No. 791,752. PATENTED JUNE 6, 1905.

F. H. DANIELS & C. S. MARSHALL.

MANUFACTURE OF SPRINGS.

APPLICATION FILED NOV. 27, 1903.

2 SHEETS—SHEET 1

Fig. 1.

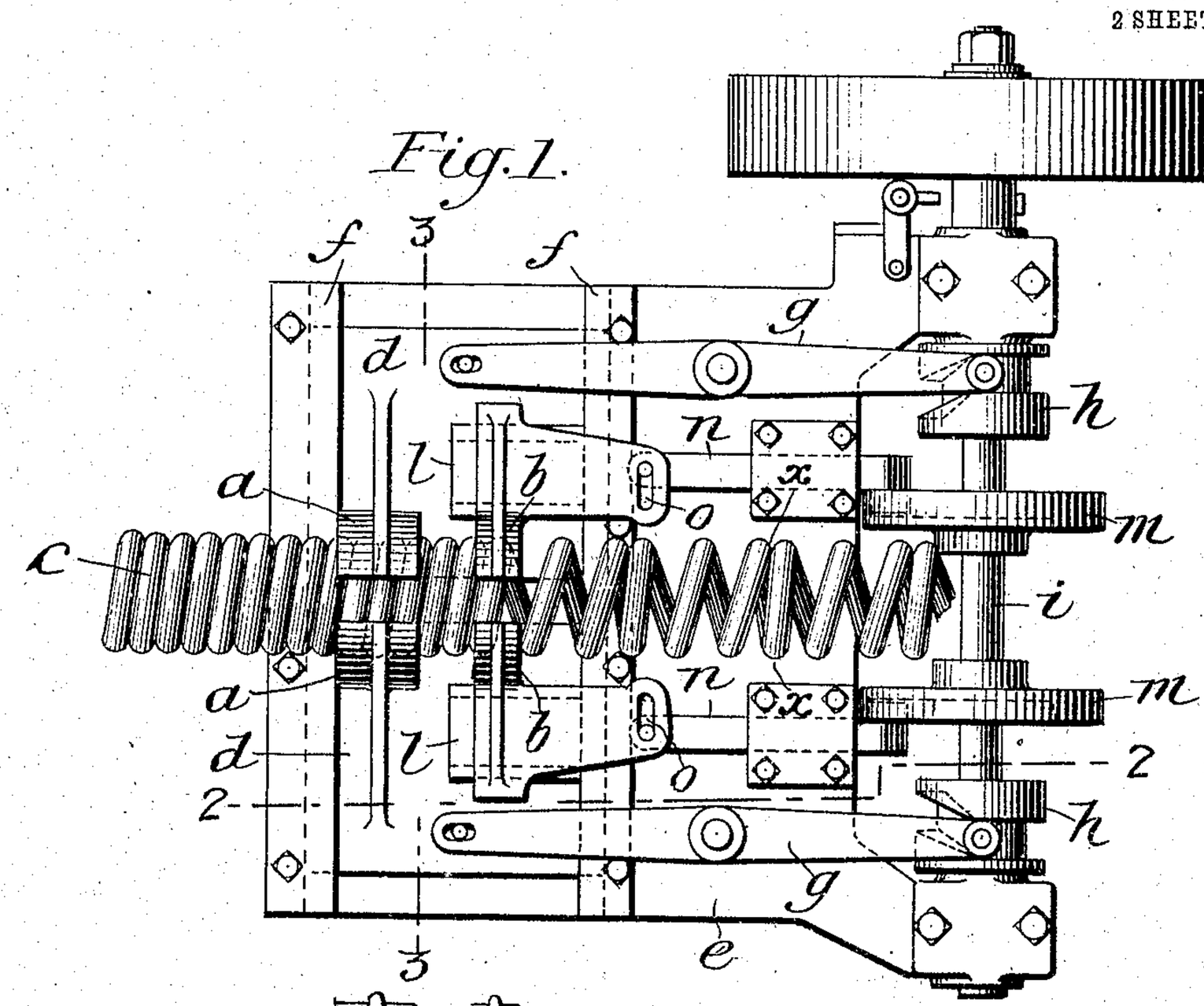


Fig. 2.

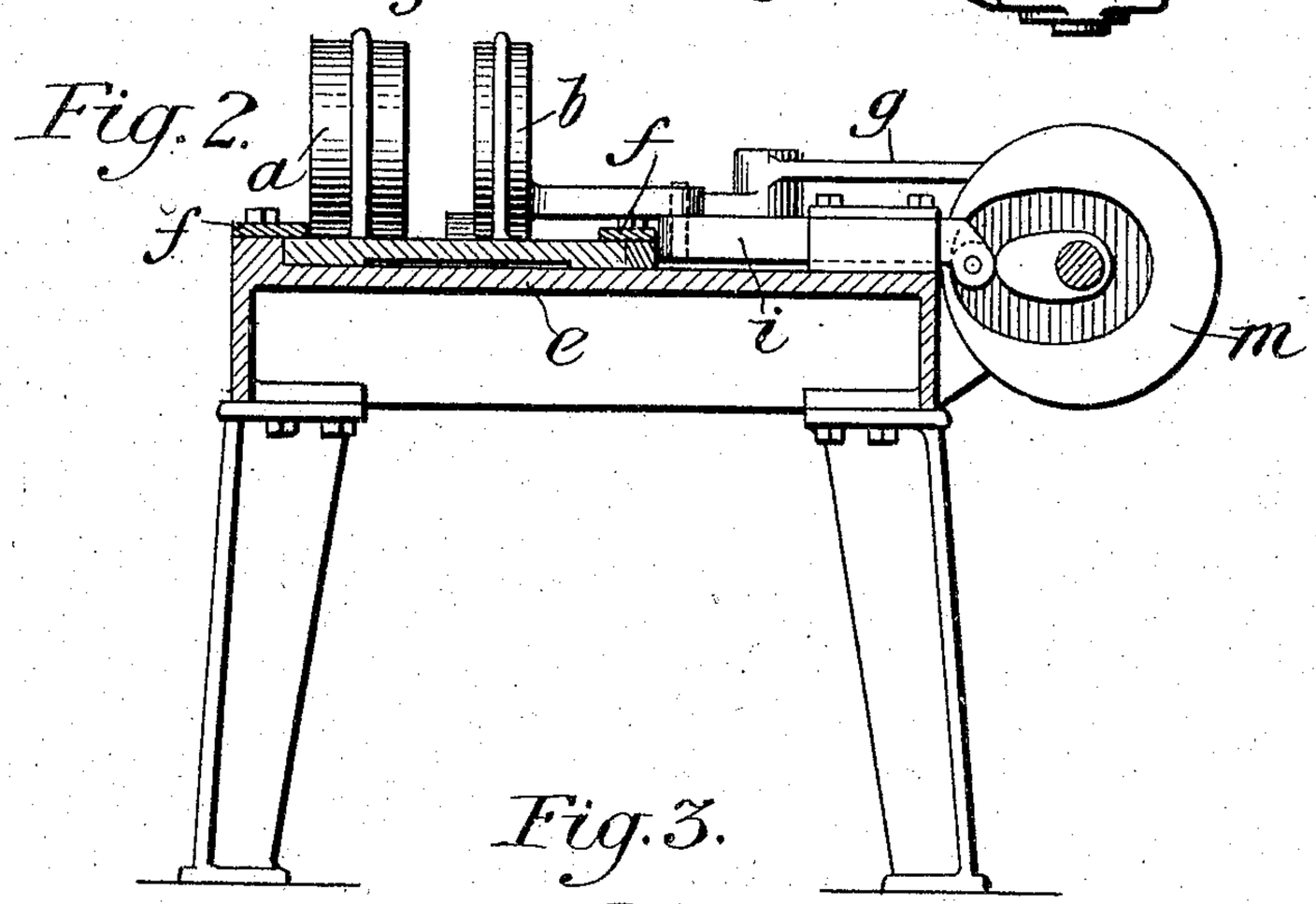
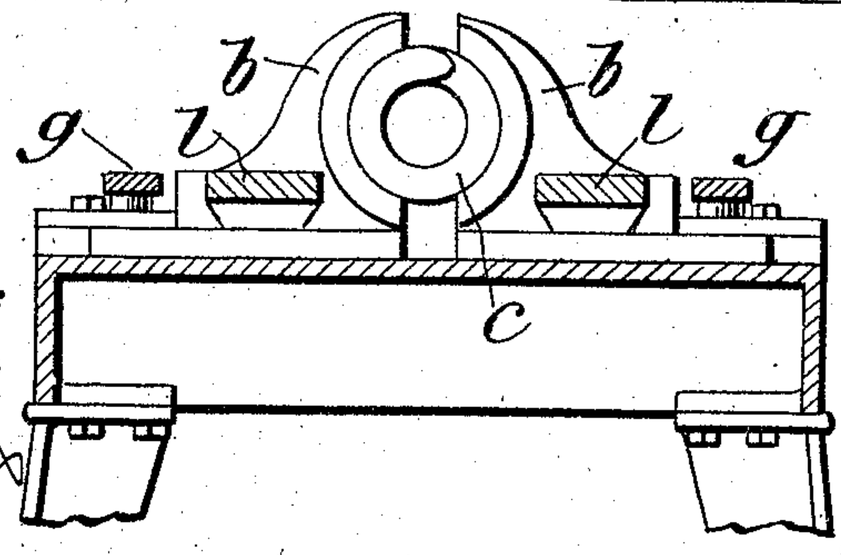


Fig. 3.



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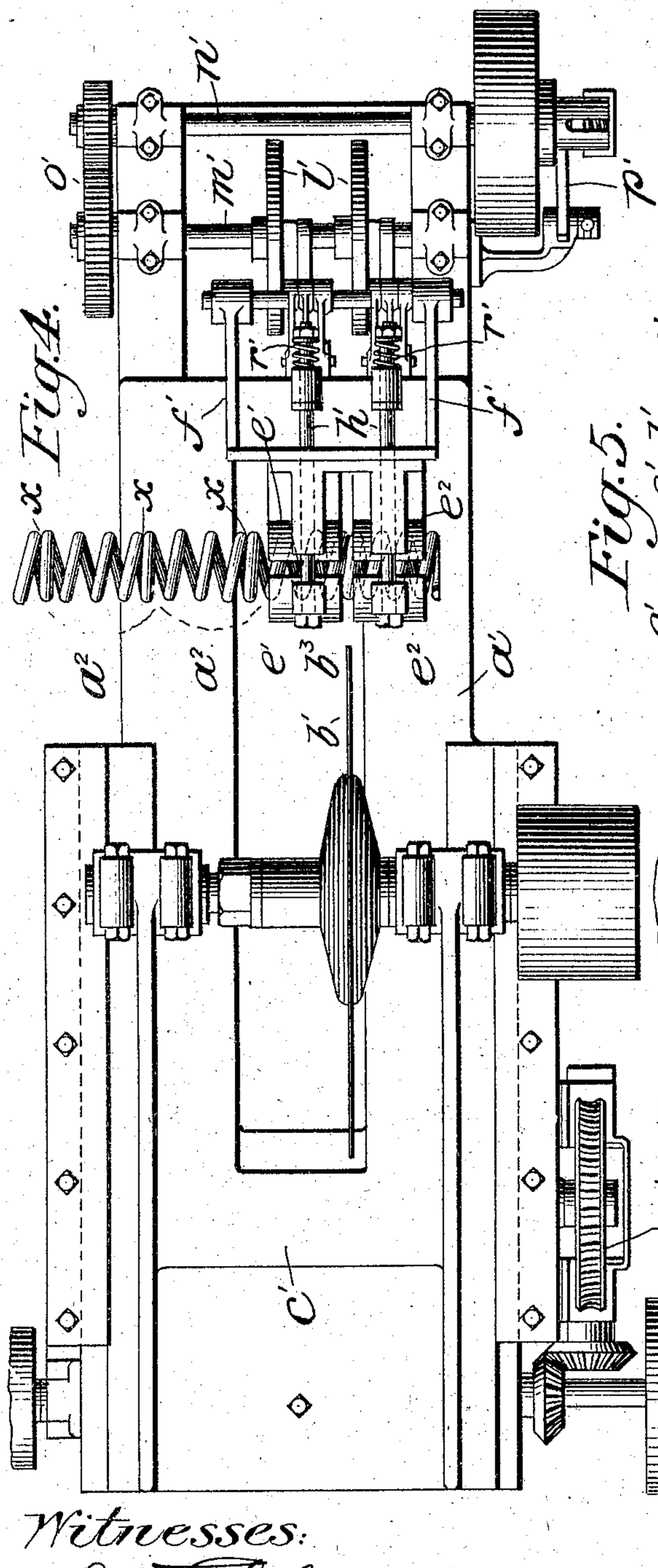
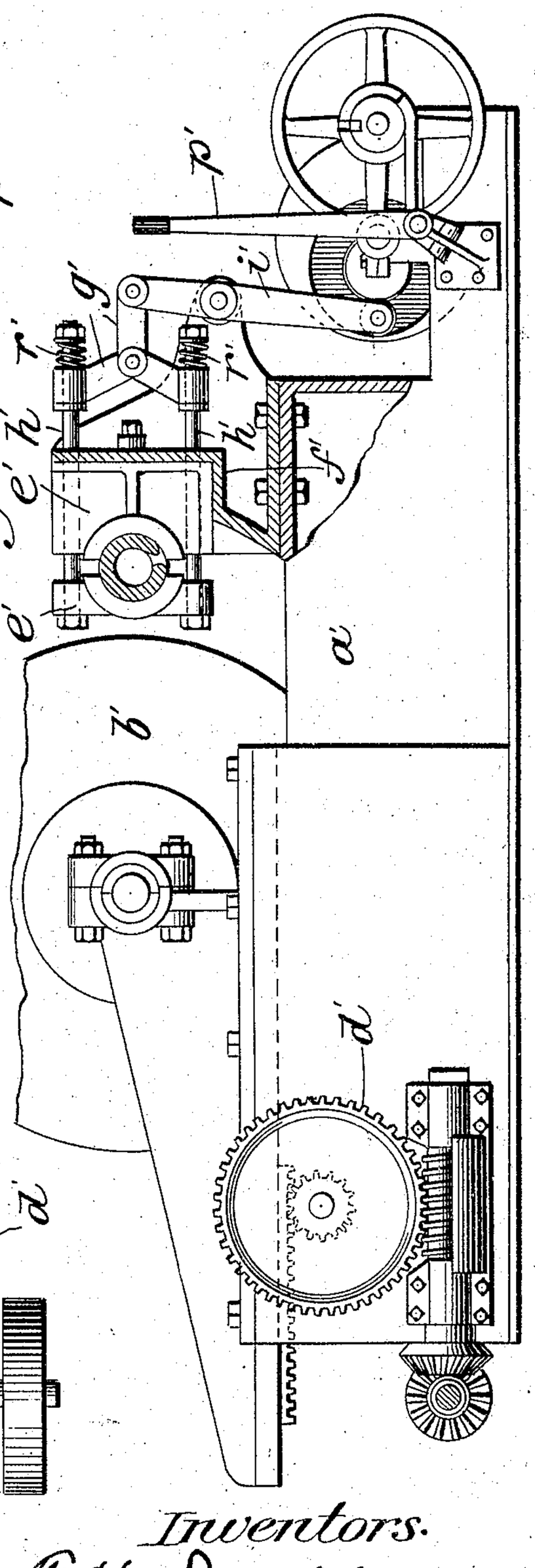
2 SHEETS—SHEET 2.





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UNITED STATES PATENT OFFICE.

FRED H. DANIELS AND CLINTON S. MARSHALL, OF WORCESTER, MASSACHUSETTS.

MANUFACTURE OF SPRINGS.

SPECIFICATION forming part of Letters Patent No. 791,752, dated June 6, 1905.

Application filed November 27, 1903. Serial No. 182,796.

To all whom it may concern:

Be it known that we, FRED H. DANIELS and CLINTON S. MARSHALL, citizens of the United States, residing in Worcester, county of Worcester, State of Massachusetts, have invented certain new and useful Improvements in the Manufacture of Springs; and we 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.

In the patent granted to us jointly with Johan O. E. Trotz, No. 716,680, dated December 23, 1902, we have illustrated, described, and claimed a method of making spiral coiled springs consisting in winding a rod or wire into a coil with closed convolutions, severing the coil by cutting clear across it in a plane at right angles to its axis, and subsequently opening up and separating all but the end convolutions of the coil.

The present invention is an improvement upon that of the above patent, particularly in respect of the manner and time of opening up the convolutions. We wind the rod or wire into a coil with closed convolutions as before and sever the coil by cutting clear across it in a plane perpendicular to its axis, also as before; but instead of cutting the coil before the convolutions are open we now open up the convolutions, except at those predetermined points where we desire to sever the coil. We then cut the coil clear across in the same way as before at the point or points where the convolutions remain closed.

In the accompanying drawings, forming part of this specification, machines for effecting the improved operation are shown as follows: Figure 1 is a plan view of a machine for opening up the convolutions of the coil at desired points. Fig. 2 is a longitudinal section of the same on the line 2 2, Fig. 1. Fig. 3 is a cross-section of the same on the line 3 3, Fig. 1. Fig. 4 is a plan view of a sawing-machine for cutting the coils; and Fig. 5 is a side view of the same, partly in section.

The coil is wound in the same manner as that illustrated and described in the patent above referred to and presents throughout its length the appearance of the left-hand end of the coil shown in Fig. 1 herein. We do not illustrate herein a machine for this purpose, as there are many constructions of such machines known in the art. As contemplated in the former patent, it is preferred to wind a considerable length of rod or wire into a single coil, so that it may be cut into sections of suitable length to form the springs. Neither the original invention nor the improvement is, however, limited to the formation of more than one spring at a time, and, if preferred, coils of only sufficient length to make single springs may be wound and subsequently opened up except at their ends, which may then be cut across in the manner already described.

After winding the convolutions of the coil, except at the point or points where it is desired to cut it, are opened up and separated by stretching. For this purpose the machine shown in Fig. 1 is suitable. It consists of a pair of clamps *a a* and *b b*, each formed of semicylindrical sections that are movable toward and from each other, so as to permit the coil *c* to be inserted between them. The sections of the two clamps are mounted upon plates *d d*, that slide laterally on the bed *e* of the machine and are guided and held in their movement by strips *f f*. The plates *d d* are operated so as to open and close the clamps by means of levers *g g*, that are pivoted to the bed of the machine and are simultaneously oscillated in opposite directions by means of grooved cams *h h* on the main shaft *i* of the machine, the forward ends of the levers being pivotally connected to the plates *d d*.

In addition to the opening and closing movement which is common to both clamps the clamp *b b* slides on guides *l l*, carried by the plates *d d*, so as to move toward and from the clamp *a a*, which is fixed in position. This movement of the clamp *b b* is effected by means of cam-grooves *m m*, carried by the main shaft of the machine and connected to the sections of the clamps by means of rods *n n*, the connection between the sections of the clamps and the rods being such that the clamp as a whole may be moved with the rods

n n and its sections be also permitted to move apart independently of the rods. The pin-and-slot connection o o (shown in Fig. 1) is suitable for this purpose; but any other connection may be employed that will permit the described movements.

As indicated in Fig. 1, the coil c, with its convolutions all closed, is put endwise into the clamps a a and b b. The clamp b should be only of sufficient width to grasp two of the convolutions; but the width of the clamp a a is immaterial, since none of the convolutions of the coil outside of this clamp are affected by the stretching operation. When the coil has been grasped by the two clamps, the movable clamp b b moves away from the stationary clamp a a, and the convolutions of the coil that lie between the clamps are opened up and separated, as indicated at the right of Fig. 1. The two adjacent convolutions x x are not separated, however, because they are firmly gripped by the movable clamp, and it will be understood that the points where the convolutions are allowed to remain closed may be regulated as desired by properly positioning the clamps with respect to each other. As shown in Fig. 1, they are located rather close together, and as the movable clamp has no great amount of movement the springs that are formed out of the coil are rather short. As above described, however, these springs may be of any length desired. In fact, the clamps or whatever other stretching devices may be employed may be located to stretch the entire coil, leaving only adjacent convolutions at the ends closed.

From the stretching-machine (shown in Fig. 1) the coil, with its convolutions stretched open, as indicated at a^2 a^2, and having certain of the convolutions closed at the points x x x, is taken to the sawing-machine (illustrated in Figs. 4 and 5) to be cut up into sections, each forming a separate spring. In these figures, a' denotes the frame of the machine, and b' the saw, which is mounted in a carriage c', that slides on the frame a' and is fed forward during the cutting operation by a gear-train d'. The machine is also provided with a pair of clamps e' e' and e^2 e^2, that are made in semi-cylindrical sections like the clamps of the stretching-machine and are located in fixed position in a line parallel with the shaft of the saw b', so that when the coil is inclosed in the clamps it will be held with its axis in a line perpendicular to the plane of the saw. The clamps have fixed and movable sections like those of the stretching-machine. The fixed sections are mounted upon a bracket f', that is securely fastened to the bed of the machine, and the movable sections are carried by rods h' h', that pass through bearings in the bracket f' and are connected, by means of links g' g', to levers i' i', that are pivoted to the bracket and are oscillated to open and close the clamps by grooved cams l' l', carried on a counter-shaft m' of the machine. The counter-shaft is connected to the main shaft n' by gearing o', and a lever p' gives the operator control of the whole mechanism. Springs r' r' are preferably interposed in the connection between the levers i' i' and the rods h' h' in order that the coil may be held in the clamps with a yielding pressure.

As shown in Fig. 4, the coil-holding clamps are provided with a transverse slit b^3, into which the saw is adapted to pass, so as to cut the coil clear across. The coil being placed endwise in the clamps and adjusted so that the closed convolutions at one of the points x coincide with the slit, the saw is fed forward and cuts the coil clear across through the closed convolutions, leaving a long flat surface that is perpendicular to the axis of the coil and forms a seat for the coil that requires little or no finishing.

As will be understood, the coil when taken from the coiler to the stretching-machine of Fig. 1 will be hot enough to permit the convolutions to be opened up without difficulty; but as the metal cools and sets rapidly it may be desirable to heat the coil before cutting it. The improvement is not, however, limited to such details, as the coil may be cut at any temperature.

Having thus described our invention, what we claim is—

1. In the art of making spiral coiled springs, the herein-described improvement, consisting in winding a length of rod or wire into a coil with closed convolutions, opening up the convolutions except at predetermined points, and severing the coil at the points where the convolutions remain closed by cutting across it in a plane perpendicular to the axis of the coil.

2. In the art of making spiral coil-springs, the herein-described improvement, consisting in winding a length of rod or wire into a coil with closed convolutions, clamping the coil at predetermined points so as to hold adjacent convolutions together, stretching the coil to open up the convolutions between the points where the coil is clamped, and severing the coil at the points where the convolutions were not opened by cutting clear across it in a plane perpendicular to the coil's axis.

In testimony whereof we affix our signatures in presence of two witnesses.

FRED H. DANIELS.
CLINTON S. MARSHALL.

Witnesses:
A. F. BACKLIN,
H. E. BERGGREN.