No. 694,036. Patented Feb. 25, 1902.

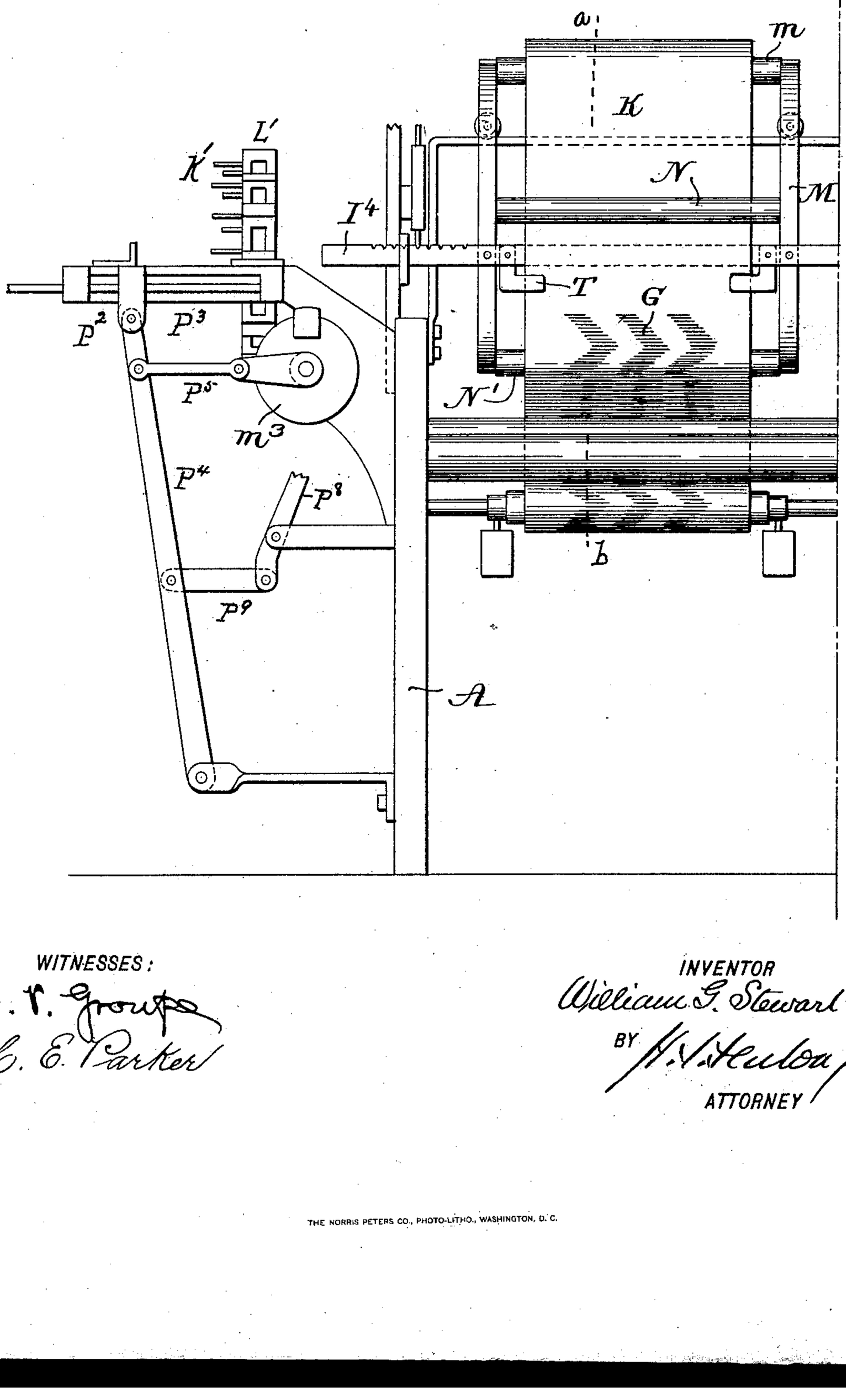
W. G. STEWART.

KNITTING MACHINE.

(Application filed Mar. 20, 1901.)

(No Model.) 4 Sheets—Sheet 1.

Fig. 1.



WITNESSES:

A. T. Gronts

C. E. Parker

INVENTOR

William G. Stewart—

BY H. V. Hudson

ATTORNEY

No. 694,036. Patented Feb. 25, 1902.

W. G. STEWART.

KNITTING MACHINE.

(Application filed Mar. 20, 1901.)

(No Model.) 4 Sheets—Sheet 2.

Fig. 3.

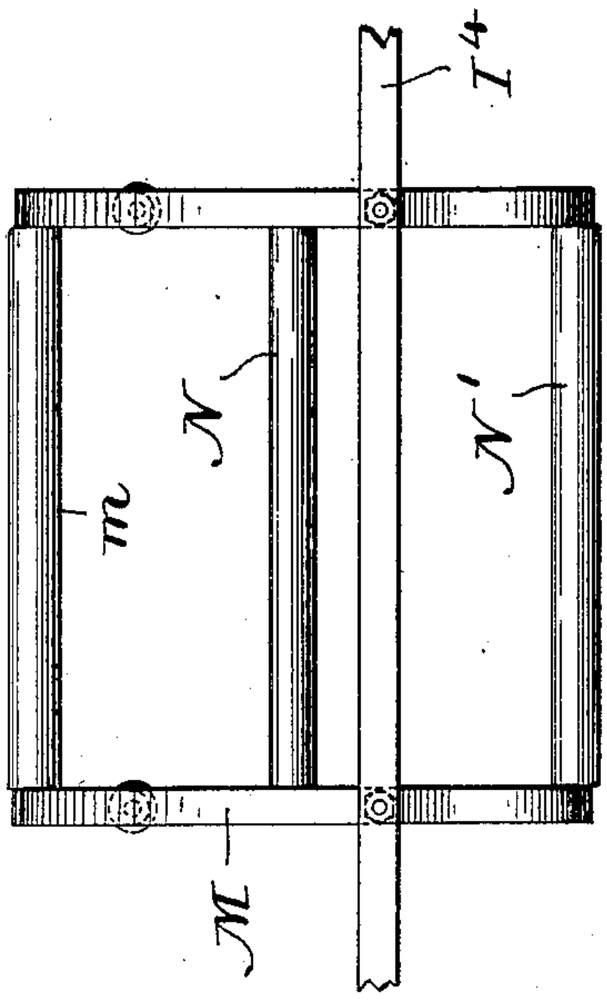


Fig. 4.

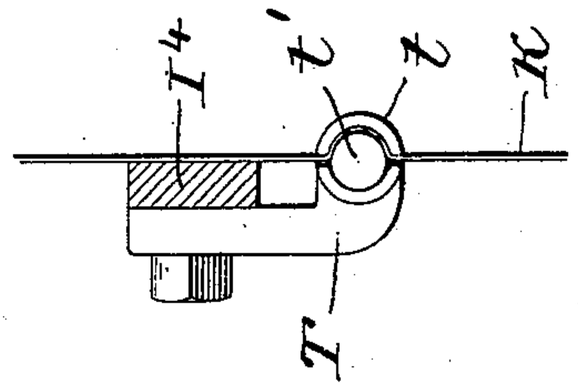
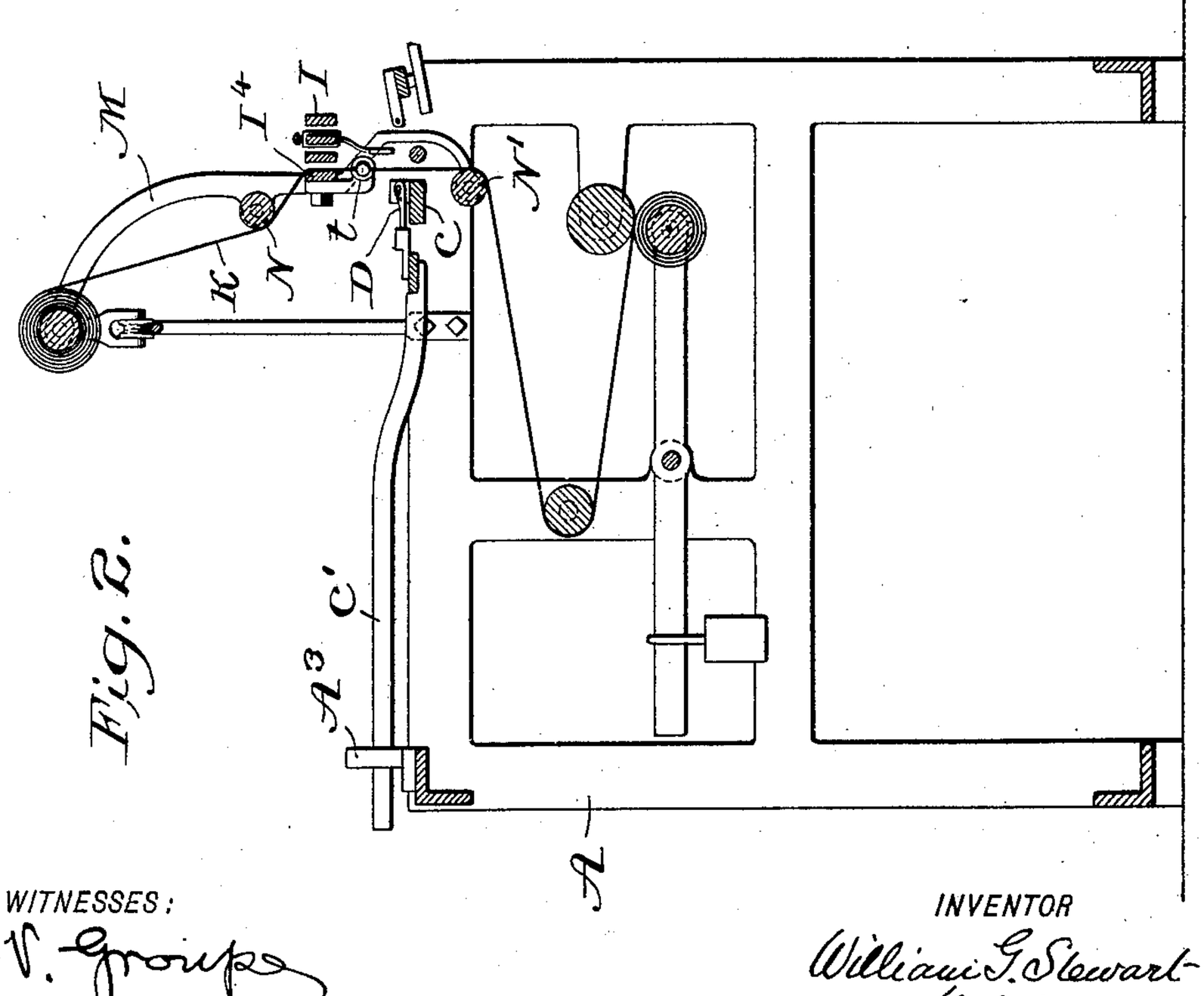


Fig. 2.



WITNESSES:

A. V. Groupe

C. E. Parker

INVENTOR

William G. Stewart

BY H. V. Haubold

ATTORNEY

No. 694,036. Patented Feb. 25, 1902.

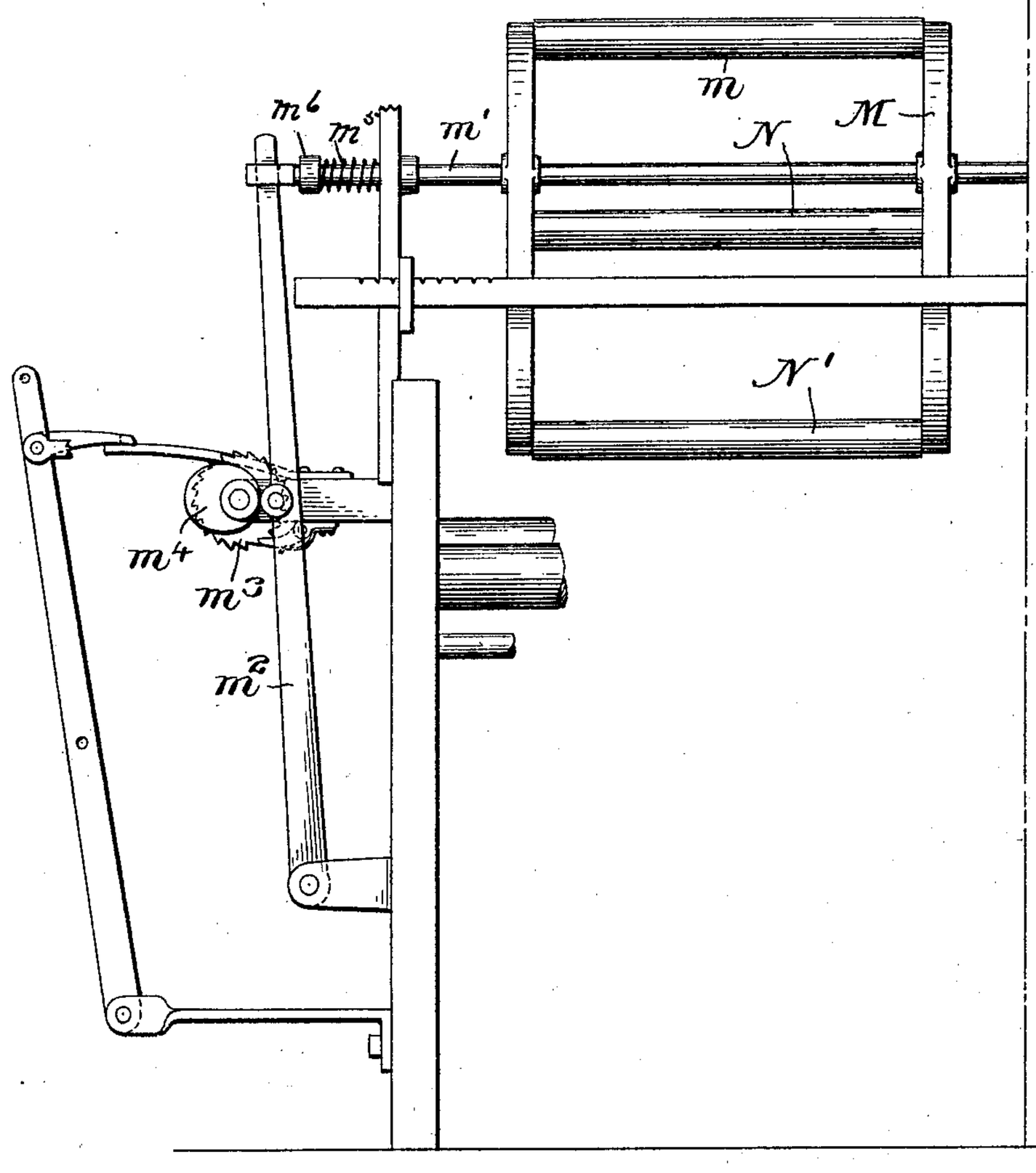
W. G. STEWART.

KNITTING MACHINE.

(Application filed Mar. 20, 1901.)

(No Model.) 4 Sheets—Sheet 3.

Fig. 5.



WITNESSES:

A. V. Brooks

C. E. Parker

INVENTOR

William G. Stewart

BY F. V. Hudson Jr

ATTORNEY

No. 694,036. Patented Feb. 25, 1902.

W. G. STEWART.

KNITTING MACHINE.

(Application filed Mar. 20, 1901.)

(No Model.) 4 Sheets—Sheet 4.

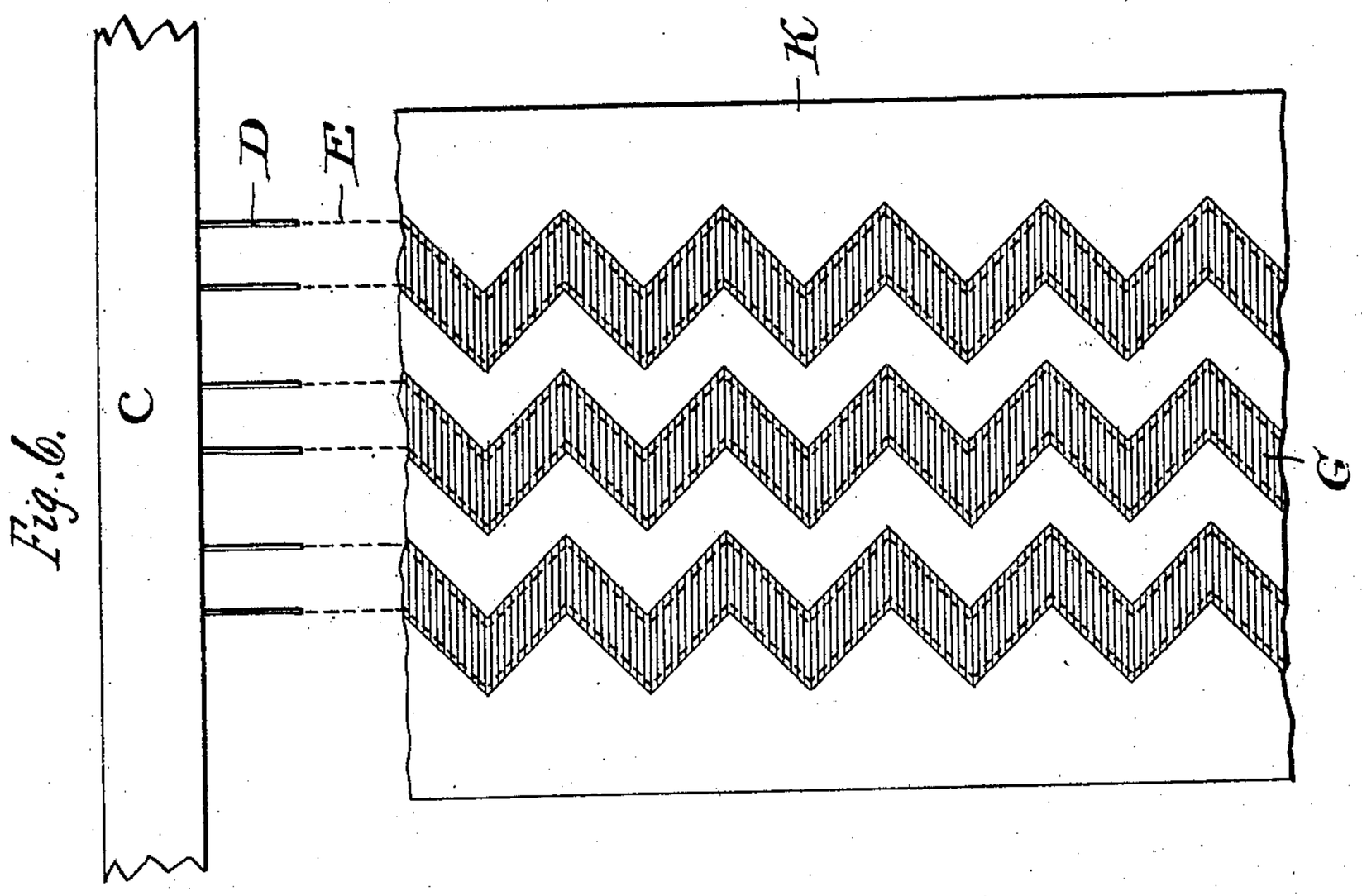


Fig. 6.

WITNESSES:

A. V. Groupe

C. E. Parker

INVENTOR

William G. Stewart

BY A. A. Hudson

ATTORNEY

UNITED STATES PATENT OFFICE.

WILLIAM G. STEWART, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO FRANK B. ESPEN, WILLIAM G. STEWART, AND HERBERT E. LOEB, OF PHILADELPHIA, PENNSYLVANIA, (COPARTNERS TRADING AS ESPEN, STEWART AND LOEB, LIMITED.)

KNITTING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 694,036, dated February 25, 1902.

Application filed March 20, 1901. Serial No. 52,065. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM G. STEWART, a citizen of the United States, residing at Philadelphia, State of Pennsylvania, 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 drawings, forming a part of this specification.

My invention relates to knitting-machines of the type having a single straight needle-bed. A specific example of the same, to which my invention is applicable, is that shown and described in the United States Letters Patent to Frelloehr and Tisch, No. 457,265, dated August 4, 1891. My improvement is designed to be applied to that machine to enable it to do a wider and different range of work, specifically to enable it when knitting upon a thin fabric backing a series of fancy ornamental chain-stitches or when uniting by such knitted chains of stitches to or upon said backing fabric a series of braids or strips of narrow fabric to form therewith on the fabric backing an ornamental patterned surface of any desired design to cause the knitted stitches to follow the pattern formed on the fabric by the stitched braids.

In the accompanying drawings, illustrating my invented improvements, Figure 1 is a front elevation of half of a transversely-bisected needle-bed and reciprocating thread-guiding bars of such a knitting-machine with my improved devices thereon, the other half being a duplicate and not necessary to be shown. Fig. 2 is a section through the line *a b* of Fig. 1. Fig. 3 is a detached view in elevation of my new reciprocating supporting-frame for delivering the woven-fabric backing to the needles. Fig. 4 is a section of the tension device employed on the needle-bar in conjunction with the frame. Fig. 5 is the same mechanism shown in Fig. 3 plus specific cam mechanism for reciprocating the frame in lieu of laterally reciprocating it through the back bar for guiding the pattern threads or braids, and Fig. 6 is a diagrammatic view showing a fabric having the braided pattern and knitted stitches in accordance with my invention.

The general construction of the whole machine it is unnecessary to show or describe, as for such information reference may be and is hereby made to said Frelloehr and Tisch patent, hereinabove referred to. On said machine the product necessarily produced is an entirely-knitted fabric, composed exclusively of threads fed to the reciprocating needles through guiding-tubes mounted on and carried by the transversely-reciprocating thread-guide bars, the latter sliding laterally in their bearings and delivering the threads to the needles to form any particular design of knitted fabric, such design being effected by controlling the length and time of sliding movement of the series of thread-guide bars by means of a series of adjustable pins so controlling the same and set to form the pattern, whereby no jacquard or other like mechanism is required to control the pattern of the fabric to be produced.

The machine is designed to produce principally fabrics such as fancy lace-like and other ornamental dress-trimmings. Upon such a machine as described in said patent it is impossible to feed a piece of woven fabric so as to bring the desired pattern in the path of the needles, and hence impossible to knit upon or to the same a superposed integral ornamentation composed of a chain or chains of knitted stitches following any desired pattern or by such chain or chains of knitted stitches to unite other narrow strips of woven fabric or braids forming the pattern to the aforesaid backing of already-woven fabric by stitches which shall follow the contour of the braided pattern.

My improvement in said machine has for its object to enable it to produce a new fabric consisting, essentially, of a woven-fabric backing to which is united a series of knitted stitches in chains which of themselves or by means of interposed braids secured to the woven backing by the knitted stitches form a superimposed but integral lace-like or other ornamental pattern of any desired contour or design upon the woven backing, the knitted stitches following the contour of the pattern to be formed, this being effected by my im-

provement, which operates to bring the woven backing and the superimposed braid-threads, if any are used, into range of the needles by means of constantly-shifting devices, which shift the woven-fabric backing, so that the knitted stitches always follow the outline of the design or pattern to be produced on the finished goods. A very great variety of unique effects or designs may be produced in a fabric so formed, consisting of knitted stitches united to a woven backing, such knitted stitches forming the outline of the ornamental design and necessarily producing thereby the effect of a superadded ornamentation, but which is in fact but an integral knitted ornamentation upon a woven backing.

My improvements hereinafter described consist of mechanism applied to, combined with, and operating by suitable connecting devices in proper relation to the reciprocating thread-guide bars and needle-bar of said Frelloehr and Tisch machine to enable it to produce such novel fabric last above described or referred to.

The machine as described in Patent No. 457,265 knits by an arrangement of horizontally-arranged latch-needles, lettered D in said patent, mounted in a needle-bar C, the bars which actuate the needles having a reciprocating movement by mechanism therein described and consisting generally of two rearwardly-extending bars C′, fitted to slide at their rear ends in bearings A^3, mounted on the machine-frame. In the said patented machine the fabric is formed from two sets of threads, one of which—namely, the pattern-thread G—is led through movable guide-bars I to and through tubular guides carried on said bars, then to and in the path of the reciprocating latch-needles, and the threads E, being binding-threads, are caught by the needles and knitted to the pattern-threads.

Referring to the drawings, the machine-frame A, the guides A^3, the bars C′, needles D, thread-guide bars I, and the parts P^2 P^3 P^4 P^5 P^8 P^9 L′ K′ and other necessary and adjunctive devices and their operating means may all be and preferably are as shown and described in the said Letters Patent No. 457,265 referred to.

Referring now to Figs. 3, 4, and 5, my improvement may be and, as shown in the drawings, is embodied in a supporting-frame M, upon which are mounted a let-off roller or long bobbin *m*, carrying the woven-fabric backing, and two other rollers N N′, which are guide-rollers delivering the backing fabric beneath the thread-guide bars I and in front of the needle-bar C, so that the needles will be projected and retracted in a substantially horizontal plane and transversely through said fabric. It is essential that the fabric backing K be held taut between the guide-rollers N N′ by some form of yielding means in order that the needles may readily pass through the fabric and perform their function without material disturbance to the general distended condition of the fabric; and to this end I mount or hang upon the bar I^4 (see Figs. 1 and 4) a yielding tension, preferably in the general form of a loom-temple, the said temple in the present embodiment of my invention comprising a slotted tube *t*, carrying therein a freely-mounted roller *t*, as more clearly shown by Fig. 4, the selvage edges of the fabric entering and passing out of the slots in the tube meanwhile passing around the contained roller. The frame M, upon which the supply-bobbins *m* and the two guide-rollers are mounted, is to be given a lateral reciprocating motion of varying lengths of reciprocation depending upon the pattern to be formed. If pattern-braid previously formed to the desired pattern is to be knitted to the fabric backing, this reciprocation is best effected by rigidly fastening the frame M to the rear thread or braid guide bar I^4, as the latter has the necessary pattern-forming reciprocations imparted to it by the pins and stops already in the machine. If, however, no pattern-braid is used, the same connecting and actuating means may be employed, simply throwing the braid-feeding devices out of action, and in consequence the pattern will be formed solely by the knitted stitches through the medium of the motions given to the braid-guides. In Fig. 5 I have shown separate actuating mechanisms for properly reciprocating the frame M, whether or not braid be fed to the machine. Said actuating mechanism consists, preferably, of a short connecting-bar *m′*, secured to the frame and movable from a cam m^4, through an operating-arm m^2, a spring m^5 being interposed between the machine-frame and a fixed abutment m^6 on the bar *m′* to maintain an operative engagement between the cam m^4 and the arm m^2, the said cam being operated by ratchet-wheel devices m^3, which in turn are actuated from the pattern pins and stops which govern the pattern-forming reciprocation of the pattern-braid guide-bars and in unison of movement therewith, as will be fully understood by one familiar with this class of machines. Thus by the simple disposition of mechanical devices described it becomes possible to produce great variety in designs and enables two entirely distinct characters of fabrics to be produced on the same machine at different times, obviating the use of many needles and of much binding or knitting thread, while producing the same contour of pattern in a more ornamental and perfect outline.

In knitting stitches due to the operation of the mechanism of Patent No. 457,265 it will be seen that no pattern or design can be formed on the woven backing fabric merely by the knitted stitches, but solely by the pattern-braid G, and the latter can only be secured to the backing by a series of straight lines of stitching, the number varying with the lateral contour of the braid design. In Fig. 6 is shown by diagram the backing fabric K, having the pattern-braid G knit there-

to by my device, as by a series of stitches E not only very much less in number, but which follow the pattern formed by the braid, and it is obvious that with my improved mechanism the pattern can also be formed on the backing without the employment of any backing-braid. It will likewise be obvious that the improved construction described as my invention saves wear and tear and much binding-thread, as many of the rows of stitches are rendered unnecessary, and a less number of needles may consequently be employed.

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

1. In a knitting-machine of the character described, having a needle-guiding bar with means to reciprocate the needles therein, reciprocatory guiding devices carrying the fabric-backing roll or bobbin, in combination with devices adapted to shift said reciprocatory fabric supplying and guiding devices, pattern mechanism to control the reciprocatory movements of the supplying and guiding devices, and guide-bars for feeding thread to the needles to form knitted stitches or loops, whereby the fabric backing in respect of the pattern to be formed thereon by the knitted stitches or superposed pattern-braids, is automatically brought in the path of the actuated needles; substantially as described.

2. In a knitting-machine of the character described, having a needle-guiding bar with means to reciprocate the needles therein, guide-bars for feeding thread to the needles to form knitted stitches or loops, of reciprocatory guiding devices adapted to supply and guide a fabric backing to and in the path of the actuated needles, with means to so reciprocate said guiding devices in respect of the pattern to be formed by or with the stitches knitted thereon by the needles, said means consisting of a suitable cam, connecting devices between the cam and the said guiding devices and between the cam and the pattern-forming devices; substantially as described.

3. In a knitting-machine of the character described having a needle-guiding bar with means to reciprocate the needles therein, guide-bars for feeding thread to the needles to form knitted stitches or loops, reciprocatory supplying and guiding devices, a tension mechanism or temple arranged between the reciprocatory guiding devices, in combination with pattern-forming devices adapted to move said reciprocatory supplying and guiding devices in accordance with a predetermined pattern whereby the fabric backing in respect to the pattern to be formed thereon by the knitted stitches or superposed braid is automatically brought into the path of the actuated needles.

In testimony whereof I have hereunto affixed my signature this 28th day of February, A. D. 1901.

WILLIAM G. STEWART.

Witnesses:
ANDREW V. GROUPE,
H. T. FENTON.