No. 714,998. Patented Dec. 2, 1902.

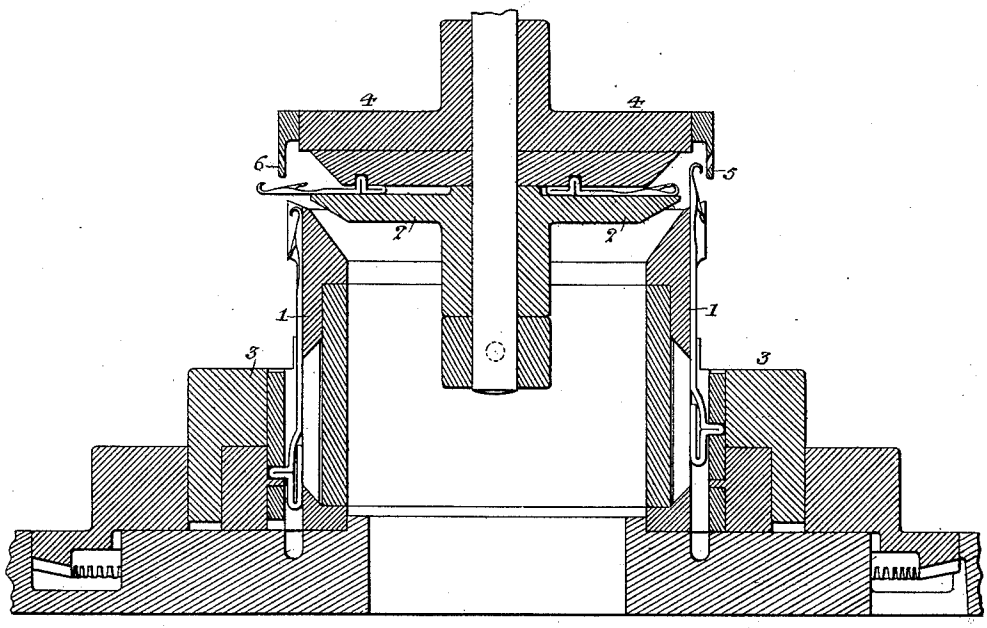
D. C. BELLIS.

KNITTING MACHINE.

(Application filed Feb. 28, 1902.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.



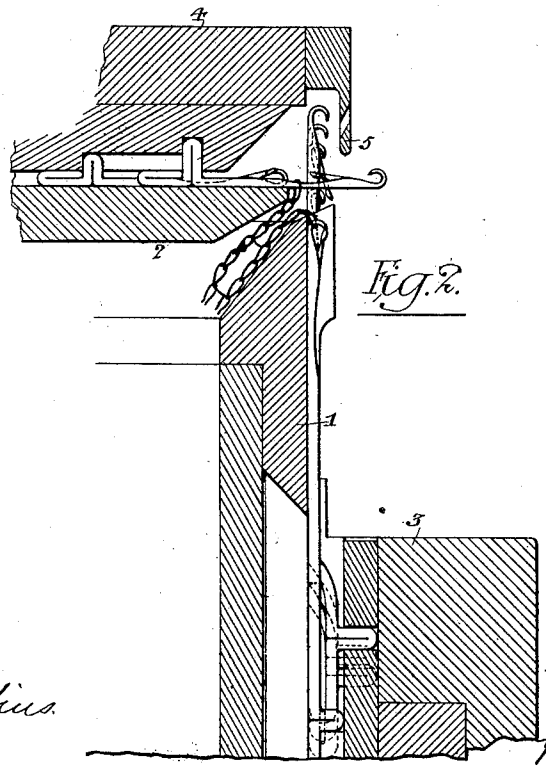




Fig. 2.

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Herman E. Metius

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

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# D. C. BELLIS.

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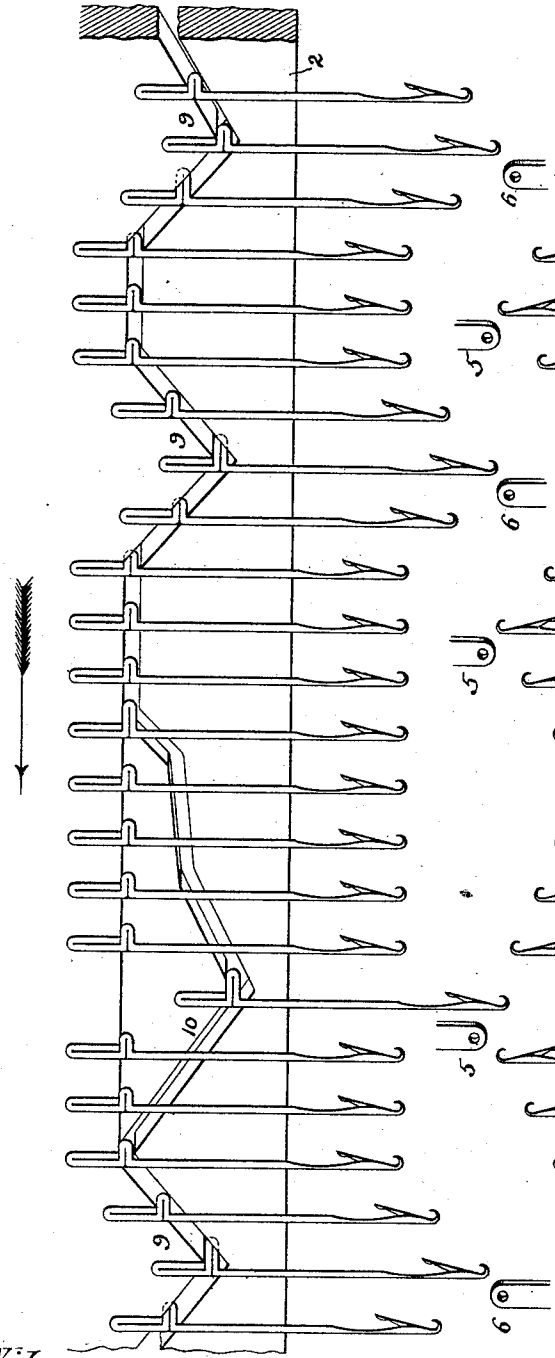


Fig. 3.

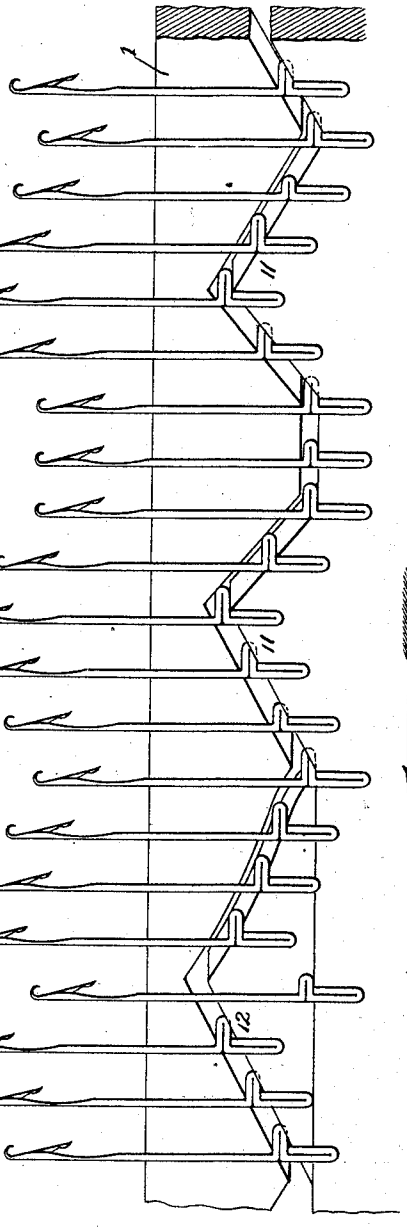


Fig. 4.

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# UNITED STATES PATENT OFFICE.

DAVID C. BELLIS, OF ELIZABETH, NEW JERSEY, ASSIGNOR TO ROBERT W. SCOTT, OF PHILADELPHIA, PENNSYLVANIA, AND LOUIS NAPOLEON DEVON WILLIAMS, OF ASHBOURNE, PENNSYLVANIA.

## KNITTING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 714,998, dated December 2, 1902.

Application filed February 28, 1902. Serial No. 96,095. (No model.)

*To all whom it may concern:*

Be it known that I, DAVID C. BELLIS, a citizen of the United States, and a resident of Elizabeth, New Jersey, have invented certain Improvements in Knitting-Machines, of which the following is a specification.

The object of my invention is to so construct a knitting-machine as to adapt it for the production of fabric consisting of two webs, one overlying the other, said webs being united at appropriate intervals by yarn of one web engaging with the other web.

In the accompanying drawings, Figure 1 is a sectional view of a knitting-machine constructed in accordance with my invention. Fig. 2 is a sectional view of part of the machine, illustrating the operation of tying the two webs together; and Figs. 3 and 4 are diagrammatic views illustrating the character of the needles and cams employed in the machine.

One of the needle-carriers is represented at 1 in the drawings and the other at 2, these needle-carriers being so disposed that their needles work in planes at a right angle to each other. Each of the needle-carriers has its appropriate cam-carrier, said cam-carriers being indicated at 3 and 4, respectively. The needle-carriers may be stationary and the cam-carriers may be caused to rotate, or the reverse construction may be adopted, the needle-carriers rotating and the cam-carriers being stationary.

One or more yarn-guides are employed for each needle-carrier, these yarn-guides being so disposed that one of them or one set of them will normally feed yarn to the needles of one carrier only, the other guide or set of guides feeding yarn to the needles of the other carrier only. Thus 5 represents a guide for feeding yarn to the needles of the carrier 1, and 6 represents a guide for feeding yarn to the needles of the carrier 2, so that two separate and independent webs will be produced, one upon the needles of one carrier and the other upon the needles of the other carrier. At intervals, however, the webs may be connected together by projecting certain of the needles of one carrier so as to receive yarn from a guide which normally operates in conjunction only with the needles of the other carrier. Thus, as shown in Fig. 2, a needle of the carrier 2 is projected so as to receive yarn from the guide 5. Hence a loop or stitch of this yarn will be drawn by said needle into the web normally produced by the needles of the carrier 2, and the two webs will thus be connected together, a stitch being formed if the needle of the carrier 2 is projected far enough to cast the stitch already on it and a simple loop being drawn if the needle is not thus projected.

In machines of fine gage, having the needles of one carrier disposed directly in line with the needles of the other carrier, a needle of one carrier will be held in the retracted position when a tying-needle of the other carrier is projected, as shown in Fig. 2; but in machines in which the needles of one carrier play between the needles of the other carrier this will not be necessary, as the needles of both carriers may be projected at the same time.

In Figs. 3 and 4 I have shown an arrangement of needles and cams which may be adopted in carrying out my invention, the cams being shown in each case as developed in a straight flat plane instead of following the curved or circular course which they actually assume in the machine.

All of the needles of the carrier 2 have short butts with the exception of those needles which are to act as tying-needles, the butts of these needles being longer than those of the other needles, and the cam-carrier, which coöperates with the needles of the carrier 2, has cams 9 and 10, the cams 9 acting upon the butts of all of the needles and the cam 10 acting only upon the long butts of the tying-needles. In like manner the carrier 1 has needles, all of which have long butts except the needles which work in line with the tying-needles of the carrier 2, these needles having short butts, and the cam-carrier 3, which operates in conjunction with the needles of the carrier 1, has cams 11 and 12, the cams 11 projecting all of the needles and the cams 12 projecting all except the short-butted needles. The cams 9 and 11 of the two cam-carriers are so disposed that the needles of one carrier will be projected only when those

of the other carrier are retracted, the tying-needles, however, being projected by the cam 10 at the same time that the needles of the carrier 1 are being projected by the cam 12, so as to receive yarn from the guide 5 at the same time that the guide is feeding yarn to the needles of the carrier 1.

The two webs are not intended to be tied together in every course, a number of courses of each fabric intervening between those courses in which the tying is effected. Hence in the claims I have used the term "alternate courses" to specify this feature of construction of the machine. The tying-needles, therefore, after once being projected so as to receive yarn from the other fabric will have to be prevented from again receiving such yarn until a number of intervening courses of fabric have been knitted, and when the machine has but a single yarn-guide for each set of needles this may be accomplished by projecting the tying-needles to receive the opposite yarn only once in so many rotations of the machine by the use of any ordinary form of adjustable projecting-cam, or in the case of a machine using a number of guides the cam which projects the tying-needle may form one of a number of cams which act upon said needles, the other cams only projecting the needles so as to receive the yarn from their own guides, as in the construction shown in Figs. 3 and 4, in which the cams 10 and 12 are those which act upon the needles at the tying-point, the cams 9 and 11 forming part of a series which project the needles so as to receive yarn from their own guides at different knitting-points.

While I have shown my invention as applied to a machine of the ordinary rib type having a cylinder and dial, it will be evident that it can be applied with equal facility to any machine having two needle-carriers disposed at opposing angles, and my invention is, moreover, not limited to cylindrical machines for producing tubular web, but is applicable as well to machines having straight needle-beds for producing flat web, and although I have shown the invention as applied to a machine using latch-needles it will be evident that it can be embodied also in machines employing in either or both carriers needles with spring-beards.

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

1. A knitting-machine in which are combined two sets of needles, carriers therefor, one or more guides operating to feed yarn to each set of needles, and means whereby certain of the needles of one set may at intervals in alternate courses be caused to engage with the yarn normally fed to the needles of the other set, substantially as specified.

2. The combination in a knitting-machine, of a pair of needle-carriers each having a circular series of needles, one or more yarn-guides operating in conjunction with the needles of each carrier, and means for causing certain of the needles of one carrier to engage at intervals in alternate courses with the knitting-yarn normally fed to the needles of the other carrier, substantially as specified.

3. The combination in a knitting-machine, of a pair of needle-carriers each having needles, some of the needles of one carrier being differentiated from the others, one or more yarn-guides for each set of needles, cams for operating the needles of each carrier so as to cause them to receive yarn from its corresponding guide or guides, and cams for operating the differentiated needles so as to cause them to receive in alternate courses yarn from a guide which is normally operative in connection only with the needles of the other carrier, substantially as specified.

4. The combination in a knitting-machine, of two needle-carriers each having needles some of which are differentiated from the others, a yarn guide or guides operating in conjunction with the needles of each carrier, and cams whereby the needles of each carrier may be projected so as to receive yarn from its corresponding guide or guides, and whereby certain needles of one carrier may be projected to receive in alternate courses yarn from a guide of the other needle-carrier, and the corresponding needles of said other carrier may be held in the retracted position, substantially as specified.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

DAVID C. BELLIS.

Witnesses:
F. E. BECHTOLD,
JOS. H. KLEIN.