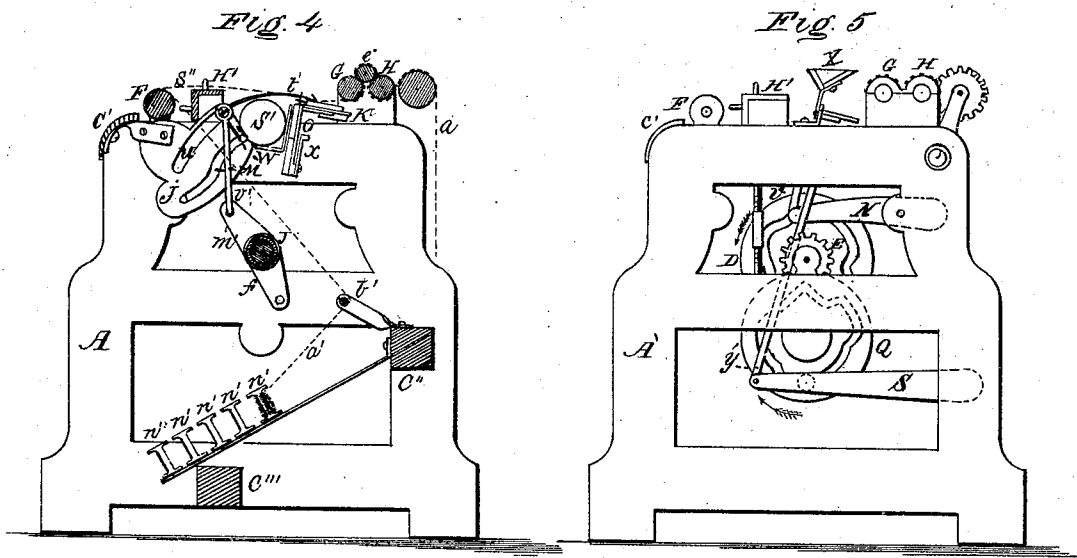




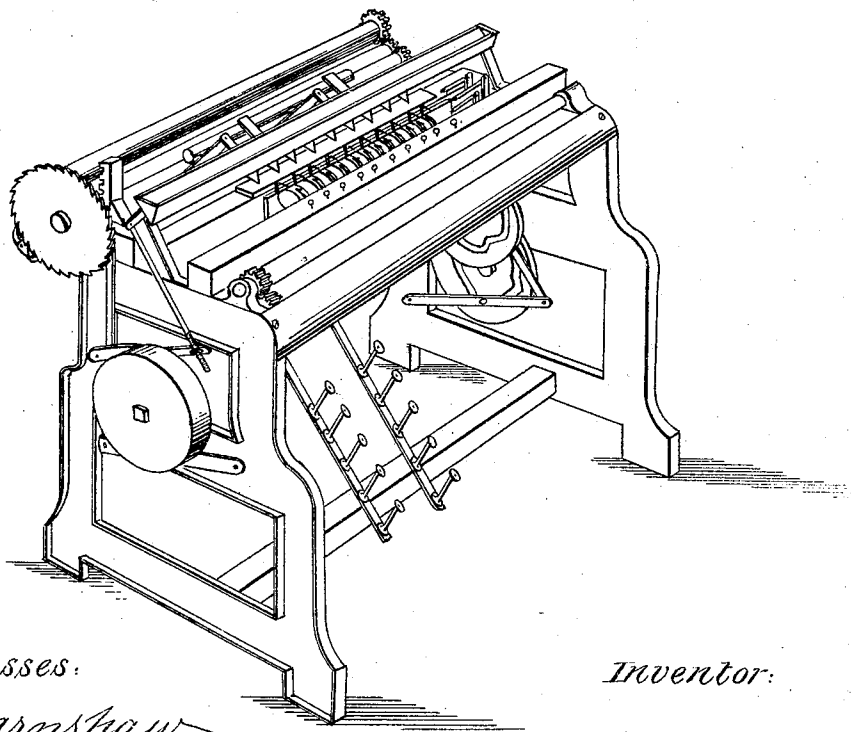
**B. ARNOLD.**  
**Netting-Machines.**

No. 152,062.

Patented June 16, 1874.



*Fig. 6*



Witnesses:

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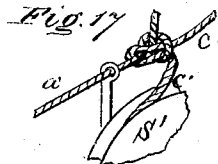
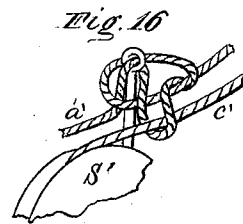
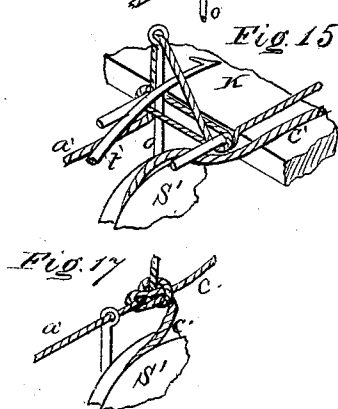
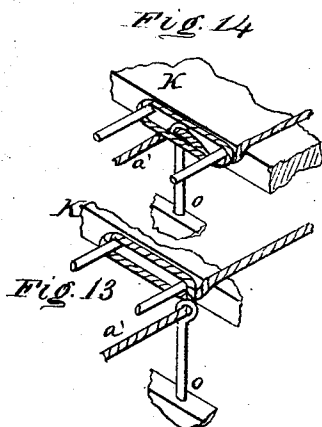
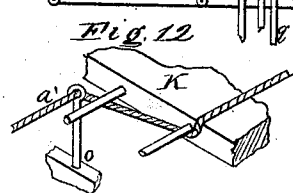
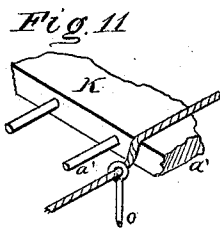
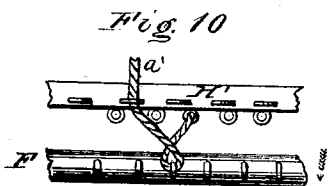
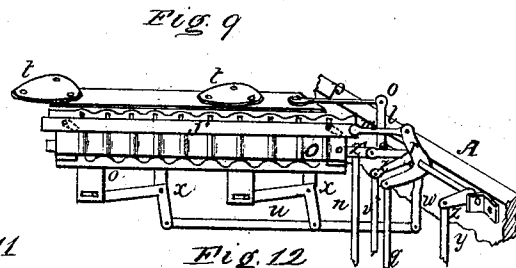
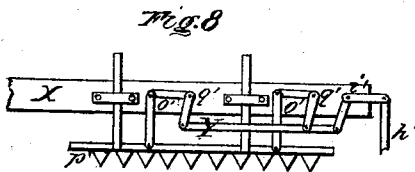
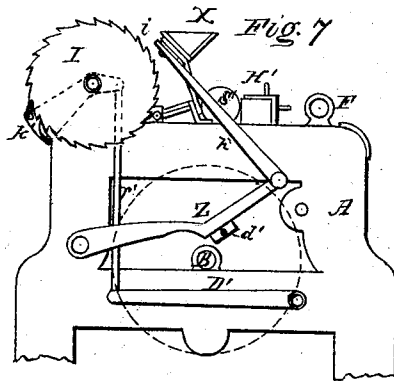
Inventor:

*Benjamin Arnold*

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Witnesses:

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Inventor:

Benjamin Arnold

# UNITED STATES PATENT OFFICE.

BENJAMIN ARNOLD, OF EAST GREENWICH, RHODE ISLAND.

## IMPROVEMENT IN NETTING-MACHINES.

Specification forming part of Letters Patent No. **152,062**, dated June 16, 1874; application filed December 10, 1873.

*To all whom it may concern:*

Be it known that I, BENJAMIN ARNOLD, of East Greenwich, in the county of Kent and State of Rhode Island, have invented certain Improvements in Machines for Making Netting for Fishing and other purposes, of which the following is a specification:

The nature of my invention consists, first, in a series of stationary bobbins made thin and flat, and standing side by side on their edges, being kept upright and separate from each other by means of grooves in the front, back, and bottom of the support that holds them combined with knot-forming mechanism, as hereinafter described; and, also, in a series of hooks corresponding in number with the flat stationary bobbins combined with the latter, and so moved and guided as to convey a loop of twine from a separate set of bobbins over each flat bobbin, and leave it on the under side, so that when the loops are drawn up they shall have passed around the bobbins; also, in combining two bars, one having a row of pins in its edge corresponding in space with the flat bobbins, and the other having on its edge a row of longer pins with holes or eyes in their ends corresponding in space with the pins in the first bar, to form loops of the twine from the large bobbins; also, in two rolls geared together and placed near each other, with a bar or loose roll placed on top so as to rest on both of them, combined with certain mechanism, as hereinafter described, for operating them to feed the net or twine through the machine; also, in a roll with staples set in its surface, through which the twines from the large bobbins pass, in combination with guides so placed as to cause the twines to wind up on themselves, and draw up the loops and knots when the roll is turned; also, in a guide-plate made with vertical slots, and placed between the bars with pins, and the flat bobbins to guide the twines from the large bobbins and draw off slack from the flat bobbins; also, in a series of points to open the loops that are formed by the pins before mentioned, and drawn out by the hooks, as herein described; and, further, in certain devices to give the proper motions to the above-mentioned parts.

Figure 1 is a top view of the machine, show-

ing the lines of the sections. Fig. 2 is a vertical cross-section in direction of the dotted line *a'' a''* in Fig. 1, looking to the left hand. Fig. 3 is a vertical cross-section in direction of the dotted line *b'' b''* in Fig. 1, looking to the right hand. Fig. 4 is a vertical cross-section, taken in direction of the line *c'' c''* in Fig. 1, looking to the left hand. Fig. 5 is an elevation of the right end of Fig. 1. Fig. 6 shows a perspective view of the machine. Fig. 7 is an elevation of the upper part of the left-hand end of Fig. 1, with the driving-pulley removed. Fig. 8 is a back view of a part of the trough, showing the devices for opening the loops on the hooks. Fig. 9 shows the arrangement of the knee-levers that hold and move the two pin-bars, O K. Fig. 10 shows how the guide-bar holds the twine, so that it shall bind on the tie-roll. Figs. 11 to 17 inclusive show the positions of the two pin-bars O K, the twine, and the hooks in making the knots.

A A' are two end frames, connected together by beams C' C'' C''' at the front, back, and bottom. B is the main shaft, turning in bearings in each end frame. On this shaft are secured the cam C near the left end, and the cam D with gear-wheel E at the right end, and a loose sleeve, J, extends on the shaft nearly the whole distance between the two cams. To this sleeve the arms *m'* are fastened. The cam C moves in succession the three levers *a b c*, and the lever *a* operates the sleeve J by means of the connecting-bar *d* attached to an arm on the sleeve. The lever *b* turns the tie-roll F by means of the segment-gear on its upper end, and the gear-wheel *e* on the tie-roll. This lever is brought back against the cam by the weight *i*, or in some other suitable way. The lever *c* operates the feed-rolls G H by means of the connecting-rod *g*, lever *j*, rod *k*, gear-rack *h*, and gear-wheel *l'*, which is fast on a sleeve, to the outer end of which the arm *k'* is fastened, which drives the ratchet-wheel I, fastened to the back feed-roll, by means of pawls on the outer end of the arm I, (see Fig. 1,) the sleeve, &c., in section. Cam D (see Figs. 3 and 9) moves, by the outer groove on its inner side, the lever *l*, which pushes the pin-bar K back and forward by the connecting-rod *n*, knee-lever *o*, bar *p*, and knee-levers *t*. By the inner groove on the same face, it

moves the lever S, which raises and lowers the guide-plate  $j'$  by means of the rod  $q$ , knee-lever  $r$ , and bar  $m$ . (See Fig. 9.) The cam D, by the groove in its outer side, (see Figs. 5 and 9,) moves the lever N, which raises and lowers the pin-bar O by the connecting-rod  $v$ , knee-lever  $w$ , rod  $u$ , and knee-levers  $x$ . The gear-wheel E, fast on the main shaft, drives the gear-wheel P, which turns on a stud fastened to the end frame. The gear-wheel P is twice as large as the wheel E that drives it, and, consequently, makes but one-half a revolution to every whole turn of the main shaft, or to every row of knots made; and the cam attached to this gear-wheel P gives those motions that are required to be the reverse in tying one row of knots to what they were in the row next previous. The groove on the inside of the cam Q (see Figs. 3 and 9) moves the lever R, which moves the eye-bar O endwise by means of the connecting-bar  $y$ , knee-lever or rocker-shaft  $z$ , and bar  $z'$ . The shape of one-half of each groove on both sides of this cam is the reverse of the other half of the same groove, for the purpose of tying the knots right and left, to make the meshes diagonal. The groove in the outside of the cam Q, Fig. 5, moves the lever S, which gives motion endwise to the pin-bar K by the rod  $y'$ , knee-lever  $x'$ , Fig. 3, and the connecting-bar  $w'$ . The arms  $m'$  on the sleeve J (see Fig. 4) are connected to the bar V by the rods  $v'$ . In this bar V a row of curved hooks,  $t'$ , are set, agreeing in number and location with the flat bobbins  $s'$ , for the purpose of drawing the loops over the bobbins. The bar V (see Fig. 4) is guided in curved ways U by the arm W, which has a friction-roll near its lower end running in the groove M. These oblige the hooks to catch the loops, draw them over the bobbins  $s'$ , and cast them off below. X is a trough, supported at each end over the front of the roll G, to hold the extra bobbins to replenish the machine with, and also to support the devices for opening the loops as they pass over the bobbins  $s'$ . These devices consist of the knee-levers  $q'$ , (see Figs. 7 and 8,) pivoted to the back of the trough, and connected by the strips  $o'$  to the bar  $p'$ , which is made with a row of V-shaped points agreeing in number with the hooks  $t'$ . The other ends of the knee-levers  $q'$  are pivoted to the bar Y, which is operated by means of the knee-lever  $i'$ , connecting-rod  $h'$ , and lever  $z$ , which is moved by a pin,  $d'$ , in the wheel B'. The points on the bar  $p'$  spread the sides of the loops apart, so as to enable them to pass down each side of the bobbins  $s'$ . The large bobbins  $n'$  hold the twine of which the loops are made that are passed over the bobbins  $s'$ . The lever D' (see Fig. 7) is pivoted at one end to the frame A, and connected at the other end to the arm  $k'$  by the rod  $r'$ . It is pushed down by the pin  $d'$  in the wheel B', when the tie-roll has taken up most of the slack of the knot, to cause the feed-rolls to draw the row of knots that are being made away from the eyes a little, so

that they may be properly drawn up tight without being drawn into the eyes. The guide-plate  $j'$  is placed on knee-levers, or their equivalents, so that it may be raised for the purpose of drawing off slack twine from the flat bobbins, to form a part of the knot; and it is furnished with slots to receive the twines from the large bobbins, so as to guide them without drawing on them when the plate is raised to get slack from the flat bobbins. The plate is operated by the lever S, rod  $q$ , knee-lever  $r$ , and bar  $m$ , and the inner grooves on cam-plate D. (See Fig. 9.) The twine  $a'$  is threaded in, as shown in Fig. 4—that is, from the large bobbins  $n'$  back over the bar  $b'$ ; then up to the guides on the front of the bar H'; thence through the staples in the tie-roll F, and through the guides on the top of bar H'; then through the guide-plate  $j'$  and the eyes in the bar O to the bottom of front feed-roll; then up between the rolls, over the bar  $e'$ , on top and down between the rolls, and out under the back feed-roll. The flat bobbins  $s'$  are placed on a support, (see Fig. 4,) and held separate from each other by ridges, forming grooves in the front, bottom, and back of the support, in which the bobbins stand on their edges. The twine  $c'$  from these bobbins goes up through the feed-rolls in the same manner as the twine from the large bobbins, or they may be tied to the twines  $a'$  in front of feed-roll G.

The machine is driven by means of a belt on the pulley B', which is fast on the main shaft. The knots are formed as follows: The pin-bar K comes forward and the eye-bar O drops down, (see Fig. 11;) then the pin-bar moves sidewise and the eye-bar rises a little, (see Fig. 12;) then the pin-bar draws back far enough for the pins to clear the eyes and moves sidewise and forward to its first position, and the eye-bar drops down. (See Fig. 13.) The pin-bar now comes forward over the eyes and a little sidewise, so that when the eyes rise a little they are back of the lower part of the twine around the pins, (see Fig. 14;) then as the pin-bar moves back, the eyes rise inside the loop around the pins, (see Fig. 15,) and the hooks  $t'$  enter under that portion of the twine that extends from the eye to the pin farthest from it, and catch it, the eyes dropping down a little to draw the twine onto the hooks, which then draw back and carry the loops which are opened by the points in bar  $p'$  down over the flat bobbins, casting them off at the bottom by passing under the ledge on which the bobbins stand. The tie-roll F now begins to turn and draws the loops up back of the bobbins  $s'$  and around the twine  $c'$ , as seen in Fig. 16, the pin-bar meantime having drawn back and left the twines around the eyes. Then the eye-pins drop out of the knot and it is drawn up tight (see Fig. 17) by a further turn of the tie-roll. The large bobbin-twines tie rows of knots alternately with the flat bobbins to the right of them, and with those on their left. This is accomplished by reversing the endwise motions

of the two pin-bars in the alternate rows, the other motions remaining the same. This makes the meshes diagonal to the sides of the netting. At this time the cam C has moved around, so as to press on the lever *c*, Fig. 2, and turn the feed-rolls G H by the connecting-bars and levers, as before described, so as to draw the row of knots just made back from the pins, the distance they are drawn back being the size of the mesh, and it is regulated by sliding the clamp *g'* on the lever *j* toward its pivot, so as to lessen the amount of draw motion on the rack *h* to lessen the size of the mesh, and the clamp is slid toward the outer end of the lever to increase the motion of the feed-rack and make the meshes larger. The arrangement of the guides on the bar H', whereby the twine is allowed to draw freely through the staple in the tie-roll F, when that roll is turned in to its farthest point and the loop is being made, and the way that one part of the twine binds on another portion when the roll turns out, so as to both draw up the loop and knot, and at the same time draw off the necessary amount of twine from the large bobbins for the next mesh, are shown in Fig. 10.

In Fig. 3 is shown the manner of gearing the feed-rolls G H, so that the back one, which is driven by the rack *h*, shall turn the front one.

The rod *u'*, Fig. 2, connects the lever *a* to the lever *c* through the lever *j*, so that when either one is operating it will draw the other back to the cam. At *s''*, Fig. 4, a small rod or wire may be laid on the twine between the roll F and bar H' to make friction on the twines, and another rod may be put on the twines between the roll F and the bar *b'* to take up the slack twine when the roll turns back to place.

Having described my improvements, what I claim as my invention is—

1. In a machine for making nets for fishing

and other purposes in which a knot is made, a series of stationary flat bobbins, arranged side by side on their edges, in combination with knot-forming mechanism, substantially as described, and for the purpose specified.

2. The combination of the feed-rolls G H and *e'*, operating as described, in combination with the lever *j*, clamp *g'*, rack *h*, gear-wheel *l*, and ratchet-wheel I, substantially as and for the purpose set forth.

3. The combination of the plate K and its pins with the plate O, and its eye-pins moving in concert with each other, substantially as herein set forth.

4. The tie-roll F, constructed and operating substantially as and for the purpose specified.

5. In combination with a series of flat bobbins, such as above described, a series of hooks, *t'*, operating substantially as and for the purpose specified.

6. The combination of the lever *j*, clamp *g'*, rack *h*, gear-wheel *l'*, and ratchet-wheel I, substantially as described, for the purpose set forth.

7. The guide-plate *j'*, in combination with the bobbins *s'* and hooks *t'*, as herein set forth.

8. The bar *p'*, with its points, in combination, substantially as set forth, with the bobbins *s'* and hooks *t'*, for the purpose specified.

9. The combination of the guide-bar H' and tie-roll F, arranged and operating as and for the purpose set forth.

10. The combination of the cam C, with the loop-hook lever *a*, tie-roll lever *b*, and feed-roll lever *c*, arranged and operating substantially as herein set forth.

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Witnesses:

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F. H. ARNOLD.