(No Model.) 4 Sheets—Sheet 1.

J. W. GRANGER.

MACHINE FOR MANUFACTURING HOOKS AND EYES.

No. 491,282. Patented Feb. 7, 1893.

FIG. 2.

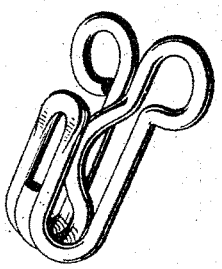


FIG. 3.

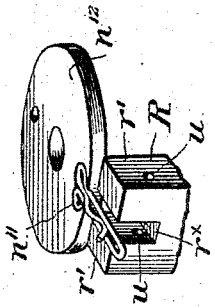
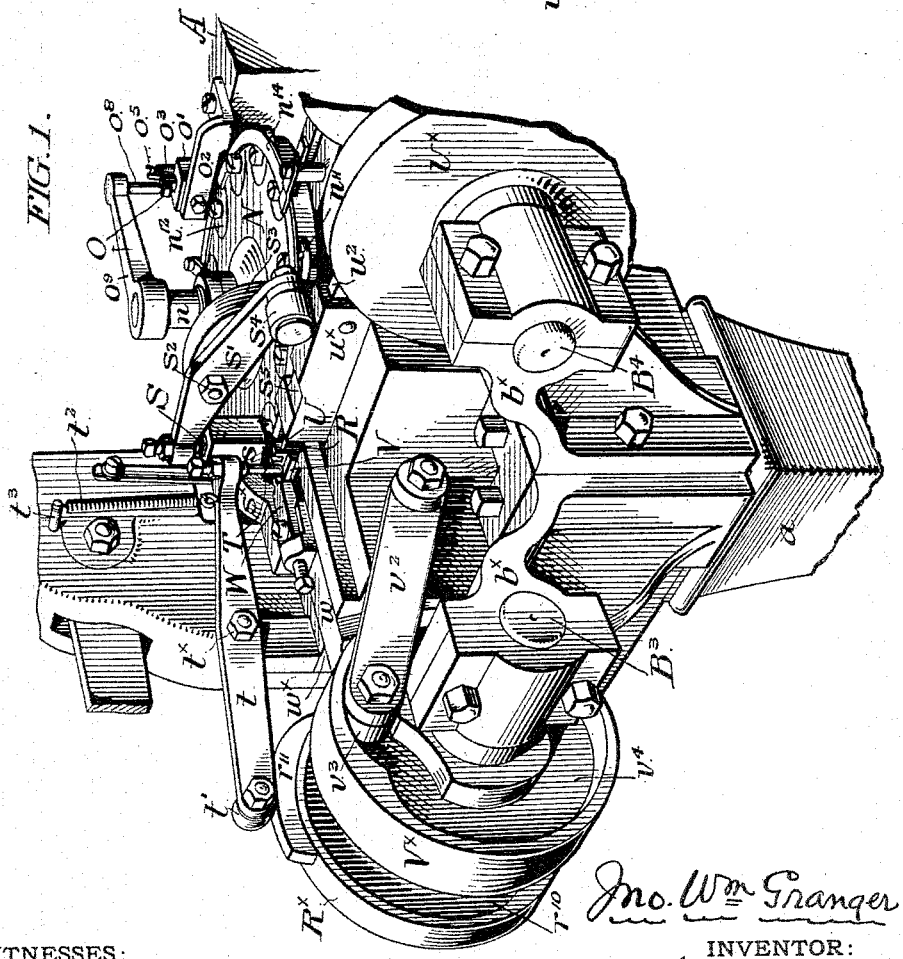


FIG. 1.



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F. Norman Dixon.

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(No Model.) 4 Sheets—Sheet 2.

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FIG. 5.

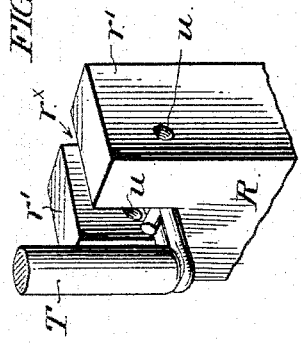


FIG. 8.

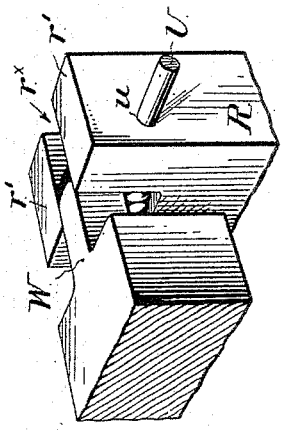


FIG. 11.

FIG. 9.

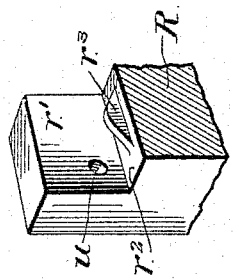


FIG. 7.

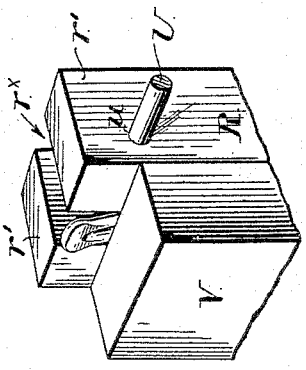


FIG. 4.

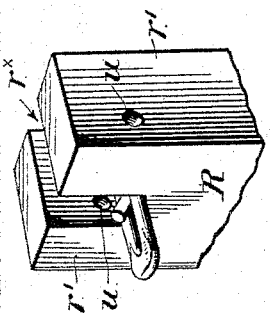


FIG. 6.

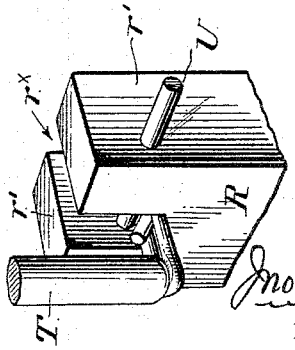
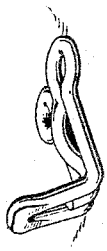


FIG. 10.



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(No Model.) 4 Sheets—Sheet 3.

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FIG. 12.

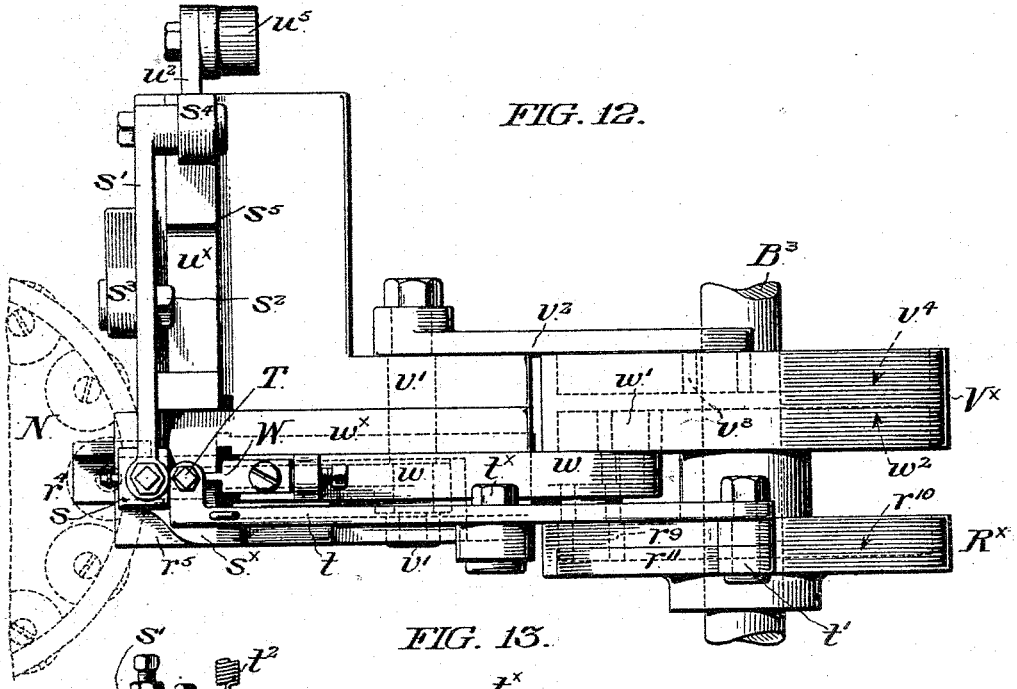
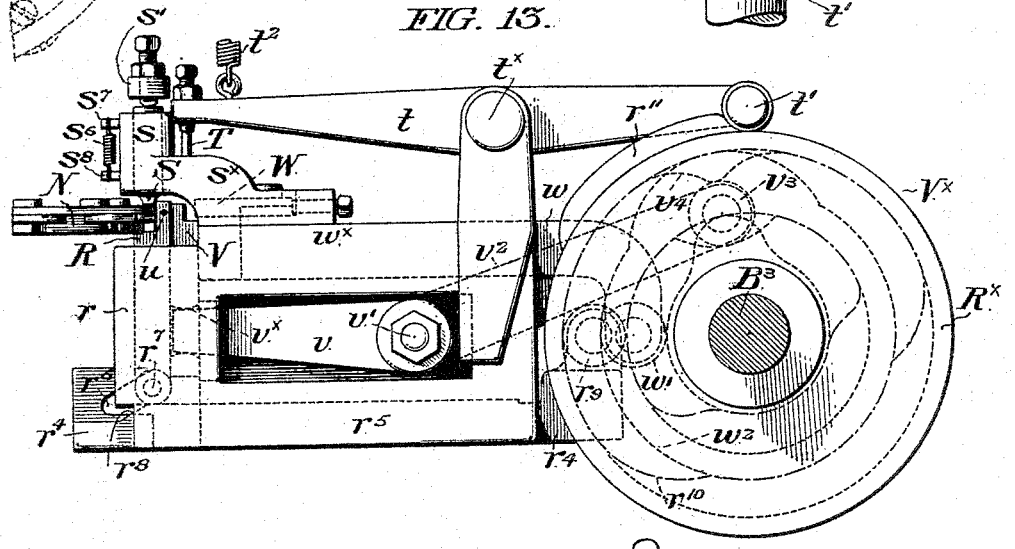


FIG. 13.



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MACHINE FOR MANUFACTURING HOOKS AND EYES.

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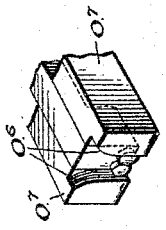
FIG. 15.



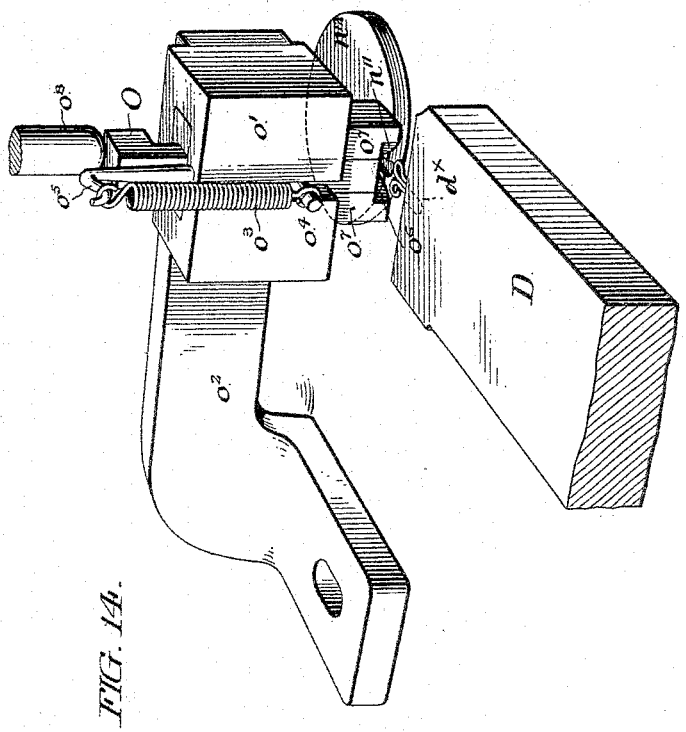


FIG. 14.

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UNITED STATES PATENT OFFICE.

JOHN WILLIAM GRANGER, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO RICHARDSON & DE LONG BROTHERS, OF SAME PLACE.

MACHINE FOR MANUFACTURING HOOKS AND EYES.

SPECIFICATION forming part of Letters Patent No. 491,282, dated February 7, 1893.

Application filed July 20, 1892. Serial No. 440,576. (No model.)

To all whom it may concern:

Be it known that I, JOHN WILLIAM GRANGER, a citizen of the United States, residing in Philadelphia, Pennsylvania, have invented certain new and useful improvements in machines for manufacturing such hooks as, in connection with eyes, are used as garment-fastenings, of which the following is a specification.

My improvements are based upon and applicable to a machine for manufacturing a garment hook of the character set forth in United States Letters Patent No. 411,857, granted October 1, 1889, to Frank E. De Long,—invented by Robert C. Manville, of Waterbury, Connecticut, and which forms the subject matter of an application for patent executed and filed by the said Manville contemporaneously with this application, and designated by the Patent Office with the Serial No. 440,574.

It is unnecessary for the purposes of this specification to describe in its entirety the Manville machine, and for its thorough comprehension reference must be made to the application of the said Manville referred to. It is necessary, however, in order that my improvements may be understood, to refer in a general way to the Manville machine, and also to describe the De Long hook to the manufacture of which both Manville's invention and mine relate.

The De Long hook of the Patent No. 411,857, is made of a single piece of wire, and embodies in its construction the usual thread eyes by which it is attached to a garment, and also a shank or shank portion composed of parallel side bars, which are bent or returned upon themselves to form the eye-engaging bends of the hook as an entirety, and thence continued on, or, so to speak, merged, into two bars, termed the bill bars or side bars of the bill, which merge into each other to form the apex of the bill, and which together with said apex constitute the bill, the beak, or the hook proper, as it is variously termed,—and also embodies between the side bars of the shank a spring tongue which emanates from the thread eyes and continues within and between the confines of the shank side bars outwardly to the region where said shank bars are bent upward into the bill, and which tongue is at such region bent to form a loop which is generally correspondent with the eye-engaging bends of the hook, and which is of any desired length, but conveniently of that represented in Figs. 2 and 11 of the drawings. In the De Long hook, moreover, the spring tongue is swelled, or bellied, or bent upwardly, toward the bill to form what is termed a "hump," which is in effect a crest or swelling formed of the wire of the tongue which partially closes the eye-space between the upper face of the shank and the under face of the bill, and slightly obstructs both the engagement and the disengagement of the eye.

The operation of manufacturing the De Long hook as practiced in the use of the Manville machine referred to, is an operation which may be generally described as one of progressive bending, in the practice of which a continuous length of wire is fed into the machine, and in the machine is, by a series of successive and quickly recurring operations, bent as to given portions to different forms, the aggregate of which is the ultimate form of the hook as an entirety.

The Manville machine embodies the following generic instrumentalities, which perform particular work, namely:—First: A wire-straightening mechanism;—Second: A wire-feeding mechanism;—Third: A wire-clamping mechanism, which clamps the wire as fed and imparts to it the initial bending;—Fourth; A wire-shearing or dividing mechanism, which cuts off a length or a blank of wire sufficient to form one hook;—Fifth: A wire-bending mechanism which forms the left thread eye, which may be termed the left-thread-eye bending mechanism;—Sixth: A wire-bending mechanism which forms the right thread eye, which may be termed the right-thread-eye-bending mechanism;—Seventh: A wire-bending mechanism which forms the "hump" in the spring tongue and imparts the initial bend to the end portion of said spring tongue, which may be termed the tongue-conforming mechanism;—Eighth: A wire-bending mechanism which parallels the spring tongue with the left shank bar, which may be termed the tongue-paralleling mechanism;—Ninth: A wire-bending mechanism which bends the wire blank

mid-way of the thread eyes to form the apex or point of the bill, hereinafter termed the bill-forming mechanism; Tenth: An advancing mechanism which carries the blank as formed by the operation of the bending mechanism already mentioned to a rotary carrier, or carrying-off mechanism, which feeds the blank first to a bill-swaging mechanism, second, to a bill-bending mechanism, and, third, to its point of final discharge from the machine;—Eleventh: The rotary carrying-off mechanism referred to;—Twelfth: The bill-swaging mechanism which flattens the bill;—Thirteenth: A bill-bending mechanism which bends over the bill as formed by the bill-forming mechanism and as flattened by the bill-swaging mechanism, to form the ultimate hook;—Fourteenth: A hook-discharging mechanism for delivering the finished hook from the machine.

My invention comprehends certain improvements operative in connection with the advancing mechanism of the Manville machine, which carries the blank as formed by the operation of the bending or bill-forming mechanism which forms the apex or point of the bill of the hook, to a rotary carrier or carrying-off mechanism which feeds the blank to the bill-bending mechanism and to its point of final discharge from the machine, and which relates to the accurate application of the blanks to their sockets,—and also comprehends certain improvements in the bill-bending mechanism which bends over the bill as formed by the bill-forming mechanism to form the ultimate hook.

So much of a machine of the general organization of the Manville, as is necessary to a comprehension of my improvements, is represented in the accompanying drawings and hereinafter described, the particular subject matter claimed as novel being recited in the claiming clauses.

In the accompanying drawings, Figure 1 is a view in perspective of a portion of a machine for making spring tongue garment hooks of the character set forth in the De Long Letters Patent No. 411,857, referred to,—which embodies my improvements. Fig. 2 is a view in perspective of the completed De Long hook, for the manufacture of which my improvements are adapted. Fig. 3 is a fragmentary perspective view of a portion of the rotary carrier and of my improved bill-bending matrix in the position which the latter device occupies before action. Fig. 4 is a fragmentary perspective detail of my improved bill-bending matrix, with the partly bent blank represented in Fig. 3 in place. Fig. 5 is a similar view of said matrix with my improved bill-depressing pin in action. Fig. 6 is a view similar to Fig. 5, illustrating also the bill-bending pin in its advanced position. Fig. 7 is a view generally similar to Fig. 6, illustrating the operation of the bill-upturning former. Fig. 8 is a view similar to Fig. 7, illustrating the operation of the bill-closing former. Fig. 9 is a fragmentary and partly sectional perspective view of the bill-bending matrix, illustrating the "hump"-supporting rib upon its floor. Fig. 10 is a view in perspective of the blank as bent by the action of the bill-upturning former. Fig. 11 is a similar view of the ultimate hook as finally completed by the operation of the bill-closing former. Fig. 12 is a top plan view of the mechanisms which are associated for the operation of bending the bill into parallelism with the shank, and which embody my improvements. Fig. 13 is a rear elevational view of the devices represented in Fig. 12. Fig. 14 is a view in perspective sighted from the north east corner of the sheet upon which appears Fig. 1, of certain of the devices which are associated in the advancing of the partly-bent blank to the rotary carrier, and in the seating of the same in the socket of said carrier. Fig. 15 is a fragmentary perspective view illustrative of the tappet and of the guide-way for directing the thread eyes of the partly bent blank to a socket in the carrier, the device being turned over for clearer illustration.

Similar letters of reference indicate corresponding parts.

Before describing my improved devices, it is proper to explain that the De Long hook represented in its completed form in Figs. 2 and 11, is, before being subjected to the action of my improvements, for the purposes of this description, assumed to have been bent to the form represented in Fig. 3, and that in said form it is assumed to be fed or advanced to a rotary carrier, or carrying-off mechanism, preferably by the operation of a longitudinally reciprocating carrier die D, Fig. 14, in the recess $d^{\times}$, in the front face of which it is as to its apex entered. So far, however, as my invention is concerned, this carrier die D, represented, is but a type of any device by which the partly-bent blank formed either by the operation of the Manville machine referred to or otherwise as may be preferred, is advanced to the rotary carrier N, Figs. 12 and 13, in a peripheral socket of which said blank is as to its thread eyes, by the operation of certain of my improvements, deposited. Assuming, however, that the carrier die D is employed,—it is to be understood that said die is caused to advance and retreat at predetermined intervals correspondent with the predetermined intermittent movements of the rotary carrier, by the action of any preferred means, a description of which would be foreign to the purposes of this specification. It is likewise unnecessary herein to specifically describe the rotary carrier N or the means by which it is caused to operate, it being sufficient to explain that said carrier is a disk the periphery of which is provided with a series of equi-distant thread eye sockets n'', Fig. 3, preferably formed in socket disks n which are adapted to seats in the periphery of the carrier,—and to further explain that said carrier is caused by any preferred mechanism, to

take on a motion of intermittent predetermined rotary advance which occasions the successive presentation of each of its thread eye sockets to the action of the devices which deposit in them in turn a partly bent blank, and of the devices which complete the bending of the hook.

Considering, first, those of my improvements which are connected with the depositing of the partly-bent blank with respect to its thread eyes within a peripheral socket of the rotary carrier,—it is to be assumed that the blank as advanced is as to its thread eyes superimposed over a thread eye socket in the rotary carrier which, for the time being, presents itself for the reception of the thread eyes.

In order to depress the thread-eye-provided extremities of the blank into the socket so that they will occupy the position therein represented in Fig. 3, and effect the engagement of the blank within the socket, in order that when the rotary carrier advances the blank may be advanced with it in the grasp of the socket, I resort to a tappet contrivance which may be appropriately made in the following manner: O is the tappet proper, a vertically-moving hammer die of any preferred construction, housed in a boxing o', conveniently supported upon a bracket o^2, mounted from the bed plate A or other point of fixed support in such manner as to stand immediately over the position in which the thread eye sockets successively come to rest, as shown in Figs. 1 and 14. Normally the tappet is maintained in the position represented in said Fig. 14 by the action of a tappet spring o^3 extending between a stud o^4 projecting from the tappet and a hook o^5 connected with the boxing o'. In its normal position the striking lower extremity of the tappet comes to rest above the guide way o^6, Figs. 14 and 15, conveniently formed by two cheek pieces o^7 formed as a part of or fixed to the bottom of the boxing o', and serving to guide the thread eyes of the partly bent blank beneath the tappet and over their socket in the carrier, as will be understood by reference to the figures referred to. Obviously, when the thread eyes have been guided into, and have come to rest in, the foregoing position, a depression of the tappet will force them into their socket, the immediately following retreat of the clamping carrier die heretofore referred to, leaving the blank engaged within the socket. n^{14} is an annular guard flange supported in any preferred manner relatively to the top face of the rotary carrier, and serving to closely cover, so to speak, the thread eye sockets in said carrier. This flange which is the invention of Manville is, of course, cut away to permit of the descent of the tappet at the point where the latter acts, and also at the point where the bill-bending mechanism operates.

The operation of the tappet to occasion the seating of the blank within the thread eye socket is, as shown in Figs. 1 and 14, conveniently accomplished by a tappet hammer o^8 affixed to the free extremity of a horizontal hammer arm o^9, keyed upon the upper extremity of a tappet stem n, which passes vertically through the center of the rotary carrier, and to which a predetermined lift and drop is imparted by any preferred mechanism, a description of which is unnecessary for the comprehension of my improvements. The timing of the movements of the stem is, however, such as to occasion the lift of the stem and the tappet hammer as the rotary carrier takes on each of its movements of intermittent advance.

Considering, next, those of my improvements which are connected with the bill-bending mechanism, which bends over the bill of the partly-bent blank shown in Fig. 3, into the form of the completed hook shown in Fig. 2,—it is to be understood that these improvements are directly applicable in connection with the machine invented by Manville and reference to the application for patent for which has already been made, and that in order that they may be understood it will be necessary to describe a portion of the Manville machine. After the partly-bent blank has been deposited in its thread eye socket, the next operation to be performed upon it is the bending over of its bill into parallelism with its shank, and in connection therewith the completion of the bending over of the end portion of the tongue, (previously partly bent to the form shown in Fig. 3,) to form the loop of said tongue and complete the hook into its ultimate form represented in Fig. 2.

In the Manville machine it is preferred to employ mechanism which bends over both the bill and the loop simultaneously, in which mechanism my improvements are embodied.

While I make no claim upon the bill-bending mechanism of the Manville machine generically as such, but only upon certain improvements in connection therewith,—particularly in the construction of the matrix proper, in the construction and operation of the bill-bending pin, and in the application of the depressing pin,—it is necessary in order that my improvements may be understood to describe at length the bill-bending mechanism of the said Manville machine, upon which my improvements are engrafted:—At each predetermined rotary advance of the rotary carrier, one of its thread-eye sockets is presented in radial registry with what Manville terms a bill-bending matrix bar R, represented in Figs. 1, 3, 4, 5, 6, 7, 8, 9, and 13, and conveniently formed as a vertically reciprocating bar housed in a suitable housing r formed in or applied to the bed plate of the machine, the upper extremity of which is formed into a matrix proper $r^\times$, above the floor r^2 of which the shank portion of the partly bent and swaged blank of Fig. 3 as advanced by the rotary carrier comes to rest or dwells. I form this matrix proper $r^\times$ by forming the upper portion of the matrix

bar R with two parallel lateral vertically-erected walls r', which, as a workshop expedient, are most conveniently formed by longitudinally slotting the upper end of the matrix bar to form the matrix proper $r^{\times}$, and at the same time the aforesaid walls. In its normal position the bill-bending matrix bar is sunk to a position in which the upper surfaces or top levels of its walls occupy a plane below the plane of the floor of the thread-eye sockets in the rotary carrier, in order that in the rotation of said carrier the radially projecting shank portion of the partly bent blank may be swept over the top of the inner wall and, without interfering with it, come to rest over the matrix proper and between the two walls. Immediately thereafter the matrix bar is caused to rise so as to occupy the position represented in Figs. 1, 4, and 13, in which position the shank portion of the blank rests upon the floor of the matrix proper.

Extending longitudinally and centrally of the floor of the matrix proper, I form a curved crest or rib r^3, which I term the "hump"-supporting rib, and which, as shown in Fig. 9, possesses the lateral outline of the "hump" of the spring tongue of the hook, and serves to maintain said "hump" which in the rise of the matrix bar comes over it, against any possible flattening or drawing out in the subsequent bending over of the end of the tongue to form the loop. A lug, stud, pin, or boss of any preferred character, would be an equivalent of the rib represented. When the rotary carrier comes to rest and presents the partly bent blank with respect to the matrix bar, as explained, the said bar is, as stated, caused to rise, and subsequently, after the operation of the other devices which co-operate with it to effect the bending under discussion, is caused to descend to its normal position. This rising and lowering of the matrix bar is, as shown in Figs. 1, 12, and 13, conveniently accomplished in the Manville machine by the operation of a matrix moving slide r^4, the same being a longitudinally extending bar of metal housed for reciprocatory movement in a suitable housing r^5, formed in or applied to the bed plate. The inner extremity of this slide is provided with an inclined slot r^6 within which is entered a slot roller r^7 laterally projecting from the basal portion of the matrix bar, and also provided with a lifting incline r^8 adapted to bear beneath said roller and the operation of which in the inward movement of the slide is to occasion the lifting of the matrix bar, while the operation of the inclined slot r^6 in the outward movement of the slide is to occasion the depression of said matrix. The appropriate longitudinal movements are in the Manville machine imparted to the matrix moving slide r^4 by equipping its outer extremity with a laterally projecting cam roller r^9, which is entered within a suitably conformed lateral cam way r^{10} formed in an appropriately-timed cam, termed the matrix cam $R^{\times}$, mounted on a shaft B^3, termed the third shaft, to which the required rotation is imparted by means which it is unnecessary to herein describe. When the rotary carrier has come to its dwell, and has presented the partly bent blank with respect to the matrix as explained, Manville insures the temporary retention of the blank within the thread-eye socket and relatively to the floor of the matrix by the employment, as shown in Figs. 1, 12, and 13, of a vertically moving blank-retaining device, or so-called blank gripper S, which is disposed so as to overhang the thread-eye sockets as they successively present to the matrix, and which descends upon the thread-eyes of the particular blank within the socket for the time presenting, and remains in tread thereon until the completion of the performance of the bill-bending action under discussion. This gripper is composed of a vertical slide, to which the letter S is applied, which is housed in a gripper bearing s supported upon a suitable standard $s^{\times}$ springing from the housing r^5 or other point of fixed support, and which is disposed to engage the blank by the operation of a gripper lever s' the inner extremity of which bears upon the head of the gripper, which is fulcrumed at s^2 upon a suitable fulcrum standard s^3, and the outer extremity of which is provided with a laterally extending friction roll s^4 which, in the organization as modified by me, treads upon the upper surface of a bill pin slide $U^{\times}$ hereinafter referred to and invented by me, and which surface is possessed of two levels connected by a lever-tilting incline s^5 which in the advance of the slide occasions the elevation of the outer end of the gripper lever and the consequent depression of the gripper. The elevation of the gripper S is conveniently effected by a gripper spring s^6 hung between a fixed pin s^7 upon the gripper bearing or housing s, and a gripper spring pin s^8, on the gripper itself, as shown in Figs. 1, 12, and 13.

The actuating mechanism of the bill-bending slide hereinafter described, is timed to occasion the appropriate advance and retreat of said slide, and the consequent appropriately timed descent of the gripper.

Bearing in mind that the rise of the matrix bar in the timing of the parts in the organization represented in the drawings, takes place after the descent of the blank gripper,— the next device called into play is one invented by me for depressing the bill in the region of its apex to insure the maintenance of the shank and spring tongue portions of the blank upon the floor of the elevated matrix, in order that the bill pin U hereinafter described may unfailingly pass over said shank and tongue. The depressing device referred to is what I term a bill-depressing pin T, Figs. 1, 5, 6, 12, and 13. This pin is conveniently constituted by a vertical stud downwardly projecting from the inner end of a longitudinally extending pin lever t, fulcrumed at $t^{\times}$ to a standard or other fixed support, and at

its outer extremity equipped with a cam roller t' which treads upon the periphery of the matrix cam $R^{\times}$ heretofore described, and which cam as to its said periphery is provided with a cam crest r'' so formed as to impart to the lever such appropriate deflection as will occasion the downward movement of the depressing pin to engagement upon the bill in the manner represented in Figs. 5 and 6. The elevation of the lever and pin are conveniently secured by an elevating spring t^2, Fig. 1, connected at its lower extremity with the inner end of the lever and at its upper extremity with a retaining stud t^3 upon the slide bearing q^2, or other point of fixed attachment. The timing of the matrix cam is such as to insure the holding down of the bill of the blank by the depressing pin during the period of the insertion of what I term the bill-bending pin, or the pin around which as a former the bill proper and the loop are finally bent.

The bill-bending pin is designated by the letter U, and in the organization represented as modified by me, preferably consists of a straight cylindric rod of diameter equal to the internal diameter of the eye-engaging bends of the completed hook, which is disposed transversely of the machine and horizontally and is adapted to be alternately entered through and withdrawn from a pair of aligned pin throats u formed transversely through both the walls r' of the bill-bending matrix bar. The thrust and retraction of this pin can be occasioned by any preferred device, but are, as shown in Fig. 12, conveniently brought about by mounting the pin upon the inner end of a horizontally traveling bill pin slide $u^{\times}$, mounted in the transverse ways u' in the framework, and at its outer extremity linked by a link u^2 to the upper extremity of a vertical slide rocker u^3 fulcrumed at its lower extremity at u^4 to the framework, and intermediately of its length provided with a laterally projecting cam roller u^5 entered within a suitably conformed lateral cam way u^6 formed in a cam which I term the bill-bending pin cam $U^{\times}$, mounted upon a shaft B^4, suitably mounted and rotated, and timed to occasion the advance of the bill pin slide and pin for the thrust of the latter through the pin throats immediately after the action of the bill depressing pin described.

Assuming the bill bending pin to have been thrust through the pin throats and over the blank as represented in Fig. 6,—the next action in point of time is the rise of the bill depressing pin to set free the bill to permit of its being bent up in the manner depicted in Fig. 7 into the position which it is represented as occupying in Fig. 10. This action is conveniently accomplished by the operation of what Manville terms a bill-upturning former V, Figs. 7 and 13,—the same being a vertically disposed bar of metal, conveniently housed for vertical reciprocation in the housing r of the bill-bending matrix bar, against the outer side face of which it bears and travels. The sole function of this former being to strike the bill portion of the partly bent blank to a right angle with respect to the shank portion, and at the same time to complete a half bend in the end portion of the tongue,—its sole movement is an up and down movement, timed to occur at the proper interval between the movement of the other elements of the bending mechanism generically considered of which it is an element. This up and down movement may obviously be accomplished by many means. Manville finds it convenient to effect it by the aid of a lifting rocker arm v, Figs. 12 and 13, the inner extremity of which is adapted to a notch $v^{\times}$, in the former and the outer extremity of which is keyed upon a rock shaft v' conveniently housed for oscillatory movement transversely in the housing r^5 or other fixture of the frame work, and to which is also affixed an oppositely projecting cam rocker arm v^2, the outer extremity of which is provided with a lateral cam roller v^3 entered within a suitably conformed lateral cam way in a cam termed the bill-completing cam $V^{\times}$, mounted upon the third shaft B^3, and timed to occasion the appropriate oscillation of the rock shaft and consequent elevation and depression of the bill-upturning former.

Assuming the bill to have been bent to the form represented in Figs. 10, and 7, and the bill-upturning former to have sunk to its normal position as shown in Fig. 1,—the final operation upon the blank is the overturning, or closing of the upturned bill into parallelism with the shank portion of the hook, and the completion of the formation of the full bend or loop in the end portion of the tongue. These operations, which Manville prefers to perform simultaneously, are readily and conveniently performed by the operation of a longitudinally reciprocating former termed the bill-closing former W, Figs. 1, 8, 12, and 13,—the same being a bar of metal applied to the inner extremity of a bill-closing former slide w, adapted for longitudinal reciprocation in ways $w^{\times}$ springing from the bed plate, and conveniently formed in the casting which embodies the housing r of the bill-bending matrix bar and the housing r^5 of the matrix moving slide, and the outer extremity of which slide is provided with a lateral cam roller w' entered within a suitably conformed lateral cam way w^2, formed in the bill-completing cam $V^{\times}$, heretofore referred to upon the opposite face of said cam from that in which is formed the cam way V^4 into which is entered the roller v^3 of the cam rocker arm v^2. The path of the cam way w^2 is calculated to occasion the appropriate advance and retreat of the bill-closing former. Simultaneously with the retreat of the bill-closing former upon the completion of the formation of the hook, the bill-bending pin is retracted, the bill-bending matrix bar caused to descend to its lowest position, and the rotary

carrier caused to advance to carry away from the bill-bending mechanism as an entirety the hook just completed and feed to it a succeeding partly bent and swaged blank for completion into a completed hook.

Having thus described my invention, I claim and desire to secure by Letters Patent:

1. In a machine for making a garment hook, in combination with mechanism for advancing a partly bent blank,—a rotary carrier provided with peripheral thread eye sockets,—mechanism for occasioning the intermittent predetermined rotation of said carrier,—the tappet O,—and mechanism for occasioning the predetermined stroke of said tappet,—substantially as and for the purposes set forth.

2. In a machine for making a garment hook, a bill-bending mechanism which bends over the bill to form the completed hook, and which is composed of the following elements in combination, namely:—a bill-bending matrix bar provided with a matrix proper and with walls formed with pin-throats,—a bill-bending pin adapted to the aforesaid pin-throats,—a bill-upturning former, operating subsequent to, and angularly with respect to the plane of movement of, said bill-upturning former,—a bill-closing former,—and means for operating said several elements in due order,—substantially as and for the purposes set forth.

3. In a machine for making a garment hook, a bill-bending mechanism which bends over the bill to form the completed hook, and which is composed of the following elements in combination, namely:—a bill-bending matrix bar, embodying a matrix proper,—a rotary carrier,—a bill-depressing pin,—a bill-bending pin,—and means for operating said several elements in due order,—substantially as and for the purposes set forth.

4. In a machine for making a garment hook, a bill-bending mechanism which bends over the bill to form the completed hook, and which is composed of the following elements in combination, namely:—a bill-bending matrix bar embodying a matrix proper,—a rotary carrier,—a bill-depressing pin,—a bill-bending pin,—a bill-upturning former,—a bill-closing former,—and means for operating said several elements in due order,—substantially as and for the purposes set forth.

5. In a machine for making a garment hook,—a bill-bending matrix embodying a matrix proper laterally confined by two walls respectively provided with aligned pin throats, and the floor of which is provided with a "hump"-supporting rib,—substantially as and for the purposes set forth.

6. In a machine for making garment hooks, in combination with a rotary carrier, a matrix bar embodying a matrix, and a blank gripper,—mechanism for operating said gripper composed of the gripper lever s' and the transversely reciprocating slide $u^{\times}$ formed with a tilting incline s^5,—substantially as and for the purposes set forth.

7. In a machine of the class above recited,—in combination with a rotary carrier formed with peripheral thread eye sockets,—and with mechanism for advancing the partly bent blank into position before a given socket,—a guide way o^6 fixed with respect to the periphery of the carrier and which guides the blank as advanced into position above said socket,—substantially as and for the purposes set forth.

8. In a machine of the class above recited,—in combination with a rotary carrier formed with peripheral thread eye sockets,—the tappet o,—the guide way o^6 with respect to which the tappet o is centered, and which guides the blank beneath the tappet and above a given socket,—and mechanism for occasioning the predetermined stroke of said tappet,—substantially as and for the purposes set forth.

9. In a machine of the class above recited,—in combination with a matrix bar, embodying a matrix laterally inclosed by walls respectively provided with aligned pin throats,—a straight bill-bending pin adapted to be entered through and to be withdrawn from out said throats,—and mechanism for imparting predetermined rectilinear movements of advance and retraction to said bill-bending pin,—substantially as and for the purposes set forth.

In testimony that I claim the foregoing as my invention I have hereunto signed my name this 8th day of July, 1892.

JOHN WILLIAM GRANGER.

In presence of—
J. BONSALL TAYLOR,
T. D. RICHARDSON.

Correction in Letters Patent No. 491,282.

It is hereby certified that in Letters Patent No. 491,282, granted February 7, 1893, upon the application of John William Granger, of Philadelphia, Pennsylvania, for an improvement in "Machines for Manufacturing Hooks and Eyes," an error appears in the printed specification requiring correction as follows: Page 6, lines 26–28, the clause "operating subsequent to and angularly with respect to the plane of movement of, said bill upturning-former," should be stricken out and inserted after the word "former," line 29 as now numbered, same page; and that the Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed, countersigned, and sealed this 21st day of February, A. D. 1893.

[SEAL.]

CYRUS BUSSEY,
Assistant Secretary of the Interior.

Countersigned:

W. E. SIMONDS,
Commissioner of Patents.