(Model.) 3 Sheets—Sheet 1.

W. C. MARR.

MACHINE FOR TWISTING METAL AND FORMING SPIRAL CONVEYERS.

No. 393,378. Patented Nov. 27, 1888.

Fig. 1.

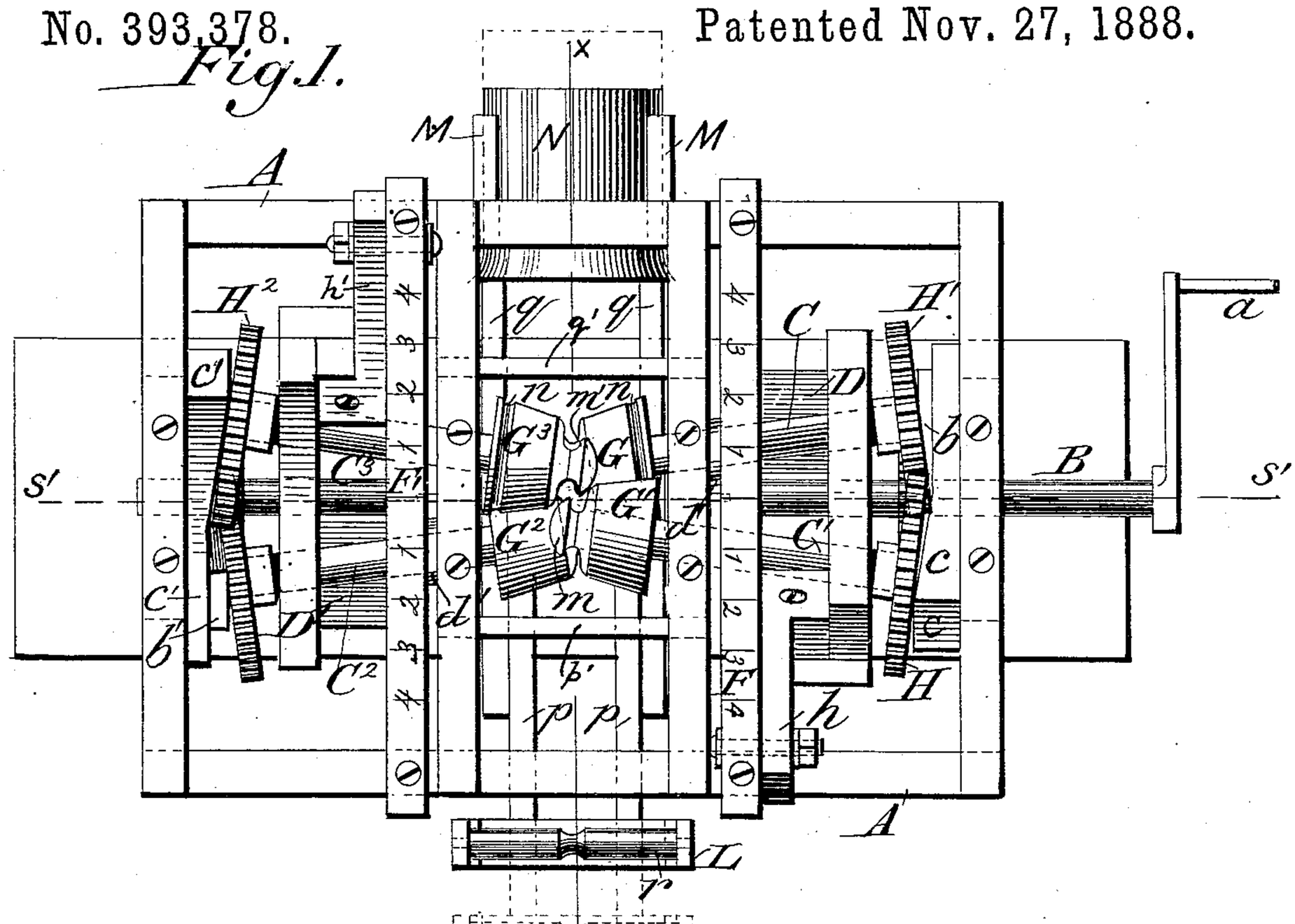
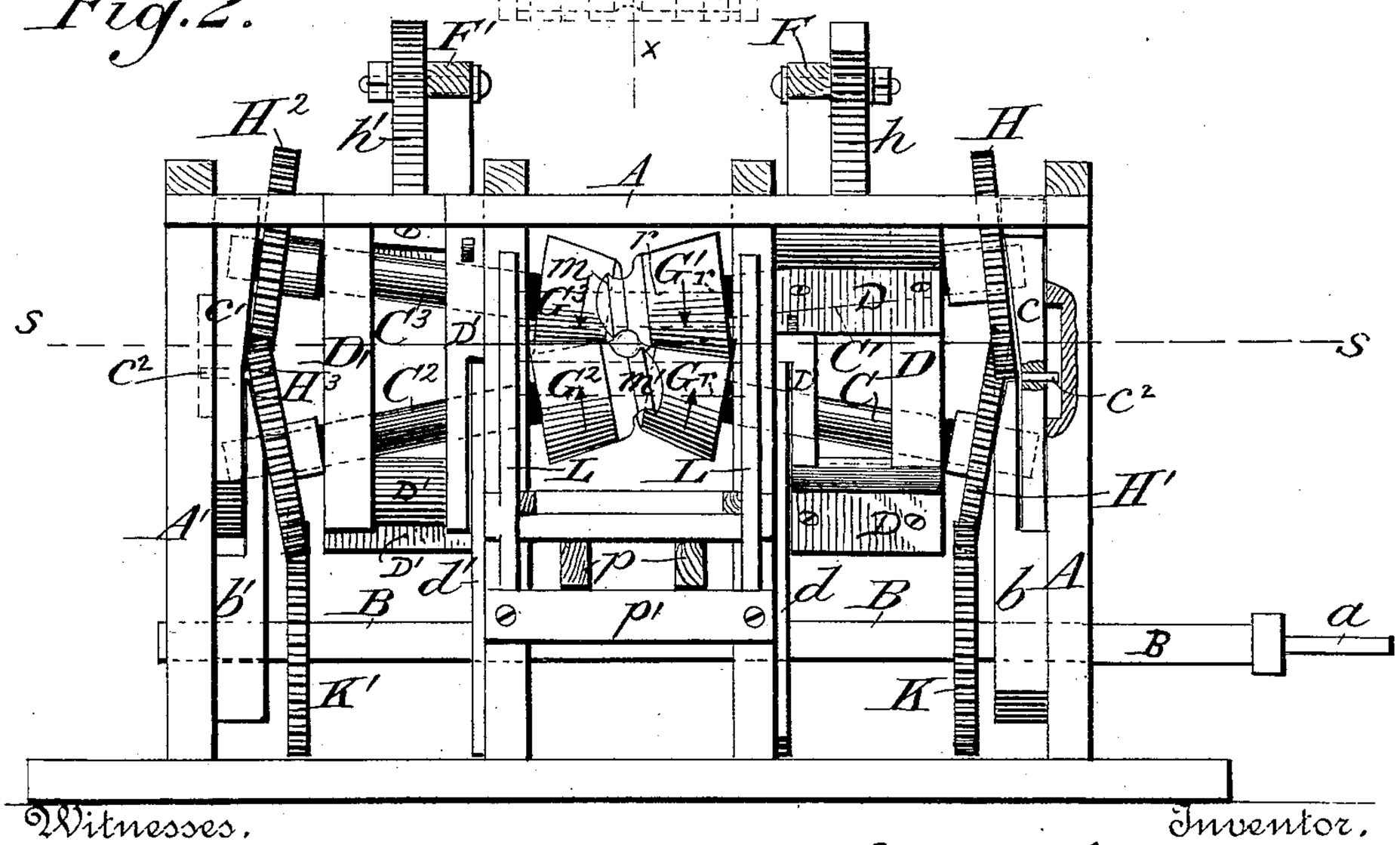


Fig. 2.



Witnesses.

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(Model.) 3 Sheets—Sheet 2.

W. C. MARR.

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Fig. 3.

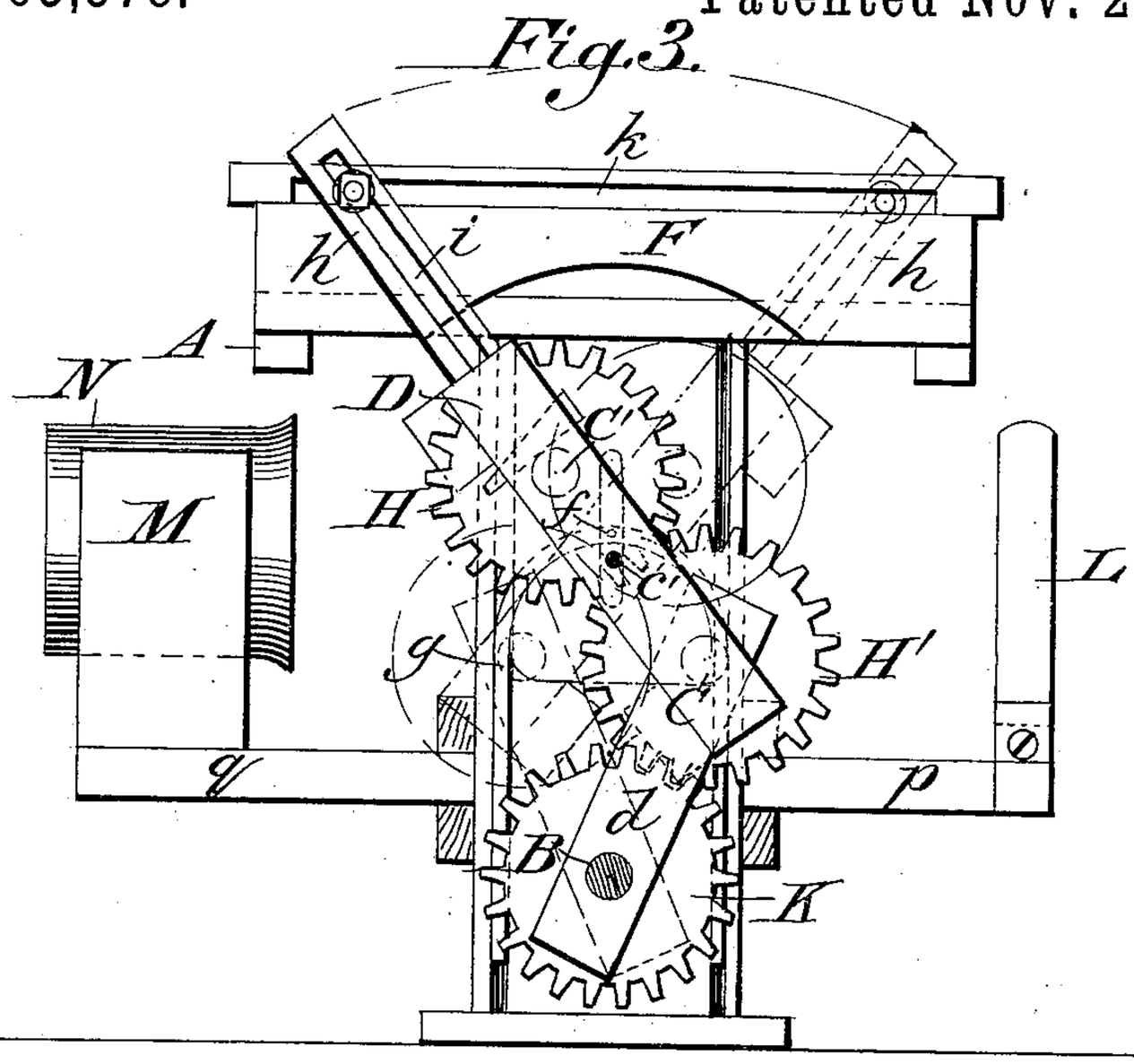
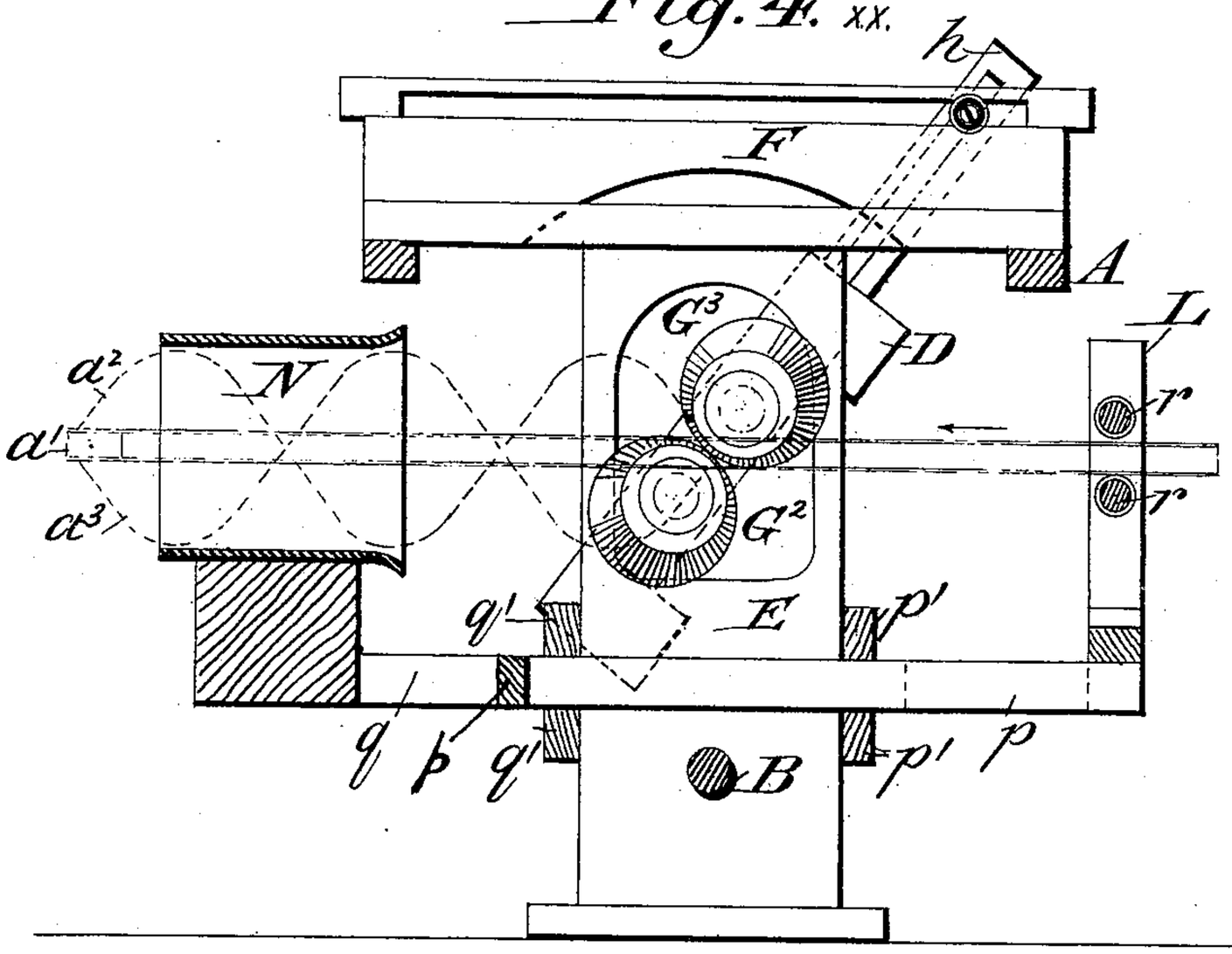


Fig. 4. x.x.



Witnesses.
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Inventor,
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(Model.) 3 Sheets—Sheet 3.

W. C. MARR.

MACHINE FOR TWISTING METAL AND FORMING SPIRAL CONVEYERS.

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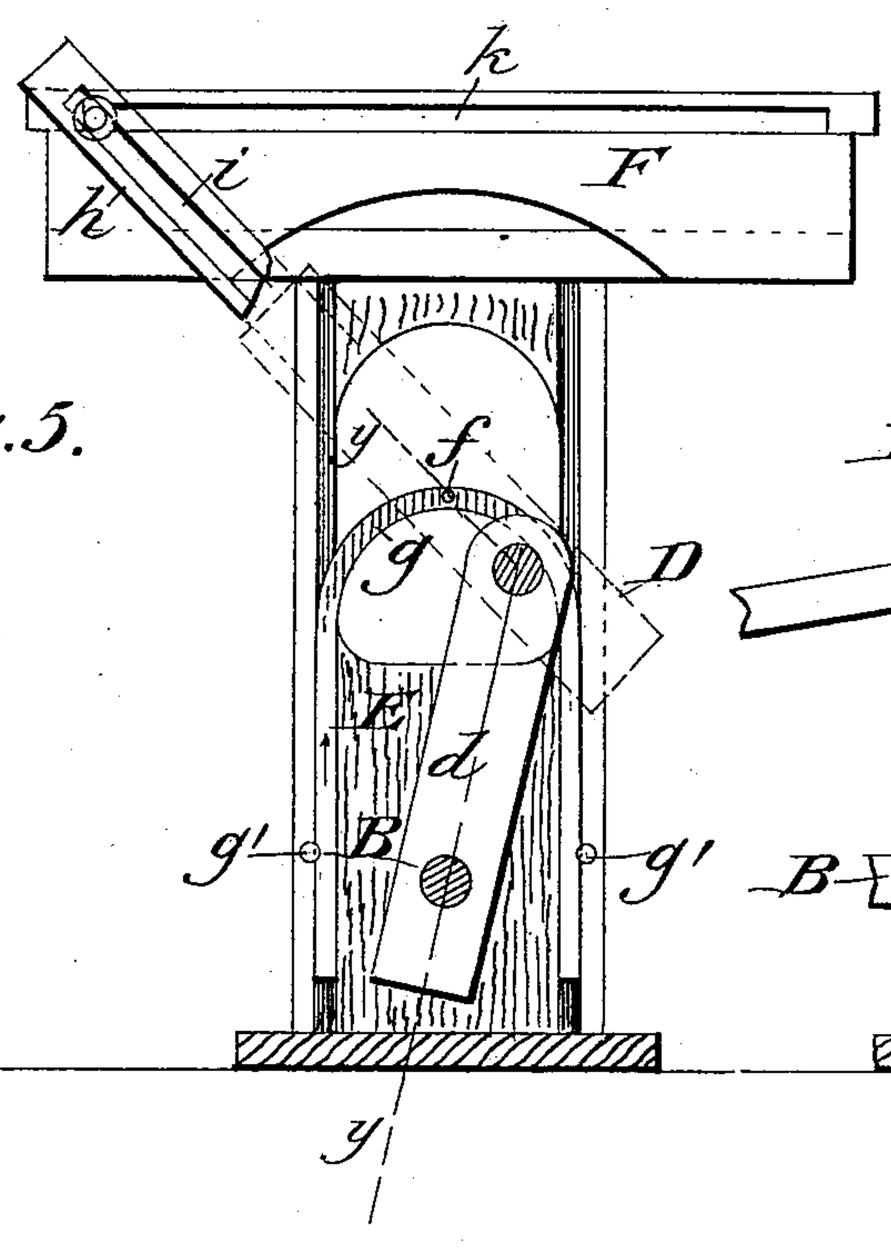


Fig. 5.

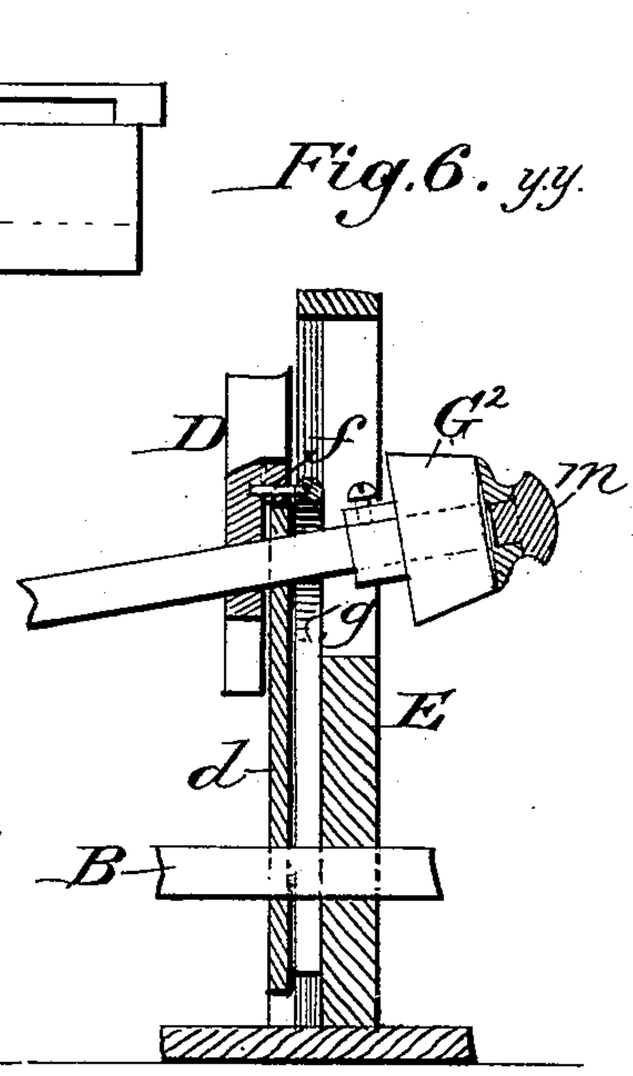
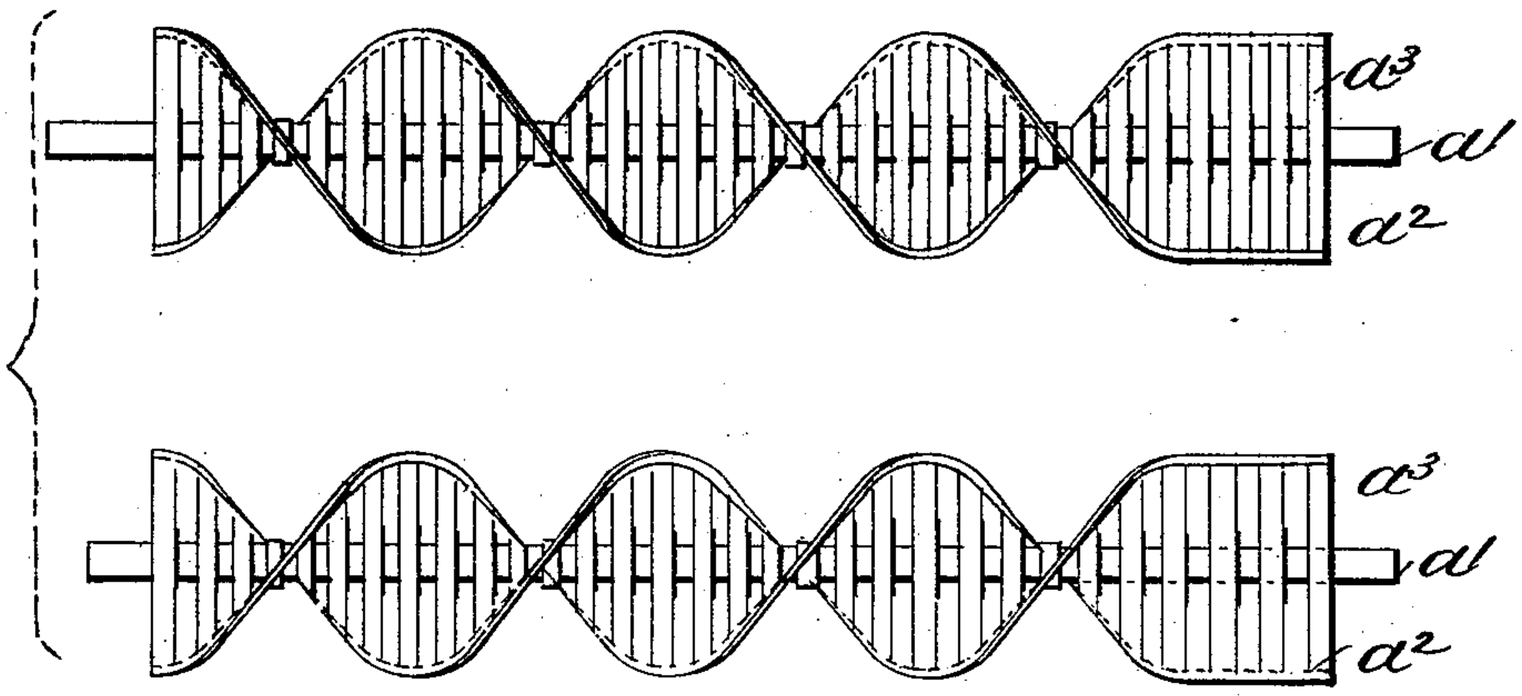


Fig. 6. y.y.

Fig. 7.



Witnesses,
F. H. Schott
C. B. Torrey,

Inventor,
W. C. Marr,
By his Attorney W. Purrington.

UNITED STATES PATENT OFFICE.

WILLIAM C. MARR, OF ONAWA, IOWA.

MACHINE FOR TWISTING METAL AND FORMING SPIRAL CONVEYERS.

SPECIFICATION forming part of Letters Patent No. 393,378, dated November 27, 1888.

Application filed November 3, 1887. Serial No. 254,162. (Model.)

To all whom it may concern:

Be it known that I, WILLIAM C. MARR, a citizen of the United States of America, residing at Onawa, in the county of Monona and State of Iowa, have invented certain new and useful Improvements in Machines for Twisting Metal and Forming Spiral Conveyers, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to machines for twisting metal and forming spiral conveyers; and it consists in certain improvements in the construction of such machines, as hereinafter described and claimed.

In the accompanying drawings, Figure 1 is a plan view of the machine. Fig. 2 is a front elevation of the same. Fig. 3 is an end view, parts being removed. Fig. 4 is a cross-section taken on line *x x* of Fig. 1. Figs. 5 and 6 illustrate certain details of the machine. Fig. 7 represents spiral conveyers with right and left twists, respectively.

A designates the frame adapted to carry the operative devices of the machine, in the main standards of which the driving-shaft B has its bearings, said shaft being provided with a crank, *a*, or with power-gearing, (not shown,) as desired. Above the driving-shaft are mounted four converging shafts, two of said shafts, C and C′, converging from one end of the frame toward the center, and two shafts, C^2 and C^3, converging from the opposite end. These shafts do not have bearings in the main frame, but in supporting-pieces, chiefly supported by the driving-shaft, as hereinafter stated.

On the shafts C and C′ is mounted a frame, D, the shafts passing through the side pieces of the frame, which is adjustably supported in an inclined position, as hereinafter stated. The outer ends of the shafts C C′ have their bearings in the movable pieces *b* and *c*, which are close to an end standard of the frame A, the piece *c* being provided with a fixed pin, which extends into a vertical slot in said standard, as indicated at c^2. The lower piece, *b*, is pivotally mounted on the driving-shaft B, and the shaft C, at its outer end, has bearing in said piece *b* at its upper end and also extends into the upper piece, *c*, at its lower end. The outer end of shaft C′ extends into the piece *c* at its upper end and has bearing therein. The inner part of shaft C has bearing in the upper end of a piece, *d*, which is pivotally mounted on the driving-shaft. The inner bearing of the shaft C′ is in the frame D, through which said shaft passes, as before stated.

Adjacent to the frame D is a yoke, *g*, the legs or bifurcations of which are loosely placed in grooves in vertical portions E of the frame, so that the yoke has a slight vertical movement in the adjustment of frame D, hereinafter mentioned, the yoke having a pivotal connection at *f* with said frame. The pivotal connection with yoke *g* on one side of the frame D, and the piece *c* with the fixed pin entering a slot in the standard at the other side, serve to retain the frame in position and prevent its lateral or irregular movement, but allow its adjustment.

The upper end of frame D has an extension or slotted arm, *h*, which is adjustably connected with a cross-piece, F, at the top of frame A by means of a bolt passing through a slot, *i*, in arm *h* and a slot, *k*, in cross-piece F, and a securing-nut. This adjustable connection allows the adjustment of frame D in its inclination as desired, and also the reversing of the frame in position from an inclination in one direction to an inclination in the opposite direction, for the purpose herein set forth.

On the inward ends of shafts C C′ are placed conical rollers G and G′, the inclined shafts holding the rollers with their surfaces adjacent to each other and with their inward ends on oblique line corresponding with the inclination of frame D. These conical rollers are adjustable longitudinally on their respective shafts, and are provided with detachable heads *m*, which are secured to their inward ends in any suitable manner. The shafts C C′ are provided with connecting gear-wheels H H′, to which motion is imparted through wheel K on the driving-shaft.

At or near the opposite end of frame A another frame, D′, is mounted on the converging shafts C^2 and C^3, said frame D′ being in construction similar to the frame D and having a slotted arm, *h*′, connected in like manner with a slotted cross-piece, F′. The shafts C^2 C^3 have

bearing-pieces b', c', and d', of like construction and arrangement of those before described in relation to shafts C C', and a yoke similar to yoke g is also in like position and has a pivotal connection with the frame D'. Headed pins or screws g' are inserted in the pieces E in position to form the external guides for the legs of the yokes, as shown in Fig. 5 of the drawings. The inward ends of said shafts have conical rollers G^2 G^3 placed thereon, the same being adjustable and provided with detachable heads m'. The shafts are also provided with connecting gear-wheels H^2 H^3, one of which engages with a wheel, K', on the driving-shaft. The said heads m m' are detachably connected with the conical rollers for the purpose of enabling the rollers to be used without the heads in twisting plates having no central shafts. The rollers and this shaft are inclined, and the rollers are made conical in shape to enable them to form and readily travel over the different surfaces of the spiral wings. The conical rollers being adjustable longitudinally on their shafts, the rollers G G' may be set closer to or farther from the rollers G^2 G^3 to adapt the machine for twisting plates of different widths and plates having smaller or larger central shafts. In forming the spiral conveyer shown in Fig. 7 the heads m m' are attached to the rollers for the purpose of swaging the metal closely around the central shaft, a'. To adjust the rollers in operative positions the frames D D' must be reversely inclined, placing the rollers G G' on one inclined plane and the rollers G^2 G^3 on a reversely-inclined plane corresponding with the inclinations of the frames. The relative positions of the conical rollers may be best described by reference to three planes—viz., a vertical plane on line x x of Fig. 1, a horizontal plane on line s s of Fig. 2, and a vertical plane on line s' s' at right angles to plane x x of Fig. 1.

Rollers G G' are on one side and rollers G^2 G^3 are on the other side of plane x x. Rollers G' G^3 are mostly above and rollers G G^2 are mostly below plane s s. When the machine is adjusted to form a right-hand spiral conveyer, the rollers G' G^2 are mostly in front and the rollers G G^3 are mostly in the rear of the plane s' s'; but when the machine is adjusted to form a left-hand spiral conveyer the positions of the rollers are reversed in relation to the last-named plane, so that G' G^2 are in the rear and G G^3 are in front of plane s' s'.

L designates an adjustable frame located on the front side of the machine, provided with guide-rollers r r, adapted to guide a metallic plate as it is introduced into the machine. This frame is attached to the front ends of horizontal bars p, arranged to slide longitudinally between the guide-bars p' and extended under the conical rollers.

M designates another frame located on the rear side of the machine, and provided with a cylindrical guide, N, adapted to receive and guide the twisted portion of a metallic plate as it passes through the machine. This frame is attached to the rear ends of the horizontal bars q, arranged to slide longitudinally between guide-bars q' q' and extended by the sides of bars p under the conical rollers. These frames are adapted to slide longitudinally for the purpose of adjusting them in the different positions required for properly supporting and guiding plates of different lengths as they are passed through the machine.

The two sets of rollers being adjusted to form a right-hand spiral conveyer, as shown in Figs. 1 and 2 of the drawings, and the driving-shaft being revolved in the required direction to rotate the rollers in the reverse directions, (shown by the arrows in Fig. 2,) one end of a plate to be twisted is inserted between the guide-rollers r and is projected forward in position for the ends of the wings to be caught between the rollers, and the plate is then fed through the machine by the reverse movements of the rollers. The plate being introduced into the machine, as above stated, the ends of the wings come in contact first with the rollers G' G^2 and afterward with the rollers G G^3, the right wing, a^2, passing under and bearing against the lower surface of roller G', and then passing over and bearing upon the upper surface of roller G, while the left wing, a^3, passes over and bears upon the upper surface of roller G^2, and then passes under and bears against the lower surface of roller G^3. Hence it will be readily seen that the forward portion of the right wing is being twisted upward by the roller G while the forward portion of the left wing is being twisted downward by the roller G^3, and that the roller G' bears downward the portion of the right wing immediately in front of roller G, while the roller G^2 bears upward the portion of the left wing immediately in front of the roller G^3, and thus the rollers G G' twist the right wing while the rollers G^2 G^3 twist the left wing. To form a left-hand conveyer the positions of the frames carrying the conical rollers are reversed, thus reversing the relative positions of the two sets of rollers, so that the end of the plate to be twisted, being inserted through the guide-rollers, comes in contact first with rollers G and G^3 and then with the rollers G' G^2.

In the operation of forming a left-hand spiral conveyer the driving-shaft and rollers are rotated in the same directions, as above described, and the functions of the conical rollers in twisting the wings of this conveyer are precisely similar to their functions in forming the right-hand conveyer.

These spiral conveyers may be formed by this machine of slitted plates such as are shown in the drawings of this application, and are fully set forth in the patent, No. 323,944, granted August 11, 1885, to W. C. and N. C. Marr; or the conveyers may be formed by this machine of solid seamless plates, as fully set forth in the patent, No. 371,609, granted to me October 18, 1887, in which last-named patent it is stated the plates may be rolled with a

central enlargement extended at the ends to form the journals; or the plates may be rolled flat, to be provided with journals formed separately and adapted to be attached to the conveyers; and it is evident that in twisting a slitted plate, a flat solid plate, or a solid plate having a central enlargement the operation of this machine will be substantially the same. Two of the rollers—one of each of the sets G G′ and G^2 G^3—are provided near their outer ends with annular grooves *n*, for the purpose of forming beads near the edges of the wings of the conveyer to strengthen the said edges. These beads are formed upon the wings by the pressure of the rollers upon the plate as it is passed in a red-hot condition through the machine in the twisting operation, the rollers being adjusted to produce upon the portions of the plate adjacent to that portion which becomes the bead sufficient pressure to reduce the thickness of those portions of the plate and press the heated metal into the grooves in a manner similar to the well-known process of rolling metallic substances. To enable the said beads to be formed with the least possible pressure and friction of the twisting-machine rollers upon the plates, the portions of the wings to be beaded may be thickened in forming the plates for this purpose in a rolling-mill, so that the pressure of the twisting-machine rollers will be mostly upon the beaded portions of the wings.

When it may be desired to dispense with the beads on the wings, plane rollers may be substituted in the places of the grooved rollers.

I claim—

1. In a metal-twisting machine, the combination of the conical rollers G G′, mounted on one side of a vertical plane upon inclined shafts which are adjustable on reversely-inclined planes, and the conical rollers G^2 G^3, mounted on the opposite side of the said vertical plane upon inclined shafts adjustable on reversely-inclined planes, and means adapted to rotate the rollers in reverse directions, whereby a metallic plate is fed between and twisted by the rollers, substantially as and for the purposes described.

2. In a metal-twisting machine, the combination, with the frames D D′, connected with mechanism whereby the frames are adjustable on reversely-inclined planes at any required inclination, of the conical rollers G G′, mounted on one side of a vertical plane upon shafts adjustable with the frame D, and the conical rollers G^2 G^3, mounted on the other side of the said vertical plane upon shafts adjustable with the frame D′, and means adapted to rotate the rollers in reverse directions, whereby a metallic plate may be fed between the rollers and twisted to the right or left at any required angle, substantially as and for the purposes described.

3. In a metal-twisting machine, the conical rollers G G′, mounted on one side of a vertical plane, and the conical rollers G^2 G^3, mounted on the opposite side of the said vertical plane, in combination with the heads *m m′*, detachably connected with the rollers, and means adapted to rotate the rollers, substantially as and for the purposes described.

4. In combination with the slotted bars F F′, attached to the frame A of a metal-twisting machine, the reversible frames D D′, provided with slotted arms *h h′*, the conical rollers G G′, mounted on one side of a vertical plane upon the shafts C C′, connected with the said frame D, the conical rollers G^2 G^3, mounted on the other side of the said vertical plane upon the shafts C^2 C^3, connected with the said frame D′, and mechanism adapted to rotate the rollers, the said slotted bars being provided with measuring-scales, and the said slotted arms being adjustably connected with the slotted bars, whereby the conical rollers may be adjusted at the different positions required for twisting the flights of spiral conveyers at different angles, substantially as and for the purposes described.

5. In combination with the slotted bars F F′, attached to the frame of a metal-twisting machine, the reversible frame D, provided with the slotted arm *h*, adjustably connected with the slotted bar F, the movable bearings *b c d*, as constructed and connected, the conical rollers G G′, mounted on the inclined shafts C C′, extended through the frame D and having their bearings in the frame and in the said movable bearings, the reversible frame D′, having the slotted arm *h′*, adjustably connected with the slotted bar F′, the movable bearings *b′ c′ d′*, as constructed and connected, the conical rollers G^2 G^3, mounted on the inclined shafts C^2 C^3, extended through frame D′ and having their bearings in the frame D′ and in the said movable bearings, and means adapted to rotate the rollers, substantially as and for the purposes described.

6. The combination, with the frame of a metal-twisting machine, of the movable frame L, located on the front side of the machine and provided with the guide-rollers *r r*, adapted to guide a metallic plate as it is introduced into the machine, and the movable frame M, placed on the rear side of the machine and provided with the cylindrical guide N, adapted to guide the twisted portion of the plate as it passes through the machine, substantially as and for the purposes described.

7. The movable bearings *b d*, mounted on the drive-shaft B, the movable piece *c*, having pivotal connection with a standard of the frame A, a vertically-reciprocating yoke, *g*, the reversible frame D, having pivotal connection with the yoke, the shafts C C′, carried by the said movable bearings and by the frame D, and the conical rollers G G′, mounted on the said shafts, in combination with the movable bearings *b′ d′*, mounted on the said drive-shaft, the movable piece *c′*, having pivotal connection with a standard of frame A, a vertically-reciprocating yoke, the reversible frame D′, having pivotal connection with the said yoke, the shafts C^2 C^3, carried by the said

movable bearings and the said frame, and the conical rollers G^2 G^3, mounted on the said shafts, substantially as and for the purposes described.

8. In a metal-twisting machine, the combination of the conical rollers G G′, mounted on one side of a vertical plane upon inclined shafts which are adjustable on reversely-inclined planes, and the conical rollers G^2 G^3, mounted on the opposite sides of the said vertical plane upon inclined shafts, adjustable on reversely-inclined planes, and means adapted to rotate the rollers in reverse directions, two of the said rollers—one on each side of the said vertical plane—being provided with annular grooves *n*, whereby thickened raised beads may be formed on the wings of a spiral conveyer as the metallic plate is passed between the rollers, substantially as and for the purposes described.

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

WILLIAM C. MARR.

Witnesses:
GEO. A. OLIVER,
A. J. MAUGHLIN.