

W. H. Abel. Sheet 1, 2 Sheets.  
Knitting Mach.

No. 106,531. Patented Aug. 23, 1870.

Fig. 1.

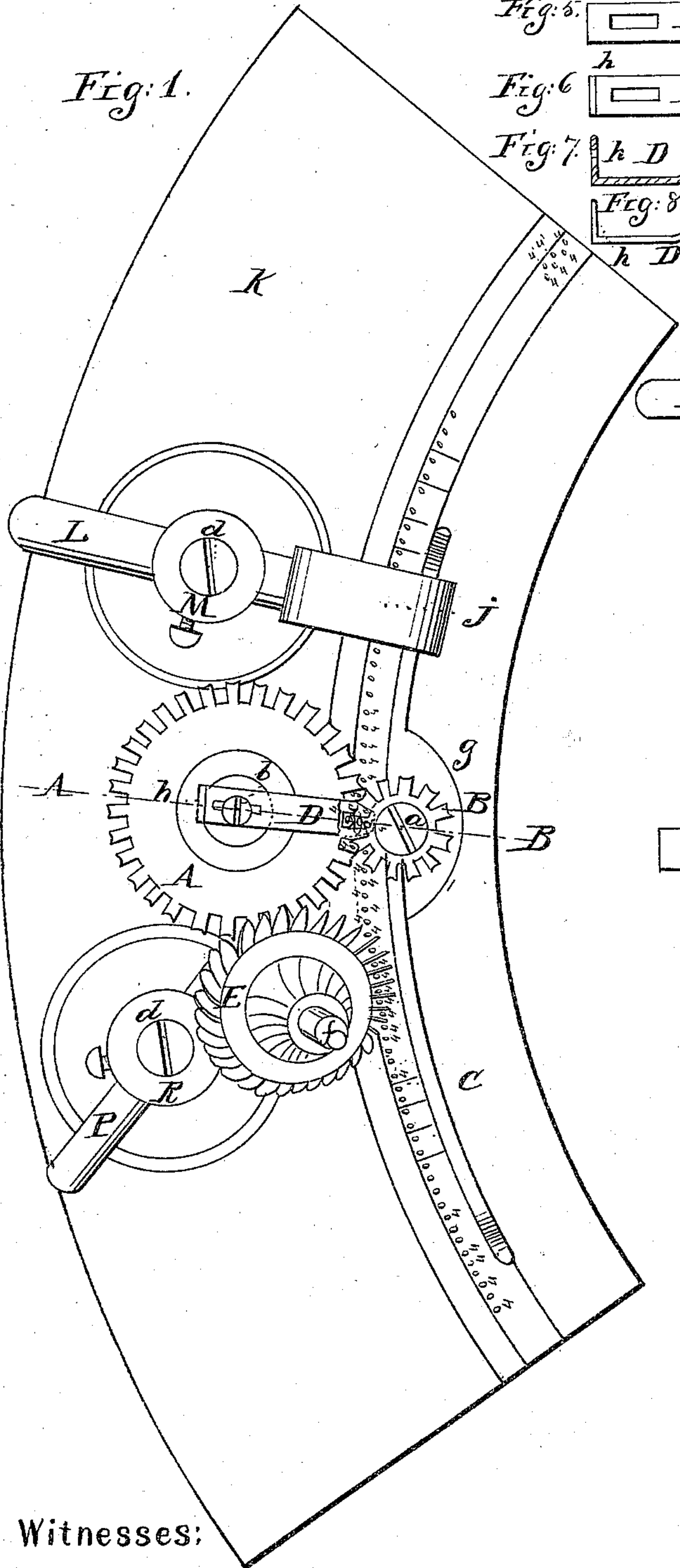


Fig. 5.



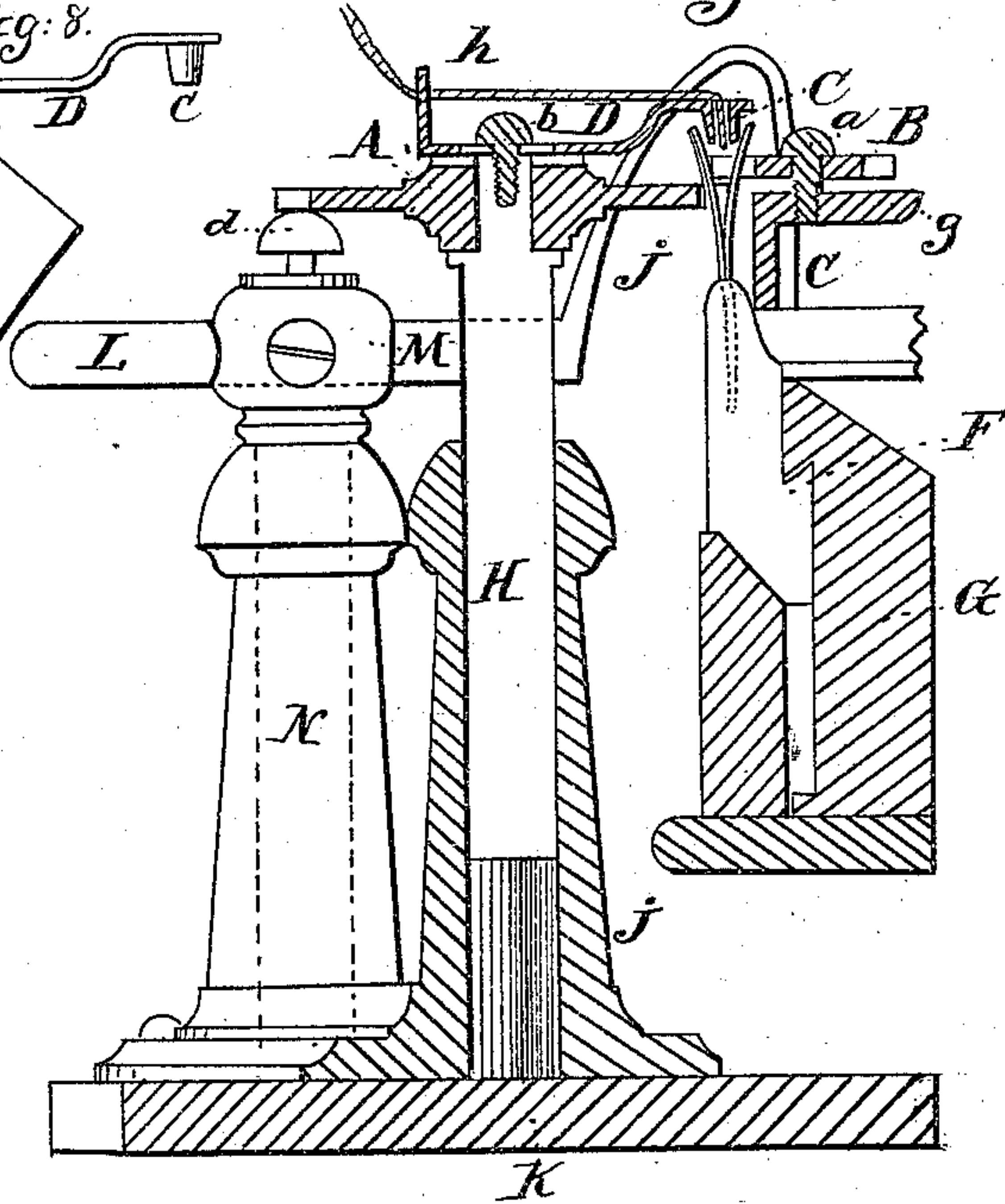
Fig. 6.



Fig. 7.



Fig. 2.



Witnesses:

J. S. Whitney  
Alvin Lawrence

Inventor:

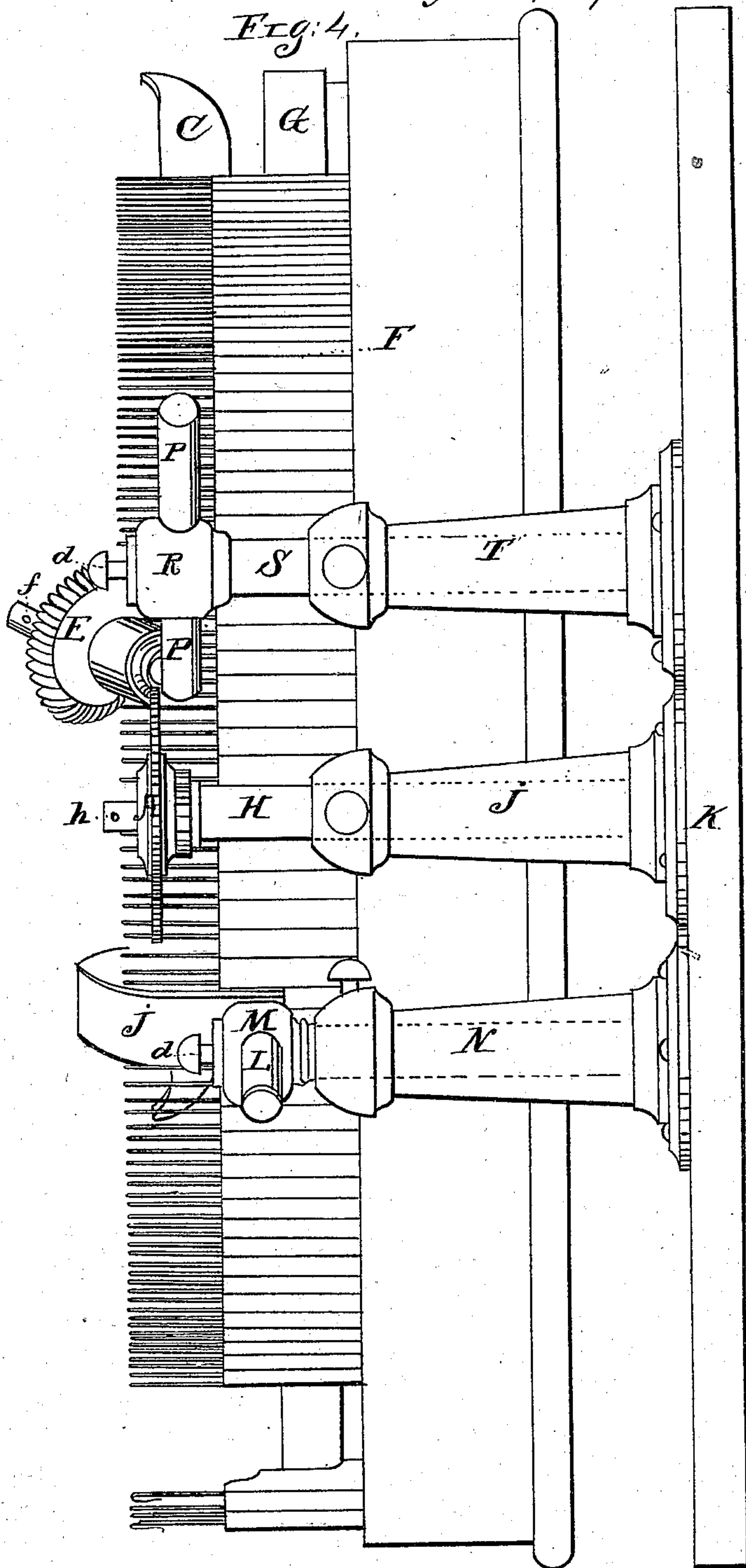
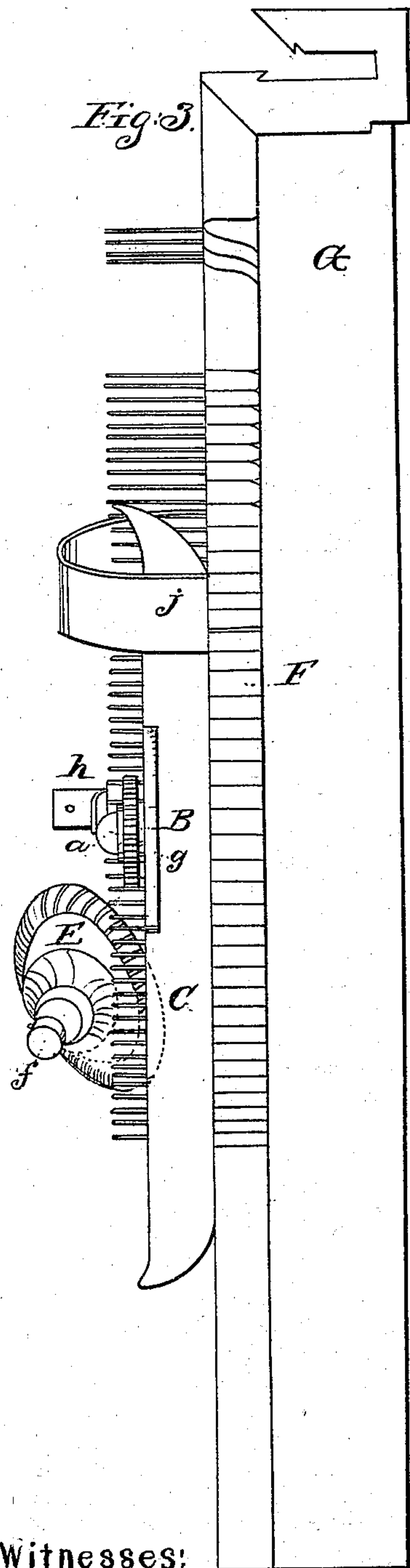
William H. Abel

W. H. Abel. Sheet 2, 2 Sheets.  
Knitting Mach.

N<sup>o</sup> 106,531.

Patented Aug. 23, 1870.

Fig. 4.



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Inventor:

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# UNITED STATES PATENT OFFICE.

WILLIAM H. ABEL, OF BENNINGTON, VERMONT, ASSIGNOR TO HIMSELF AND JOHN E. CRANE, OF LOWELL, MASSACHUSETTS.

## IMPROVEMENT IN KNITTING-MACHINE.

Specification forming part of Letters Patent No. 106,531, dated August 23, 1870.

*To all whom it may concern:*

Be it known that I, WILLIAM H. ABEL, of Bennington, in the county of Bennington and State of Vermont, have invented certain new and useful Improvements in Knitting-Machines, of which the following is a full, clear, and exact description, reference being had to the accompanying drawing, making part of this specification, in which—

Figure 1, Sheet 1, represents a plan or top view; Fig. 2, a sectional elevation through the two dividing-wheels, A and B, and on the line A B of Fig. 1. Figs. 3 and 4, on Sheet 2, represent each an opposite side elevation of that shown in Fig. 1. Figs. 5, 6, 7, and 8, on Sheet 1, represent different elevations of the tubular guide or thread-layer, which I employ for laying the continuous weft-thread between the divided needles.

This invention relates to that kind of knitting-machines which introduce continuous weft or filling-thread between the loops or stitches, and has for its object to simplify the weft-thread knitting process, and render it certain to insure the introduction of the weft-thread between the needles, consequently between the loops or stitches, and to produce fabric of finer and closer texture, and in greater variety of style or figure. This invention consists in the method, substantially as described, of forming or creating a path or passage for the tubular guide between the needles by means of outer and inner dividing-wheels A and B, arranged and operating in connection, as clearly shown in the drawing, whereby alternate needles are pushed or spring outward and inward, each a sufficient distance to pass the tubular guide on opposite sides thereof and insure the introduction of the weft-thread passing through the tube *c*, between the divided needles and below their beards, or between their beards and their leads or setting. This invention also consists of the stationary adjustable tubular guide D, constructed and applied substantially as described, in combination with the outer and inner dividing-wheels and with the divided needles, whereby continuous weft or filling thread is laid between the needles and below

their beards while revolving, and while dividing and passing at each side of the guide-tube *c*, thus insuring the introduction of the weft-thread, as described. This invention also consists in the combination, with the inner and outer dividing-wheels, of the inner guard C, which supports the inner wheel B and carries down and retains the fabric at the stems of the needles while the weft-thread is inserted and new loops formed on the needles, and, unaided by a rising or knocking-over wheel, allows the work to rise at the proper time for knocking the old loops over the newly-formed loops and over the beards of the needles. A knocking-over wheel may be advantageously used in connection with the guard C, for heavy or close knitting. This invention also consists in the combination, substantially as described, with the tubular guides and dividing-wheels, of the presser-wheel E, for pressing down the weft-thread which has been thus laid or inserted between the revolving spring-needles.

In this invention I use the common spring or bearded needles set in leads F, and applied to the rim or needle-bar G in the usual way; and, with the exception of the tubular guide, the dividing-wheels A and B, the guard C, and certain new combinations of these with some other parts, this machine is intended to be substantially similar to the common circular spring-needle knitting-machine, carrying the work inward and upward in the same or a similar way.

The outer dividing-wheel A revolves on a bearing formed on the upper end or part of a shaft, H, which is adjustable vertically to bring the wheel at the proper height on the needles. The inner dividing-wheel B revolves on a stud or a screw, *a*, passing through its center into the substance of the guard-shield *g*. The shaft H is supported in a stand, I, having its base or foot resting on the bed K, and there fastened. The slotted plate portion of the tubular guide D is adjustably secured to the top end of the shaft H by a screw, *b*, and is set to bring the tube *c* in the circular line of the needles, so that, when the needles are divided by pressing alternate ones outward and in



ward, by means of the wheels A and B acting or operating in connection, a path or passage is created or formed between the thus divided needles, sufficient for the depending or projecting tube *c* to enter and lay the filling-thread below the beards of the needles and between them, where it is pressed down by the wheel E to below the beards, so that, when the old loops are drawn over the newly-formed loops, the weft-thread is inclosed between them. The guard C is adjustably supported inside of the circular series of needles by a curved brace, J, which overtops them, and which is connected to a horizontal rod, L, passing through the head or hub M of a shaft, which is adjustable in the stand N like the shaft H. Each of these vertical shafts is adjustable by a set-screw, *d*, so also the rod L and the similar rod P, which supports the presser-wheel E on an oblique stud, *f*. The rod P passes through the head or hub R of a vertical shaft, S, adjustable in a stand, T, by a set-screw, *d*, and by these means the presser-wheel is adjusted to any desired height or angle. The shield or guard-plate *g* serves to keep the fabric away from the wheel B. The circular series of needles revolve beneath the arched curve of the curved brace J. On the outer extremity of the plate portion of the tubular guide D a perforated ear, *h*, rises, for guiding the weft-thread from the spool or bobbin to the eye of the tube *c*.

In the use of spring-needles for making weft-thread fabric, such as herein described, there exists, in my opinion, a necessity for two dividing-wheels, which may be set to press on alternate or on consecutive needles, and this insures the pressing of alternate needles, both outward and inward, so as to form a broad oval path for the tube *c* of the guide, even though some of the needles may become spring-bent or set and out of their circular line, one dividing-wheel operating on the needles at each side of the series; whereas, in the ordinary mode or means of introducing weft-thread between spring-needles, and especially as shown in the English patent to Cooley, numbered 468, for 1857, and where only an inner dividing-wheel is shown or described, the suitable pressing and dividing of the needles is not accomplished with as much certainty as by the employment of the two wheels, as herein described, as some of them are liable to become bent or to set or to break, owing to the inequality of their spring temper, and it is believed that to spring the needles, as shown in the patent to Cooley, so as to receive a tubular guide or even a weft-thread between them, there is a liability of breaking them or bending and setting them, and leaving some of them out of their circular line, and if one needle is set and out of this line, and the two adjoining ones are pressed by only one wheel, the set needle comes directly in the path of the weft-thread or allows the weft-thread to be laid on one side of three consec-

utive needles, and this would cause imperfect work, to the injury of any set figure and of the fabric.

I have stated the danger to which the needles are subject on account of the inequality in their spring temper when they are pressed or divided by means of but one dividing-wheel. The reasons are as follows:

Most of the spring-needles are arranged two in each lead. Some are too hard and break before the others, and when one needle in a lead is broken, the other is removed by melting the lead, and replaced by recasting the lead upon it, and frequently with a new one.

The new needle is more liable to break than the other, which has been partially or fully annealed, and if the new needle breaks, the old one is again heated by melting the lead and recasting it in with another. This recasting process soon so softens and anneals some of the needles that they will bend at their junction with the lead and thus become set outward by the first action of the inner dividing-wheel, and, when thus set, and in the next revolution of the series of needles 4, other and alternate needles are presented to the dividing-wheel, the set or bent needles will retain their outward-pressed position, or nearly so, and the weft-thread will be laid on the same side of several needles or be prevented from passing between them.

Thus it will be seen that the outer and inner dividing-wheels are important, in order to insure a sufficiently broad path for the tubular guide and the introduction of the weft-thread, as described.

In connection with the knitting process and machine and with the outer and inner dividing-wheels, as described, I use the well-known presser or tuck-presser, for pressing alternate or other beards of needles, and the construction of such pressers is varied according to the pattern desired for the fabric, the weft-threads aiding, by their different colors or shades, in the production of various styles and figures, as will be readily apparent to persons skilled in the art of machine-knitting.

Having described my invention, I claim as follows:

1. The combination of outer and inner dividing-wheels A and B with the needles for the purpose of forming a path or passage between the needles for the tubular guide *c* and the weft-thread, when all are arranged and operate substantially in the manner set forth.

2. The stationary adjustable tubular guide D, as described, in combination with the outer and inner dividing-wheels and with the divided needles, as set forth.

3. The guard C, constructed as described, in combination with the wheels A and B, and with the needles.

4. In combination with the guard C, the shield *g*, which supports the wheel B and keeps

ing-wheels of the presser-wheel E, for pressing down the weft-thread inserted between the needles.

6. The combination, substantially as described, of the tubular guide D, the dividing-wheels A and B, the presser-wheel E, the guard C, and the shield *g*, with the needles

all arranged and operating in the manner specified.

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Witnesses:

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