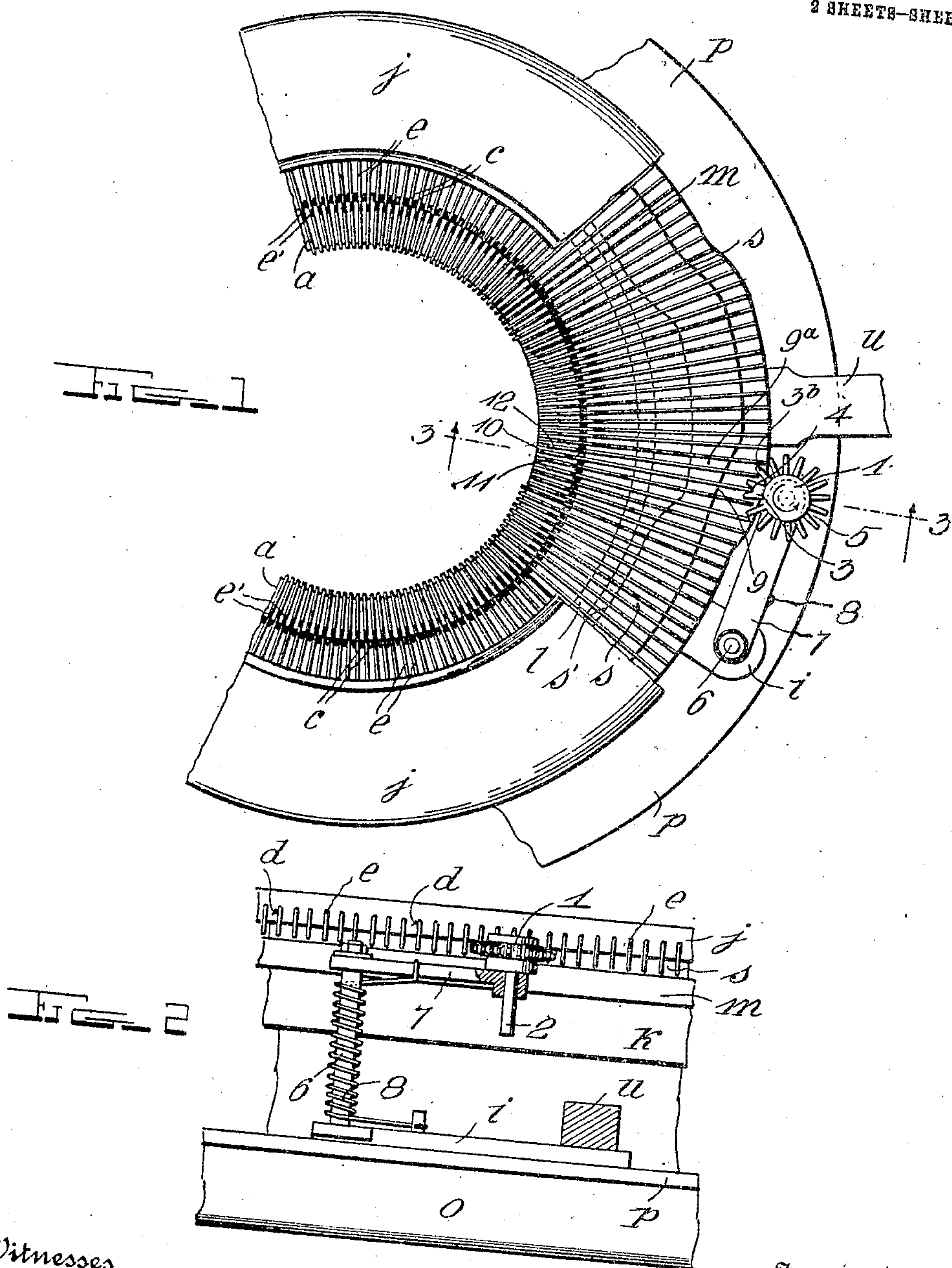


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OPENWORK ATTACHMENT FOR KNITTING MACHINES.
APPLICATION FILED OCT. 28, 1909.

Patented July 25, 1911.
2 SHEETS-SHEET 1.



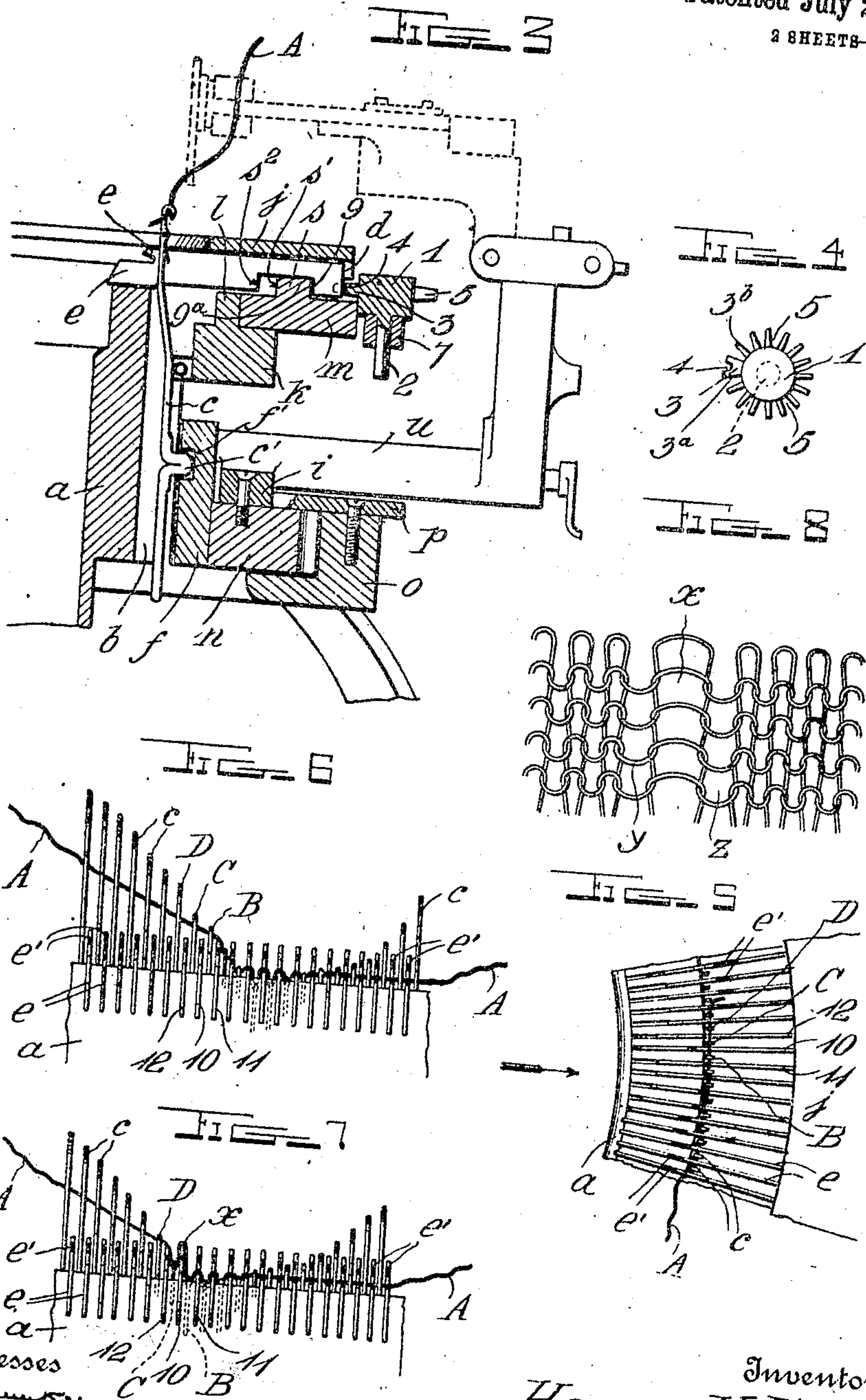
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UNITED STATES PATENT OFFICE.

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OPENWORK ATTACHMENT FOR KNITTING-MACHINES.

999,074.

Specification of Letters Patent.

Patented July 25, 1911.

Application filed October 28, 1909. Serial No. 535,106.

To all whom it may concern:

Be it known that I, HARRY H. WEST, a citizen of the United States, residing at Plymouth, in the county of Luzerne and State of Pennsylvania, have invented certain new and useful Improvements in Open-work Attachments for Knitting-Machines; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to an improved attachment for knitting machines for making open-work fabric which is particularly applicable to that class of machines known as circular knitting machines such as are used for knitting hosiery.

The principal object of the invention is to provide a simple and efficient device so constructed and operated as to change the stitch from a regular knitting mesh to an open work mesh at predetermined intervals to form any desired open or lace work pattern in the fabric in conjunction with the regular knit work, without removing the fabric from the machine, and without removing any of the needles.

With this and other objects in view, the invention consists of certain novel features of construction, combination and arrangement of parts, as will be more fully described and particularly pointed out in the appended claim.

In the accompanying drawings: Figure 1 represents a top plan view of a portion of the knitting head with parts broken out to show the construction of the sinker operating cam and the relative arrangement of the sinkers operated by the toothed wheel; Fig. 2 is a detail side elevation showing this improved attachment applied; Fig. 3 is a vertical sectional view taken on the line 3—3 of Fig. 1; Fig. 4 is a detail plan view of the toothed sinker operating wheel; Fig. 5 is a diagrammatic plan view on an enlarged scale of a portion of the knitting head, showing the position of the needles and sinkers as they appear in Fig. 1; Fig. 6 is a front elevation looking in the direction of the arrow shown in Fig. 5 and showing the formation of the elongated loops produced by the wheel projected sinkers; Fig. 7 is a similar view with the sinkers and needles slightly advanced over the position shown in Fig. 6

and clearly showing the elongated loop formed by the sinker actuated by the mutilated tooth; and Fig. 8 is a fragmentary view of a piece of fabric showing the stitches formed by this improved attachment.

In the embodiment illustrated, only so much of a knitting machine has been shown as is deemed necessary to properly show the application of this attachment, the knitting head herein shown being similar to that shown in Fig. 17 of the Patent No. 538,518 to Houseman, dated April 30, 1895. The needle cylinder *a* is of the ordinary type and is provided on its outer face with longitudinally disposed slots *b* in which the needles *c* are adapted to reciprocate by means of the usual cams *f'* which engage the butts *c'* of the needles. The sinker bed *j* is rigidly secured to a stationary bed plate *k* having an annular shoulder *l* on its upper face on which a cam ring *m* is revolubly mounted. This sinker bed *j* is provided on its lower face with a plurality of radially disposed slots, as *d*, into which fit and slide sinker bars or web holders *e* having web holding fingers *e'*. An annular gear *n* is revolubly mounted in a bed or supporting plate *o* and the teeth thereof are designed to be engaged by the main operating wheel of the machine, not shown. An annular gear retaining plate *p* overlaps the upper edge of the gear *n* and is secured in position by any suitable means, preferably by screws. A cam cylinder or head *f* is fixed to the gear *n* and carries the cams *f'* which operate the needles. A bracket such as is shown in Fig. 2 of the Houseman Patent No. 538,518, of April 30, 1895, is also secured to the gear wheel *n* and projects upwardly between two spaced laterally extending lugs, also shown in said patent, which are fixed to the sinker operating cam ring *m* by means of which the cam ring is revolved with the gear wheel *n*. The cam *s* carried on the upper face of the ring *m* is preferably constructed similar to that shown in the patent above referred to, having a recess *9* for a purpose to be described. A bracket *u* is also secured to the revolving annular gear wheel *n* and a tread guide shown in dotted lines in Fig. 3, is carried by this bracket, it being obvious that the bracket may be changed to accommodate different forms of sinker operating wheels now to be described.

A freely revoluble horizontally disposed

toothed wheel 1 is secured to the annular gear wheel *n* to rotate therewith by any suitable supporting means arranged to hold the wheel in position to revolve in a horizontal plane with its teeth in the path of the rear ends or tails of the sinkers *e* which are exposed between the lower face of the sinker bed and the upper face of the cam ring, said sinker ends being designed to mesh with the teeth of the wheel, whereby said wheel is revolved.

The wheel supporting means herein shown comprises a bracket arm *i* extending laterally from the yarn guide supporting bracket *u* and from which an upright post or standard *6* extends, being spaced laterally a suitable distance from the outer faces of the cam cylinder to hold the wheel in operative position. A laterally extending arm *7* is pivotally mounted at one end on the upper end of the post *6* and is held in operative position by any suitable means. A coil spring *8* is preferably wound around said post *6* and one end thereof is preferably secured to the arm *5* in any suitable manner and the other upper end is engaged with the arm *7* to hold said arm yieldably in operative position relatively to the sinkers, as will be hereinafter more fully described.

The toothed wheel 1 is preferably provided with a stub shaft 2 extending laterally therefrom and it is loosely and removably mounted in an aperture in the free end of the arm *7*, whereby the wheel may be revolved in a horizontal plane with the teeth thereof arranged in position to receive the tails or rear ends of the sinkers *e* between them and by means of which said wheel is revolved by the rotation of the gear wheel *n*. The cam *s* on the upper face of the sinker operating cam ring is recessed as shown at 9 at a point opposite the wheel 1 and said recess is of sufficient length to permit the free inward movement of the sinkers when engaged by a mutilated tooth of said wheel and by the sides of adjacent teeth at one side of the mutilated tooth, otherwise the sinkers would be held against movement when so engaged. This wheel 1 may be of any desired size and provided with any number of teeth and one or more of these teeth is enlarged and mutilated or notched as shown at 3 and engaged with the outer end of a sinker, whereby the sinker is moved inwardly and its inner end projected a predetermined distance to engage the yarn being fed before the needle is moved downwardly, whereby said yarn is caused to extend across the upper edge of the web holding finger *e'* of said projected sinker, said yarn being thereby held a predetermined time to form an opening or gap in the fabric being knit. These mutilated teeth 3 are each of a width corresponding to the width of two of the other teeth and each

has a notch 4 in its free end in position corresponding to the space 5 between the other teeth to engage the rear end of the sinker to be moved forward.

It will be obvious that wheels of any desired size may be employed and these wheels may be provided with any desired number of mutilated teeth suitably arranged to produce the desired open-work pattern. It will also be obvious that the depth of the notch in the teeth may be varied to provide for the formation of loops of different length, thereby varying the size of the openings in the fabric.

It is well known that in the knitting of the ordinary mesh the needle takes the thread before the sinker moves forward and to produce open-work or lace mesh the sinkers actuated by a mutilated tooth of wheel 1 and by the sides of the adjacent teeth move forward before the needle is drawn down, whereby the stitches so formed will loop over the sinkers so projected and thus form gaps in the fabric.

When the annular gear *n* is rotated by the driving mechanism, not shown, the tails or rear ends of the radially disposed sinkers *e* engage the teeth of the wheel 1 carried by said gear and revolve it, and the recessed portion 9 of the cam *s* being opposite said wheel 1 permits the sinkers 10, 11 and 12, engaged respectively by the side 3^a and by the end 4 of the mutilated tooth 3, and sinker 12 engaged by the side of the tooth 3^b arranged at one side of said mutilated tooth, to move freely inward into the position shown in Fig. 1 and to remain in this position until the cam *s* is turned sufficiently to cause the inclined rear edge *s'* thereof to engage the walls of the recesses *s*² in said sinkers and move them into normal position in alignment with the other sinkers. As shown in Fig. 1, the sinker 10 engaged by the mutilated tooth 3 will be projected considerably in advance of the sinkers 11 and 12, whereby the yarn *A* drawn down by the needle *B* transversely across the upper edge of the web holding finger of said sinker 10 will be positively held in this position a predetermined time. In Fig. 6 the sinker 10, which forms the long loop *x* in the fabric illustrated in Fig. 8, is shown moved inwardly into the position which it assumes when projected by the engagement of its rear end with the notched end of the mutilated tooth 3. In this position the free end of the finger of the sinker 10 extends well beyond the inner faces of the needles ready to receive the yarn *A* across its upper edge. The sinker 11 adjacent to sinker 10 is shown projected slightly inward with the free end of its finger extending slightly beyond the inner faces of the needles and with the yarn *A* extending across its upper edge and in the act of sliding off said finger under the

drawing down action of the needle B just before the yarn engages the upper edge of the finger of sinker 10. This sinker 11 is moved into this position by the engagement of its rear end with the inner side 3^a of the tooth 3 and it remains there inert in position to receive the yarn for an instant, owing to the fact that the recess *e*² in its lower edge is arranged over the narrow portion 9^a of the cam *s* and hence the sinker is not affected by the cam. The continued movement of the gear *n* and the cam cylinder carried thereby causes the needle, as C, to draw the thread A down over the sinker 10, as shown in Fig. 7, and thereby form the loop *x* in the fabric. Simultaneously the thread A passes over the end of the finger of the sinker 12 which has been projected by the engagement of its end with the side of the tooth 3^b into this position, shown in Figs. 1 and 7. The finger of this sinker 12 is projected beyond the inner faces of the needles a sufficient distance only to cause its upper edge to receive the yarn for an instant and the yarn slips off said finger on the downward movement of the needle, as D, whereby the loop *y* shown in Fig. 8 is produced.

As above pointed out, the size of the toothed wheel 1 and the number and arrangement of the mutilated teeth carried thereby may be varied indefinitely to produce different patterns in the fabric being knit. Any number of different sized wheels 1 may be supplied, which are readily interchangeable, the stub shaft 2 of all being of the same size to fit the aperture in arm 7. If a wheel 1 be used, having a plurality of teeth, the spaces or recesses between which including the notches in the mutilated teeth, divide equally into the number of sinkers used, then the open-work meshes in the fabric produced by the mutilated teeth will be formed in vertical alinement as is shown in Fig. 8 of the drawings. For instance, if a knitting head having one hundred and seventy-six sinkers be in operation and a sinker actuating wheel 1 having say sixteen teeth, be used, with one tooth thereof mutilated, then it will be clearly seen that every sixteenth sinker will be actuated and the loop formed thereby will produce an opening or gap in the fabric, and there will be formed eleven vertically disposed rows of openwork. On the contrary, if a wheel should be used having a number of teeth which will not divide equally into the number of sinkers used, say seventeen, the open-work stitch or gap will be formed each course one stitch in advance of the preceding gap and thereby producing obliquely arranged rows of lacework in the fabric.

From the above description, it will be ob-

vious that the rotation of the gear *n* will cause the toothed wheel 1, which is carried thereby, to revolve in the free end of the arm 10 by reason of the engagement of its teeth with the rear ends or tails of the sinkers, and this turning of the wheel 1 causes the mutilated tooth 3 and the tooth 3^a to engage the sinkers 10, 11 and 12 and move them inwardly into the position shown in Fig. 1, and when so actuated, said sinkers engage the thread before the needles B, C and D are drawn down and hold it out of the path of the needles, whereby the stitches engaged by said sinkers are formed into lengthened loops, more yarn being drawn out by this projection of the sinkers than is utilized for the ordinary loops produced by the other sinkers, thereby producing the effect of open or lace work in the fabric, the middle row *x* produced by sinkers as 10 being wider than the rows *y* and *z* formed by the sinkers 10 and 11. It is also to be observed that should the wheel 1 fail to produce the desired pattern it is only necessary to swing the arm 7 outward to disengage the teeth of the wheel from the sinkers, when said wheel may be turned to bring the mutilated teeth thereof into desired position or the wheel may be removed and another substituted without stopping the machine.

From the foregoing description, taken in connection with the accompanying drawings, the construction and operation of the invention will be readily understood without requiring a more extended explanation.

Various changes in the form, proportion and the minor details of construction may be resorted to without departing from the principle or sacrificing any of the advantages of the invention, as defined in the appended claim.

I claim as my invention:

In a knitting machine comprising a rotary member, a cam cylinder secured to said member, needle operating mechanism, sinkers operable between the needles, a revoluble detachable toothed wheel carried by said rotary member, and having one of its teeth enlarged and provided with a notch for engagement with ends of said sinkers, the remaining teeth of the wheel being adapted to freely pass between the ends of the sinkers, whereby the wheel is rotated to cause the notch of the enlarged tooth to engage with the sinkers at predetermined distances.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

HARRY H. WEST.

Witnesses:

PHILIP J. JONES,
JOSEPH WEST.