J. F. SMITH & C. LEHMANN.

Cam for Knitting-Machines.

No. 214,722. Patented April 22, 1879.

Fig. 1.

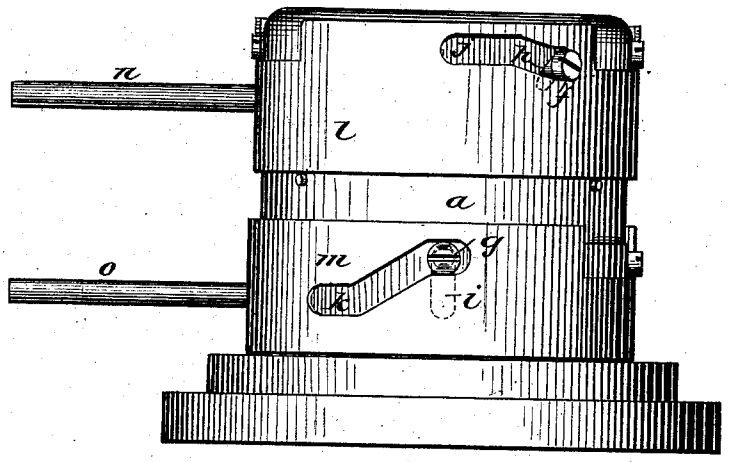


Fig. 2.

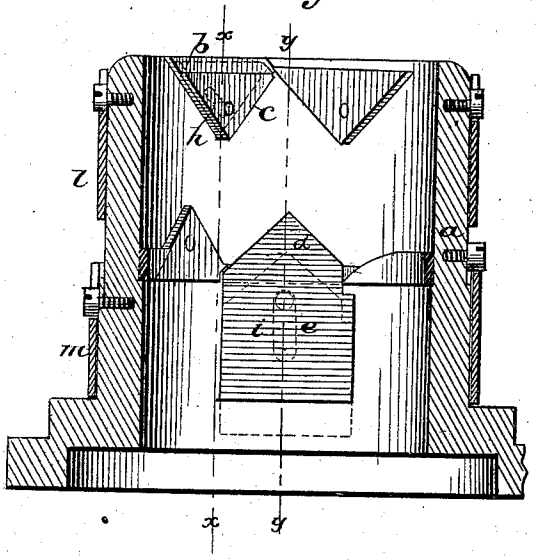


Fig. 3.

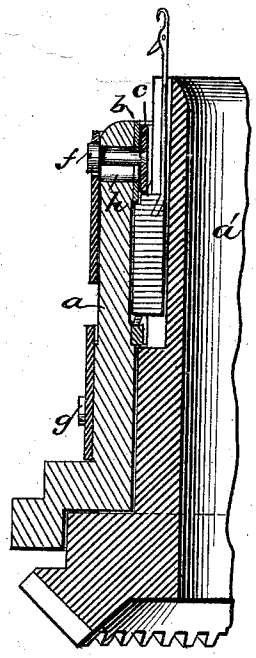
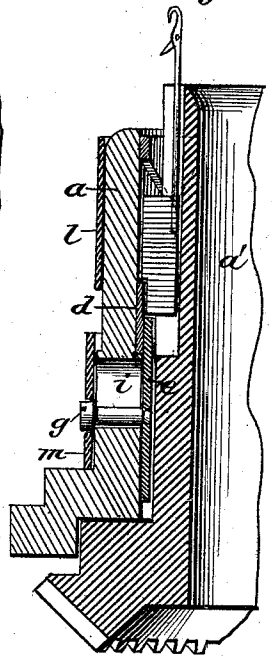


Fig. 4.



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UNITED STATES PATENT OFFICE.

JOSEPH F. SMITH, OF GERMANTOWN, AND CHRISTIAN LEHMANN, OF PHILADELPHIA, PENNSYLVANIA.

IMPROVEMENT IN CAMS FOR KNITTING-MACHINES.

Specification forming part of Letters Patent No. **214,722**, dated April 22, 1879; application filed February 13, 1879.

To all whom it may concern:

Be it known that we, JOSEPH F. SMITH, of Germantown, and CHRISTIAN LEHMANN, of the city of Philadelphia, in the county of Philadelphia, in the State of Pennsylvania, have invented certain new and useful Improvements in Cams for Knitting-Machines, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, making part hereof.

This invention relates to cams for knitting machinery controllable without stopping the machine for the production of plain and tuck work, especially in stocking fabrics.

The invention consists in compound cams composed of a fixed portion and a movable portion, the latter being adapted to be shifted vertically over or upon the fixed portion in the direction of the length of the said fixed portion, so as to give two cam-faces to the cams, in combination with a pin, the slotted cylinder through which the pin projects, and the slotted operating-band, the said cams being operated without stopping the machinery, and applied as top and bottom cams to serve in changing from plain to tuck and from tuck to plain work. With these cams are employed jacks having suitable top or bottom tucks or notches, and also plain jacks, which are inserted in the comb or needle-cylinder at proper intervals in accordance with the pattern of work to be made, the tuck-jacks being worked by the shifting of the cams at the desired times, while the plain jacks are unaffected by such shiftings.

In the drawings hereinbefore referred to, Figure 1 is a side elevation of a cylinder embodying our invention; Fig. 2, a vertical cross-section, showing the cams in elevation, the top cam in full lines being in position for plain work, and in broken lines in its shifted position for tuck-work, and the bottom cam being in normal position in full lines, and in its shifted position for tuck-work in dotted lines. Fig. 3 is a vertical section on line *x x* of Fig. 2, showing the top cam in position for tuck-work; and Fig. 4 is a vertical section on line *y y* of Fig. 2, showing the bottom cam in its shifted position for tuck-work.

The revolving needle comb or cylinder, the outer cylinder, and the jacks are of any ordinary construction. The invention is shown applied to a cylindrical knitting-machine, *a* being the outer cylinder, and *a'* the comb or needle-cylinder. On the inner face of the cylinder *a* are the cams, which in this invention consist of a fixed portion, *b*, and a movable portion, *c*, for the top cam, and a fixed portion, *d*, and movable portion *e* for the lower cam. These movable, or preferably shifting, portions *c e* work over and upon the fixed portions, and the two portions form, when in line, cams of sufficient width to operate the plain jacks, while the movable or shifting portions are of such width as to engage, when shifted, the tuck-jacks to operate them without at the same time taking the plain jacks from their paths upon the fixed portions, and without interfering with their work. The cams *c e* are respectively provided with studs *f* and *g*, the stud *f* extending through a diagonal slot, *h*, through the fixed cam *b* and cylinder *a*, and the stud *g* through a vertical slot, *i*, in the cylinder, and thence, respectively, through cam-slots *j* and *k*, made in bands *l* and *m*, encircling the cylinder. These bands *l* and *m* are provided with operating-handles *n* and *o*, in convenient reach of the attendant, while the machine is in motion. Instead of slotted bands slotted plates or cams may be employed, or any other mechanical equivalent which will serve to shift the movable cams *c e* vertically over the faces of the fixed cams. This shifting of the movable cams effects the changes from plain to tuck work according to their positions thus: When the top cam, *c*, is in the position shown in full lines at Fig. 2, and the bottom cam, *e*, in that shown by full lines, Fig. 2, plain work is being made—that is to say, all the needles are operated to produce plain stitches, or a fabric of uniform appearance. When cam *c* is in the position shown in Fig. 3 top tuck-work is being made, for the cam has been shifted so that as the top tuck-jacks come into contact with it and necessarily follow its surface their needles cannot descend far enough to throw off their loops, but merely lay them straight across the back of the fabric, and the stitches are not formed until the next plain cam is reached,

which depresses the needles sufficiently to cause them to throw off their loops into stitches. When the bottom cam, *e*, is shifted downward, as in dotted lines, Fig. 2, and full lines, Fig. 4, the bottom tuck-needles are rendered inoperative—that is to say, fail to throw off their loops to form stitches, but merely lay them straight across the back of the fabric, and bottom tuck-work is produced. Similarly, when the cam *c* is as in Fig. 3, and the cam *e* as in Fig. 4—that is to say, both cams shifted—both the top and bottom tuck-jacks are inoperative, and top and bottom tuck-work is produced; in other words, the loops of both sets of tuck-needles are laid straight across the back of the fabric until plain cams are again reached and plain stitches formed. These several changes may be effected at any time, and all without any stoppages of the machinery.

The terms "plain work," "top tuck-work," and "bottom tuck-work," as herein employed, are respectively used in the art to designate the kind of fabric produced. The needles having jacks without any notches, recesses, or tucks, or plain jacks, produce a fabric of uniform stitches or plain work. The needles having jacks with notches or tucks at their upper ends are so operated by the top cams when shifted as to fail to draw the loops into stitches, merely laying them straight across the back of the fabric, and so produce top tuck-work. Tuck-work may be shown on the face of the fabric by stripes or figures of a different color from the body. Those needles whose jacks have notches or tucks at their bottoms are operated by the bottom cams to produce bottom tuck-work. The two kinds of work may be combined to produce different effects, whereby the appearance or design of the fabric may be greatly varied.

It must be borne in mind that the top and bottom cams are entirely independent of one another in construction, operation, and effect; but both can be so adjusted as to combine their offices in producing a given kind of work. Their operation does not affect the plain jacks, nor reciprocally are the tuck-jacks in the least affected by the fixed cams which operate the plain jacks.

This mechanism will be found specially valuable in machinery for knitting striped or figured stocking fabrics.

What we claim is—

1. The compound cams herein described, each consisting of a fixed portion and a shifting portion, movable vertically upon or over the said fixed portion in the direction of the length of the said fixed portion, in combination with a pin, the slotted cylinder, and the slotted band for shifting the said movable portion, substantially as specified.

2. The top cam described, composed of the diagonally-slotted fixed portion *b* and the shifting portion *c*, in combination with the diagonally slotted cylinder *a*, pin *f*, and slotted operating-band, substantially as specified.

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