

(No Model.)

2 Sheets—Sheet 1.

H. STOLL & F. MAERCKLIN.
STRAIGHT KNITTING MACHINE.

No. 523,820.

Patented July 31, 1894.

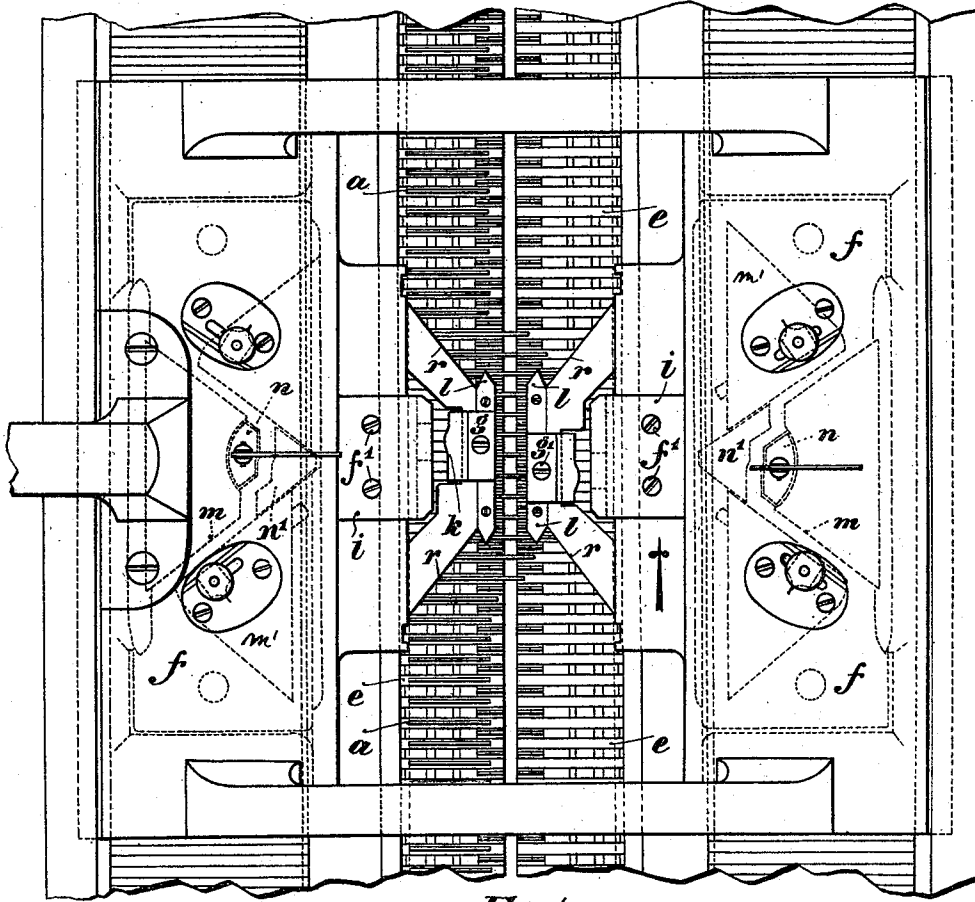


Fig. 1.

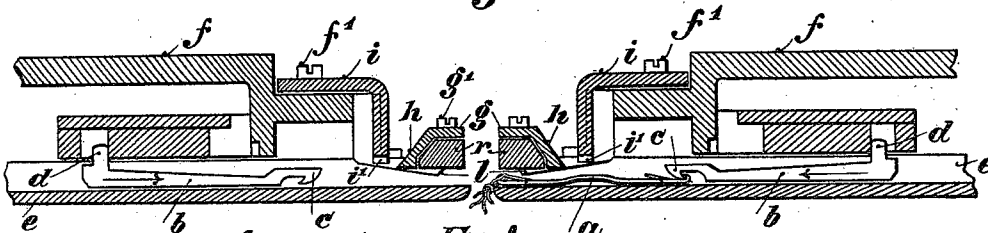


Fig. 4.

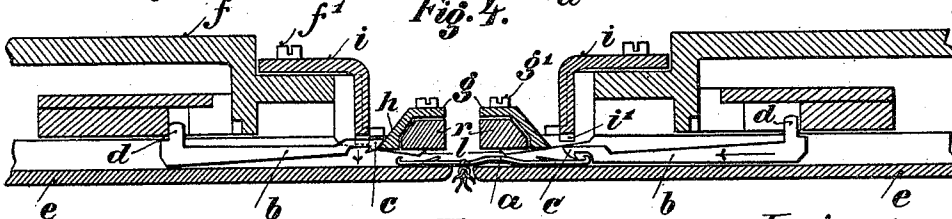


Fig. 2.

Attest:

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by Max Georgii, Atty.

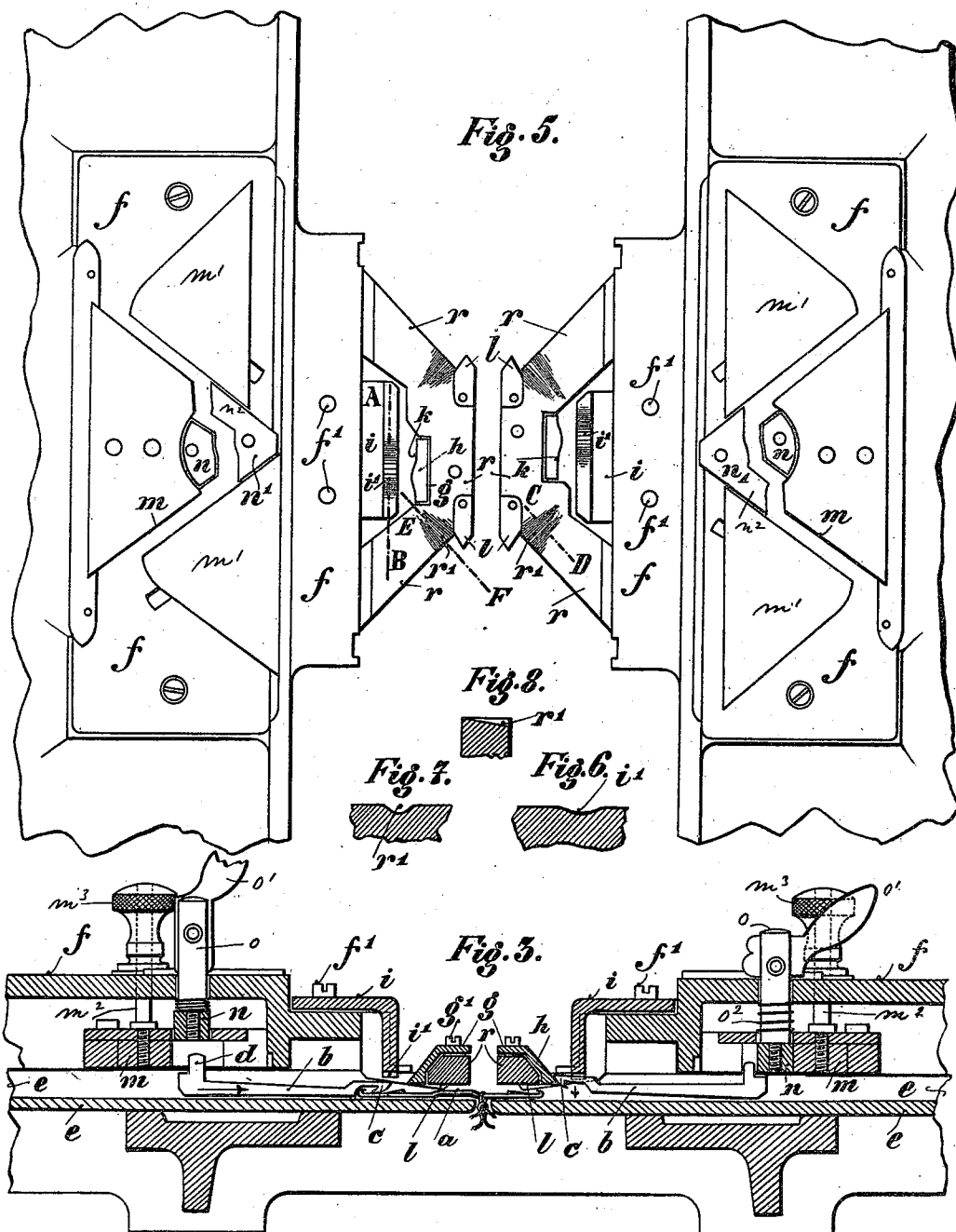
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2 Sheets—Sheet 2.

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STRAIGHT KNITTING MACHINE.

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UNITED STATES PATENT OFFICE.

HEINRICH STOLL AND FRIEDRICH MAERCKLIN, OF REUTLINGEN, GERMANY.

STRAIGHT-KNITTING MACHINE.

SPECIFICATION forming part of Letters Patent No. 523,820, dated July 31, 1894.

Application filed June 30, 1893. Serial No. 479,311. (No model.) Patented in Germany August 11, 1891, No. 62,734; in Switzerland October 30, 1891, No. 4,514, and May 7, 1892, No. 5,160; in France October 30, 1891, No. 217,108; in Austria-Hungary October 30, 1891, No. 51,805 and No. 82,581; in England December 8, 1891, No. 21,451, and in Italy October 22, 1892, XXVII, 32,875, LXVIII, 440.

To all whom it may concern:

Be it known that we, HEINRICH STOLL and FRIEDRICH MAERCKLIN, subjects of the Emperor of Germany, and residents of Reutlingen, in the Kingdom of Württemberg, Germany, have invented certain new and useful Improvements in Straight-Knitting Machines, (patented in Germany, No. 62,734, dated August 1, 1891; in Switzerland, No. 4,514, dated October 30, 1891, and No. 5,160, dated May 7, 1892; in France, No. 217,108, dated October 30, 1891; in Austria-Hungary, No. 51,805 and No. 82,581, dated October 30, 1891; in England, No. 21,451, dated December 8, 1891, and in Italy, Reg. Gen., Vol. XXVII, No. 32,875, Reg. Attest, Vol. LXVIII, No. 440, dated October 22, 1892,) of which the following is a specification.

Our invention relates to knitting machines.

The object of our invention is to simplify the construction of flat knitting machines, without reducing the efficiency in any way.

With this object in view, our invention consists in such features of construction and combination of parts as will first be described in connection with the accompanying drawings and then particularly pointed out in the claims.

In the drawings—Figure 1 is a plan view of so much of a flat knitting machine as is necessary to illustrate our invention. Figs. 2, 3, and 4 are transverse, sectional views of the same showing the needles in different positions. Fig. 5 is a bottom, plan view of the cam mechanism. Fig. 6 is a detail, sectional view on the line A—B, Fig. 5. Fig. 7 is a similar view on the line C—D, Fig. 5. Fig. 8 is a similar view on the line E—F, Fig. 5.

As will be seen from Figs. 2, 3, and 4, the two needle-beds are placed in one plane, and a double needle, *a*, of the form shown in Figs. 2, 3, and 4 is employed. This needle consists of a central body or shaft provided with hooks and latches at both ends. This double needle is pushed alternately from the needle-channel or slot of one needle-bed, *e*, to the corresponding channel of the opposite needle-bed, *e*, by the operation of the carriage. This is effected by means of the jacks, *b*, which have the forms shown in Figs. 2, 3 and 4, being

provided with the toothed inner ends, *c*, and with the upward-extending lug or arm, *d*, which projects above the slotted needle-bed, so as to become engaged by the cams, in order that the jacks may be pushed to and fro. When the jacks of one side are pushed inward by the cams, they force the needles toward the opposite side and then release them, whereupon the jacks of the opposite side draw the needles some distance toward their own side and then push them forward toward the opposite side and release them. In operating the needles, the toothed ends, *c*, of the jacks engage the hooked ends of the needles, and hence it becomes necessary to employ special mechanism for releasing the jacks from the needles. This is done by the following mechanism: On both carriage parts or sley-parts, *f*, are secured butt-plates, *r*, on top of which are mounted the angle pieces, *g*, by means of suitable screws. Each angle piece forms an inclined plane (see Figs. 2, 3 and 4), up which the inner ends of the jacks are forced by the longitudinal movement of the jacks when pushed inward by the cams, the toothed ends, *c*, gliding upward and thereby releasing the hooked ends of the needles.

Now, the construction of the machine is such that, on the one hand, the jacks are pushed earlier, so that the needles, approaching from the other side, can be pushed in under the toothed ends of said jacks, and that these return earlier into the lower position, to grasp and draw back the needles. Then the other needle-ends cannot be grasped by the descending ends of the jacks on their sides. To obtain these results, the intermediate cam-block, *n*, on one side of the machine is not directly opposite that on the other side of the machine, that is to say, they are out of line, as will be seen from Figs. 1 and 5.

The jacks are guided by a curved opening or rounded groove, *i'*, as soon as their toothed ends, *c*, glide up the inclined plane, *h*. These grooves, *i'*, are cut in the inner faces of the angle pieces, *i*, which are secured to the carriage portions, *f*, by screws, *f'*. The form of these grooves is better illustrated in Fig. 6, which is a section on the line A—B, Fig. 5. As the jacks are drawn in, they are forced

downward, sliding along the inclined planes until finally lowered to their positions in the needle-slots.

In order to permit the jacks to drop freely, the inclined planes, *h*, are cut away somewhat, as at *k*. On the inner free ends of the two carriage or sley-parts, *f*, the latch openers, *l*, are arranged.

When the carriage is in the starting position, and the loops on the right side, the jacks on the right have grasped the needles, while the jacks at the left are free, as shown in Fig. 4.

As the carriage moves in the direction of the arrow, Fig. 1, the following occurs: The jacks are pushed inward at both sides by the cams, and as the latter are not directly opposite each other, those jacks at the left are pushed inward earlier than those at the right. These latter ones push the needles in the direction of the arrow, Fig. 2, until the left ends of the needles are placed directly under the toothed ends, *c*, of the jacks which have been lifted at the left side by the inclined plane, *h*. At the same moment, the toothed ends, *c*, of the other jacks leave the needles, being directed upward by the inclined plane, *h*, at the right. Now the jacks at the left fall from the inclined plane on their sides and engage the needles, drawing them toward the left. The hooked ends at the right of the needles catch the yarn, while the needles are withdrawn from the loops formed before, which are attached to the texture beyond. As soon as the carriage has traveled to the other side, the new loops are hanging at the left. The carriage then moves backward, that is, in a direction opposite to the arrow. The needles are pushed again to the right, as indicated by the arrow in Fig. 3, whereupon the operation is reversed and the new meshes formed at the right. In this manner, the needles are pushed alternately to the left and right and by this means the ware is produced.

As shown in Figs. 1, 3, and 5, the middle-cams are constructed in two parts, whereby it is possible to operate only one side of the machine if desired.

Each cam-device consists of an outer stationary cam, *m*, an inner stationary cam, *n'*, an intermediate movable cam or block, *n*, and two lateral adjustable cams, *m'*, as will be plain from Fig. 5. The intermediate cam, *n*, is provided with a stud, *o*, which projects upward through the plate, *f*, and is slotted at its upper end, a lever, *o'*, being pivoted in the slot. Between the plate, *f*, and the cam-block, *n*, is placed a spiral spring, *o''*, surrounding the stud and normally tending to hold the cam-block, *n*, in its lowered position. By raising the lever, *o'*, to a vertical position, the stud will be raised, and with it, the cam-block, *n*. Between the inner cam, *n'*, and the outer cam, *m*, is formed an irregular space which is the race-way for the upward-extending lugs, *d*, on the jacks of its respective side. This race-way is an irregular path, as will be fully

understood from Fig. 5, where it will be seen that each inner cam-block, *n'*, has a wing, *n''*, which projects outward, the wing of one cam-block, *n'*, being on the side opposite that of the other cam, so that the part of one race-way which is nearest the inner portion of the machine is directly opposite the wing of the other cam.

The race-way is contracted by the intermediate cam-block, *n*, when the latter is in its lower position, whereby the jacks will be forced inward to the full limit, whereas, when the cam-block, *n*, is raised, the lugs, *d*, on the jacks, will not be forced inward to the full extent. Therefore, when one of the cam-blocks, *n* is raised, the jacks on one side, only, will be worked, thereby knitting on one side, only, as will be fully understood by those skilled in the art.

The lateral cams, *m'*, are each capable of being adjusted inward or outward, by means of upward-projecting pins, *m''*, which pass through slotted openings in the plate, *f*, and are provided with thumb-nuts, *m'''*, by which the lateral cams may be moved or fastened at any desired position, whereby the jacks may be moved outward to a greater or less extent, as desired.

By the lifting of the cam-block, *n*, at the left, the race-way is contracted so that only the outer part, *m*, operates. This cannot entirely move the jacks at the left, so, therefore, they cannot reach the inclined plane, *h*. In this way also the needles are not pushed entirely to the right, so they cannot be grasped by the jacks falling at the right. On the contrary, they are withdrawn by the jacks at the left, the hooks at the right hand ends of the needles catching the yarn and pulling it through the loops formed before, which loops are attached to the ware beyond. When the carriage moves backward again, the work just described is repeated at the same side.

By lifting the cam block, *n*, of the cam at the right of the machine, the operation described above will be repeated at the right, as will be fully understood by those skilled in the art. By this construction it will be seen that it is possible to knit on either the right or left side, or both if desired.

As latch needles are employed in this machine, it becomes necessary to use means for preventing the latches from being forced into the yarn when operating. This is done by the butt-plates, *r*, heretofore mentioned, which prevent the turning backward of the opened tongues or latches when the needles are moving below the said butt-plates or covering plates. To these covering plates the latch openers, *l*, are secured.

In order to allow the opened needle-latches to move freely under the covering plates, *r*, the latter are provided with suitable grooves or concavities, *r'*, as shown in Figs. 7 and 8.

Having thus fully described our invention, what we claim, and desire to secure by Letters Patent, is—

1. In a knitting machine, needle-beds, a series of needles having latches at each end, means for moving the needles from one bed to the other, and covering plates above the needles. 35
2. In a knitting machine, the combination, with a pair of needle-beds, a series of needles having latches at each end, and a series of jacks located in the beds and arranged to engage the needles, of a pair of covering plates above the needles and provided with inclined planes, substantially as set forth. 40
3. In a knitting machine, the combination, with a pair of needle-beds, a series of needles having latches at each end, and a series of jacks located in the beds and arranged to engage the needles, of a pair of covering plates above the needles and provided with inclined planes, and a pair of angle pieces, each having a groove on its under side in which the jacks are guided when elevated by their respective inclined planes, substantially as set forth. 45
4. In a knitting machine, the combination, with a pair of needle-beds, and a series of needles having latches at each end, of a carriage having means for operating the needles and moving over the needle-beds, a pair of covering plates attached to the carriage, and a latch-opener at each end of each covering plate, substantially as set forth. 50
5. In a knitting machine, the combination, with a pair of needle-beds, and a series of needles having latches at each end, of a carriage having means for operating the needles and moving over the needle-beds, and a pair of covering plates attached to the carriage, each plate having a pair of concavities, r' , in its under side, substantially as set forth. 55
6. In a knitting machine, the combination, with a carriage, and an inner and an outer cam secured to the carriage and having a race-way between them, the inner cam having an outward-projecting wing, of an intermediate cam-block movable in the race-way and located at one side of the wing of the inner cam, substantially as set forth.
7. In a knitting machine, the combination, with a carriage, and an inner and an outer fixed cam secured to the carriage and having a race-way between them, the inner cam having an outward-projecting wing, of a pair of adjustable lateral cams, one on each side of the fixed cams, and a movable cam-block located in the race-way between the inner and outer cams, substantially as set forth.

In testimony that we claim the foregoing as our invention we have signed our names in presence of two subscribing witnesses.

HEINRICH STOLL.
FRIEDRICH MAERCKLIN.

Witnesses:

ANTON EIFERT,
CHRISTIAN GROTZ,
Both of Reutlingen.