No. 725,723. PATENTED APR. 21, 1903.

F. KIRK.

SPRING COILING MACHINE.

APPLICATION FILED OCT. 18, 1902.

NO MODEL. 3 SHEETS—SHEET 1.

FIG. 1.

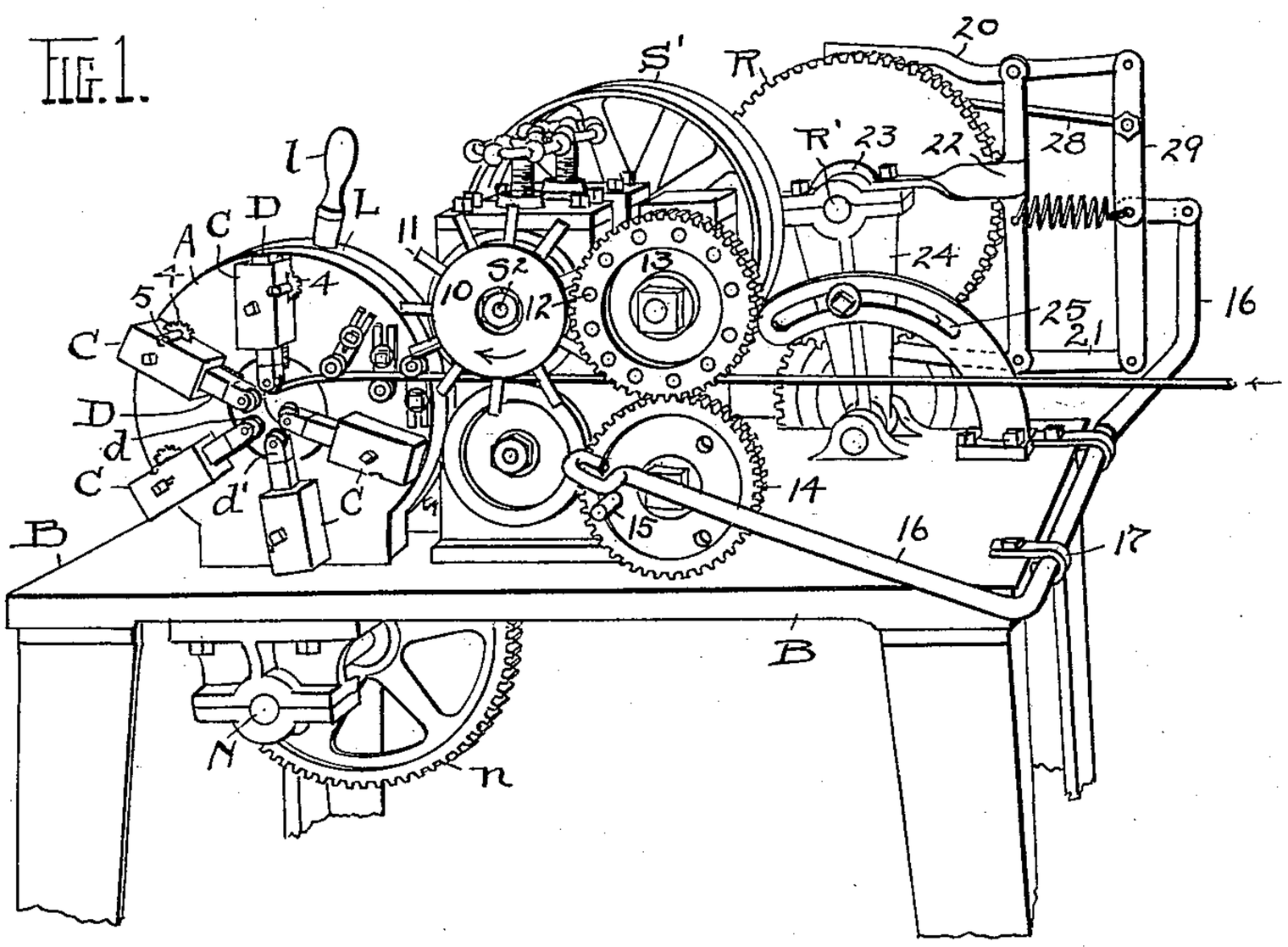
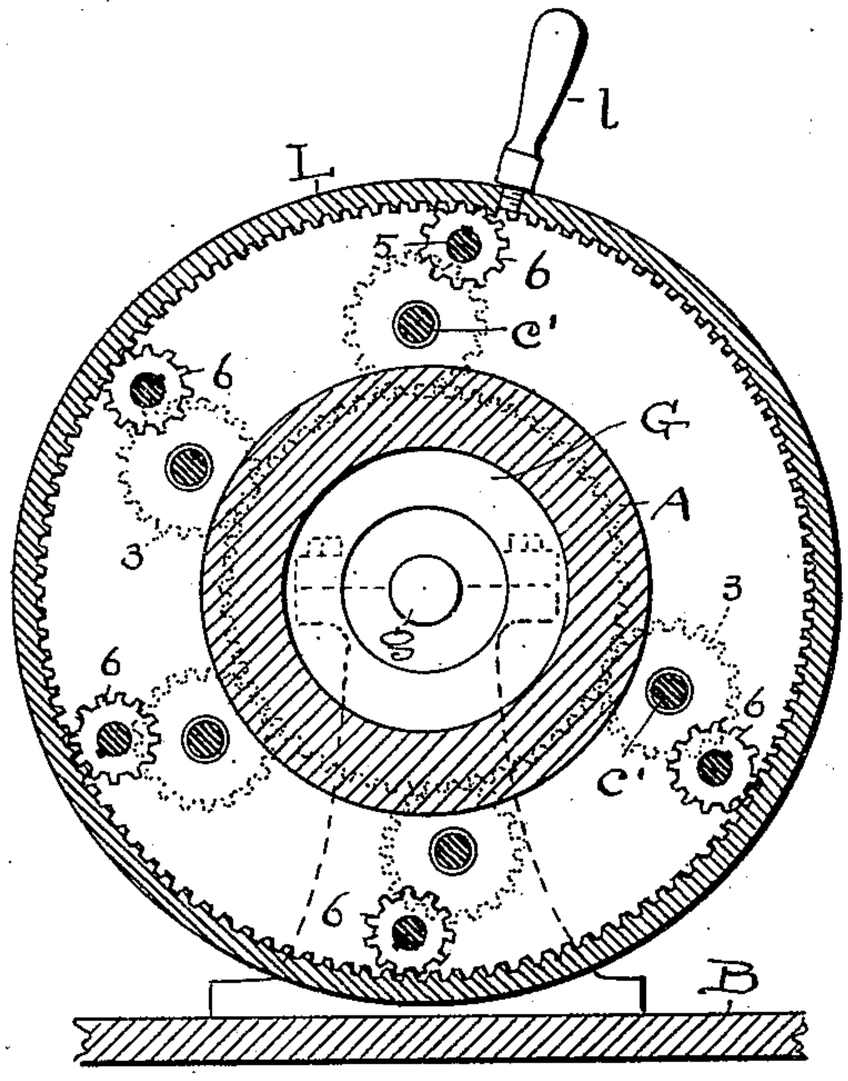


FIG. 2.



ATTEST.

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FIG. 3.

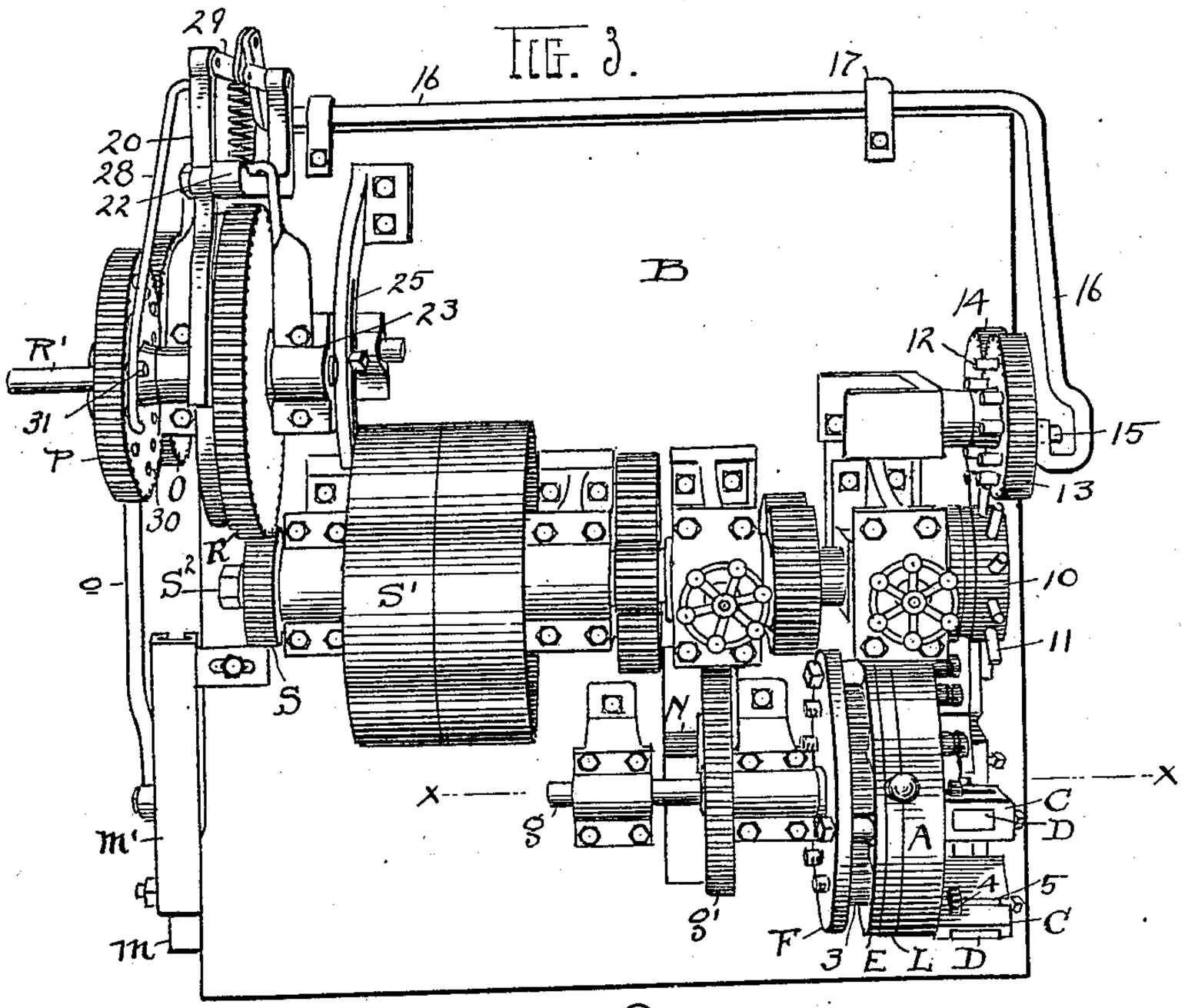
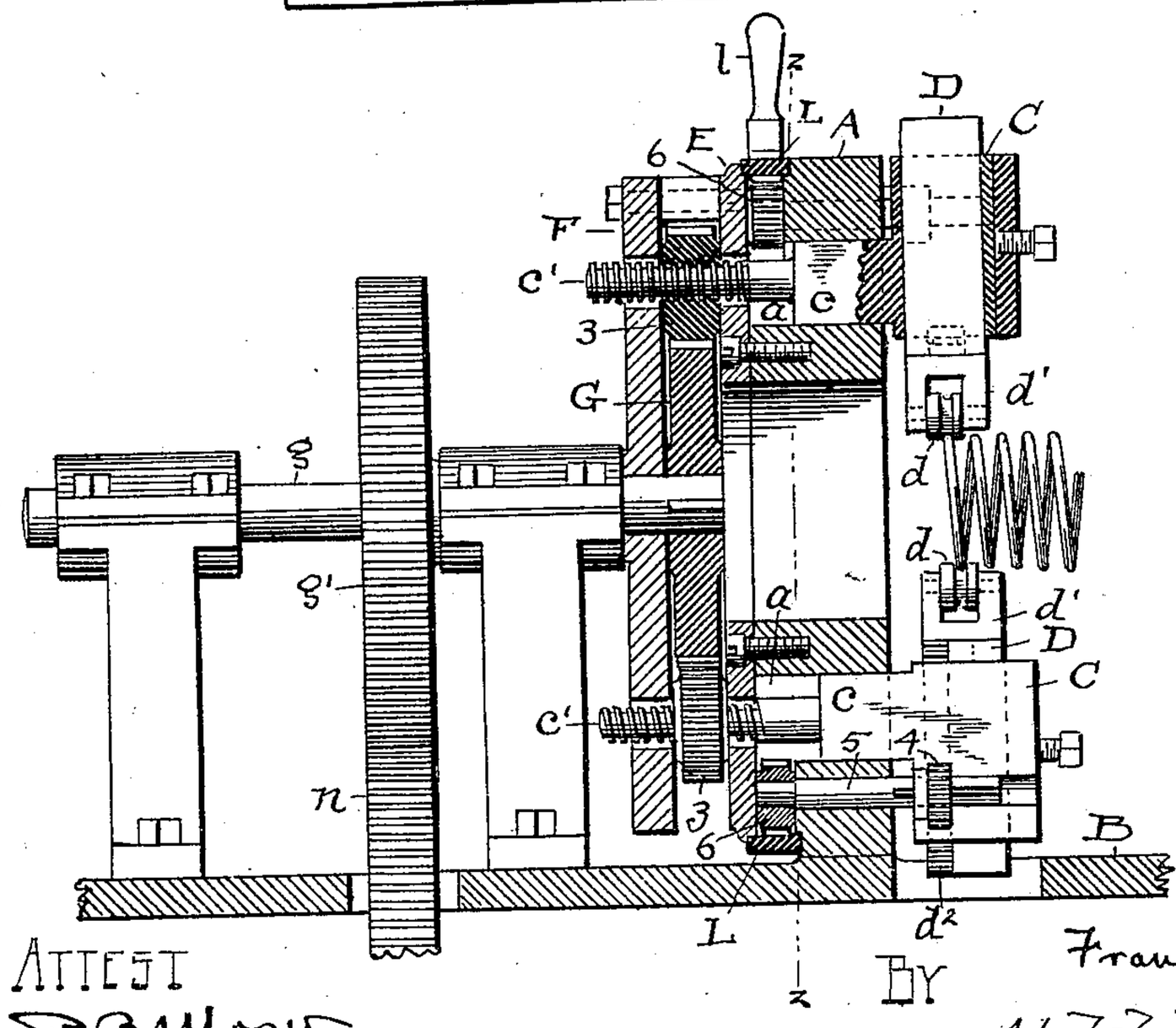


FIG. 4.



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NO MODEL. 3 SHEETS—SHEET 3.

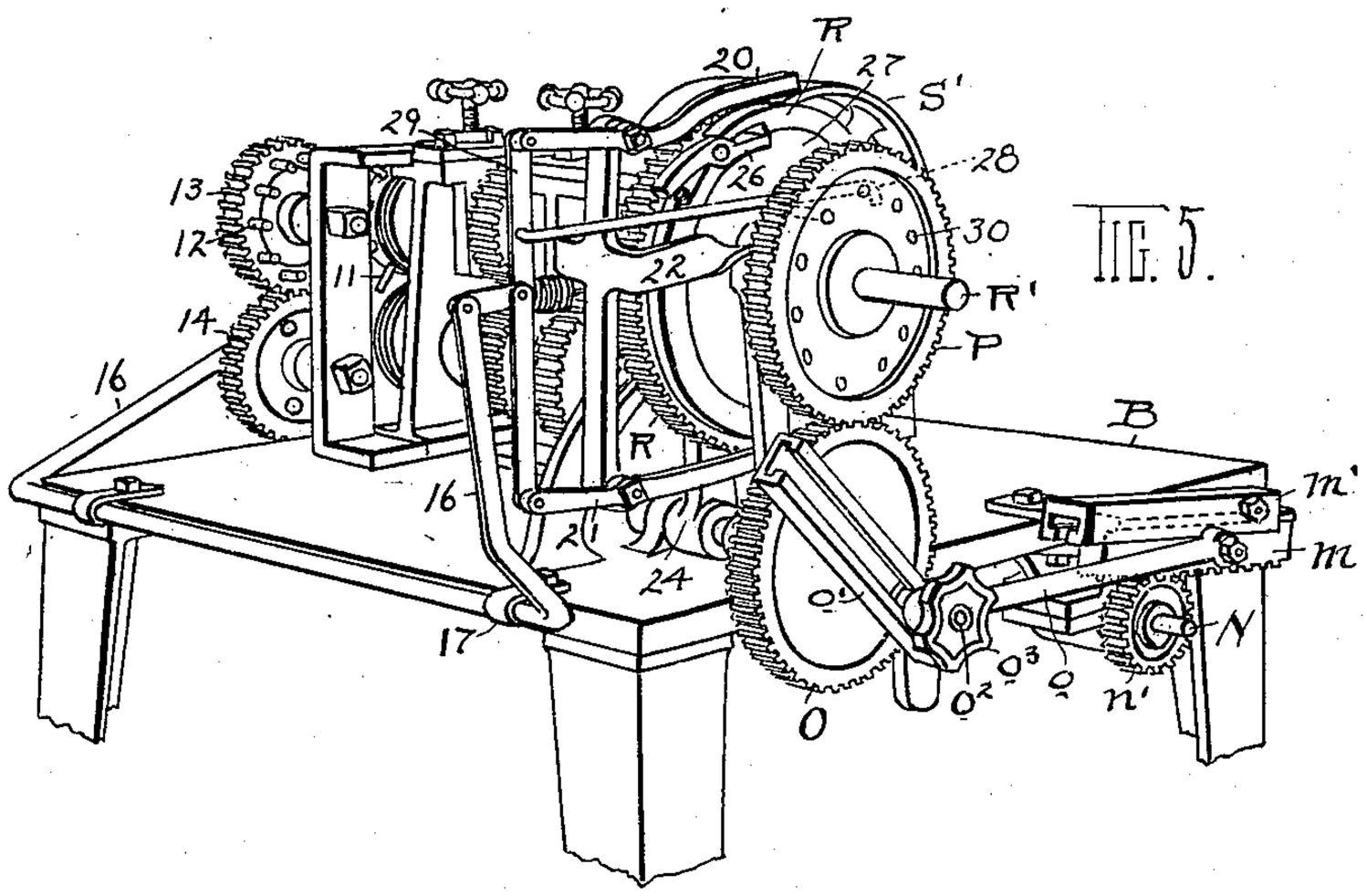


FIG. 5.

FIG. 6.

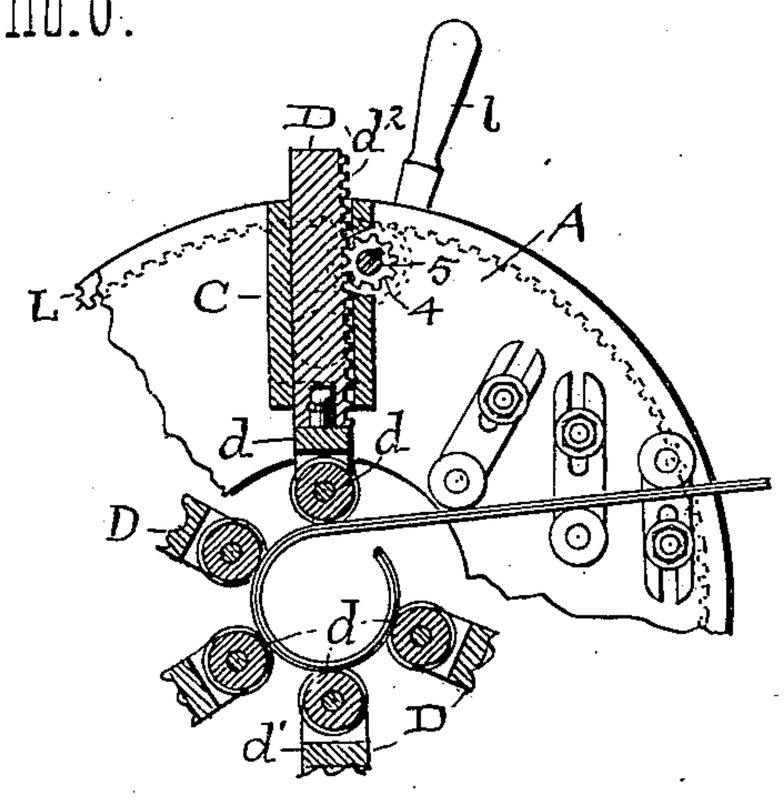
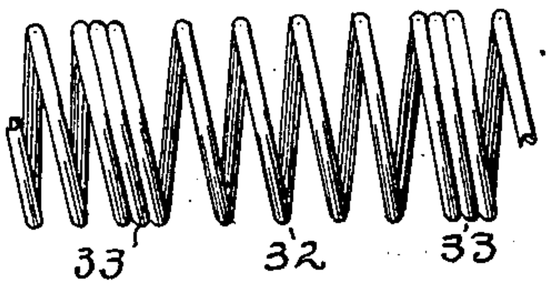


FIG. 7.



ATTEST

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A. N. Moser.

INVENTOR

Frank Kirk

BY H. T. Fisher

ATTY

UNITED STATES PATENT OFFICE.

FRANK KIRK, OF AKRON, OHIO.

SPRING-COILING MACHINE.

SPECIFICATION forming part of Letters Patent No. 725,723, dated April 21, 1903.

Application filed October 18, 1902. Serial No. 127,880. (No model.)

To all whom it may concern:

Be it known that I, FRANK KIRK, a citizen of the United States, residing at Akron, in the county of Summit and State of Ohio, have invented certain new and useful Improvements in Spring-Coiling Machines; and I do declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to spring-coiling machines; and the object of the invention is to provide a machine which is especially adapted to coil wire into springs of varying pitch and diameter and wherein both the pitch and the diameter of the coil may be automatically controlled, substantially as shown and described, and particularly pointed out in the claims.

In the accompanying drawings, Figure 1 is a perspective elevation of the machine. Fig. 2 is a cross-section of a gear-ring and parts within on a line corresponding to line Z Z, Fig. 4, and showing the means for adjusting the spring-coiling heads to determine the width of coil. Fig. 3 is a plan view of the machine; and Fig. 4 is a section on line X X, Fig. 3. Fig. 5 is a rear and end elevation of the machine in perspective; and Fig. 6 shows a portion of the gear-ring seen in Fig. 2 and a section of one of the spring-coiling heads, as hereinafter fully described. Fig. 7 is a side view of a spring as produced by my machine.

The real work of the machine is done by the mechanism shown for the most part in Figs. 2, 4, and 6, which comprises the coiling mechanism proper, while the mass of gears and other parts shown as associated therewith have to do chiefly with bringing the power to the spring-coiling mechanism and the adjusting of parts, as will be seen in the further description.

Referring, therefore, especially to Figs. 4 and 6, A represents a substantially ring-shaped upright base which is firmly supported on the top of the strong rigid main frame B and is provided with a series of openings *a*, extending through from side to side and arranged in a true circle equidistant apart and about the large opening through the middle of the base, as there is in this instance, but not necessarily.

Upon base A and in or through the holes *a* therein I mount the series of heads C, which support the wire or spring coiling plungers D. The said heads have shanks *c*, adapted to occupy and fill the holes *a* more or less completely—say, as shown, Fig. 4—and the said shanks are prolonged or extended by the integral screw-threaded stems *c'*, which project rearward through base A and plate E on its rear end and the plate F to the rear of plate E.

The stems *c'* on heads C have each a threaded pinion 3, mounted on the threaded portion thereof and which pinions are confined between plates E and F. Meshing with all these pinions is a gear G on shaft *g*, and said gear comes between plates E and F on said shaft, as shown, and is driven thereby through power connections hereinafter traced.

The stems *c'*, carrying pinions 3, are provided with gradually-increasing pitch from the first upward, and the measure of the increasing pitch is determined by the pitch of coil wanted in the spring, and the pitch may be greater or less at pleasure. For this reason the same machine may have interchangeable sets of heads C, having spindles of largely-varying pitch. In this machine there is a series of five such pinions, which are sufficient in all ordinary sizes of coil. So it occurs when gear G is rotated and is in mesh with the said series of pinions that each successive pinion from the first will force the stem on which it is mounted and the head C, actuated by said stem, forward in proportion to the pitch of the stem, and the gradations run up gradually from the first to the last of the five pinions used. If there were more, the same principle would hold good. Thus it will also be seen that the shanks *c* of heads C have a limited sliding movement in base A, and they are run back again by the same mechanism when reversed, as will also be hereinafter more fully described.

In the heads C are radially mounted so-called "plungers" D, adapted to slide in said heads and to be fed toward the center when it is desired to diminish the coil of the wire being formed and to slide or work in the op-

posite direction when the coil is being enlarged. When the diameter of the coil is to remain the same, the plungers are held stationary. Sheaves or grooved rollers d are mounted in horizontally-rotatable bearings d' on the inner ends of plungers D. Thus said sheaves automatically adapt themselves to the pitch of the wire as the coil is formed between them and passes thence away, as seen in Fig. 4. The said plungers are each and all provided with racks d^2 on their edges, which are engaged by pinions 4 on the long rods or shafts 5, Fig. 4, which project from plate E through base A into a grooved hole or bore in head C, and the said pinions 4 are set into recesses in heads C, Fig. 6, and are slidingly fixed to rotate with said rods or shafts 5. Other pinions 6 are placed on said rods 5 in recesses in the rear of base A, and rods 5 are splined for these pinions; but pinions 4 may be drawn outward axially as heads C are carried outward more or less and still hold said pinions in operative relation. All said pinions 6 are engaged by a ring or band-shaped gear L, which encircles the outer edge of base A and rests between said base and plate E upon ledges on both said parts, so as to be freely rotatable around the same, and all the pinions 6 are in mesh with this ring-gear. Said gear has a handle l, by which the operator controls the rotation of the gear and the consequent rotation of rods 5 and pinions 4, through which plungers D are controlled. The operator can, therefore, personally control the diameter of the coil and make it large or small, as he pleases, within the limits of the machine. It will thus be seen that the mechanism for controlling the pitch of the coil is automatically operated in this machine, while that which controls diameters is by hand; but both may be automatic or both by hand, as may be found desirable. Now returning to shaft g, carrying gear G, Fig. 4, and through which power is transmitted, the said shaft is driven by gear n in mesh with gear g' on shaft g, and gear n is carried on shaft N on the under side of table B, Fig. 5. On this shaft is a pinion n', which engages a rack-bar m over the same and is slidable back and forth in a guide m,' fixed at the edge of table B. A connecting-rod o runs from the guide-bar o', which lies across the center of gear O and has a wrist-pin o^2 engaged adjustably in said guide-bar, whereby more or less eccentricity of action and length of throw can be obtained for rack-bar m, as the machine may require and as also will be seen. A thumb-screw o^3 or its equivalent serves to fix pin o^2 here or there in guide o'. Gear P on shaft R′ meshes with gear O, and gear R on shaft R′ is meshed by pinion S on the power-shaft carrying band-wheels S′, to which the power-belts are applied. This provides a line of gear and other mechanism for communicating the power to shaft g and gear G, as well as for other uses, and the speed and measure of power transmitted is easily controlled by fixing pin o^2 and its bearing-guide o' nearer to or farther from the center of gear O. The said mechanism is automatically thrown in and out at stated times from the other end of power-shaft S^2, as seen most clearly in Fig. 1, and the means for accomplishing these changes comprises a gear 10 on shaft S^2, having fingers or pins 11, working on pins 12, extending laterally from the side of gear-wheel 13, Fig. 3. This wheel meshes with gear 14, Fig. 1, and gear 14 has a series of holes adapted to receive a pin 15, projecting outward therefrom, adapted to engage and operate an arm or lever 16, bent at right angles, as shown, and confined in its rear portion by keepers 17 on the main frame. This lever is extended to an upright double pivoted or linked frame, which controls two pawls 20 and 21, respectively mounted upon an arm 22, bolted to bearing 23 for shaft R′. Bearing 23 is at the upper end of an upright pivoted arm 24, which is held in a fixed position by means of a bolt passing through slot 25 in a curved projection mounted rigidly upon frame B. When said bolt is released, arm 24 and the shaft and gears carried thereby can be thrown to one side, and thus place gear R and pinion S out of mesh. This is done whenever a continuous coil of a fixed pitch is desired. One or more pawls 26 are shown mounted on the face at the edge of gear-wheel R, and these pawls are thrown down by pawls 20 and 21 to disconnect gear R, which is free on shaft R′, from the ratchet-disk 27, which is fastened to said shaft. A spring under one end of pawls 26 normally keeps said pawls in engagement with the shoulders in the edge of ratchet-disk 27; but when pawls 20 and 21 are not actuated through lever 16 said pawls press the free end of pawls 26 inward and release ratchet-disk 27, thereby stopping the movement of the train of gears leading to the pitch-changing mechanism in base A. The change of pitch in the coil is more or less as governed by the length of time pawls 20 and 21 are held out of engagement with pawls 26, and this is normally fixed by pin 15 on gear 14, which strikes the end of arm 16; but as a further means of prolonging the time to give an extreme acute pitch and to cause the wire coil to have its successive coils lie close against each other at some length I provide an L-shaped or hook arm 28, which is pivotally connected with link 29 of the pawl-actuating link-frame and which extends opposite the face of gear-wheel P. A series of holes 30 are concentrically arranged in the face of gear P, and a pin or series of pins 31 are inserted in said holes to engage arm 28, and thereby operate to pull link 29 and raise pawls 20 to permit pawls 26 to remain engaged with wheel 27. When not in use, said arm is thrown back or to one side of pin 31.

In Fig. 7 I show a section of a coil wherein the convolutions are of two different pitches, one of them being open or separated and the

other close together. This provides a spring having an open central coil 32 with closed ends 33. Of course the coil as turned out by the machine is substantially endless and must be cut into lengths of the desired size. This cutting is made at the closed ends 33, and the object is to obtain a spring with closed ends—that is, with the wire coils at each end lying flat and close upon each other.

Any suitable mechanism may be provided to give the wire the force fed to the grooved forming members. I do not limit myself to any particular style or form of such feeding mechanism, and grooved rollers or the like which have commonly been used heretofore may also be used herein.

What I claim is—

1. In a spring-coiling machine, a series of radially-disposed coil-forming plungers, and means to move said plungers laterally to change the pitch of the coil, substantially as shown.

2. In a spring-coiling machine, a series of radially-disposed adjustable plungers, means to adjust said plungers for varying diameters of springs, and means to adjust said plungers laterally for varying pitches of springs, substantially as described.

3. In a spring-coiling machine, a series of radially-disposed plungers and bearing members axially and rotatably mounted upon their inner ends and having grooved formers for the spring, substantially as described.

4. In a spring-coiling machine, a set of radially-disposed plungers and horizontally-rotatable bearings at the inner ends of said plungers, and forming-rollers mounted in said bearings, substantially as described.

5. In a spring-coiling machine, a set of coil-forming plungers, laterally-moving heads supporting said plungers and provided with threaded stems, threaded pinions upon said stems, and gearing to rotate said pinions and thereby move said heads laterally to change the pitch of the spring-coil, substantially as shown.

6. In a spring-coiling machine, a set of coil-forming plungers having laterally-movable supporting-heads provided with threaded extensions of different pitch for each plunger, threaded pinions for each extension, and means to rotate said pinions, substantially as shown.

7. In a spring-coiling machine, a series of adjustable forming-plungers adapted to make springs of varying diameter and pitch, a movable supporting-head for each plunger, and gearing to separately move said heads and plungers, substantially as shown.

8. In a spring-coiling machine a series of radially-disposed adjustable plungers, a supporting-head for each plunger, a rack on each plunger, and a set of pinions and gear to adjust said plungers for varying diameters of springs, substantially as shown.

9. In a spring-coiling machine, a series of radially-disposed coil-forming plungers having laterally-movable supporting-heads, mechanism and gearing to move said heads back and forth, and means to automatically control and time said mechanism, substantially as shown.

10. In a spring-coiling machine, a series of radially-disposed coil-forming plungers, means to support and means to move said plungers back and forth laterally to form varying pitches of coil-springs, and mechanism to automatically control the position of the plungers whereby springs with convolutions of different pitches are formed successively and continuously, substantially as shown.

Witness my hand to the foregoing specification this 30th day of September, 1902.

FRANK KIRK.

Witnesses:
R. B. MOSER,
H. T. FISHER.