(No Model.) 2 Sheets—Sheet 1.

P. FRASER.

MACHINE FOR KNOTTING THE ENDS OF SPIRAL SPRINGS.

No. 481,396. Patented Aug. 23, 1892.

Fig. 1.

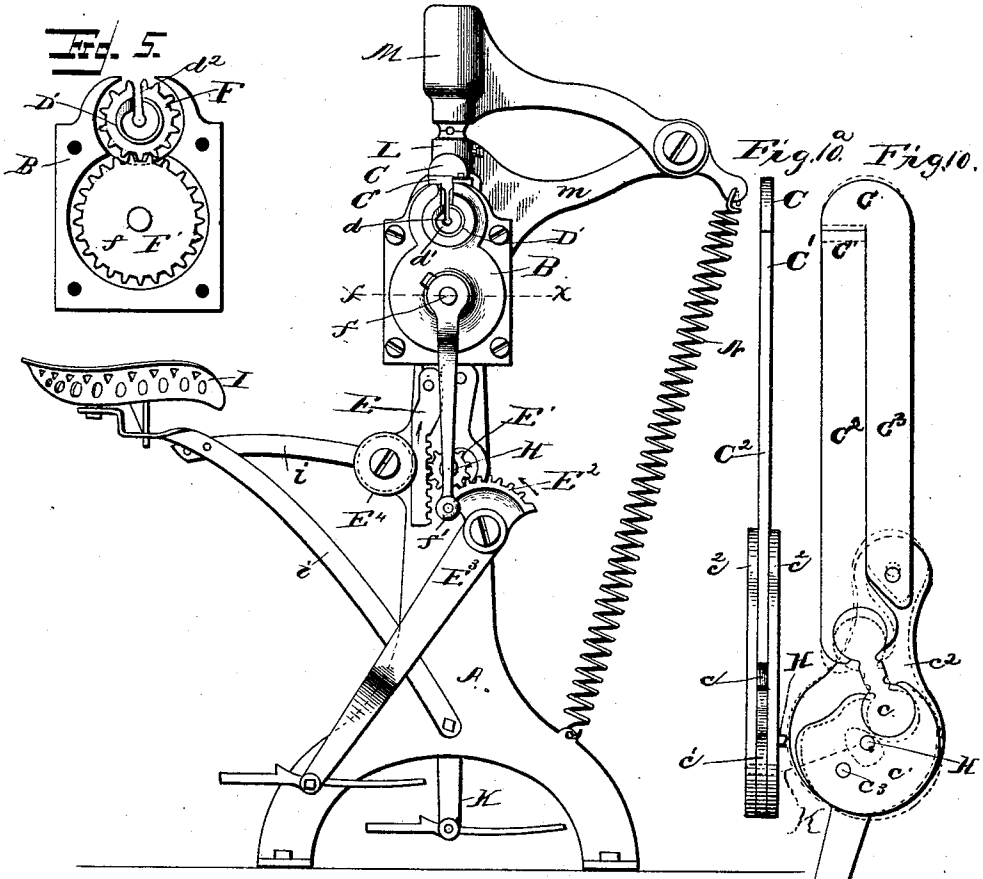
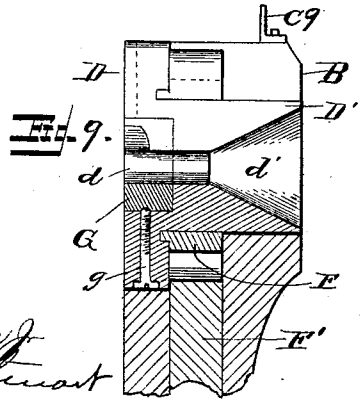


Fig. 9.



Witnesses

J. M. Fowler Jr.

Alex. J. Stuart

Inventor

Peter Fraser,

By Church & Church

His Attorneys.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

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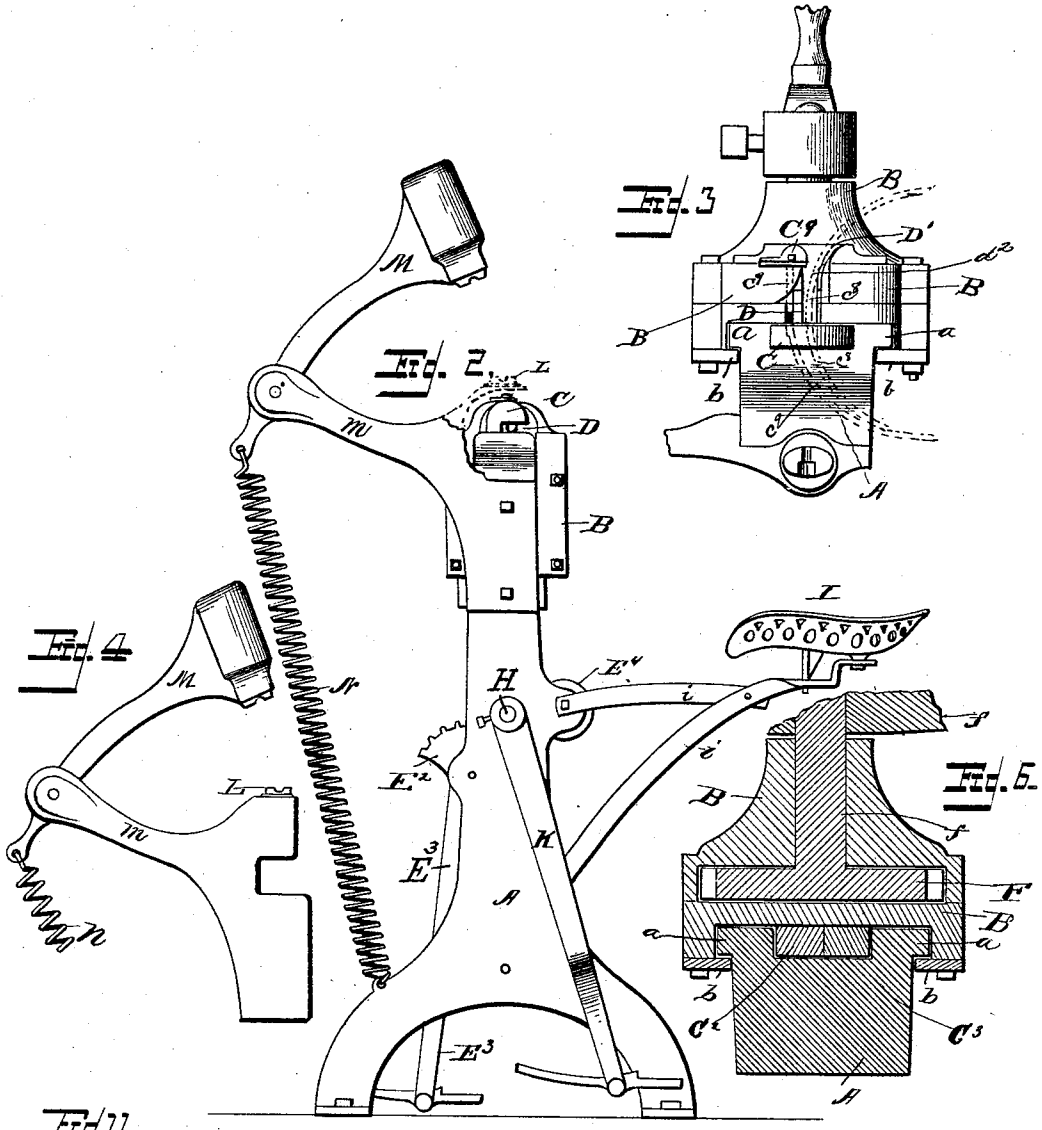

Witnesses
J. M. Fowler Jr.
Alex. F. Stewart

Inventor
Peter Fraser,
By Church & Church
His Attorneys

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

PETER FRASER, OF TRENTON, NEW JERSEY, ASSIGNOR TO THE ATLAS TACK CORPORATION, OF MASSACHUSETTS.

MACHINE FOR KNOTTING THE ENDS OF SPIRAL SPRINGS.

SPECIFICATION forming part of Letters Patent No. 481,396, dated August 23, 1892.

Application filed January 19, 1892. Serial No. 418,553. (No model.)

To all whom it may concern:

Be it known that I, PETER FRASER, of Trenton, in the county of Mercer and State of New Jersey, have invented certain new and useful Improvements in Wire-Knotting Machines; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming a part of this specification, and to the letters of reference marked thereon.

This invention has for its object to provide a machine for knotting or uniting sections of wire by twisting the same together, the machine shown being particularly adapted for knotting or securing the ends of wire springs used in upholstering, bed-bottoms, &c.

The invention consists, first, in a clamp for holding the portions to be united firmly in position, with a rotary twister-head adapted to wrap one portion around the other; secondly, in a clamp having oppositely-moving jaws in combination with said movable twister-head, whereby the knot is at once released after being formed; thirdly, it consists in moving the twister-head and clamping-jaws, or either of them, by foot-treadles, with means for rotating the twister-head when brought to operative position, and, finally, the invention consists in certain novel details of construction and combinations and arrangements of parts, all as will be hereinafter described, and pointed out particularly in the appended claims.

Referring to the accompanying drawings, Figure 1 is a side elevation of a knotter constructed in accordance with my present invention. Fig. 2 is a similar view looking at the opposite side. Fig. 3 is a top plan of the head of the machine. Fig. 4 is a side elevation of the hammer. Fig. 5 is a detail of the movable carriage for the twister-head, showing the rotating gears. Fig. 6 is a section through the same on line $x\ x$ of Fig. 1. Figs. 7 and 8 are detail perspectives of the twister-head. Fig. 9 is a section of the same. Fig. 10 is a detail elevation of the clamping-jaws and the operating mechanism therefor. Fig. 10^a is an edge view of the jaws, showing the two yokes for moving the upper jaw. Fig. 11 is a view of a knot formed by the machine.

Like letters of reference indicate the same parts in all the figures.

The machine illustrated for carrying the invention into practice is what may be termed an "upright" machine, the main frame A being screwed down or otherwise securely held in position and carries the clamping and knotting mechanisms at a convenient height to receive the sections of wire presented by the operator, who stands or is seated in front of the machine.

The clamp is provided with jaws C C′, which open at approximately the level of the upper end of the frame, and are preferably operated by mechanism, to be hereinafter specifically described, to grasp and hold the two sections of wire firmly in position, one slightly in advance of the other. Thus in knotting the ends of springs the coil lies in front, as at c^8, and the end slightly in rear thereof, as at c^9, Fig. 3, the length of the end beyond the clamp being determined by an adjustable gage C^9 on the carriage B. Besides carrying the clamp, the upper end of the frame constitutes, in effect, a guide, upon which slides the knotting-mechanism carriage B, for which purpose the frame is provided with flanges *a*, Figs. 3 and 6, which fit within recesses in the carriage formed by plates *b*.

Journaled transversely in the top of the carriage B is what I term the "twister-head," consisting, essentially, of the disk or face-plate D, working close to the flat side face of the clamping-jaws, and a tubular cylindrical extension D′, taking a bearing in the outer portion of the carriage. (See Fig. 9.) The twister-head has a central perforation *d*, beveled or flared outward evenly at *d′* in the cylindrical prolongation, and on one side a slot d^2 is formed, extending out to the periphery, and through which the strand around which the end is to be knotted may pass to the center of the twister-head, which position it occupies while the head is revolving. A groove d^3, Fig. 8, is formed in the face of the disk D at one side of the slot d^2, preferably merging into the same at the point where they both enter

the central opening d. This groove is approximately of the size of the wire operated upon, and extends across the periphery of the disk, as shown at d^4, Fig. 7. Thus it will be seen that when the two sections of wire are inserted, as in Fig. 3, one section c^8 will be in position to enter the slot d^2 as the twister-head and carriage are raised, and the end c^9 will be in position to enter the groove d^4. As the twister-head rises the end in the groove is bent up in the groove d^3 at right angles to the other section, which passes into the central opening, and it is only necessary then to rotate the head to wind the end closely and uniformly around the section in the central opening and form a knot of the character shown in Fig. 11.

Many mechanisms, it is obvious, may be employed to rotate the twister-head and to move the carriage containing the same with relation to the clamping-jaws, or for moving the latter bodily with relation to the said twister-head; but I have devised and successfully used a simple mechanism of great power and convenience, as follows: The carriage B, as before explained, is mounted to slide vertically (or transversely to the strands of wire) on the frame, and to its lower portion I connect a link E, formed into a rack-bar at the lower end, which meshes with a pinion or idler E′, journaled loosely on the frame, preferably on the shaft H, journaled in the frame. Pivoted on the frame, at one side of and below the pinion E′, is a segmental rack E^2, to which is connected (or forming a part of which is) a foot-lever E^3, in the present instance having a sole-piece for the foot, being adapted to move away from and toward the operator, who occupies a seat I, supported from the frame by arms and braces i. As the lever is moved of course the pinion is rotated and the carriage raised or lowered, as the case may be, a guide or stay-roller E^4 being employed to hold the link E in mesh with the pinion, as will be readily understood.

Immediately behind the disk D on the twister-head is mounted a gear-wheel F, with a slot between two of its teeth corresponding to the slot d^2, said wheel forming, practically, a part of the head, and below the head a larger gear-wheel F′ is mounted on a shaft f, journaled in the carriage and carrying on its outer end a crank-handle f'. The gears F F′ intermesh, as shown in Fig. 5, and when the handle is moved the twister-head is caused to rotate. I prefer to so proportion the gears and adjust the handle that one complete revolution of the handle gives the twister-head the desired number of turns, the hand always stopping at the lowest point of its travel, when it is out of the way and in position to enable the operator to exert the greatest power as the head is started. The only portion of the twister-head subjected to great wear and strain is the center of the disk including the end of the partition between the groove d^3 and the slot d^2, and this portion (lettered G in the drawings) I preferably make removable and of hardened steel, with a set-screw g for holding the same in place. Turning now to the clamp, Figs. 1, 2, 3, 6, and 10, it will be seen that the jaws C C′ are formed on the upper ends of bars C^2 C^3, fitting snugly and capable of longitudinal movement in a recess formed in the side of the frame next to the twister-head, bringing the jaws in position to grasp the wires close up to the said head. The lower ends of the bars C^2 C^3 lie in proximity to the shaft H, and the one C^3, carrying the lower jaw C′, is connected by means of the toggle-link c with the cam c', mounted rigidly on the shaft H, and the other bar C^2 is connected to the upper ends of yokes c^2, lying on each side of the cam and connected thereto by a crank pin or bearing c^3 on the side of the shaft opposite to connection of the toggle-link c. The link c, preferably, has enlarged circular or disk-shaped ends fitting corresponding bearings in the bar and cam, respectively, to move the jaw positively in both directions, and it is held in place by yokes c^2, which fit closely up on each side of the same, as shown clearly in Figs. 10 and 10^a. The yokes have enlarged openings k, through which the shaft H passes, as shown in dotted lines, Fig. 10, and in order to positively open or close the jaws simultaneously it is only necessary to turn the shaft H, as by a foot-lever K, similar in all respects to the lever E^3, before described, and adapted to be operated in the same manner. For instance, if the jaws are open, a forward movement of the foot-lever turns the shaft and its attached cam c', forcing the toggle-link and bar C^3 and jaw C′ upward and simultaneously draws the yokes c^2, bar C^2, and jaw C downward, grasping the wires firmly without moving the same from their position. Of course a single movable jaw—such as C—could be employed, permitting the jaw C′ to remain stationary; but in operation the knot is formed against one side of the jaws, and if only one were moved the knot would not clear and be so easily removed from the machine. Hence I employ the double jaws, which open and leave the knot entirely free.

An anvil L is located on one side of the frame having a die thereon, in which the knot after being formed may be placed and struck a blow with the pivotal hammer M to securely fix it in place on the other wire. The hammer is pivoted to an arm m on the frame and its weight is partially counterbalanced by a long spring N, as shown.

From the foregoing the operation will now be readily understood and is as follows: The operator first grasps the spring and places the last two coils at one end between the jaws C C′, with the end of the last coil against the gage C^9, as shown clearly in the top plan view, Fig. 3. He then brings the jaws together by pressing the foot-lever K forward, and the wires are held rigidly in such position that the strand c^8 is just above the slot d^2 in the

twister-head, and the end c^9 is just above the groove d^3 d^4 in said head. The carriage B, carrying the twister-head, is now elevated by pressing the foot-lever E forward, causing the strand c^8 to pass through the slot d^2 into the central opening d of the twister-head and the end c^9 to be bent at a right angle in the groove or channel d^3 in the face of the twister-head or disk D, the flat side of the clamping-jaws serving to retain the said end in the groove as the carriage and head move up to the position shown in Fig. 2. The end c^9 now occupying a position at right angles to the strand c^8 in the central opening of the twister-head and both the strands being held rigidly by the jaws just back of the twister-head, it is only necessary to rotate the latter, carrying the end of the wire in the groove d^2 to wrap said end closely around the strand c^8. The end of the wire, while it cannot escape laterally from the groove d^2, draws readily toward the center as it is wrapped around the strand c^8. A knot is shown in Fig. 11, and after it is formed, as just described, the carriage is lowered, the strand c^8 and knot passing out through the slot d^2 and occupying a position above the twister-head. Then the jaws are opened, the spring removed, and the knot is struck a blow with the hammer, being for this purpose placed on the anvil L. This last step is found highly desirable, particularly in spring-knotting for fine upholstering, and practice has demonstrated that a blow is much more effective than a powerful slowly-acting clamp, seeming to set the metal perfectly against any possibility of springing back.

By employing the two movable jaws instead of one two material advantages are gained: First, I am enabled to get a very much more powerful action, as the operating mechanism for each, which is in effect a toggle, is enabled to approach very close, indeed, to the central line, and at the same time the jaws may be separated widely without sacrificing the power in the least, and, secondly, by moving both jaws the knot is at once cleared and may be removed easily, a fact fully demonstrated in the actual operation of the machine, as with one movable jaw the knot hangs in the jaws, while with both jaws movable it clears at once and the operator is enabled to knot many more springs in a day's work.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a wire-knotting machine, the combination, with the clamp for holding the sections of wire to be united, of the rotary twister-head movable bodily with relation to the clamp, substantially as described.

2. In a wire-knotting machine, the combination, with the clamp for holding the sections of wire, of the twister-head mounted in a carriage movable toward and from the clamps and means for rotating said head, substantially as described.

3. In a wire-knotting machine, the combination, with the clamp for holding the sections of wire, of the twister-head, the carriage in which the twister-head is journaled movable toward and from the clamps, and the gear-wheel carried by the carriage for rotating said head, substantially as described.

4. In a wire-knotting machine, the combination, with the frame having the guideway thereon and the clamp for holding the sections of wire, of the carriage held by the guideway on the frame and movable toward and from the clamp and the rotary twister-head mounted in the carriage, substantially as described.

5. In a wire-knotting machine, the combination, with the frame having the guideway thereon and the clamp for holding the sections of wire, of the carriage held by the guideway on the frame and movable toward and from the clamp, the rotary twister-head journaled in the carriage and having the gear-wheel thereon, the gear-wheel meshing with the gear-wheel on the twister-head, and the crank-handle for rotating the same, substantially as described.

6. In a wire-knotting machine, the combination, with the frame having the guideway thereon and the clamp for holding the sections of wire, of the carriage held by the guideway on the frame and movable toward and from the clamp, the rotary twister-head journaled in the carriage and having the gear-wheel thereon, the gear-wheel of greater diameter also journaled in the carriage and meshing with the first-mentioned gear-wheel, and the crank-handle connected therewith for rotating the gears and twister-head, substantially as described.

7. In a wire-knotting machine, the combination, with the transversely-movable rotary twister-head having the central opening and a groove in its face leading into said central opening, of the relatively stationary clamp lying in proximity to the twister-head, whereby as the twister-head is moved one strand of the wire is bent at an angle in the groove and when rotated it is wrapped around the other strand of the wire, substantially as described.

8. In a wire-knotting machine, the combination, with the transversely-movable rotary twister-head having the central opening, a slot from said opening to the exterior, and the groove in the face of the head merging into the central opening, of the relatively stationary clamp against which said twister-head works, whereby as the twister-head is moved one section of wire passes into the central opening through the slot and the other section of wire is bent at right angles and wrapped around the first-named section as the head rotates, substantially as described.

9. In a wire-knotting machine, the combination, with the transversely-movable rotary twister-head having the flat face, the central opening, a slot from said opening to the exterior, and the groove in the flat face separated from the slot at the periphery of the head and merging into the same at the central

opening, of the clamping-jaws having the flat face against which the flat face of the twister-head works, substantially as described.

10. In a wire-knotting machine, the combination, with the transversely-movable rotary twister-head, of the clamp in proximity to said head having the two movable jaws, with mechanism for opening and closing said jaws simultaneously, substantially as described.

11. In a wire-knotting machine, the combination, with the frame and the twister-head mounted thereon, of the clamp having the jaws formed on bars sliding in a recess in the frame adjacent to the twister-head, with means for moving said jaws simultaneously in opposite directions, substantially as described.

12. In a wire-knotting machine, the combination, with the twister-head, of the co-operating clamping-jaws, the bar carrying one of said jaws, the operating-shaft and treadle therefor, the crank-pin moved by the shaft, and the yoke connecting said pin with the bar carrying the clamping-jaw, substantially as described.

13. In a wire-knotting machine, the combination, with the twister-head, of the oppositely-arranged clamping-jaws and bars carrying the same, the operating-shaft therefor carrying the cam, and connections between the respective bars and cam on opposite sides of the shaft, whereby the jaws are moved in opposite directions as the shaft is rotated, substantially as described.

14. In a wire-knotting machine, the combination, with the twister-head, of the oppositely-arranged clamping-jaws and bars on which they are mounted, the operating-shaft therefor, the cam secured rigidly on said shaft, the yokes connected to one of said bars and to the cam at one side of the shaft, and the toggle-link connecting the other bar and the opposite side of the cam, substantially as described.

15. In a wire-knotting machine, the combination, with the twister-head, of the oppositely-arranged clamping-jaws and bars on which they are mounted, the operating-shaft therefor, the cam secured rigidly on said shaft, the toggle-link uniting the cam and one bar at one side of the shaft, and the yokes arranged on each side of the cam and toggle-link and connecting the other bar with the cam on the opposite side of the shaft, substantially as described.

16. In a wire-knotting machine, the combination, with the clamp and the twister-head journaled in a movable carriage, of the link connected to the carriage, the idler-wheel engaging said link, and the foot-treadle co-operating with the wheel to rotate the same and move the carriage, substantially as described.

17. In a wire-knotting machine, the combination, with the clamp, the twister-head, and the movable carriage in which the twister-head is journaled, of the link connected to the carriage and having its lower portion formed into a rack-bar, the idler-wheel meshing with said rack-bar, the foot-lever having the segmental rack meshing with the idler, and the guide-roller for holding the link in gear, substantially as described.

18. In a wire-twisting machine, the combination, with the clamp, the rotary twister-head, and the movable carriage in which the twister-head is journaled, of the gage for determining the length of wire to be inserted, mounted on the movable carriage, substantially as described.

19. In a wire-twisting machine, the combination, with the clamp having the flat face, of the rotary twister-head movable transversely with relation to the clamp, having the groove in its face, journaled with said face in proximity to the flat face of the clamp, whereby by the transverse movement the wire held by the clamp may be bent at an angle in the groove, substantially as described.

20. In a wire-twisting machine, the combination, with the clamp having the flat face, of the rotary twister-head movable transversely with relation to the clamp, having the central opening and slot, and the groove in its face, said head being journaled with its face in proximity to the flat face of the clamp, whereby by the transverse movement the wire held by the clamp may be bent at an angle in the groove, substantially as described.

PETER FRASER.

Witnesses:
THOMAS DURANT,
J. M. FOWLER, Jr.