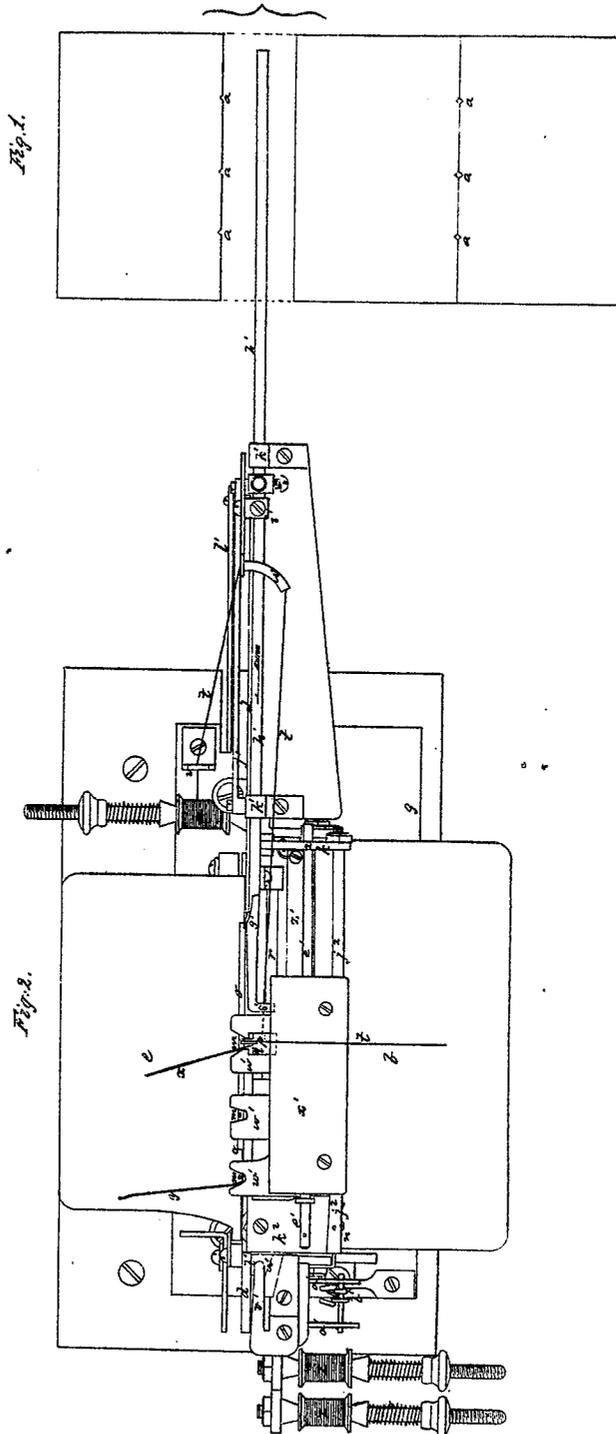


D. M. Smyth.
Sewing Machine.

N^o 91175

Patented Jun. 8. 1869.



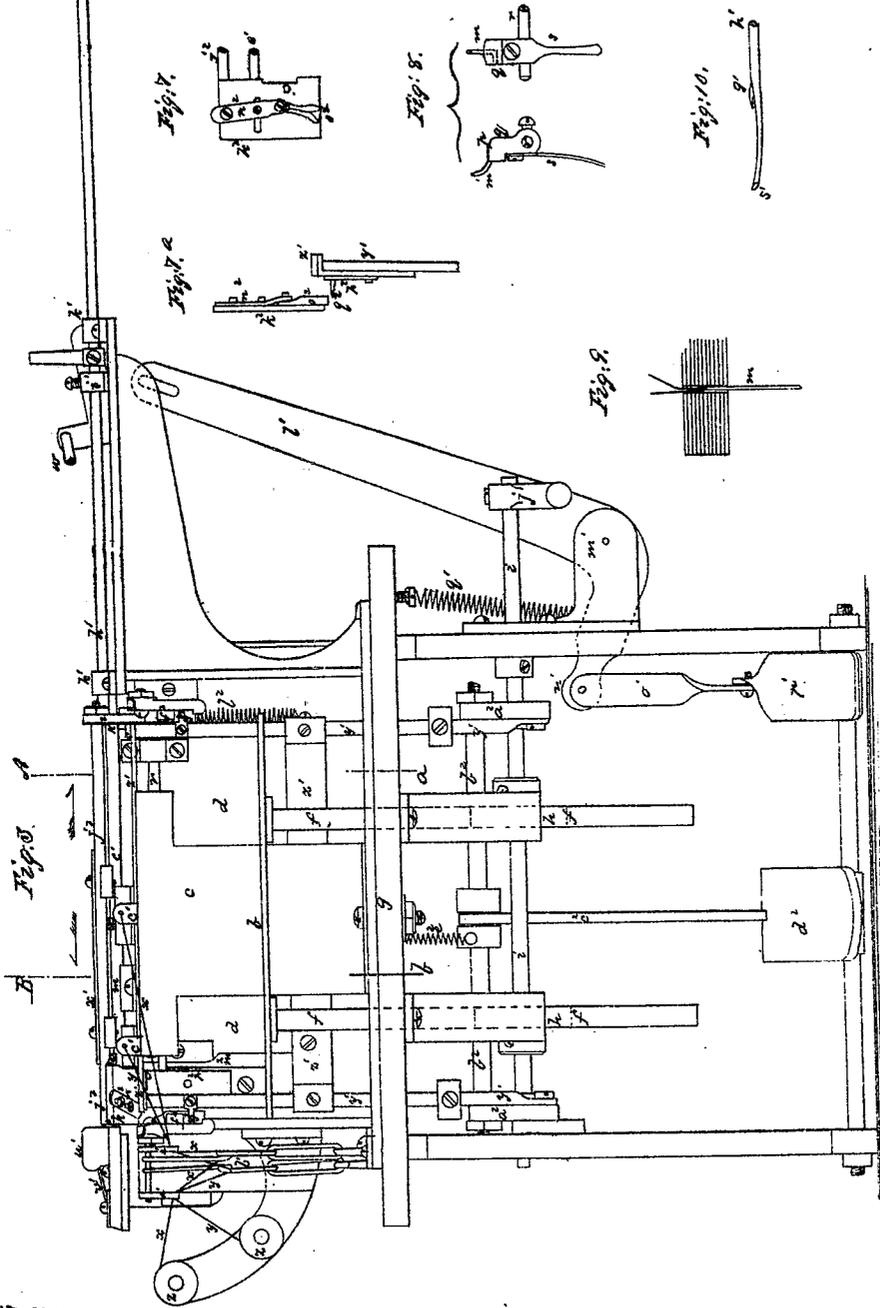
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Fig. 6. P.P.

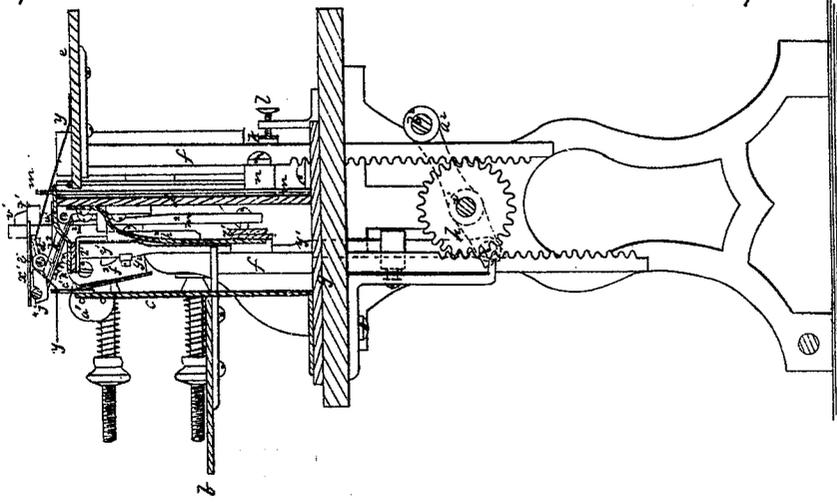


Fig. 5. P.P.

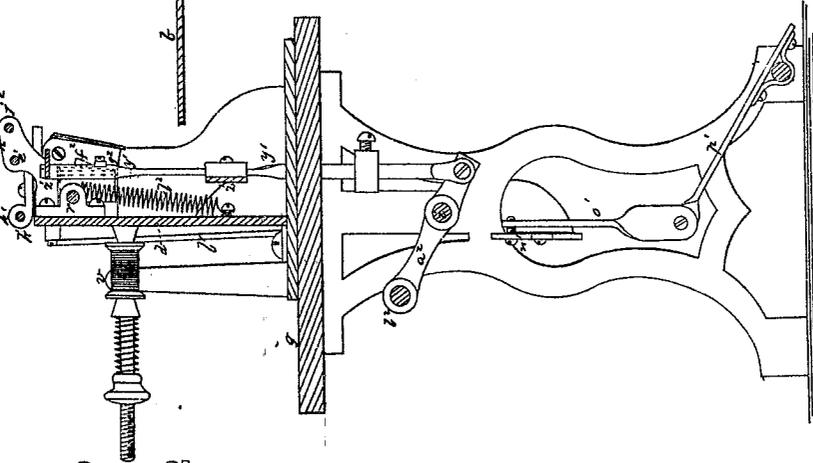
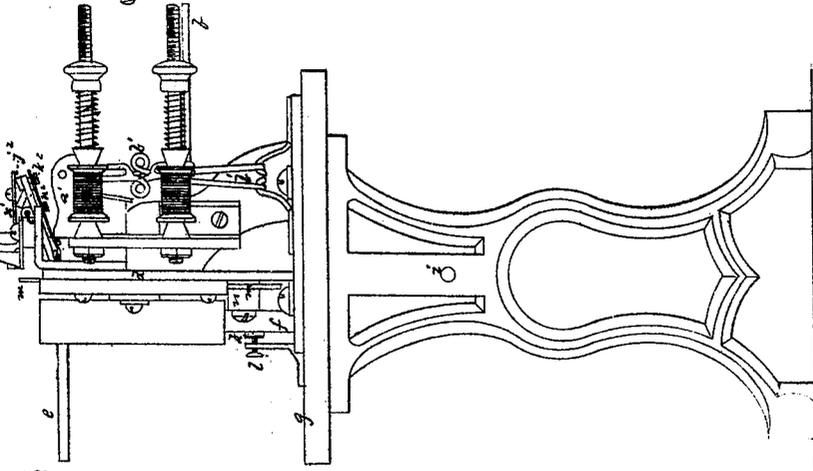


Fig. 4.



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Letters Patent No. 91,175, dated June 8, 1869.

IMPROVEMENT IN MACHINERY FOR SEWING BOOKS.

The Schedule referred to in these Letters Patent and making part of the same.

To all whom it may concern :

Be it known that I, DAVID McCONNELL SMYTH, of Orange, in the county of Essex, and State of New Jersey, have invented certain new and useful Improvements in Machinery for Sewing Books and Pamphlets; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, making part of this specification, in which—

Figure 1 represents a folded sheet of paper, with the folded edge notched, and also one such sheet opened out ready to be operated upon;

Figure 2 is a plan of the machine;

Figure 3, a front elevation;

Figure 4, an elevation of the left side of the machine;

Figures 5 and 6, sections taken in the vertical planes of the lines A *a* and B *b* of fig. 3, and looking in the direction of the arrows;

Figure 7 is a separate view of one of the arms of the rocking-frame for operating the assistant folder;

Figure 8 are separate views of the first needle;

Figure 9, a separate view of one of the other needles with the band, and as the sewed book is being taken off; and

Figure 10, a separate view of the hook for carrying the thread in front of the needles.

The same letters indicate like parts in all the figures.

The object of my invention is to sew and unite the several sheets to constitute a book or pamphlet.

The folded sheets which are to be connected or sewed together, to constitute a book or pamphlet, are put together, and a series of notches, *a*, cut across the back-folded edge, as for sewing by hand, three such notches being represented in the accompanying drawings. The number may be varied.

The notches so cut form holes in the sheets when opened out, as represented in fig. 1 of the accompanying drawings.

The pile of sheets so notched is placed upon a feeding-table, *b*, with the notched back edges against a vertical plate, *c*, which is part of the frame.

There is another plate, similar to *c*, marked *d*. The two are parallel, and the sewing-mechanism is mounted between them.

At the back of the plate *d* there is a receiving-table, *e*, similar to the feeding-table *b*, and this table *e* is for receiving the sheets as they are in succession turned over and sewed.

It is essential to the operation of the machine that the receiving-table *e* should descend at each operation to an extent equal to the thickness of a folded sheet; and it is a matter of convenience to the operator that the feeding-table *b* should rise as the receiving-table

descends, and to about the same extent, so that the top of the pile may be at the same elevation at all times during the operation of the machine.

To effect this, the two tables are secured each to the upper ends of two rods, *f f*, adapted to slide accurately in suitable holes in the platform *g* of the frame, and the lower faces of the lower ends of these rods are cogged racks, which engage on opposite sides of two cog-wheels, *h*, (only one shown in the drawings,) on a horizontal shaft, *i*, provided with a handle, *j*, by which the operator can move the two tables at pleasure to any desired elevation.

The mechanism, to be hereafter described, by which the sheets are turned over during the operation of sewing, is sufficient to depress the receiving-table to the required distance to suit the thickness of the folded sheets, as the friction of the moving parts is the only resistance to be overcome in moving the tables; but as this friction might become insufficient to hold the table steady, it is deemed best to apply a spring, *k*, to press against the rods *f f*, with a temper-screw, *l*, to regulate the friction.

Immediately back of the vertical plate *d* there is a series of needles, *m*. The number and their distance apart should correspond with the number of notches cut in the back-folded edge of the sheets to be sewed. Three are represented in the accompanying drawings.

These needles have eyes at their upper ends, all but the first, to receive the "bands," as they are termed by book-binders, that is, threads for completing the tie after the required number of sheets has been sewed, and after they are discharged from the machine, but which are passed through the eyes of the said needles after the required number of sheets has been sewed, and before the sheets are removed. Such a band is represented by red lines on one of the needles in fig. 9.

All but the first of these needles are held at their lower ends by a clamp, *n*, or equivalent means, a screw-clamp being deemed best, as that is a convenient means for changing the number and distance apart of the needles.

The receiving-table has a long mortise, *o*, through which the needles pass, so that it can move up and down without interfering with them.

The first of the series of needles is short and slightly curved, and has a flat shank, *p*, at right angles to the general line, by which it is attached to a rocker, *q*, on a rock-shaft, *r*, and the rocker is provided with a spring, *s*, the tension of which holds the needle in line with the upper end of the other needles, but which will permit it to yield forward when required.

The rocker *q* can slide on its shaft *r*, for adjustment to sheets of different sizes, and when set is held in place by a set-screw.

In sewing with this machine, three threads are used, besides the "bands," on all the needles except the first of the series.

One of these threads, (see fig. 2,) marked *t*, from a spool, *u*, mounted on any suitable part of the machine, passes through a guide, *v*, and thence to the carrier *w* of a travelling-hook, to be hereafter described, so that it may travel with the said carrier, and from this through a guide-hole in the rocker *q* of the first needle, and thence along a groove in the back of the needle, to and through the eye to the front of the needle, where it is held by the hand of the attendant, or hitched to anything until it is tied in with the other threads.

The other two threads, termed the binding-threads, and marked *x* and *y*, (see fig. 3,) are drawn, as required, from two spools, *z z*, suitably mounted on the frame, and pass through two guide-eyes, *a' a'*, and between the two eyes each thread passes through an eye in a spring or weighted slide, *b'*, there being one such for each thread to take up the slack, and from the guide-eyes *a' a'* the threads pass through guides *c' c'*, one in front of the first, and the other in front of the last of the series of needles; and from the guides *c' c'* these binding-threads pass through eyes in the outer end of two short arms, *d' d'*, in front of the series of needles, (only one shown in the drawing, fig. 6,) on a rod, *e'*, which is mounted so as to slide longitudinally in the rocking frame of the assistant folder, to be hereafter described.

These two arms, *d' d'*, are to be placed as far apart as the distance between the first and last needles of the series; and to admit of adjusting them when the needles are shifted, they are made to embrace the rod, to which they are secured, and held in position thereon by screws.

At the beginning of the operation the loose ends of the two threads *x y* are hitched to anything, or held by hand.

The feeding-table, the pile of sheets, and the receiving-table, having been brought to the required elevation, the top sheet of the pile is opened out by the attendant, and slipped on to the series of needles, the notches *a* cut into the folded edges of the sheets, forming holes, to slip on to the needles when the sheets are opened out.

The sheet of paper, when so opened out, is over the threads *x* and *y*, and over that part of the thread *t* which has been passed through the eye of the first needle, and hence this thread is stretched in a straight line from the hole in the sheet of paper up to the eye of the needle. As this needle is curved, the thread is at some distance from the body of the needle, that it may be readily taken by the hook.

The hook just referred to, indicated by the letter *g'*, projects from the back and near the end of a rod, *h'*, attached to a carrier, *i'*, which slides in ways *j'*, at one end of and parallel with the plates *c* and *d*, before referred to; and both ends of this rod slide in guides *k' k'*, one at each end of the ways *j'*.

A reciprocating motion is given to the carrier *i'* and rod *h'* by a staff, *l'*, the upper end of which is connected with the carrier, and the lower end pivoted to a bracket, *m'*, of the frame. And the said staff has an arm, *n'*, projecting from its lower end at right angles, which arm is connected by a joint-link, *o'*, with a treadle, *p'*, by which the operator, with the foot, can give the required longitudinal motion to the carrier and rod, the return motion being given by a spring, *q'*. Other equivalent means for operating the hook-rod may be substituted.

When the rod *h'* is moved in the direction of the arrows, (see fig. 2,) its hook *g'*, in passing in front of the first needle, catches the thread *t*, and, drawing it from the spool, through the eye of the first needle, carries it double in front of the other needles, and over the sheet

of paper, until it approaches the last needle of the series, and then the hook is lifted, and moved slightly back to lift and drop the thread over the last needle.

To effect this result, the rod *h'* must have some spring, and that portion of it which extends beyond the hook has a lip, *s'*, which comes in contact with and rides upon an inclined plane or cam-face, *r'*, which lifts the hook *h'*. And the cam-face is provided with an oblique face, *u'*, which at the same time pushes the rod back, so that the hook *h'* passes over the upper end of the needle, to carry the thread around it, and then the lip *s'* of the rod passes beyond the cam-face, and drops by the spring of the rod, leaving the thread single around that needle, and double in front of the other needles, one end of it being in the eye of the first needle, and the other end of it through the hole in the sheet in which the first needle is, and extended below the sheet.

The rod *h'* is then drawn back, to be ready for the next operation.

A spring, *v'*, may be placed, as represented, over the cam-face *r'*, to steady the end of the rod *h'* during the said movements, and prevent it from vibrating.

In that condition, the sheet is to be folded, that is, the half sheet which rests on the assistant folder, is to be turned over on to the other half, which rests on the receiving-table, and after that is effected all the needles, instead of being in the holes of the sheet, as when it was applied in the unfolded state, are found in the notches cut in the folded edge of the sheet, the thread *t* being around the last needle of the series, and extending double within the folded edge of the sheet, and in front of the intermediate needle or needles, if more than three in all are used, and one end of the said thread through the eye of the first needle, and the other out through the notch at the first needle to the place where it was hitched, or into the next preceding sheet after more than one sheet has been applied.

As the needles project some distance above the level of the sheet when first put on, before the sheet can be folded, it is necessary to lift it up nearly to the level of the upper end of the needles, otherwise the holes in the sheet could not pass over the upper end of the needles. The sheet is lifted at the same time that that half of it which was on the assistant folder is turned over to make the fold.

The mechanism by which these operations are performed consists of what I term lifters and folders, *w'*, and assistant folder *x'*.

The lifters and folders *w'* receive motion from two vertical rods, *y' y'*, which pass through holes in the platform of the frame, and extend above and below it.

Above this platform, the vertical rods are fastened to two cross-bars, *z' z'*, to the upper one of which the lifters and folders are secured, and their lower ends are pivoted to the front ends of two levers, *a' a'*, that rock, not with, but on the horizontal shaft *i*, before described, the other arms of the said levers being firmly secured to a bar, *b'*, the whole forming a rocking frame; and the said bar *b'* is connected by a rod, *c'*, with a treadle, *d'*, by the depression of which the lifters and folders are elevated, a spring, *e'*, being connected with the bar *b'*, for the purpose of restoring the parts to their original position so soon as the treadle is liberated.

The lifters and folders are thin plates, one for each needle, and notched at their front edges, so as to extend on each side of, and to a short distance back of the needles, and when depressed, rest on, and hold down the sheet, which has been turned over before.

As the lifters and folders are elevated, they are drawn forward from the needles by two cam-faces *f'*, *f'*, connected with the frame, one at each end, the two vertical rods *y' y'* being sufficiently flexible to yield,

and being provided with spurs $g^2 g^2$, one for each rod. These spurs pass in front of the cam-faces in rising, by which the lifters are drawn from the needles, and as soon as the lifters are carried up higher than the upper ends of the needles, the spurs pass over the upper ends of the cam-faces, and back of them, by the spring of the rods, aided, if required, by a spring, h^2 , which bears against the lower connecting-bar z . The lifters are thereby moved toward the needles to partially fold the sheet.

The rods $y' y'$ are then drawn down by the tension of the spring e^2 , before described, and as they descend, the lifters carry down and complete the folding of the sheet of paper, and there hold it until the next operation. As the rods and lifters are drawn down, the spurs $g^2 g^2$ pass behind the cam-faces $f^2 f^2$, which yield forward to permit the spurs to pass, the cam-faces being pivoted, at their upper ends, to the frame, and being provided with springs in front, to force them back to their original positions, so soon as the spurs on the rods get down to their lowest position to be ready for the next lifting-operation.

As the needles are not hooked at their upper ends, the lifters, in operating to turn over the half sheet to make the fold, have a tendency to lift the sheet over the points of the needles, and thus to mar the operation.

To prevent this, there is an assistant folder, which, in the preferred form, is a plate, x' , but a rod or rods would answer the purpose, which plate lies under that half of the sheet of paper which is in front of the needles; and as the lifters begin to rise, that edge of the plate nearest the needles is carried over the points of the needles with a motion much more rapid than the lifting-motion of the lifters, and by this motion the said plate turns the half sheet over on to the pile on the receiving-table, and there holds it until the lifters have completed the fold.

The edge of this assistant folder, after it has turned over the half sheet, makes pressure on it at a sufficient distance back of the needles not to conflict with the operation of the lifters in completing the fold.

The plate x' is attached to a rod, j^2 , which connects the outer ends of two arms, $k^2 k^2$, constituting a rocking-frame, the said arms being pivoted, at their inner ends, to the frame, a little forward of the line of the needles.

One of the said arms is connected with a spring, l^2 , by the tension of which the rocking-frame is returned after the folding-operation; and the motion for the folding-operation is imparted to the other of the said arms by the upper end of a stud, m^2 , which acts against the under face of the said arm k^2 , near to the axis on which it rocks, to give the assistant folder the required rapid rocking motion.

The stud m^2 slides in suitable ways, and is attached to the lower bar z' , which connects the lifter-rods $y' y'$ so that the motions of the lifters and folders, and the assistant folder, are derived from the same source.

As before stated, the two binding-threads x and y pass through the eyes of two short arms $d' d'$, which slide with a rod, e' , of the rocking frame of the assistant folder, and before the first sheet to be sewed is put on to the needles, the ends of these threads are hitched to some part of the machine beyond the needles, and on the right or left side of the first and of the last needle.

After the thread t has been operated by the hook, as above described, and the sheet has been folded, the binding-threads are to be carried each around its appropriate needle.

To properly understand the operation, let it be supposed that the two binding-threads are each on the left side of their appropriate needles, and the short arms, which carry these threads, to be forward of the

needles. As the rocking frame of the assistant folder moves back to turn over the sheet, the two short arms $d' d'$ carry the two binding-threads to the rear of the needles, and on the same side which carries the two binding-threads around the folded edge of the sheet which contains the thread previously carried by the hook.

The arms $d' d'$ are then moved laterally to the right of the needles, and when the assistant folder is returned to its original forward position, the arms $d' d'$ are moved forward of the needles, but, by reason of having been shifted from the left to the right side of the needles, the binding-threads are thereby passed around the needles.

As before stated, when the arms $d' d'$ are carried forward beyond the needles at the time of folding the sheet, they passed on the left side of the needles, and are then moved laterally to the right, so as to pass on the right of the needles in returning.

At the next operation, in moving forward, they pass on the right side of the needles, are then shifted to the left, and return on the left side of the needles, so that the binding-threads pass from the under side of the first sheet, around the folded edge of that sheet, around the needles to the right side, around the folded edge of the next sheet, then around the needles from the right to the left, and so on successively from left to right, and from right to left, the said arms $d' d'$ being shifted at each operation from one side to the other, but after the forward, and at the time of beginning the return motion, and before the arms $d' d'$ pass the needles.

The preferred mechanism for effecting this result is as follows:

The rod e' , which carries the said arms $d' d'$, is fitted to slide in the arms of the rocking frame of the assistant folder, and one end of it is pivoted to the middle of a small lever, n^2 , fig. 7, the outer end of which has a slot, which turns and slides on a fulcrum-pin on the face of one of the arms of the said rocking frame.

The inner end of the said lever is in turn pivoted to the end of what may be termed a double tilting-cam, o^2 , having two cam or wedge-formed faces, as represented in fig. 7, and the said tilting-cam is pivoted to the under face of the said arm of the rocking frame, so that when the said double cam is tilted, it will shift the thread-carrying arms, first to the right and then to the left, and *vice versa*.

To the bar which carries the lifters, and moving up and down with them, is pivoted a dog, p^2 , with a projecting pin, q^2 , (see Figure 7^a) which is to act alternately on opposite sides of the tilting-cam. And this dog is held in position by a spring, r^2 , (see fig. 3,) which bears against a square-faced projection on its side, so that it may yield and be brought back by the tension of the spring, as a knife-blade.

At the time the lifters rise, the arm of the rocking frame of the assistant folder is in a horizontal position, and the dog p^2 , in rising, moves at right angles thereto, so that when it reaches the arm of the rocking frame, it takes on the right or left side of the tilting-cam, according to the side to which it was moved during the previous operation.

When the assistant folder has turned over the sheet, the under face of the arm, to which the tilting-cam is pivoted, is then in a vertical position, and by the side of the dog p^2 , so that as the lifters are depressed, the pin q^2 on the dog p^2 acts on one face of the tilting-cam to shift the arms $d' d'$ to one side, and at the next operation the dog will act on the other side to reverse the motion, and so on.

It will be remembered that all the needles, except the first, carry each what is termed a band, and that when the needles are withdrawn, these bands remain