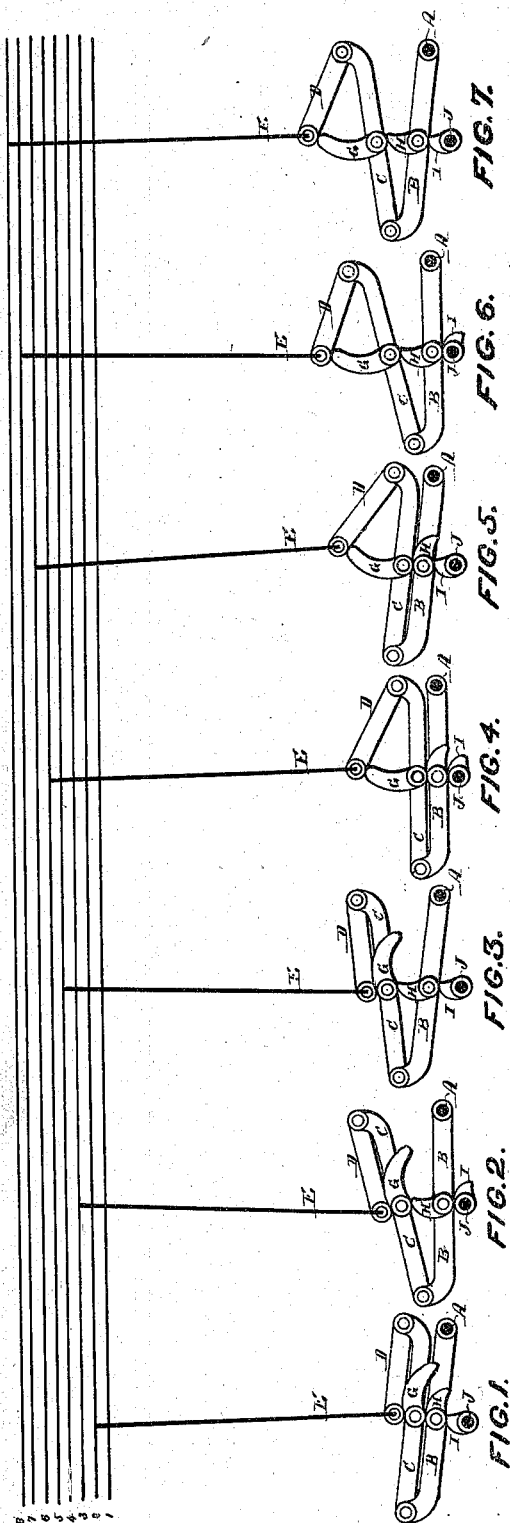


A. NIMMO.
Improvement in Looms.

2 Sheets--Sheet 1.

No. 115,508.

Patented May 30, 1871.



*A. Nimmo
By his Atty
Glasgow & Co.*

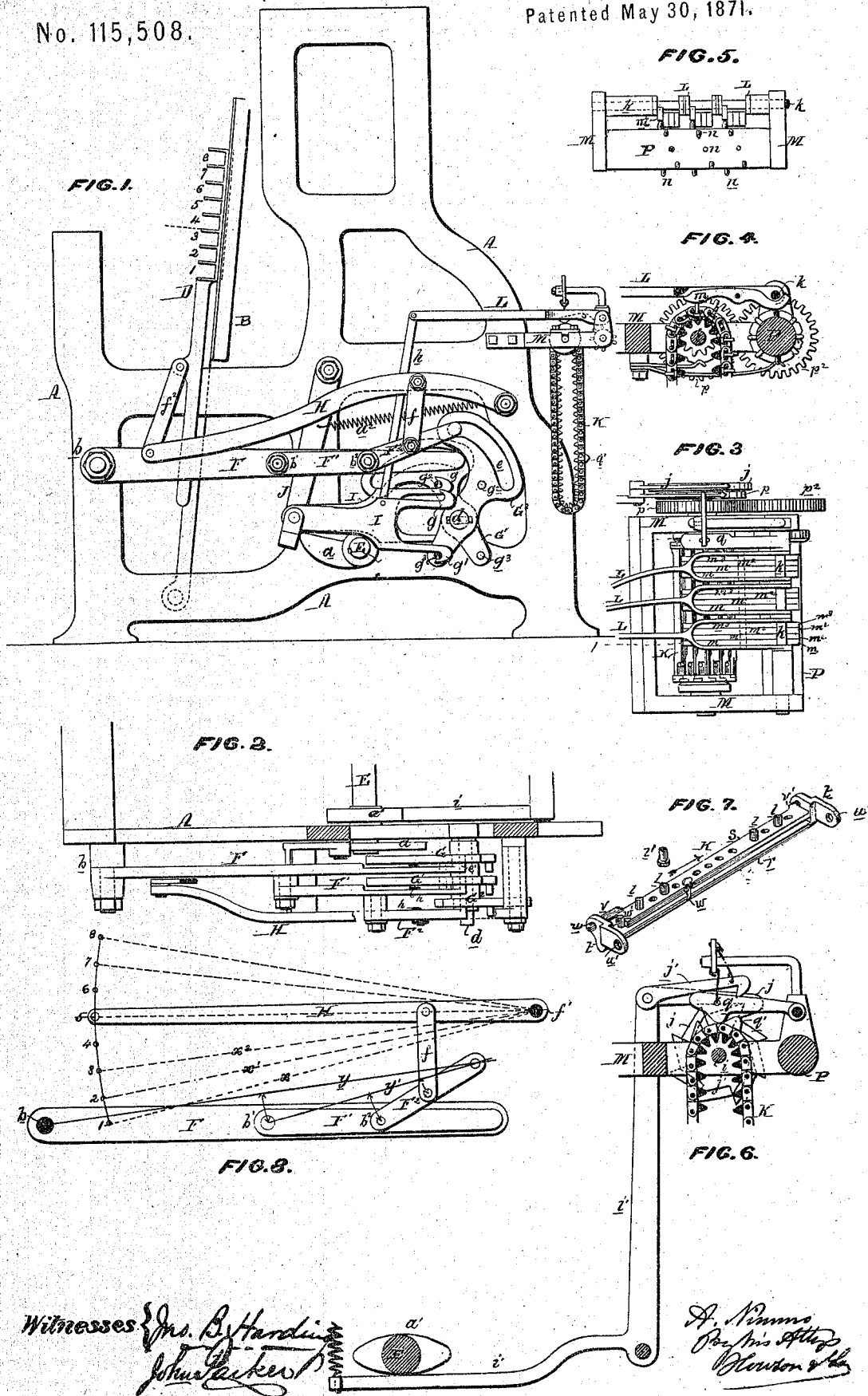
*Witnesses
J. B. Harding
James Parker*

A. NIMMO.
Improvement in Looms.

2 Sheets--Sheet 2.

No. 115,508.

Patented May 30, 1871.



UNITED STATES PATENT OFFICE.

ARCHIBALD NIMMO, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO HIMSELF, THOMAS MORAN, AND VALENTINE STAUSSE, OF SAME PLACE.

IMPROVEMENT IN LOOMS.

Specification forming part of Letters Patent No. 115,508, dated May 30, 1871.

I, ARCHIBALD NIMMO, of Philadelphia, county of Philadelphia, State of Pennsylvania, have invented certain Improvements in Looms, of which the following is a specification:

Nature and Object of the Invention.

My invention consists of certain improvements in looms, too fully described hereafter to need preliminary explanation, the improvements having been designed with the view of increasing the capacity of the loom as regards the production of intricate patterns.

Description of the Accompanying Drawing.

Figures 1, 2, 3, 4, 5, 6, and 7, Sheet No. 1, are diagrams illustrative of the main feature of my invention; Fig. 1, Sheet No. 2, is a side view of a loom with my improvements; Figs. 2 and 3, plan views of portions of the same; Fig. 4, a sectional view on the line 1 2, Fig. 3; Fig. 5, an edge view of Fig. 3; Fig. 6, a section on the line 3 4, Fig. 3; Fig. 7, a perspective view of one of the links of the pattern-chain; and Fig. 8, a diagram illustrating a portion of my invention.

General Description.

The main feature of my invention is based on a new mechanical movement, for which I have made a separate application for a patent; and in order that my present invention may be thoroughly understood I will proceed to explain the movement, which can be best done by referring to Sheet No. 1 preparatory to a description of the invention as applied to a loom.

It should be understood in the outset that my invention is not dependent on specific unalterable devices, but the movement obtained can be accomplished through the medium of different combinations of devices. The cams and levers shown in Sheet No. 1 are not such as I would use in connection with a loom, but, standing alone, and disconnected from all other appliances, they are well adapted for displaying the manner of carrying one part of my invention into effect, and are, in my opinion, the equivalents of the devices, fully explained hereafter, as attached to the loom.

The eight parallel and horizontal lines in-

dicate the different positions to which any one of eight boxes of a drop-box loom may be brought.

In each of the Figs. 1, 2, 3, &c., of the diagram, A represents a fixed pin, to which the lever B is hung, and to the outer end of this lever is connected a second lever, C, and to the outer end of the latter is jointed a third lever, D, to which is connected a rod, E, supposed to be attached to the sliding drop-box frame. The lever D is controlled by a cam, G, hung to the lever C, and the latter is controlled by a cam, H, hung to the lever B, which is controlled by a cam, I, on a fixed pin, J. These cams are graduated in a manner and for a purpose fully set forth in my above-mentioned application for a patent for mechanical movement. When all the cams are turned down the rod E will extend to the lowest line only of the series 1, 2, 3, &c., indicating that the highest shuttle-box of the series is in line with the shuttle-race. On turning the lowest cam upward, as in Fig. 1, the whole of the levers will be elevated, and the rod E will extend to the second horizontal line, 2, of the series, indicating the position of the second shuttle-box from the top as in line with the shuttle-race. By turning up the cam H, as in Fig. 2, the other two cams being depressed, the third line, 3, is reached, and thus, by the manipulation of these cams in the order shown in the diagram, line after line is reached by the rod, which arrives at the limit of its upward movement when all the cams are elevated, as shown in Fig. 7, the turning down of all these cams at once restoring the rod to its lowest point when it reaches the lowest line only. It is not necessary that the cams should be graduated if the levers themselves are graduated, as will appear more fully hereafter. If we suppose a drop-box frame with eight shuttles to be attached to the rod E, we can understand how one shuttle after another can be brought to coincide with the shuttle-race by operating the three cams, G, H, and I.

It may be remarked that by adding another cam and another lever no less than sixteen shuttles could be used and operated in the manner described, and by adding a fifth lever and cam thirty-two shuttles might be used.

The capacity of my invention, however, is not restricted to its ability to make successive movements of one shuttle after the next. If, for instance, the rod has been elevated to the position shown in Fig. 7, the turning down of the cam G, as in Fig. 3, will permit the rod to descend at once from the line 8 to the line 4 without hesitating at the intermediate lines 7, 6, or 5. In fact, the number of changes which can be effected by operating the three cams may be counted by hundreds.

The advantages of this mechanical movement when applied to a drop-box loom will be understood when we consider that each of the eight shuttles may have thread differing in color from the threads of all other shuttles, and that by the simple operation of the three cams any one of these colored threads can be made to succeed any other of the eight colors which may have been previously woven into the fabric.

Having now described the principle, or mechanical movement, on which my invention is based, I will proceed to explain how it may be applied to a drop-box loom, reference being had to Sheet No. 2, where—

A represents one of the frames; B, the shuttle-box guide attached to the usual vibrating lathe; D, the sliding shuttle-box, containing eight compartments, 1, 2, 3, &c., for holding as many shuttles; and E, the cam-shaft, which receives its motion from the driving-shaft of the loom, as usual, and which has two extra cams, *a* and *a*¹, more particularly referred to hereafter. To a fixed point, *b*, on the frame of the loom is hung a lever, F, (corresponding to the lever B in the diagram, Sheet No. 1,) and to this lever, at a point, *b*¹, midway between its fulcrum and outer extremity, is hung a lever, F¹, of exactly one-half the length of the lever F, and to the said lever F¹, at a point, *b*², midway between its opposite ends, is hung a third lever, F², of one-half the length of the lever F¹ and of one-quarter that of the lever F. The lever F is controlled in its movements by a cam, G, hung to a fixed pin, *d*, on the frame of the loom, and having a slot, *e*, in which is arranged to slide a pin, *e*¹, at the outer end of the said lever *f*. This latter, owing to this connection, is caused to rise or fall when the cam is turned upon its fulcrum, and the slot *e* is flattened or depressed at one end, as shown in Fig. 1, so as to retain and prevent the accidental descent of the said lever when the latter has reached the limit of its upward movement. The levers F¹ and F² are in like manner controlled by precisely similar slotted cams G¹ and G², which are also hung to the pin *d*, adjacent to the slotted cam G. The lever F² is connected by a link, *f*, to an arm, H, which is hung to a fixed pin, *f*¹, on the frame, and attached at its outer end through the medium of a link, *f*², to the sliding shuttle-box D.

The above devices are the equivalents of and operate the sliding shuttle-box in precisely the same manner as the devices shown

in the diagram, Sheet No. 1, the levers F, F¹, and F² corresponding to the levers B, C, and D of the diagram, and the slotted cams G, G¹, and G² to the cams I, H, and G.

I will now proceed to describe the operation of these devices, reference being had to the diagram, Fig. 8, where the points 1, 2, 3, 4, 5, 6, 7, and 8 indicate the different positions to which any one of the eight boxes of the loom may be brought. When all of the levers F, F¹, and F² are depressed and on line with each other, the arm H will be also depressed and will extend to the lowest point of the series 1, 2, 3, &c., as shown by the dotted line *x*, this indicating that the highest shuttle-box of the series is in line with the shuttle-race. If the longest lever F be raised by its slotted cam G to the position indicated by the line *y* in Fig. 8, the other lines being depressed, the arm H will also be raised to the point 2, as shown by the dotted line *x'*, this indicating the position of the second shuttle-box from the top, as in line with the shuttle-race; and if the lever E be depressed and the second and shorter lever F¹ be elevated to the position shown by the line *y'* the arm H will be raised to a height twice as great as by the lever F, or to the point 3, as indicated by the dotted line *x''*. The third and shortest lever F² will, in like manner, when raised by its cam, as shown by the full lines in Fig. 8, the other levers being depressed, elevate the arm H to the point 5, or to a height twice as great as by the lever F¹, and four times as great as by the lever F. If two of the levers—the levers F¹ and F², for instance—be raised at one time, the point 7 may be reached by the arm H, and if all of the levers are raised at once the arm H will be elevated to the point 8, indicating that the lowest shuttle-box is in line with the shuttle-race. In like manner, when all of the levers are depressed simultaneously, the arm H will be lowered at once to the lowest point; or it may, by a single movement of one lever, or by a simultaneous movement of two or more of the same, be adjusted at once to any of the eight points shown in the diagram, Fig. 8, so as to bring any one of the eight shuttles opposite the race, the usual step-by-step movement being thus avoided, and the operation of the loom, in weaving with a variety of colors, being much facilitated. By adding a fourth lever to the series of one-half the length of the lever F², and operated by an additional slotted cam, sixteen shuttles could be controlled in the manner above described.

Although this feature of my invention can be carried into effect in a variety of ways, I prefer the arrangement of devices above described, when the movement is used in connection with a loom, as it insures a positive operation of the arm H in both ascending and descending, and enables each shuttle-box to be brought to a point directly opposite the race, and there retained for as long a time as may be necessary.

The slotted cams G , which control the levers F , F^1 , &c., are operated by double-hooked pawls I , hung to the lower end of a vibrating arm, J , which is pivoted to the fixed frame, and operated by the cam a , before referred to, on the end of the cam-shaft E , the said vibrating arm being held against this cam by a spiral spring, a^2 , attached to the fixed frame. Each of the pawls I has two hooked arms, g and g^1 , the former of which, when the pawl is elevated, acts on a pin, g^2 , of its slotted cam, and turns the latter to the position shown by G^1 in Fig. 1, or to such a position as to depress the lever F , which the said slotted cam controls. When any one of the pawls is depressed its hooked arm g^1 acts on a second pin, g^3 , of one of the slotted cams, and turns the latter to such a position as to elevate its lever F , as shown by G^2 in Fig. 1. All of the pawls I are moved backward and forward with every revolution of the cam-shaft E , but they only operate the slotted cams immediately after being raised or lowered, the said slotted cams, after being turned by the pawls to such a position as to raise or lower their levers, remaining in the same position until the pawls are again adjusted. Each of the pawls is capable of being raised and lowered independently of the others, and is controlled by a pattern-chain, K , through the medium of a lever, L , and connecting-rod h , each pawl having an independent connecting-rod and lever; but one wide pattern-chain sufficing for all of the pawls. The pattern-chain is turned as usual by chain-wheels on a spindle, i , which has its bearings on a frame, m , bolted to the frame of the loom, the required intermittent rotary motion being imparted to the said spindle by the cam a^1 on the cam-shaft through the medium of a bell-crank lever, i' , and pawl and ratchet-wheel j . (See Fig. 6.) The levers L are hung to a transverse rod, k , on the frame m , and extends across and are supported by the pattern-chain, so that the said levers, and consequently the pawls I , may be raised by the pins l on the chains, and be depressed when resting upon the plain portion of the latter.

It will be observed, on reference to Fig. 1, that a comparatively short pattern-chain is used; but by the combination of this short chain with an arrangement of devices which I will now proceed to describe the same effect in the weaving of intricate pattern-chain can be produced as by the use of a very long chain, the objections to which are well known to those familiar with the art of weaving.

The pattern-chain is made considerably wider than would be required for the levers L alone if the latter were perfectly straight and plain; but the said levers are forked at a point above the pattern-chain, so as to increase their width, and thus afford space for four short levers, m , m^1 , m^2 , and m^3 , which are hung loosely and side by side between the forked ends of each of the said levers L . One arm of each of these supplementary levers m , m^1 , &c., overhangs the pattern-chain, and its opposite arm a roller,

P , the latter turning in the frame m , parallel with the pattern-chain spindle, and being furnished with pins n , arranged spirally, as best observed in Fig. 5. These spirally-arranged pins, when the roller is turned, successively elevate one end of each of the levers m and depress the opposite end so as to bring it within the range of the pins on the pattern-chain, the levers L being thus operated through the medium of these supplementary levers m , instead of directly, for a purpose which will presently appear. A ratchet-wheel, p , and cog-wheel p^1 , the latter gearing into a wheel, p^2 , on the spindle of the roller P , are connected together, and are hung loosely on the pattern-chain spindle, Figs. 3 and 4. A pawl, j' , hung to the bell-crank lever i' , is adapted to the teeth of the ratchet-wheel p , but is held above the latter by a weighted arm, q , Fig. 6, which rests upon the edge of the pattern-chain, one of the links of the latter having a projection, q' , which, on the completion of every revolution of the chain, strikes and elevates the weighted arm q , and permits the pawl j' to descend and engage with the ratchet-wheel p and move the same to the extent of one tooth, this movement being transmitted, through the gear-wheels p^1 and p^2 , to the roller P , which is turned sufficiently to bring another set of its spirally-arranged pins n uppermost, and to consequently act on another of the supplementary levers m on each lever L , and lower the same into the path of another set of pins on the pattern-chain.

The operation of the pattern-chain and supplemental levers, and the advantages gained by using the latter, will be readily understood if we suppose the first lever m of each series on all of the levers L to be acted on by the pattern-chain until the latter has been turned completely around. If no change were then made the portion of the pattern completed by the short chain would be repeated, or if there were no changing of the parts, and a more intricate pattern were to be woven, the length of the chain would have to be increased. This latter necessity, however, is avoided by the use of the supplemental levers, for when the chain has been turned completely around after acting on the first lever m of each series, the latter will, through the medium of the devices already described, be immediately released, and the second lever m of each series be brought within range of another set of pins on the pattern-chain, which will enable as many additional changes of the pattern to be made as if the length of the chain were doubled. In like manner the third and fourth levers of each series will be brought into play and operated on by new sets of pins on the pattern-chain, so that the effectiveness of the latter will, by the aid of these levers, be increased fourfold. It should be understood, however, that it is not absolutely necessary that four levers, m , should be employed in connection with each lever L , as two, three, or any greater number may be used, it being understood that

each lever added has the effect of doubling the capacity of the chain which is actually used.

It will be readily understood how any additional pattern-chain arranged on the roller P in place of the pins *n* could be used for adjusting the supplemental levers *m*.

The construction of the pattern-chain forms another important feature of my invention, and is as follows, reference being had to Fig. 7: Each link of the chain consists of two plates, *r* and *s*, at each end of the former of which are cross-pieces *t*, adapted to similar cross-pieces of the adjoining links, and having holes *u* and *u'* for the passage of the connecting rods or pins. The plate *s* is hinged to the plate *r* by trunnions *v* and *v'* at its opposite ends, which are adapted to the holes *u* of the cross-pieces *t*, and are of such length as to project entirely through these holes and into the holes *u'* of the cross-pieces of the adjoining link, the said trunnions thus serving also as a means of connecting the several links together. It will be observed that the trunnion *v* of each plate *s* is of greater length than the trunnion *v'*, the object of which is to enable the said plate *s* to be moved longitudinally over the plate *r* in the direction of the arrow, Fig. 7, in order to insert the trunnion *v'* into the holes of the cross-pieces without withdrawing the trunnion *v*; the plate *s*, after having been thus moved longitudinally, being folded down onto the plate *r* and there retained by a spring-catch, *w*, it being also prevented from sliding longitudinally over the plate *r* in such a direction as to withdraw its trunnion *v'* by a stop-pin, *w'*, on the said plate *r*. The plate *s* is perforated with a number of holes for the pins *l* of the chain, and the latter, instead of being permanently affixed, as usual, consists of simple loose rivets *l'*, Fig. 7, the shanks of which are passed through the holes in the plate *s*, and their heads retained between the latter and the plate *r*.

A pattern-chain thus constructed can be readily lengthened or shortened, and the pins can be quickly adjusted to any position required.

Referring again to the mechanism by which the drop-box is operated, it will be seen that the cams are all alike and that the desired va-

riety of changes is effected through the medium of the peculiar system of levers described; but it should be understood that the cams themselves may be graduated to produce the desired effect, as shown in Sheet No. 1, and as more fully explained in my aforesaid application for a patent for a new mechanical movement.

Claims.

1. The combination, with a drop-box, of graduated levers and slotted cams or their equivalents, the whole being arranged and operating substantially as described.
2. The combination of the slotted cams G G¹ with double-hooked pawls I, controlled by a pattern-chain, the whole being arranged to operate in the manner described.
3. The levers L, controlled by the pattern-chain through the medium of a system of levers, *m*, hung to the said levers L, and controlled by pins on a cylinder, P, or by a supplementary pattern-chain on the said cylinder, all substantially as described.
4. The combination, with the supplementary levers *m m'*, of a series of pins, *n*, arranged on the cylinder P so as to operate the said levers successively when the roller is turned.
5. The combination of the projection *q'* on the pattern-chain with the arm *q*, and with devices substantially as herein described, through the medium of which the roller P may be slightly turned at the termination of every complete movement of the pattern-chain.
6. A pattern-chain, the links of which are composed of two bars hinged or otherwise connected together so as to retain the pins of the pattern-chain in the manner described.
7. The hinged retaining-plate *s*, having journals which serve as pins for connecting the links of the chain together.
8. The said plate *s*, hinged to the bar *r*, as set forth, so as to be detached therefrom in the manner described.

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

ARCHIBALD NIMMO.

Witnesses:

WM. A. STEEL,
HARRY SMITH.

B. 750
words.