

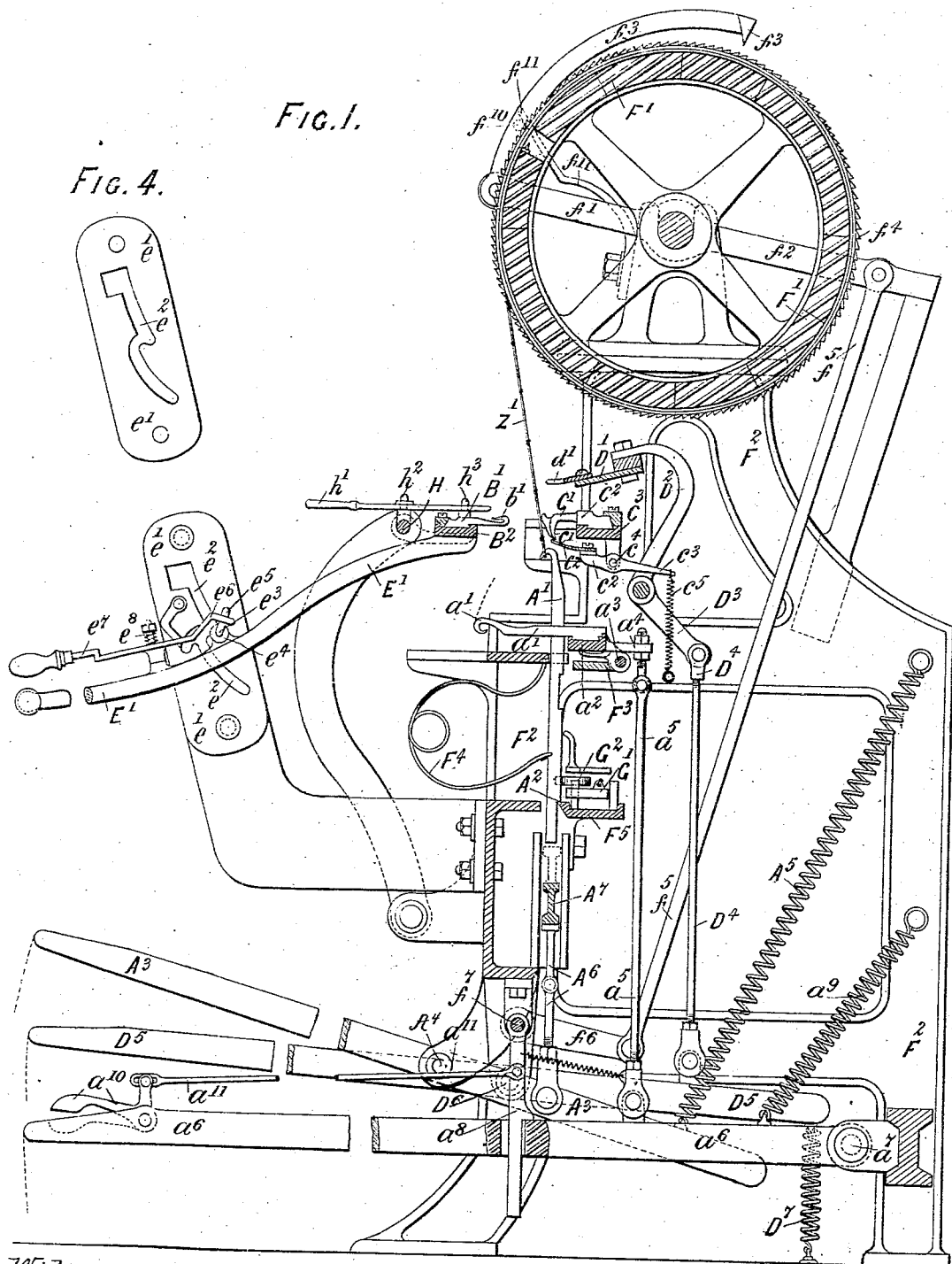
(No Model.)

5 Sheets—Sheet 1.

J. KNOX.
MACHINE FOR MAKING NETS.

No. 504,595.

Patented Sept. 5, 1893.



Witnesses

George Baumann

S. B. Connor

Inventor.

Jama Knox

By his Attorney.

Howe and Howe

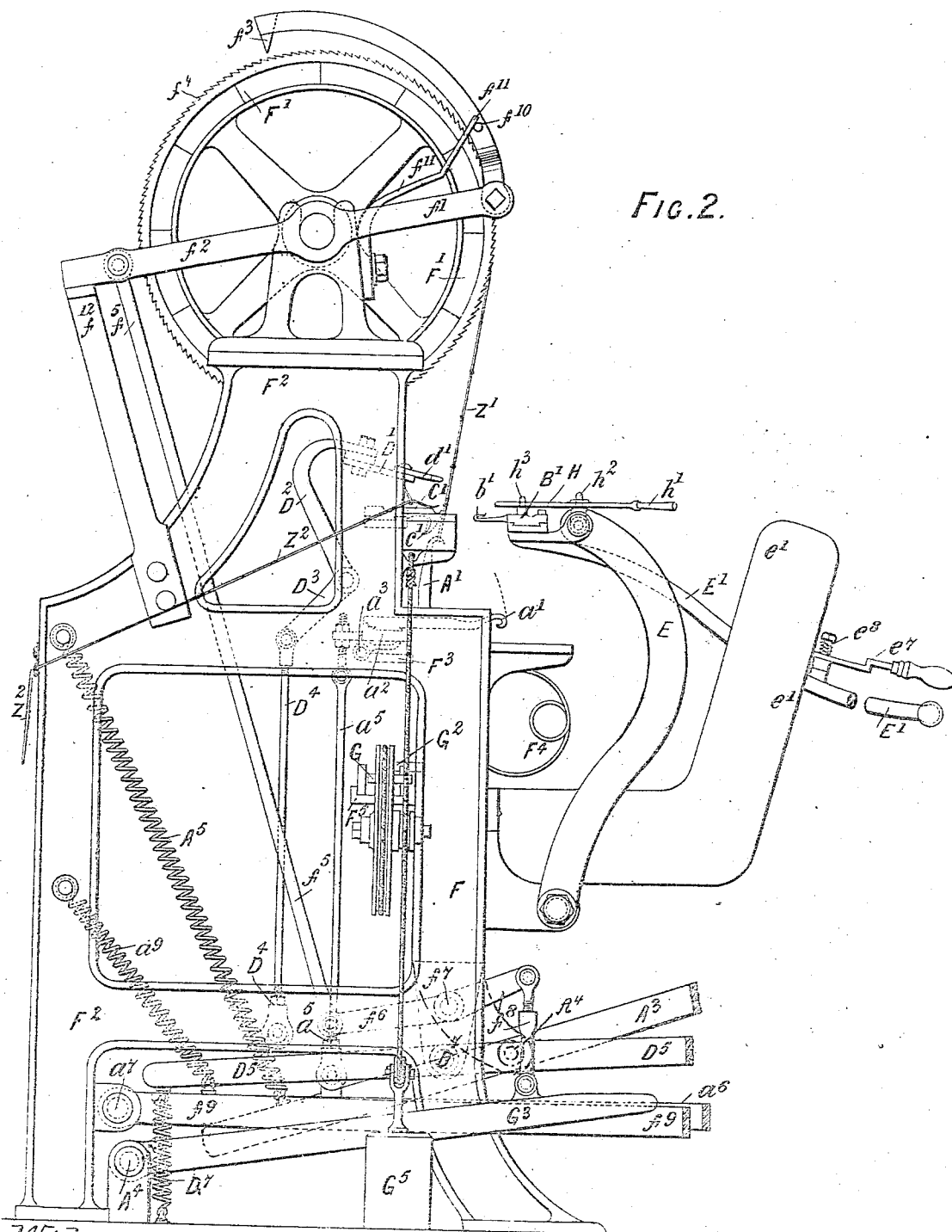
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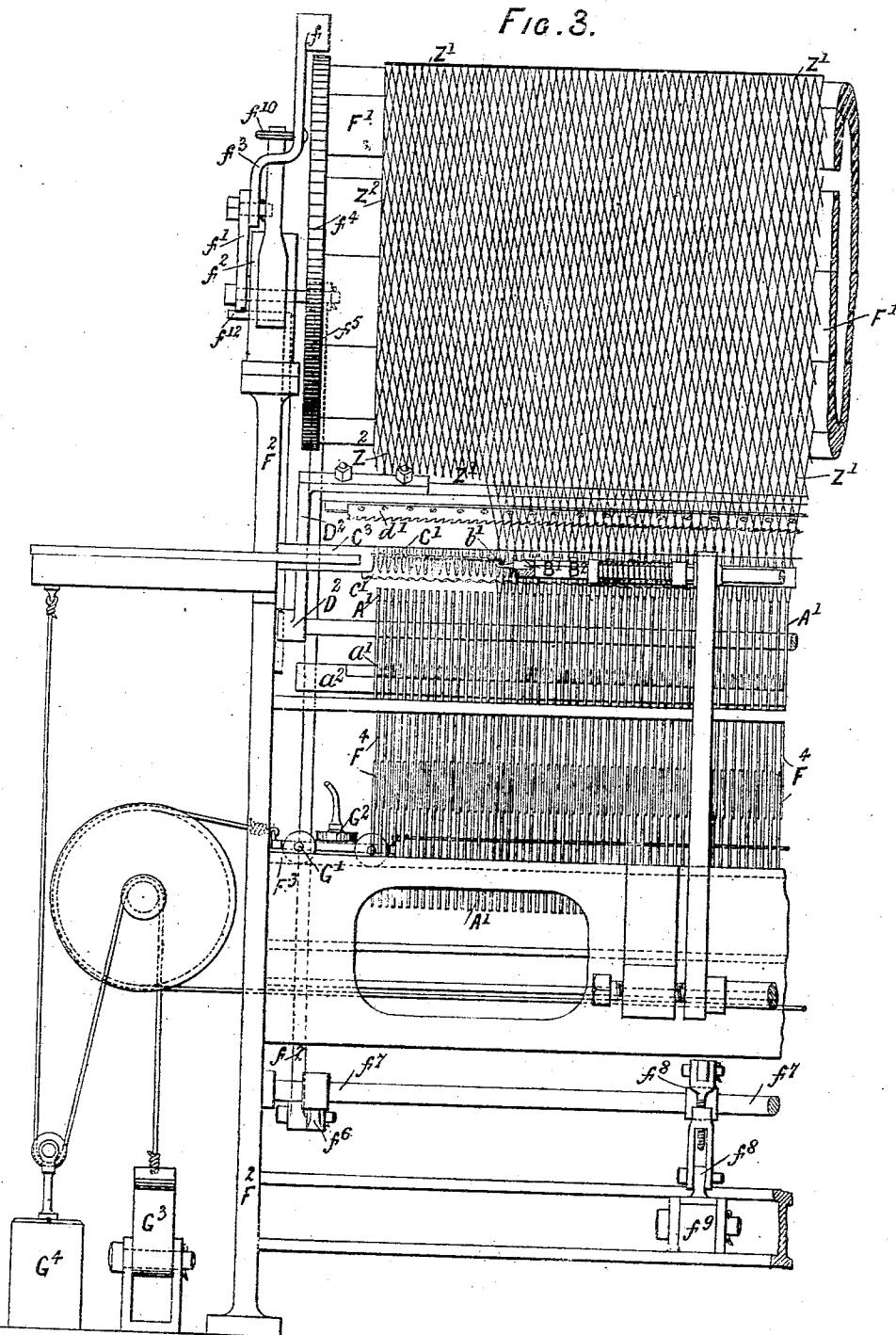
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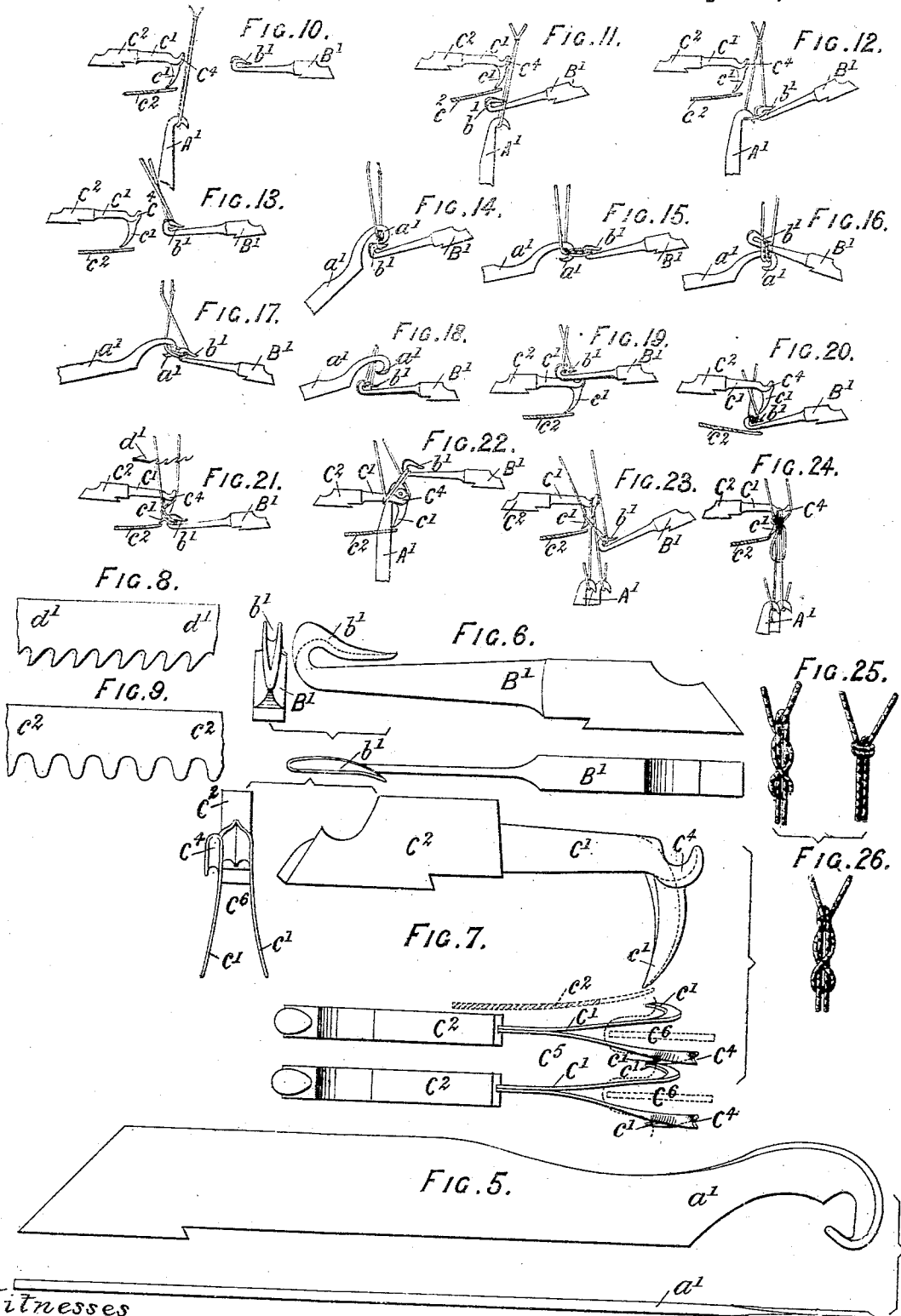
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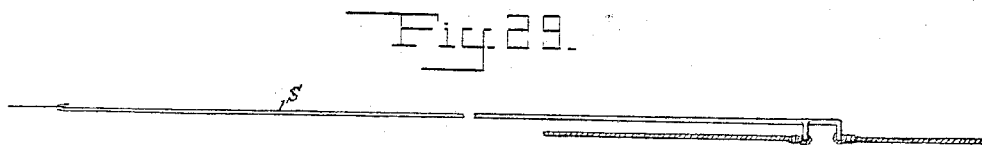
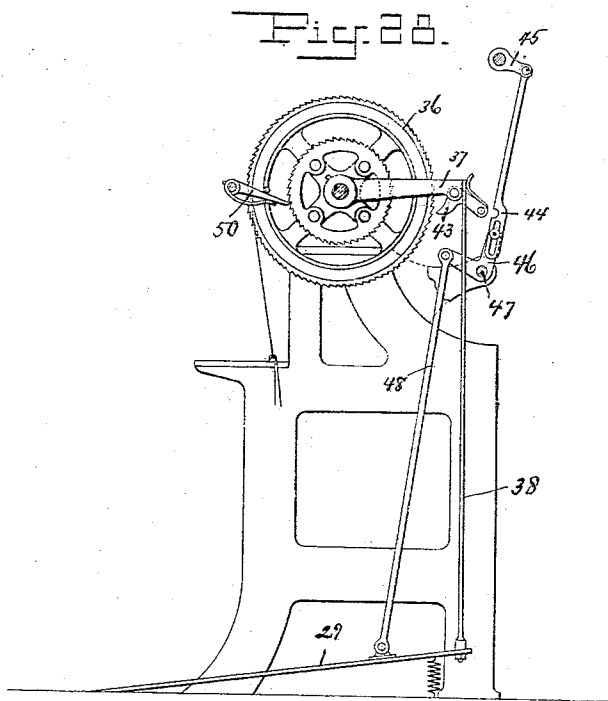
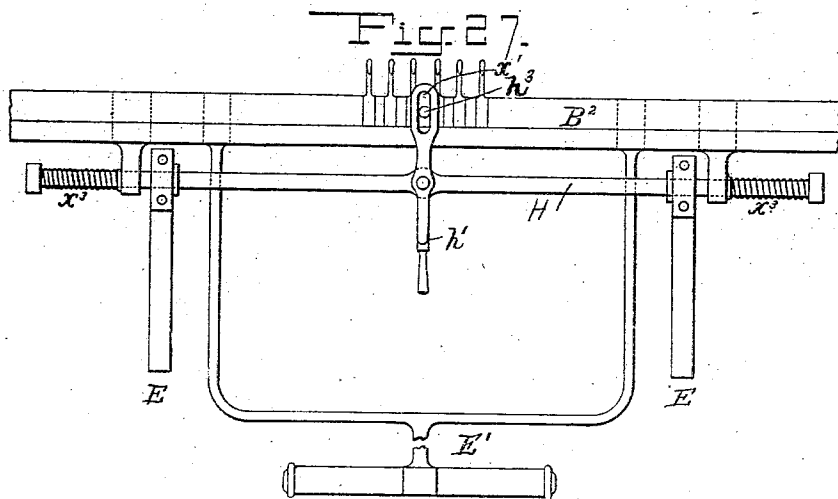
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WITNESSES:

George Baumann
James Gracie

INVENTOR:

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BY

Howson and Howson
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UNITED STATES PATENT OFFICE.

JAMES KNOX, OF KILBIRNIE, SCOTLAND.

MACHINE FOR MAKING NETS.

SPECIFICATION forming part of Letters Patent No. 504,595, dated September 5, 1893.

Application filed July 8, 1891. Serial No. 398,823. (No model.) Patented in England July 5, 1890, No. 10,426.

To all whom it may concern:

Be it known that I, JAMES KNOX, manufacturer, a subject of the Queen of Great Britain and Ireland, residing at Kilbirnie, in the county of Ayr, Scotland, have invented Improvements in Machines for Making Nets, (for which I have obtained a British patent, No. 10,426, dated July 5, 1890,) of which the following is a specification.

My invention has reference to and comprises mechanism to be applied to the ordinary net weaving machine loom known as the "Scotch net machine" in which the net fabric is knotted in a vertical traversing web for the purpose of forming the net meshes with double knots. These improvements essentially comprise an auxiliary set of vertical oscillating faller needles which receive mechanical motions to act in combination with the front hooks, and auxiliary cam motions for the latter, a serrated needle pressing plate, and "chapping" bar, and lever mechanism for slackening back the taking up beam.

In order to enable others skilled in the art to which my invention relates to understand how it may be carried into practice, I have hereunto appended five explanatory sheets of drawings, in which the same reference letters and numerals are used to indicate corresponding parts in all the figures where shown, the new or improved parts being represented by *Italic letters*.

Figure 1 is a transverse vertical section of an ordinary "Scotch" net machine or hand loom, as fitted with my improved mechanism for forming a double knot on the meshes in weaving a fishing net or net fabric. Fig. 2 is an elevation of the machine looking at the opposite end to that illustrated in Fig. 1. Fig. 3 is a front elevation of one end of the machine, and partly broken away. Fig. 4 is an enlarged view detached of the cam plate or cam groove *e' e'* for giving the motion to the front hook bar *B*² and hooks *B'* to enable them to take up the turn of thread necessary to form the double knot while the faller needles *a'* are in operation. Fig. 5 shows an elevation and edge plan respectively of one of the auxiliary vertical oscillating faller needles *a'* which come into operation in the positions shown in the diagram views Figs 14 to 18 to perform their functions in forming the double

knot on the net meshes. Fig. 6 shows an elevation and plan and front end view respectively of one of the ordinary front hooks *B'*, but as formed with an auxiliary groove in the hook part *b'*. Fig. 7 shows an elevation and front end view of one and a plan respectively of two sets of the ordinary sets of stationary duplex needles and holders *C' c' C*² but having the needles *C'* formed with an inward or forward curved part *c'* to enter the auxiliary grooves *b'* in the front hooks *B'* as hereinafter described. Fig. 8 shows a detached view to an enlarged scale of part of the pressing or "chapping" bar, as formed with a saw-tooth shaped or serrated front edge blade surface *d'*. Fig. 9 shows an enlarged view of the serrated or slotted oscillating or vibrating needle spring plate or plates *c*². Figs. 10 to 24 show the various positions and functions performed by the fallers *A'*, stationary needles *C'*, front hooks *B'*, and faller needles *a'* in forming each double knot on the net meshes. Fig. 25 shows a left hand form of the double knot on the net meshes in its formation loose and tightened up positions respectively, and Fig. 26 a right hand knot loose. Figs. 27, 28 and 29 are detail views.

Referring to the drawings,—to perform the functions of forming double knots on the mesh fabrics the following improvements in the loom mechanism are necessary: A horizontal needle bar or plate *a*² shown in Figs. 1 and 2 is fitted to the loom extending the length of the machine across the net fabric *Z'* to be woven, and carries a series of faller needles or needle hooks *a'* secured by angled or dovetailed ends at proper distances apart, shown to an enlarged scale in Fig. 5 and each shown in Figs. 1 and 2 in its lowest inactive position projecting through between each pair of the ordinary vertical fallers or sinkers *A'* below the ordinary horizontal hooks *B'*. These auxiliary faller needles or needle hooks *a'* are for the purpose of coming up and putting a turn loop or twist of the thread round the front hooks *B' b'* as hereinafter described. The horizontal bar *a*² is mounted to oscillate on stud spindles *a*³ on the stationary bar *F*³, and receives a rising and falling motion from a foot treadle *a*⁴ fulcrumed at *a*⁷ and connecting rod *a*⁵ secured at its lower end to the treadle *a*⁴ and at its upper end at

tached to an arm a^4 on bar a^2 , the needles a' being held in their horizontal position by the spring actuated catch lever a^8 passing through a slot in treadle a^6 when the treadle a^6 is depressed to the position shown in Fig. 1, the catch being released by another foot arm lever a^{10} and connecting rod a^{11} . The ordinary horizontal hooks B' shown to an enlarged scale detached in Fig. 6, secured by their inner ends on the front horizontal bar B^2 are formed with an auxiliary grooved or slotted center part b' along their hook ends and upper surface, so as to enable the auxiliary faller hooks a' and the lower hook parts c' of the needles C' to lift the loops or threads as hereinafter described. The ordinary sets of needles C' shown to an enlarged scale detached in Fig. 7, projecting and deflecting out from and secured by their usual dovetailed ends to the horizontal fixed needle bar C^3 of machine, are curved inward on their lower front ends c' so as to enter the auxiliary groove b' in the ordinary front hooks B' for the purpose of lifting the loop parts of the net knots of the meshes off these slotted hooks b' as hereinafter described. A toothed spring plate c^2 is fitted underneath the hooked ends c' of the stationary needles C' and extends along the whole length of the machine, and is secured at intervals to lever arms c^3 fulcrumed on a spindle at c^4 underneath the stationary needle beam C^3 , with lever and helical spring attachments at c^5 so as to permit the plate c^2 to oscillate. This plate c^2 has the projections coming underneath the points c' of each needle C' for the purpose of guiding the loop thread, while being formed, from the points c' of the needles C' on to the grooved hooks b' B' and also guide the loops off the points of needles as hereinafter described. The front edge of the pressing or "chapping" bar D' is formed or fitted with a saw toothed plate or rack d' a part of which is shown detached in side view to a large scale in Fig. 8, (instead of having only a plain edge surface as heretofore) for the purpose of pressing the "leg" thread into the front and under groove of the upper grooved hooks C^4 of the needles C' and separating these as hereinafter described. The bar D' is secured in the ordinary manner to a bell crank D^2 D^3 and connecting rod D^4 , actuated by the foot treadle D^5 , fulcrumed at D^6 and which is depressed in front against the action of the spring D^7 at the other end when the serrated teeth d' are desired to be brought into action. A cam plate e' shown detached in Fig. 4 is fitted to the machine with slotted or cam groove e^2 in which works a reciprocating or oscillating shifting arm or cam pin e^3 carried on the hand lever E' which operates the front hooks B' . The object of shifting the pin e^3 by the hand lever E' is to connect the hand lever E' with the cam groove or release it therefrom. In the first condition the pin e^3 moves within the groove e^2 and guides the hand lever E' while giving the front hooks B' b' a motion

backward and upward, to bring the threads, where they cross each other, below the faller needles a' , and get the double twist thereby formed as indicated in Figs. 14 to 18. This cam pin e^3 works through a bearing at e^4 in the hand lever E' and is shifted by a vertical projection e^5 on it working up through a slot at e^6 in a small hand lever e^7 fulcrumed on a spring-carrying pin e^8 in the large hand lever E' which operates the ordinary front or loop forming hooks B' .

The action of the net making machine fitted with the hereinbefore described improved combinations of mechanism is as follows:—The ordinary fallers A' are shown in Figs. 1 to 3 and 10 to 12 in position for starting the new mesh and resting by their notches A^2 on rail F^5 after being raised by the bar A^7 and the treadle A^3 fulcrumed at A^4 , and connected to the bar A^7 , by the adjustable rods A^6 all as hereinafter described. These fallers A' have the lower parts of the last loops of the meshes Z' passed under or round them as usual, as shown in Figs. 1 to 3, and in this position in Fig. 10. The front hook bar B^2 , and hooks B' b' are then moved horizontally back through the meshes to take the position shown in Fig. 11, and receive a slight transverse motion to the left. This is done as shown in the detached view, Fig. 27, by having a projecting pin h^3 on the front hook bar B^2 , working within a slot x' in a hand operated lever h' and moving said lever to one side, the recoil of springs x^3 x^3 , bringing back the lever h' and bar B^2 to their normal positions. The hooks B' b' are then drawn to the front, by which action the points or feet of the hooks catch and draw one leg of the threads of the meshes diagonally across to put the ordinary cross on the loop, as shown in this position in Fig. 12, and are then lowered to take the cross loops off the fallers A' . The front hooks B' b' are then drawn up by their hand levers E' and hold the ends or loops of the diagonal meshes, as shown in this position in Fig. 13. The bar a^2 carrying the auxiliary faller needles or needle hooks a' is now oscillated and the needles a' raised by depressing the treadle a^6 , and the front hooks B' b' are lowered and then receive a motion backward and upward from the before mentioned cam groove e^2 and pin e^3 operated from hand levers e^7 E' to bring the threads where they cross each other below the auxiliary faller needles a' . The hooks B' are raised until their auxiliary grooves b' come in contact with the points or under hook parts of the auxiliary faller needles a' which enter and catch the crossings of the thread in the grooves b' of the hooks B' , as shown in this position in Fig. 14. The hooks B' b' are then drawn outward and upward, to the position shown in Fig. 15, and then pushed backward through the net meshes over the auxiliary faller needles a' to the position shown in Fig. 16, and returning backward receive a slight transverse motion to the left,—by a hand lever h' fulcrumed

at h^2 on the hook bar shaft H with a slot in its end operating a pin h^3 on the hook bar B^2 —and carry with them one of the “legs” of the threads of the meshes and cross these to the position shown in Fig. 17, and the hooks $B' b'$ are then brought in front and lowered downward and backward, by which means the threads or loops leave the auxiliary faller needles a' and are taken up wholly by the front hooks $B' b'$ as shown in this position in Fig. 18, and the cam groove e^2 and operating hand lever e^7 have now completed their requisite action. At this stage the front hook bar B^2 and hooks B', b' receive a slight transverse motion to the right, by the same hand lever mechanism h^2 to h^3 as previously gave this to the left, to clear the auxiliary faller needles a' when the loop or twist is formed. The faller needles a' are now released, from the position shown in Fig. 18, and lowered to their bottom inactive position shown in Figs. 1 to 3 by releasing the before mentioned catch a^3 and foot treadle a^6 so operating the faller lever bar a^2 . The front hooks $B' b'$ with the loops on them, now receive from the ordinary hand lever E' and operating mechanism of the machine a forward movement over and between the pairs of stationary duplex needles C', c' , and holders C^2 , as shown in Fig. 19, and lowered in that position, in the inner spaces c^6 , as shown in the plan view Fig. 7.—The hooks $B' b'$ are then moved downward and forward until they come below and behind the adjacent points c' of the different stationary needles C' and these points c' of each needle C' rest in the auxiliary grooves b' of the hooks B' and catch the crossing and double loop parts of the threads on the hooks, as shown in the act of doing so in Fig. 20, after having pressed the plate c^2 down with it. The “chapping” bar D' with the saw teeth d' is now moved forward and enters between the meshes above the needles C' to place each alternate crossed “leg” or back thread into each under groove or face C^4 of the stationary needles C' to hold these legs or threads of the meshes in open position all as shown in this position in Fig. 21. The taking up cylinder or beam F' is now momentarily slackened by the mechanism herein-after described, and the loops lengthened and the hooks $B' b'$ brought up and placed between the meshes with the ends c' of the different adjacent needles C' within the loops. The ordinary vertical fallers A' are now raised to their highest position with their notches A^2 resting on the slur carriage rail F^5 above the hook eyes C^4 in the outer end space C^6 between each stationary needle and holder C' C^2 as usual by depressing the treadle A^3 . At this stage the empty shuttle or long wire S (see detached view Fig. 29) is made to pass in the ordinary manner through the whole set of hooks or eyes of the vertical fallers A' above the grooves C^4 of the needles C' and under the loops of the thread on the needles C' and hooks $B' b'$ and the shuttle with its

thread is then drawn back transversely through, all as shown in this position in Fig. 22. The vertical fallers A' are now released and lowered to the required length of mesh desired to be formed, by traversing the ordinary slur carriage G' shown in Figs. 1 and 3 with horizontal roller G^2 bearing on fallers A' by depressing the treadle lever G^3 and the lowering of the pulley actuating weight G^4 in the ordinary manner. The end of each shot of weft thread is then tied at the selvage Z^2 at one side of the machine. The front hooks $B' b'$ with the threads round them are now drawn out and down in front of the needles C' , and then lowered down in front of the horizontal serrated thread guide plate c^2 below the needles $C' c'$ to free the loops from the points c' of the needles as shown in the act of doing so in Fig. 23 and the “chapping” bar D' with the serrated teeth d' is brought forward between the meshes to keep the mesh part of the net clear of the stationary needles C' . The front hooks $B' b'$ are now pushed back and freed altogether from the net threads or loops and these are tightened up while on the hooks C^4 of the needles C' by the taking up beam F' , by which and the simultaneous action of raising the vertical fallers A' the threads or loops are set free from the top C^4 of the stationary needles C' as shown in the position of doing so in Fig. 24. The operations are again repeated in the manner described starting from the position shown in Fig. 10 to form a fresh length of meshes and set of double knots in the new manner described. The arm 37 carries a stud, on which is centered a bell-crank lever 43, which swings on the stud, one arm forming a pawl to actuate the ratchet wheel 36. The other arm of the lever 43 has a laterally projecting stud which is caught by the curved recess or catch made in the rod 44, to which a reciprocatory movement is communicated from the crank 45. The lower end of the rod 44 is slotted and loosely connected, as shown to the bell crank lever 46, which is carried on a transverse shaft 47, the other arm of the lever being connected to the treadle 29 by the link 48. The ratchet wheel 36 is fast to the shaft of the drum F' (Fig. 1) and it is made with an annular ring of teeth; the wheel is prevented from turning toward the front of the machine by a pawl 50. When the treadle 29 is depressed the rod 44 catches on the stud of the lever 43, which takes into the teeth of the ratchet wheel 36, the rotation of the crank 45 causing the lever 43 to force round the drum sufficiently to draw the knots tight. The back motion is given to the taking up beam F' during the forming of the double knot between the positions shown in Figs. 21 and 22, by a two armed lever f', f^2 , fulcrumed on the spindle of the beam F' at the opposite end of the machine to the ordinary taking up motion (such as is illustrated in elevation in Fig. 28), with a segmental pawl and teeth f^3 on the free end of the lever f' working down into a

ratchet or spur wheel f^4 , mounted on the end of beam F' carried on the top of the frames F^2 . The acting end f^2 of the lever f' is operated by a connecting rod f^5 attached to an arm f^6 on a horizontal shaft f^7 worked by another lever and connecting rod f^8 by the foot treadle f^9 when the strain is desired to be relieved from the beam F' by depressing the treadle f^9 for a short distance. The pawl f^3 is kept out of gear by a pin f^{10} on its coming in contact with a stop arm f^{11} and the lever arm f^2 comes to its normal position on the stop bracket f^{12} when the foot is raised off the treadle f^9 by the weight of the lever f^2 and connecting rod f^5 , and leaves the beam F' in position for taking up the net. The double knot shown in Fig. 25 is termed a left handed knot, but the right handed knot shown in Fig. 26 may be similarly formed by angling the grooved hooks b' , and the grooves C' , to the opposite side of that shown in Fig. 6, and giving them the slight lateral traverse in the opposite direction to catch and twist the limbs of the meshes in the opposite direction to that shown and described.

What I claim is—

1. In machines for forming double knots on the meshes of net fabrics, the combination of the fallers and means for operating the same, and stationary needles, with front hooks, auxiliary faller needle hooks, and means for operating these hooks, substantially as set forth.

2. In a net machine, the fallers A' and needles C' , in combination with vertical oscillating faller needle hooks a' , front hooks $B' b'$, plate e' provided with a cam groove e^2 and shifting pin e^3 , serrated plates $c^2 d'$ and slackening back beam mechanism, all substantially as set forth.

3. In a net machine, the vertical oscillating auxiliary faller needle hooks a' , treadle lever a^6 and connecting link fittings, in combina-

tion with the front hooks $B' b'$, hand lever E' , and pin and cam mechanism e' to e^3 acting after the thread has been released from the ordinary fallers A' , to perform the functions of putting a double loop twist of the thread round the front hooks $B' b'$ in forming the double knots on the net meshes, substantially as and in the manner herein set forth.

4. In a net machine for forming double knotted net fabrics, the combination comprising a grooved plate e' , e^2 , shifting cam pin e^3 , means for shifting the said pin, and front hooks $B' b'$ mounted on a rocking frame, and a hand lever to operate the said rocking frame, all substantially as and for the purpose set forth.

5. In a net machine for forming double knotted net fabrics, the front hooks B' provided with a grooved part b' , in combination with the stationary needles C' provided with curved-in points c' , substantially as and for the purpose set forth.

6. In a net machine for forming double knotted net fabrics, the stationary needles C' in combination with a plate bar c^2 having serrated saw-like teeth, substantially as and for the purpose set forth.

7. In a net machine for forming double knotted net fabrics, the stationary needles C' in combination with a "chapping" bar D' having serrated saw-like teeth d' , substantially as and for the purposes set forth.

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

JAMES KNOX.

Witnesses:

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