

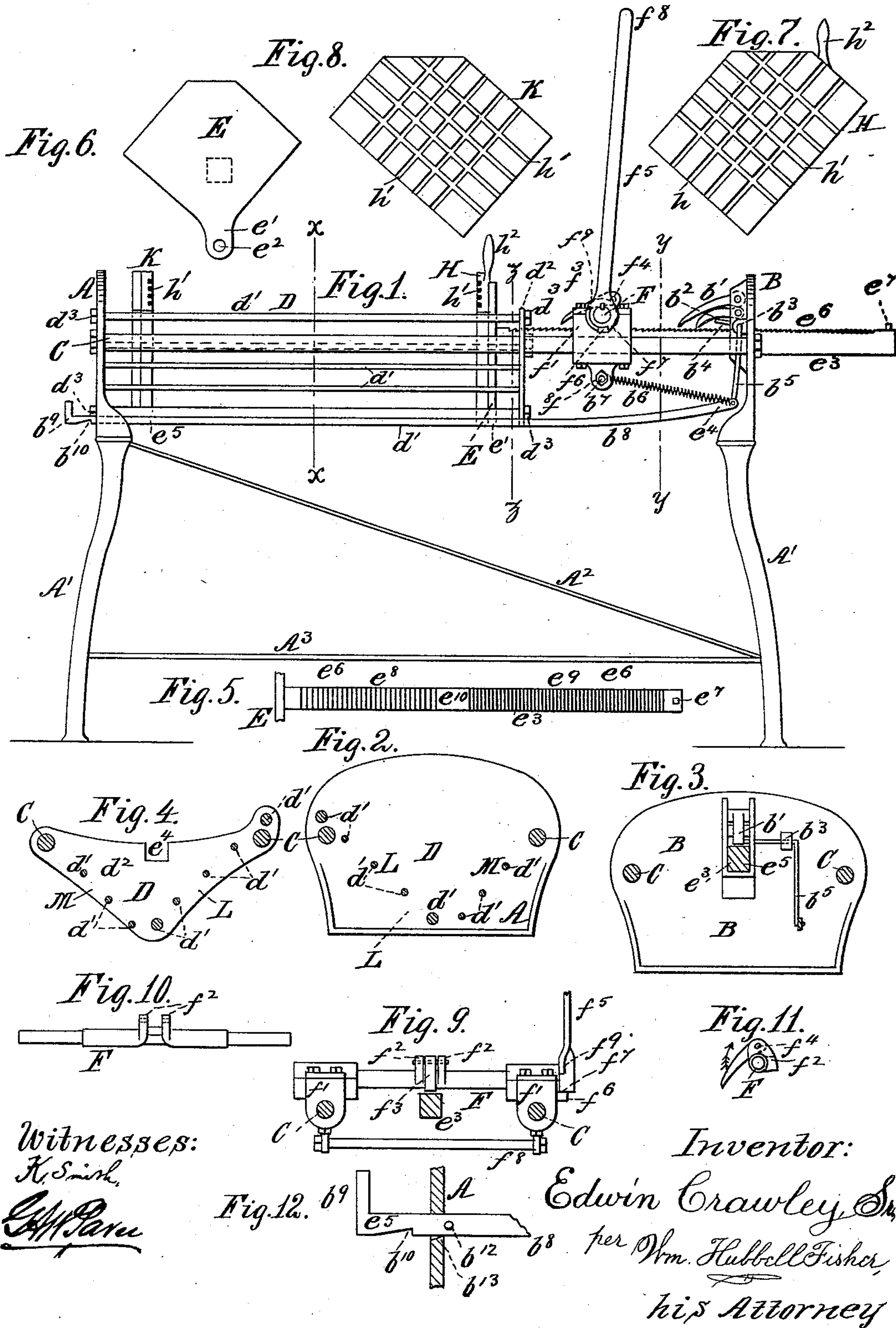
(No Model.)

E. CRAWLEY, Sr.

MACHINE FOR BUNDLING SHEETS OF UNBOUND BOOKS.

No. 453,312.

Patented June 2, 1891.





# UNITED STATES PATENT OFFICE.

EDWIN CRAWLEY, SR., OF NEWPORT, KENTUCKY.

## MACHINE FOR BUNDLING SHEETS OF UNBOUND BOOKS.

SPECIFICATION forming part of Letters Patent No. 453,312, dated June 2, 1891.

Application filed June 11, 1889. Serial No. 313,833. (No model.)

*To all whom it may concern:*

Be it known that I, EDWIN CRAWLEY, Sr., a citizen of the United States of America, and a resident of the city of Newport, in the county of Campbell and State of Kentucky, have invented certain new and useful Improvements in Machines for Bundling the Sheets of Unbound Books, of which the following is a specification.

The several features of my invention and the advantages arising from their use, conjointly or otherwise, will be apparent from the following description and claims.

In the accompanying drawings, forming part of this specification, Figure 1 is a side elevation of a machine embodying my invention. Fig. 2 is a vertical transverse section of the machine, taken at the dotted lines  $x x$  of Fig. 1, looking from right to left. Fig. 3 is a vertical transverse section of the machine, taken at the dotted line  $y y$  of Fig. 1 and looking from left to right. Fig. 4 represents a vertical transverse section of the machine, taken at the dotted line  $z z$  of Fig. 1, looking from left to right, showing the yoke-piece and its connecting-rod. Fig. 5 is a top or plan view of the plunger-bar. Fig. 6 is an elevation of the flanged end, or, more properly, the side of the head of the plunger-bar as it is seen in Fig. 1, in looking from left to right, when the grooved plates adjacent to said plunger-head have been removed. Fig. 7 is an elevation of the grooved side of that plate which is secured to the front side or end of the plunger-head, the grooves facing the left-hand end of the machine. Fig. 8 is an elevation of the grooved side of the plate which is at the left-hand end of the machine, the grooves of said plate facing toward the right-hand end of the machine. Fig. 9 is an elevation of certain details of my invention, and showing more particularly the crank-shaft, journal-bearings therefor, and pawl, together with the rod binding the journals together, and showing in section the rods upon which the crank-shaft journals are supported, also showing in section the plunger-bar, and also showing in elevation the lever which operates the said crank-shaft, the view being taken at a point in the longitudinal axis of the machine to the left of said device. Fig. 10 is a side elevation of the crank-shaft by

itself. Fig. 11 is an end view of the said crank-shaft, said view being taken at the right hand of Fig. 10, looking toward the left. Fig. 12 is a detailed view of that end portion of the trigger-rod shown at the left hand in Fig. 1, and showing in section the adjacent portion of its supporting-frame.

The frame-work of the machine consists, in general, of two transverse supporting-plates and two connecting-bars. One of these supporting-plates (indicated by the letter A) is at one end of the machine and the other vertical transverse supporting-plates B is at the other end of the machine. These plates A and B are rigidly connected together by two parallel horizontal bars C, one of these bars being at one side of the machine and the other at the other side of the machine, substantially as shown in Figs. 1 and 2. This skeleton frame-work is suitably supported, preferably on legs A', as shown. These legs are braced by braces A<sup>2</sup> A<sup>3</sup> to withstand the strains to which the frame is subjected. The left-hand portion of this machine is provided with the receptacle D, into which the book-sheets to be pressed are placed. The sides of the receptacle may be open or closed. The sides are preferably formed of the parallel bars  $d'$ . One of the rods C of the frame also preferably contributes to completing one side of the receptacle. Two of these rods  $d'$  also perform the further function of tying the right-hand end  $d^2$  of the receptacle D to the left-hand end, forming plate A of the machine. The rods which perform this function are the lowest rod  $d'$  and the upper left-hand rod  $d'$ , (shown in Fig. 2, and also seen in Fig. 1,) said rods being suitably secured in position by nuts  $d^3$ . The shape of this receptacle D in cross-section is rectangular, the bottom angle of the receptacle being at the bottom portion of the main frame of the machine, and for the purpose of enabling the book-sheets to better stand on edge in the machine, and also for the further purpose of lowering the position of the sheets in the machine, the bottom angle of the receptacle is at the rear of the longitudinal central plane of the machine. The object of thus lowering the sheets in the machine is to enable the plunger to directly operate upon the sheets at a point nearer their center without unduly elevating the plunger-



bar and its head in relation to the other parts of the machine and thereby necessitating extra mechanism for holding the plunger at the same elevated position or unduly lowering the receptacle and thereby complicating the construction of the machine in this direction. I accomplish these purposes in a very simple manner by shifting the bottom angle of the receptacle past the vertical longitudinal center of the machine, substantially as shown in Fig. 2. Within this receptacle moves the plunger-head E, whose face is parallel to the face of the end pieces A and B of the frame. The outlines of this plunger-head conform in shape to the inner frame in cross-section of the receptacle D, with the exception that the bottom of the plunger-head is provided with an extension  $e'$ , which extends downward and is provided with an opening  $e^2$ . Through this eye or opening  $e^2$  the lowest tie-rod  $d'$  passes, and this last-named rod serves as a guide and a support for the plunger-head as the latter is reciprocated in the trough or receptacle D. This plunger E is actuated by the plunger-bar  $e^3$ . This plunger-bar  $e^3$  is supported and slides in a recess or opening  $e^4$  in the plate  $d^2$ , forming the right-hand end of the receptacle D, and also is supported by and slides through an opening  $e^5$  in the frame-plate B of the machine. The upper surface of this plunger-bar  $e^3$  is provided with a toothed rack  $e^6$ , the faces of the teeth being so arranged that they shall be properly operated in the well-known manner by the pawls hereinafter described.

Pivoted to a suitable portion of the frame, preferably to the end plate B, are two pawls  $b' b^2$ . Both of these pawls are arranged to engage with the rack  $e^6$  of the plunger-bar  $e^3$ ; but the length of these pawls and their position is substantially as shown and such as to cause one of the pawls to engage the rack when the other pawl is half-way between two adjacent teeth. By these means and by this arrangement I am enabled to hold the plunger-bar and its plunger-head against the elastic resistance of the compressed book-sheets at shorter intervals of progression. When desired, one of the pawls  $b' b^2$  may be dispensed with, and the machine will yet be operative; but the pressure of the plunger-head cannot be so closely adjusted against the bundle.

For the advancement of the plunger-bar  $e^3$  and its head E, I provide the following mechanism: A crank-shaft F is journaled at each end in the journal-boxes  $f' f''$ . These journal-boxes are respectively fixed upon their respective adjacent bars C of the frame. These journal-boxes are kept in a vertical position by suitable means, preferably by means of the tie or brace rod  $f^8$ , substantially as shown in Fig. 9. The crank-shaft F is centrally provided with the cranks or lug-pieces  $f^2 f^3$ , and between these lugs  $f^2$  is placed a pawl  $f^3$ . This pawl is pivotally connected to the lugs  $f^2$  at a point  $f^4$  thereon. To one end

of the crank-shaft is rigidly attached the operating-lever  $f^5$ . As will be observed by reference to Fig. 1, the relative positions of the pivoted point of connection between the pawl and its lugs are such in relation to the lever that when the lever  $f^5$  is lifted and thrown back the pawl  $f^3$  is out of engagement. The manner wherein this pawl  $f^3$  is elevated is shown in Fig. 11, where the pawl is shown in dotted lines. As the lever  $f^5$  is elevated the shaft turns in the direction of the arrow (see Fig. 11) and the middle portion of the pawl will be caused to rest upon the crank-shaft F, and the point of the pawl will be thrown up and out of engagement with the rack. Whenever the lever  $f^5$  is moved in a contrary direction—viz., from right to left in Fig. 1—the shaft F will be rotated in a direction contrary to that shown by the arrow in Fig. 11, and consequently the point of the pawl  $f^3$  will be lowered and come into engagement with the rack  $e^6$  of the rack-bar  $e^3$ . When the lever  $f^5$  is not in use, it is in the position shown in Fig. 1 and it leans past the perpendicular to the right. This inclination of the lever prevents it from falling forward and striking the operator. In order to uphold the lever and prevent it, after being inclined to the right of the perpendicular, as shown in Fig. 1, from falling downward the right-hand end of the machine, there is provided a lug  $f^6$ , (see Figs. 1 and 9,) which is rigidly attached to the journal-box adjacent to the said lever  $f^5$ . The lower end of the lever  $f^5$  is likewise provided with a lug  $f^7$ , which, when the lever is inclined as shown in Fig. 1, engages the lug  $f^6$  on the journal-bearing and stops any further movement of the lever toward the right of the machine. As the lever  $f^5$  is moved from right to left the point of the pawl, as aforementioned, descends and engages with the rack, and as the lever is continued to be moved the pawl will operate to press the plunger-bar  $e^3$  to the left. By continued reciprocating movement of the lever  $f^5$  the rack-bar is moved forward until the plunger-head is stopped by mechanism hereinafter specified, or, if the receptacle contain a bundle of book-sheets, until the plunger-head impinges against the bundle of sheets, and the resistance of said sheets prevents the plunger-head from being moved any farther from right to left. In the meantime all backward movement of the bar  $e^3$  is prevented by means of the supplemental pawls  $b' b^2$ , hereinbefore mentioned. In order to prevent the lever  $f^5$ , when moved forward, from descending below a horizontal position, it is provided with a lug  $f^9$ , and upon the descent of the lever from right to left to a horizontal position this lug  $f^9$  will impinge against the aforementioned lug  $f^6$  on the journal-bearing and prevent further descent of the lever.

For convenience of operating the plunger-bar in connection with the supplemental pawls  $b' b^2$ , I have provided a novel mechanism, which I will now describe. Beneath the lower pawl  $b^2$  is placed a lever, pivoted at  $b^3$



to the frame, and preferably to the upright end plate B of said frame. One arm  $b^4$  of the said lever lies directly below and in proximity to the lower pawl  $b^2$ , and the other arm  $b^5$  of said lever extends downward in a nearly-vertical position. To this arm  $b^5$  of the lever is connected a spring or weight, preferably the former, whose tendency is always to press the arm  $b^5$  from right to left, and thereby elevate the arm  $b^4$  of said lever. A preferred arrangement of mechanism for this purpose consists in the spring  $b^6$ , strained from a fixed point, as  $b^7$ , on the journal-box. To this lower arm  $b^5$  of the lever is also connected a push-rod  $b^8$ , the free end of this push-rod being preferably provided with a handle  $b^9$ . The rod is also provided with a notch or catch  $b^{10}$  in its under side and a stop  $b^{12}$ . The notch  $b^{10}$  is arranged to engage an edge  $b^{13}$  of the frame-plate A. The pin or stop  $b^{12}$  prevents the push-bar  $b^8$  from being thrown too far from right to left by the action of the spring  $b^6$ . The movement of the rod  $b^8$  from left to right is properly limited by the plate B, against which the right-hand end of the rod  $b^8$  impinges. When the rod  $b^8$  is pushed from left to right, the notch  $b^{10}$  engages the lip or edge  $b^{13}$  of the frame. The spring  $b^6$  is strained and the lever-arm  $b^4$  is depressed and allows the pawls  $b' b^2$  to fall and engage with the rack  $e^6$  of the plunger-bar  $e^3$ , as heretofore mentioned. As the movement of the rod  $b^8$  from left to right is limited by the plate B of the frame, the lever-arm  $b^4$ , after dropping the pawls  $b' b^2$ , does not descend far enough to engage itself with the rack  $e^6$  of the plunger-bar  $e^3$  and remains stationary at a point between the pawl  $b^2$  and the rack  $e^6$ . The rod  $b^8$  and its free ends  $e^5 e^4$  are allowed to remain in this last-named position while the operator is actuating the main lever  $f^5$  and advancing the plunger-bar and plunger-head against the bundle of sheets lying within the receptacle or trough D. After a bundle of sheets has been tied, as hereinafter specified, it is desirable to retract the plunger and plunger-bar from left to right in order to remove the tied bundle of book-sheets and place the machine in readiness for the reception of the new set of book-sheets to be duly tied into bundles. In order to loosen the pawls  $b' b^2$ , it is necessary for the operator to employ his weight and energy. When the pawl  $f^3$  is in engagement with the rack  $e^6$ , the free end of the main lever  $f^5$  will be depressed, as aforementioned, from right to left and will be located somewhere at the left-hand portion of the machine. The operator is therefore, while working the main lever  $f^5$  in order to release the pawls  $b' b^2$ , at a considerable distance from the latter, and is practically unable to lift them while pressing upon the lever  $f^5$  to cause the pawl  $f^3$  of said lever to take the strain and relieve the pawls  $b' b^2$  from pressure. Furthermore, the pawls  $b' b^2$  must be continually upheld by the operator while the plunger-bar  $e^3$  is being re-

tracted. Otherwise the pawl  $b^2$  or  $b'$  will prevent the further retraction of said plunger-bar  $e^3$ . My device, consisting of the rod  $b^8$ , levers  $b^4 b^5$ , and spring  $b^6$ , obviates these difficulties and disadvantages, and at this point in the operation of the machine comes into active use.

Its operation is as follows: The operator disengages the notch of the bar  $b^8$  from the lip or edge  $b^{13}$  of the frame A, and the tension of the spring  $b^6$  moves the bar  $b^8$  from right to left, carrying with it the lever  $b^5$  and lifting the lever  $b^4$  until the latter impinges against the pawl  $b^2$ . The pressure of the plunger-bar  $e^3$  upon one of the pawls  $b' b^2$ , according as one or the other is in engagement with the rack  $e^6$ , prevents the spring  $b^6$ , through the agency of the levers  $b^5 b^4$ , from raising the pawls  $b' b^2$  at this juncture. The operator, pressing down the lever  $f^5$ , as aforementioned, relieves the pressure of the bar upon the engaged pawl  $b' b^2$ , and thereupon the pressure of the spring  $b^6$ , exerted through the lever  $b^4$ , raises the pawls  $b' b^2$  away from the rack  $e^6$ . At this point in the operation of the device the pin  $b^{12}$  comes into play and limits the movement of the rod  $b^8$  from right to left, and for the same reason limits the elevation of the arm  $b^4$  and constantly limits the elevation of the pawls  $b' b^2$ , leaving them in a convenient position for readily engaging with the rack  $e^6$  when the arm or rod  $b^8$  shall be moved from left to right and the notch  $b^{10}$  may be engaged with the lip or edge  $b^{13}$  of the frame. The operator now lifts the lever  $f^5$ , thereby releasing the pawl from engagement with the rack  $e^6$ , and the plunger-bar is now free to slide from left to right and to return to its original position, the plunger-head E being at or near the plate  $d^2$  of the receptacle D. It may be here remarked that in order to limit the movement of the plunger-bar  $e^3$  from right to left and prevent the right-hand end of the bar from passing through and out of the plate B of the frame I provide suitable stops. When the lever  $f^5$  is elevated and its pawl  $f^3$  is out of contact with the plunger-bar, I provide a suitable stop  $e^7$ . This prevents the plunger-bar from being drawn through the plate B by hand. To prevent the right-hand end of the plunger-bar from being carried through the plate B by power—namely, by means of the operation of the lever  $f^5$  and the pawl  $f^3$ —I provide on the plunger-bar  $e^3$  a blank space  $e^{10}$  between the forward portion  $e^8$  of the rack  $e^6$  and the rear portion  $e^9$  of the rack  $e^6$ . When the right-hand end of the plunger-bar has nearly reached the plate B, the point of the pawl  $f^3$  reaches the blank space  $e^{10}$ , and farther movement of the plunger-bar  $e^3$  from right to left through the agency of the pawl  $f^3$  is impossible. It is desirable to adjust the pressure of the plunger against the bundle of book-sheets to as fine a degree as possible. For this reason the teeth on rack  $e^9$  are preferably finer and closer together than on the forward rack  $e^8$ . Were it not for this construction it would



happen that when the operator had almost fully compressed the bundle of sheets and could advance by lever  $f^3$  the plunger for the distance of only one-half a tooth of rack  $e^8$  he could not take advantage of this advance, but would have to let the rack slide back said one-half tooth, thereby leaving the bundle not fully compressed.

In order to facilitate the application of the string to the bundle of book-sheets while under the pressure of the machine, I make use of the well-known means heretofore employed for similar purposes. These means are as follows: A block H, adapted to set within the receptacle D in the position shown in Fig. 1, has provided on that one of its faces which is toward the left-hand end of the machine a double series of grooves  $h'$ , one series of grooves crossing the other series at right angles. These grooves are of a sufficient size to readily allow the passage through them of the string or cord with which the bundle of book-sheets in the press is to be tied. This block H is preferably provided with a handle  $h^2$ . This block H is then bolted to the plunger-head E. The handle  $h^2$  enables the plunger-head E and the plunger-bar  $e^3$  to be readily reciprocated by hand.

K indicates a block which is complementary to the block H aforementioned. This block K is similarly provided with two series of grooves  $h'$ , crossing each other at right angles and of sufficient size to admit the passage of the string or cord with which the bundle of book-sheets in the press is to be tied. The block K is located in the left-hand portion of the receptacle D, and its grooves face toward the right-hand end of the machine. Preferably this block is not fastened to the end plate A of the machine, but is movable toward the right. It is made movable for the following reason: In order to economize space and to enable the machine to be operated in a smaller compass, the plunger-bar  $e^3$  is made only of such a length as that the plunger-head with its block H can come only to the middle of the receptacle D—namely, the point shown in dotted lines  $x x$  of Fig. 1. Ordinarily any bundle of sheets that may be tied in this machine will occupy more than one-half of the receptacle D. In case, however, the bundle of sheets to be tied occupies less than one-half of the receptacle D, the block K is moved forward and a suitable block of wood or other suitable material is to be placed between the plate A and the block K, thereby advancing it sufficiently to enable the plunger-head E to exercise a proper amount of pressure on the bundle of sheets to be tied. Were it not for the fact that the block K is movable, the plunger-bar  $e^3$  would have to be made much longer, and consequently the working-space occupied by the machine in a room or factory where it is operated would be much greater.

I will now describe in general the mode in which my machine operates.

The plunger-head being at or near the right-hand end of the receptacle D and the block K having been properly adjusted, as aforementioned, the operator sees that the notch  $b^{10}$  of the rod  $b^8$  is in engagement with the lip or edge  $b^{13}$  of the frame A. A sufficient quantity of book-sheets is placed on edge within the receptacle D. In case the sheets are folded sheets the folded edge which is to form the back of the book is placed on the side L of the receptacle D, while the folded edge that is to form the head or top of the book rests against the side M of the receptacle D, the leaves being readily and quickly adjusted so that their respective edges are in line. The operator now seizes the handle  $h^2$  and rapidly draws the plunger-head and block H into contact with the adjacent head of the bundle of book-sheets. He then reciprocates the lever  $f^5$ , and, through the agency of the pawl  $f^3$ , further advances the plunger-bar  $e^3$  and the head E, with its block H, thereby compressing together book-sheets in the receptacle D to the desired degree. He now passes the cord or string with which the bundle is to be tied around the bundle of sheets to be tied, and in accomplishing this result he passes the cord through one of the grooves of the block H and one of the grooves of the block K. Having securely tied the bundle together in the ordinary manner, he now disengages the notch  $b^{10}$  of the rod  $b^8$  from the lip  $b^{13}$  of the frame A. He now applies power to the lever  $f^5$  until the pressure of the plunger-bar  $e^3$  upon the pawls  $b' b^2$ , according as one or the other is in engagement with the rack  $e^6$ , is relieved. The pawls  $b' b^2$  rise out of contact with the rack  $e^6$ , leaving the plunger-bar free to be moved back from left to right by hand. The operator thus moves back the plunger-bar head and block H by means of the handle  $h^2$  to a position in proximity with the right-hand end of the receptacle. He then removes the tied bundle of sheets from the receptacle and again proceeds to repeat the aforementioned operation. In this way the desired number of book-sheets are successively tied.

While the various features of my invention are preferably employed together, one or more of them, so far as applicable, may be employed without the remainder.

What I claim as new, and desire to secure by Letters Patent, is—

1. In combination with the receptacle D and the frame-plate B, the reciprocating plunger-bar  $e^3$ , provided with rack  $e^6$ , and provided at its end with the plunger-head E and grooved block H, substantially as and for the purposes specified.

2. In a machine for compressing and tying book-sheets, the receptacle D and reciprocating plunger E, provided with the extension  $e^2$ , sliding on the bottom guide-rod  $d'$ , substantially as and for the purposes specified.

3. In a machine for compressing and tying book-sheets, the combination of the receptacle for the sheets, plunger E, plunger-bar  $e^3$ ,



pawl  $f^3$ , pawl or pawls  $b' b^2$ , and rack  $e^6$ , provided with the space  $e^{10}$ , vacant of teeth, substantially as and for the purposes specified.

4. In a machine for compressing and tying  
5 book-sheets, the combination of the receptacle for the sheets, plunger E, plunger-bar  $e^3$ ,  
pawl  $f^3$ , pawl or pawls  $b' b^2$ , rack  $e^6$ , provided  
with the space  $e^{10}$ , vacant of teeth, and lug  $e^7$ ,  
located at the right-hand end of the plunger-  
10 bar  $e^3$ , substantially as and for the purposes  
specified.

5. In a machine for compressing and tying  
book-sheets, the receptacle D, plunger E,  
plunger-bar  $e^3$ , provided with the rack  $e^6$ ,  
15 pawl  $f^3$ , lever  $f^5$ , and pawl or pawls  $b' b^2$ , en-  
gaging the rear portion of the rack  $e$ , substan-  
tially as and for the purposes specified.

6. In a machine for compressing and tying  
book-sheets, the receptacle D, plunger E,

plunger-bar  $e^3$ , pawl  $f^3$ , pawl or pawls  $b' b^2$ , 20  
pivotally supported, substantially as de-  
scribed, lever  $b^4$ , connected to and operated  
by lever  $b^5$ , spring  $b^6$ , operating-rod  $b^8$ , pro-  
vided with notch  $b^{10}$ , and stationary lip  $b^{13}$  for  
engagement therewith, substantially as and 25  
for the purposes specified.

7. In a machine for compressing and tying  
book-sheets, the plunger-head E, plunger-bar  
 $e^3$ , rods C C, pawl  $f^3$ , crank-shaft F, provided  
with lugs  $f f^2$ , rigidly connected, and lever  $f^5$ , 30  
journaled in the box  $f' f'$ , located on the rods  
C C and braced by cross-braces  $f^8$ , substan-  
tially as and for the purposes specified.

EDWIN CRAWLEY, SR.

Attest:

A. L. HERRLINGER,  
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