontal arm of the bell-crank draws the vertical arm of said bell-crank toward the middle of the machine, so that said clutch is drawn away from and out of engagement with the bevel-wheel F^4, whereby the train of mechanism concerned in driving the coiler is stopped. Said train of mechanism is so speeded that one coil is formed by the coiler for each rotation of the shaft F^2, less a portion of said rotation covered by the interval required for cutting and shifting the fabric. In Fig. 3 the extension G^3 is shown as covering about one-fourth of the periphery of the cam G′, and when this proportion exists the coil must be formed during a three-fourths rotation of the shaft F^2. When the machine is thus stopped, the wire is to be cut and the fabric shifted transversely to the coiling-axis before the coilers are again started. Both of these steps may be performed by hand or by mechanism operated by hand; but I have devised automatic mechanism for these purposes, which mechanism is arranged in such relation to the shaft F^2 as to be actuated by the latter at suitable intervals, and the new coils may be supported and guided in any suitable manner; but I have devised special mechanism for this purpose, which will be next described.

I is a stationary jaw extending lengthwise and resting upon the table A between the two coilers B and C.

J is a movable jaw resting upon the jaw I and hinged at one side to said jaw I in ears I′. At the side of said jaws opposite said hinge both of said jaws are provided with two opposing channels of proper dimensions in cross-section to receive the coils *d′* of the fabric D′. The channels of said jaw I are marked I^2, while the channels of said jaw J are marked J^2, and the outer edges of each of said jaws I and J are preferably provided each with a partial channel I^3 and J^3, which together make a space sufficiently large to receive about one-half of the last-finished coil of the fabric. The said channels on each jaw have non-coincident and parallel axes, and the distance of such axes from each other is such as that the passages formed by the channels of the two jaws will have non-coincident axes and will reach one into the cylindric limits of the other. In other words, the walls of the coil-support will form passages which are interreaching and have non-coincident axes. This construction is important, for it provides a way to guide each coil independently of the other and keep the coils separated axially and yet allow them to intertwine, each coil being allowed to reach into the cylindric limits of the other sufficiently to intertwine, while said walls prevent it from leaving the distinct course or path chosen for it.

L is a presser-blade extending lengthwise of the machine parallel to the side of the jaw I and having its upper edge resting against the front lower portion of the last-finished coil of the fabric and having its lower edge secured to the bar L′, resting in a recess I^4 of the jaw I, and there confined by blocks L^2, secured to the table A. To provide for a variation of the pressure of said presser against the last-finished coil of the fabric, arms L^3 extend horizontally from the bar L′ in the direction opposite the jaw I, and are provided each with a screw L^4, extending through said arm and bearing upon the table A. By turning said screw downward the arm L^3 and the presser L are raised, so that the latter bears harder against the last-finished coil of the fabric. L^5 is a similar presser arranged in front of and above the jaw J and bears by one edge on the front upper portion of the last-finished coil of the fabric. The other edge of said presser is secured to a bar L^6, which latter is journaled in standards L^7, rising from the table A, and arms L^8, similar to the arms L^3, extend from said bar L^6 to screws L^9, supported by the standards L^7, and by turning said screws forward the arms L^8, bars L^6, and presser L^5 are rotated, so that the latter presses harder upon the last-finished coil of the fabric. It will be seen by an inspection of the drawings that the space between the free edges of said pressers is less than the diameter of one of the coils *d′*, but said pressers or their connections are to be yielding so that when the fabric is to be shifted the coil then held by said pressers can be drawn forward between the latter, and said pressers will immediately close upon the next succeeding coil and hold it until it is also drawn with sufficient force to part the pressers. As arranged in the drawings, the coiler B will project its coils through the passage formed by the channels I^2 and J^2 nearest the hinge of the jaw J, while the coiler C projects its coil through the other of said passages. These coils are projected simultaneously, and must pass each other as they progress. In thus passing the two coils intertwine with each other and the coil projected from the coiler C also intertwines with the last-finished coil of the fabric—viz., the coil then being held against the outer edges of the jaws I and J by the pressers L and L^5. It is to be noted that the last-finished coil is always held in exactly the same position, and is not allowed to vibrate or shift about in any manner. There is, therefore, no difficulty in causing the coils projected from the coiler C to intertwine with said last-finished coil. This is emphasized by the fact that the paths of the coils projected from the coiler B and from the coiler C are made exact by channels formed by the jaws I and J. When the two coils projected from the coilers are completed, the

fabric is to be shifted in a direction transverse to the length of the jaws and the coiling-axes and in a direction from the pressers opposite the jaws a distance sufficient to bring the coil last projected by the coiler B into the grasp of the pressers and the front edges of the jaws. It is obvious from an inspection of the drawings that this cannot be done without separating the jaws. This separating is effected by turning the jaw J upward on its hinge. This might be accomplished by hand; but I have connected said jaw mechanically with the shaft F^2, so that said jaw is shifted automatically away from the jaw I and back again upon the completion of each pair of coils. To this end arms J^4 extend downward from said jaw J past the jaw I and through the table A to the periphery of the cams J^8. Said cams have each an extension j^8 of proper radial location to throw said arm J^4 outward just before the fabric is to be shifted. This movement of said arm raises said jaw. A contracting-spring J^6 may be joined by one end to a projection J^7 on the table A and by the other end to the arm J^4, so as to normally draw the arm J^4 in the proper direction to lower the jaw J. A stationary knife M (see Fig. 3) is located upon each end of the jaw I and extends into the space between said jaws, into which the coil from the adjacent coiler is projected, its cutting-edge being adjacent to the path through which the wire is projected.

M′ M′ are movable knives, one of each being arranged in opposition to one of the stationary knives M, so as to co-operate with the latter in cutting the wire. Said knives M′ move in planes at right angles to the coiling-axes, and therefore at right angles to the shaft F^2. Each such knife M′ extends downward and is connected with a rock-shaft M^2, supported in ears M^3, depending from the table. The arm M^4 extends laterally from said rock-shaft to the periphery of the cam M^5, which latter has an extension of proper radial location to lift said arm M^4 when the coiler has stopped, thus turning said rock-shaft and throwing said knife M′ toward the knife M and cutting the wire. The cams M^5 are to be so timed as to cause the knives to operate simultaneously. As both the knife M′ and the arm M^4 are at the same side of the rock-shaft M^2, their combined weight will keep the knife M′ normally away from the knife M. If so desired, this weight may be supplemented by the power of a spring.

In addition to the jaws J and I and the pressers co-operating with said jaws, I show an automatic fabric-drawing mechanism consisting of two parallel rolls N and N′. These are supported at any convenient distance from the jaws I and J and the fabric passes between them.

N^2 N^3 are intermeshing gears secured, respectively, to the rollers N and N′. These insure the movement of the rolls in unison.

N^4 is a ratchet-wheel fixed upon the shaft of the roller N′. N^5 is a dog arranged to engage said ratchet-wheel and joined to the rock-shaft N^6, and said rock-shaft has at its opposite end an arm N^7, extending upon the periphery of the cam N^8. Said cam N^8 is located upon the shaft F^2, and has in the proper radial position the extension n^8 to raise said arm N^7 and turn the rock-shaft N^6, so as to cause the dog N^7 to turn said ratchet-wheel and said rolls through the radial space covered by one of the teeth of said ratchet-wheel, and said radial space equals the radial space covered by so much of the periphery of the rolls N and N′ as must be moved to draw the fabric through the space covered by two of the coils. An expanding spring n^7 is located between the table and the arm N^7 to depress the latter and turn the rock-shaft, so as to keep the dog N^5 normally raised.

O is a wheel located upon the shaft of the roll N. Said wheel has two rows of alternately-spaced teeth O′, the radial spacing from side to side of one tooth to the next tooth in the row being equal to the radial space through which the rolls are to intermittently turn.

P is the standard which supports the rolls N and N′ at the head end of the machine, and said standard is extended upward to support a shiftable member P′, which is placed in a vertical position and hinged between its ends, so as to move in a plane at right angles to the plane of said wheel O, and the lower end of said shiftable member P′ extends downward farther than the height of the teeth O′ of said wheel O, so that it may stand in the paths of said teeth. Said standard P supports magnets Q and Q′ opposite the upper end of said shiftable member, said magnets being set apart a little farther than the thickness of an armature p', secured to the upper end of said member P′. The lower end of said member is shown in Fig. 1 as being in the path of one of the teeth O′ in the row of said teeth toward the head of the machine. In this position said member prevents the forward movement of said rolls and before said rolls can be again turned forward said member must be shifted so that its lower end will move away from the tooth which then rests against it in the other row of teeth. Then the rolls can move until a tooth O′ of the row toward the foot of the machine comes into contact with said shiftable member. This is done when the desired movement of the rolls has been effected, and the rolls are thereby prevented from moving farther than desired. This shifting of the member is accomplished by energizing the magnet Q, so that it draws the armature p' toward the head of the machine. When the member P′ is to be again shifted, the magnet Q′ is energized, so that the armature p' is drawn to said magnet Q′. It will be understood that the magnet which last shifted the member P′ may remain energized while said member is to be

shifted by the other magnet, but that it is only necessary that each of said magnets shall be energized at the time it shifts said member. Said magnets are in a double circuit, which is controlled mechanically from the shaft F^2.

R is a spur-gear located upon the shaft F^2, and R′ is a spur-gear meshing into said wheel R and has twice the circumference of the latter, so that it rotates only once while the shaft F^2 makes two rotations or completes a rotation upon the completion of every second coil.

R^2 is a bracket supporting three brushes r', r^2, and r^3 along one side of the wheel R′ near the periphery of the latter and in a line radial thereto.

R^3 and R^4 are insulated metallic plates secured to the side of the wheel R^2, to which the said brushes are applied. Said plates are at opposite sides of the center of said wheel R′, and the outer end of the plate R^3 and the inner end of the plate R^4 each extends into the path of the brush r^2, and the inner end of the plate R^3 also extends into the path of the brush r^3, so that when said plate comes beneath said brushes the gap between the latter is closed by said plate R^3. The outer end of the plate R^4 extends into the path of the brush r' as well as into the path of the brush r^2, so that when said plate R^4 passes beneath said brushes it closes the gap between said brushes r' and r^2.

T is an electric battery, and T′ is an insulated conductor running from the battery to the brush r^2.

T^2 is an insulated conductor running from the brush r' through the magnet Q to the battery, and T^3 is an insulated conductor running from the brush r^3 through the magnet Q′ to the battery.

It will be understood now that when the plate R^3 passes beneath the brushes the circuit will be closed through the magnet Q′, and the member P′ will be shifted so as to stand in the path of the set of teeth O′ toward the head of the machine, and that when the plate R^4 passes beneath the brushes the circuit will be closed through the magnet Q, and the latter will shift the member P′ into the path of the other set of teeth O′. It will be seen from an inspection of the drawings that one of the plates R^3 R^4 will be brought into contact with the brushes at the end of every half-rotation of the wheel R′, and since said wheel R′ makes a half-rotation while the shaft F^2 makes one rotation or while one pair of coils is being formed the member P′ will be shifted once to the completion of each set of coils and as often as the rolls N and N′ are to be turned.

I claim as my invention—

1. In a machine for weaving coiled-wire fabric for bed-bottoms, the combination of two coilers having parallel and non-coincident axes and having wire-forcing rolls and spiral-coil passages concentric to and at such distance from their coiler-axes and in such radial relation to said axes that if spiral lines be produced from said passages conforming to the latter in pitch and diameter of coil said lines will intertwine and be concentric to distinct axes, a support for the fabric, and suitably-timed automatic mechanism for drawing the fabric through two coil-spaces in a direction transverse to the length of the coils after the operation of both of said coilers, substantially as shown and described.

2. In a machine for weaving coiled-wire fabric, the combination of two coilers having parallel and non-coincident axes and having wire-forcing rolls and spiral-coil passages concentric to and at such distance from their coiler-axes and in such radial relation to said axes that if spiral lines be produced from said passages conforming to the latter in pitch and diameter of coil said lines will intertwine and be concentric to distinct axes, a coil-support having walls forming passages which have non-coincident parallel axes and are interreaching and are each arranged to receive one of the coils when projected from the coil-forming mechanism, and means for engaging and holding the last coil of the fabric in fixed relation to said passages, substantially as shown and described.

3. In a machine for weaving coiled-wire fabric, the combination of two coilers having parallel and non-coincident axes and having wire-forcing rolls and spiral-coil passages concentric to and at such distance from the coiler-axes and in such radial relation to said axes that if spiral lines be produced from said passages conforming to the latter in pitch and diameter of coil such lines will intertwine and be concentric to distinct axes, a coil-support having walls forming passages which have non-coincident parallel axes and are interreaching and each arranged to receive one of the coils when projected from the coil-forming mechanism, means for engaging and holding the last coil of the fabric in fixed relation to said passages, and automatic mechanism for shifting the fabric through two coil-spaces in a direction transverse to the length of the coils after each operation of said coilers, substantially as shown and described.

4. In a machine for weaving coiled-wire fabric, the combination, with mechanism adapted to simultaneously form two coils, of mechanism for guiding the coils into paths which are interreaching and axially separated and one of which intertwines with the last-finished coil, suitably-timed automatic mechanism for effecting the movement of the fabric a distance equal to two coil-spaces in a direction transverse to the length of said coils after each forming of two coils, and mechanism for effecting and maintaining the axial separation of the last-finished coil and the preceding coil of the fabric, substantially as shown and described.

5. In a machine for weaving coiled-wire fabric, the combination, with dual coil-forming mechanism, of a coil-support having walls forming two passages which have parallel and

non-coincident axes and are interreaching and in line with the coil-forming mechanism, substantially as shown and described.

6. In a machine for weaving coiled-wire fabric, the combination, with coil-forming mechanism adapted to simultaneously form two coils, of a coil-support having walls forming passages which have parallel and non-coincident axes and are interreaching and are each arranged to receive one of said coils when projected from the coil-forming mechanism, and automatic means for engaging and holding the last coil of the fabric in fixed relation to said passages, substantially as shown and described.

7. In a machine for weaving coiled-wire fabric, the combination of two coilers connected with a common source of driving power, said coilers having parallel and non-coincident axes and having wire-forcing rolls and spiral-coil passages concentric to and at such distance from their coiler-axes and in such radial relation to said axes that if spiral lines be produced from said passages conforming to the latter in pitch and diameter of coil said lines will intertwine and be concentric to distinct axes, a support for the fabric, and automatic mechanism for shifting the fabric through two coil-spaces in a direction transverse to the length of the coils after each operation of said two coilers, substantially as shown and described.

8. In a machine for weaving coiled-wire fabric, the combination of two coilers connected with a common source of driving power, said coilers having parallel and non-coincident axes and having wire-forcing rolls and spiral-coil passages concentric to and at such distance from their coiler-axes and in such radial relation to said axes that if spiral lines be produced from said passages conforming to the latter in pitch and diameter of coil said lines will intertwine and be concentric to distinct axes, a coil-support having walls forming passages which have non-coincident parallel axes and are interreaching and are each arranged to receive one of the coils when projected from the coil-forming mechanism, and automatic means for engaging and holding the last coil of the fabric in fixed relation to said passages, substantially as shown and described.

9. In a machine for weaving coiled-wire fabric, the combination of two coilers connected with a common source of driving power, said coilers having parallel and non-coincident axes and having wire-forcing rolls and spiral-coil passages concentric to and at such distance from the coiler-axes and in such radial relation to said axes that if spiral lines be produced from said passages conforming to the latter in pitch and diameter of coil said lines will intertwine and be concentric to distinct axes, a coil-support having walls forming passages which have non-coincident parallel axes and are interreaching and each arranged to receive one of the coils when projected from the coil-forming mechanism, automatic means for engaging and holding the last coil of the fabric in fixed relation to said passages, and automatic mechanism for shifting the fabric through two coil-spaces in a direction transverse to the length of the coils after each operation of said coilers, substantially as shown and described.

10. In a machine for weaving coiled-wire fabric, the combination of two coilers having parallel and non-coincident axes and having wire-forcing rolls and spiral-coil passages concentric to and at such distance from their coiler-axes and in such radial relation to said coiler-axes that if spiral lines be produced from said passages conforming to the latter in pitch and diameter of coil said lines will intertwine and be concentric to distinct axes, a support for the fabric, automatic mechanism for shifting the fabric through two coil-spaces in a direction transverse to the length of the coils after each operation of said two coilers, and automatic mechanism for simultaneously starting and stopping said coilers, substantially as shown and described.

11. In a machine for weaving coiled-wire fabric, the combination of two coilers having parallel and non-coincident axes and having wire-forcing rolls and spiral-coil passages concentric to and at such distance from their coiler-axes and in such radial relation to said axes that if spiral lines be produced from said passages conforming to the latter in pitch and diameter of coil said lines will intertwine and be concentric to distinct axes, a coil-support having walls forming passages which have non-coincident parallel axes and are interreaching and are each arranged to receive one of the coils when projected from the coil-forming mechanism, automatic means for engaging and holding the last coil of the fabric in fixed relation to said passages, and automatic mechanism for simultaneously starting and stopping said coilers, substantially as shown and described.

12. In a machine for weaving coiled-wire fabric, the combination of two coilers having parallel and non-coincident axes and having wire-forcing rolls and spiral-coil passages concentric to and at such distance from their coiler-axes and in such radial relation to said axes that if spiral lines be produced from said passages conforming to the latter in pitch and diameter of coil said lines will intertwine and be concentric to distinct axes, a coil-support having walls forming passages which have non-coincident parallel axes and are interreaching and each arranged to receive one of the coils when projected from the coil-forming mechanism, automatic means for engaging and holding the last coil of the fabric in fixed relation to said passages, automatic mechanism for shifting the fabric through two coil-spaces in a direction transverse to the length of the coils after each operation of said coilers, and mechanism for simultaneously starting and stopping said coilers, substantially as shown and described.

13. In a machine for weaving coiled-wire fabric, the combination, with dual coil-forming mechanism, of a coil-support having walls forming two passages which have parallel and non-coincident axes and are interreaching, and mechanism for simultaneously starting and stopping said coil-forming mechanism, substantially as shown and described.

14. In a machine for weaving coiled-wire fabric, the combination, with dual coil-forming mechanism adapted to simultaneously form two coils, of a coil-support having walls forming passages which have parallel and non-coincident axes and are interreaching and are each arranged to receive one of said coils when projected from the coil-forming mechanism, automatic mechanism for engaging and holding the last coil of the fabric in fixed relation to said passages, and mechanism for simultaneously starting and stopping said coil-forming mechanism, substantially as shown and described.

15. In a machine for weaving coiled-wire fabric, the combination, with a suitable support for the fabric, of two coilers having parallel and non-coincident axes and having wire-forcing rolls and spiral-coil passages concentric to and at such distance from their coiler-axes and in such radial relation to said axes that if spiral lines be produced from said passages conforming to the latter in pitch and diameter of coil said lines will intertwine and be concentric to distinct axes, automatic mechanism for shifting the fabric through two coil-spaces in a direction transverse to the length of the coils after each operation of said coilers, and mechanism for simultaneously starting and stopping said coilers, substantially as shown and described.

16. In a machine for weaving coiled-wire fabric, the combination of two coilers connected with a common source of driving power, said coilers having parallel and non-coincident axes and having wire-forcing rolls and spiral-coil passages concentric to and at such distance from their coiler-axes and in such radial relation to said axes that if spiral lines be produced from said passages conforming to the latter in pitch and diameter of coil said lines will intertwine and be concentric to distinct axes, a support for the fabric, automatic mechanism for shifting the fabric through two coil-spaces in a direction transverse to the length of the coils after each operation of said coilers, and mechanism for simultaneously starting and stopping said coilers, substantially as shown and described.

17. In a machine for weaving coiled-wire fabric, the combination of two coilers connected with a common source of driving power, said coilers having parallel and non-coincident axes and having wire-forcing rolls and spiral-coil passages concentric to and at such distance from the coiler-axes and in such radial relation to said axes that if spiral lines be produced from said passages conforming to the latter in pitch and diameter of coil said lines will intertwine and be concentric to distinct axes, a coil-support having walls forming passages which have non-coincident parallel axes and are interreaching and are each arranged to receive one of the coils when projected from the coil-forming mechanism, automatic mechanism for engaging and holding the last coil of the fabric in fixed relation to said passages, and mechanism for simultaneously starting and stopping said coilers, substantially as shown and described.

18. In a machine for weaving coiled-wire fabric, the combination of two coilers connected with a common source of driving power, said coilers having parallel and non-coincident axes and having wire-forcing rolls and spiral-coil passages concentric to and at such distance from the coiler-axes and in such radial relation to said axis that if spiral lines be produced from said passages conforming to the latter in pitch and diameter of coil said lines will intertwine and be concentric to distinct axes, a coil-support having walls forming passages which have non-coincident parallel axes and are interreaching and are each arranged to receive one of the coils when projected from the coil-forming mechanism, automatic mechanism for engaging and holding the last coil of the fabric in fixed relation to said passages, and mechanism for simultaneously starting and stopping said coilers, substantially as shown and described.

19. In a machine for weaving coiled-wire fabric, the combination of two coilers having parallel and non-coincident axes and having wire-forcing rolls and spiral-coil passages concentric to and at such distance from their coiler-axes and in such radial relation to said axes that if spiral lines be produced from said passages conforming to the latter in pitch and diameter of coil said lines will intertwine and be concentric to distinct axes, a support for the fabric, automatic mechanism for shifting the fabric through two coil-spaces in a direction transverse to the length of the coils after each operation of said coilers, and suitable cutting mechanism for severing the wire when the coils are completed, substantially as shown and described.

20. In a machine for weaving coiled-wire fabric, the combination of two coilers having parallel and non-coincident axes and having wire-forcing rolls and spiral-coil passages concentric to and at such distances from their coiler-axes and in such radial relation to said axes that if spiral lines be produced from said passages conforming to the latter in pitch and diameter of coil said lines will intertwine and be concentric to distinct axes, a coil-support having walls forming passages which have non-concentric parallel axes and are interreaching and are each arranged to receive one of the coils when projected from

the coil-forming mechanism, automatic means for engaging and holding the last coil of the fabric in fixed relation to said passages, and suitable cutting mechanism for severing the wire when the coils are completed, substantially as shown and described.

21. In a machine for weaving coiled-wire fabric, the combination of two coilers having parallel and non-coincident axes and having wire-forcing rolls and spiral-coil passages concentric to and at such distance from the coiler-axes and in such radial relation to said axes that if spiral lines be produced from said passages conforming to the latter in pitch and diameter of coil said lines will intertwine and be concentric to distinct axes, a coil-support having walls forming passages which have non-coincident parallel axes and are interreaching and each arranged to receive one of the coils when projected from the coil-forming mechanism, automatic means for engaging and holding the last coil of the fabric in fixed radial relation to said passages, automatic mechanism for shifting the fabric through two coil-spaces in a direction transverse to the length of the coils after each operation of said coilers, and suitable cutting mechanism for severing the wire when the coils are completed, substantially as shown and described.

22. In a machine for weaving coiled-wire fabric, the combination, with dual coil-forming mechanism, of a coil-support having walls forming two passages which have parallel and non-coincident axes and are interreaching and in line with the coil-forming mechanism, and suitable cutting mechanism for severing the wire when the coils are completed, substantially as shown and described.

23. In a machine for weaving coiled-wire fabric, the combination, with coil-forming mechanism adapted to simultaneously form two coils, of a coil-support having walls forming passages which have parallel and non-coincident axes and are interreaching and are each arranged to receive one of said coils when projected from the coil-forming mechanism, automatic means for engaging and holding the last coil of the fabric in fixed relation to said passages, and suitable cutting mechanism for severing the wire when the coils are completed, substantially as shown and described.

24. In a machine for weaving coiled-wire fabric, the combination of two coilers having parallel and non-coincident axes and having wire-forcing rolls and spiral-coil passages concconcentric to and at such distace from their coiler-axes and in such radial relation to said axes that if spiral lines be produced from said passages conforming to the latter in pitch and diameter of coil said lines will intertwine and be concentric to distinct axes, mechanism for simultaneously driving said coilers, and automatic mechanism for guiding the coils being formed and for controlling the lateral movement of the finished coils, substantially as shown and described.

25. In a machine for weaving coiled-wire fabric, the combination of two coilers having parallel and non-coincident axes and having wire-forcing rolls and spiral-coil passages concentric to and at such distance from their coiler-axes and in such radial relation to said axes that if spiral lines be produced from said passages conforming to the latter in pitch and diameter of coil said lines will intertwine and be concentric to distinct axes, and means for simultaneously driving said coilers, substantially as shown and described.

26. In a machine for weaving coiled-wire fabric, the combination of two coilers having parallel and non-coincident axes and having wire-forcing rolls and spiral-coil passages concentric to and at such distance from their coiler-axes and in such radial relation to said axes that if spiral lines be produced from said passages conforming to the latter in pitch and diameter of coil said lines will intertwine and be concentric to distinct axes, mechanism for simultaneously driving said coilers, automatic mechanism for guiding the coils being formed, and mechanism for holding the last-finished coil of the fabric in proper relation to the mechanism for guiding the coils being formed, substantially as shown and described.

27. In a machine for weaving coiled-wire fabric, the combination, with coil-forming mechanism having wire-forcing rolls and spiral-coil passages, of separable jaws distinct from said coil-forming mechanism and embracing the coiling-axis and channeled in line with the coil-forming mechanism, substantially as shown and described.

28. In a machine for weaving coiled-wire fabric, the combination, with coil-forming mechanism having wire-forcing rolls and spiral-coil passages, of separable jaws distinct from said coil-forming mechanism and embracing the coiling-axis and channeled in line with the coil-forming mechanism, and mechanism for drawing the fabric from said jaws, substantially as shown and described.

29. In a machine for weaving coiled-wire fabric, the combination, with mechanism for forming the coils, of jaws embracing the coiling-axis and channeled in line with the coiling mechanism, one of said jaws being connected with mechanism for automatically shifting it away from the other jaw upon the completion of the coils, substantially as shown and described.

30. In a machine for weaving coiled-wire fabric, the combination, with mechanism for forming the coils, of jaws embracing the coiling-axis and channeled in line with the coiling mechanism, one of said jaws being connected with mechanism for automatically shifting it away from the other jaw upon the completion of the coils, and mechanism for drawing the fabric from said jaws, substantially as shown and described.

31. In a machine for weaving coiled-wire fabric, the combination, with mechanism for forming the coils, of channeled separable jaws embracing the coiling-axis for receiving the coils, and pressers for engaging and holding the last coil of the fabric in proper relation to said jaws, substantially as shown and described.

32. In a machine for weaving coiled-wire fabric, the combination, with mechanism for forming the coils, of channeled separable jaws embracing the coiling-axis, pressers for engaging and holding the last coil of the fabric in proper relation to said jaws, and roller mechanism for drawing the fabric from said jaws, substantially as shown and described.

33. In a machine for weaving coiled-wire fabric, the combination, with mechanism for forming the coils, of channeled jaws embracing the coiling-axis, one of said jaws being connected with mechanism for automatically shifting it away from the other jaw upon the completion of the coils, and pressers for engaging and holding the last coil of the fabric in proper relation to said jaws, substantially as shown and described.

34. In a machine for weaving coiled-wire fabric, the combination, with mechanism for forming the coils, of channeled jaws embracing the coiling-axis, one of said jaws being connected with mechanism for automatically shifting it away from the other jaw upon the completion of the coils, pressers for engaging and holding the last coil of the fabric in proper relation to said jaws, and mechanism for drawing the fabric from said jaws, substantially as shown and described.

35. In a machine for weaving coiled-wire fabric, the combination, with mechanism for forming the coils, of guide mechanism comprising two interreaching passages for receiving and separately retaining two coils projected from the coil-forming mechanism, substantially as shown and described.

36. In a machine for weaving coiled-wire fabric, the combination, with mechanism for forming the coils, of channeled separable jaws for receiving the coils projected from the coil-forming mechanism, mechanism for holding the last-finished coil against said jaws, and mechanism for periodically separating said jaws, substantially as shown and described.

37. In a machine for weaving coiled-wire fabric, the combination, with mechanism for forming the coils, of channeled separable jaws for receiving the coils projected from the coil-forming mechanism, yielding pressers for holding the last-finished coil against said jaws, and mechanism for periodically separating said jaws, substantially as shown and described.

38. In a machine for weaving coiled-wire fabric, the combination, with mechanism for periodically shifting the fabric, of mechanism for intermittently progressing said shifting mechanism, a locking mechanism for preventing untimely or excessive progression of said shifting mechanism, and an electric circuit and its adjuncts for controlling said locking mechanism, substantially as shown and described.

39. In a machine for weaving coiled-wire fabric, the combination, with a fabric-shifting roll, of ratchet mechanism for periodically progressing said roll, a toothed wheel mounted upon the axis of said roll and made rigid therewith, a shiftable mechanism arranged to be moved into the path of the teeth of said toothed wheel, and an electric circuit and its adjuncts for shifting said shiftable mechanism, substantially as shown and described.

In testimony whereof I affix my signature, in presence of two witnesses, this 12th day of February, 1891.

CYRUS KEHR.

Witnesses:
FRANK L. STEVENS,
AMBROSE RISDON.