(No Model.) 5 Sheets—Sheet 1.

J. T. ROBINSON, H. J. CHAMBERLAIN & D. M. SMITH.

QUADRUPLE SCORER.

No. 589,577. Patented Sept. 7, 1897.

Fig. 1.

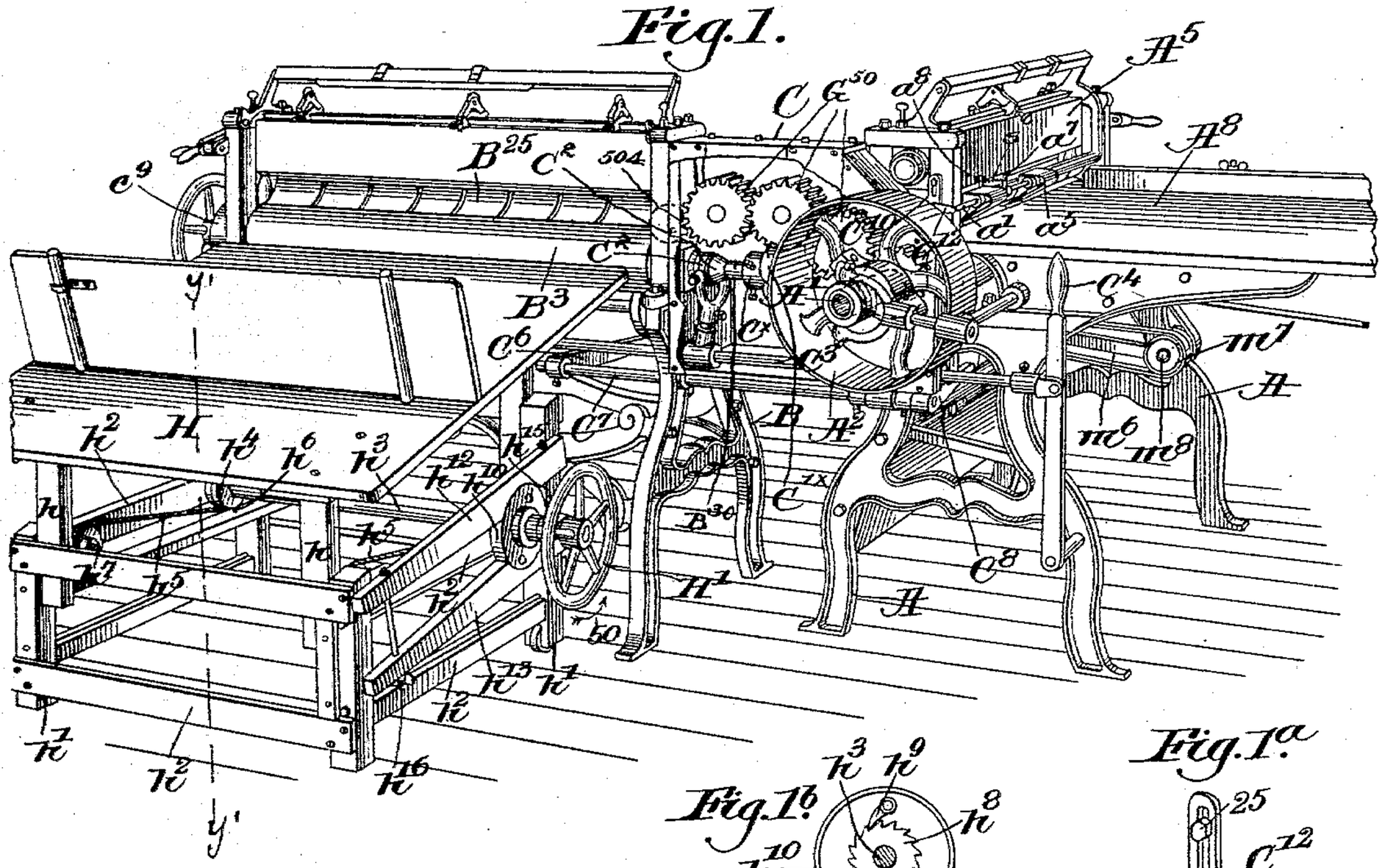


Fig. 1a.

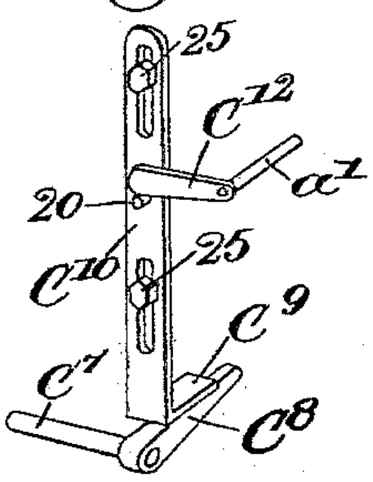
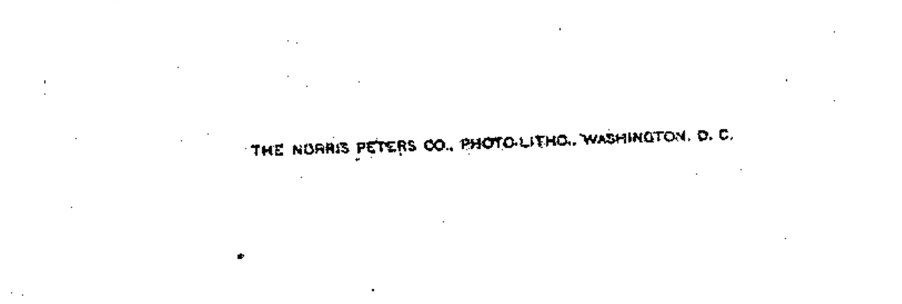


Fig. 1b.

Fig. 2.

Fig. 12.



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(No Model.) 5 Sheets—Sheet 2.

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Fig. 3.

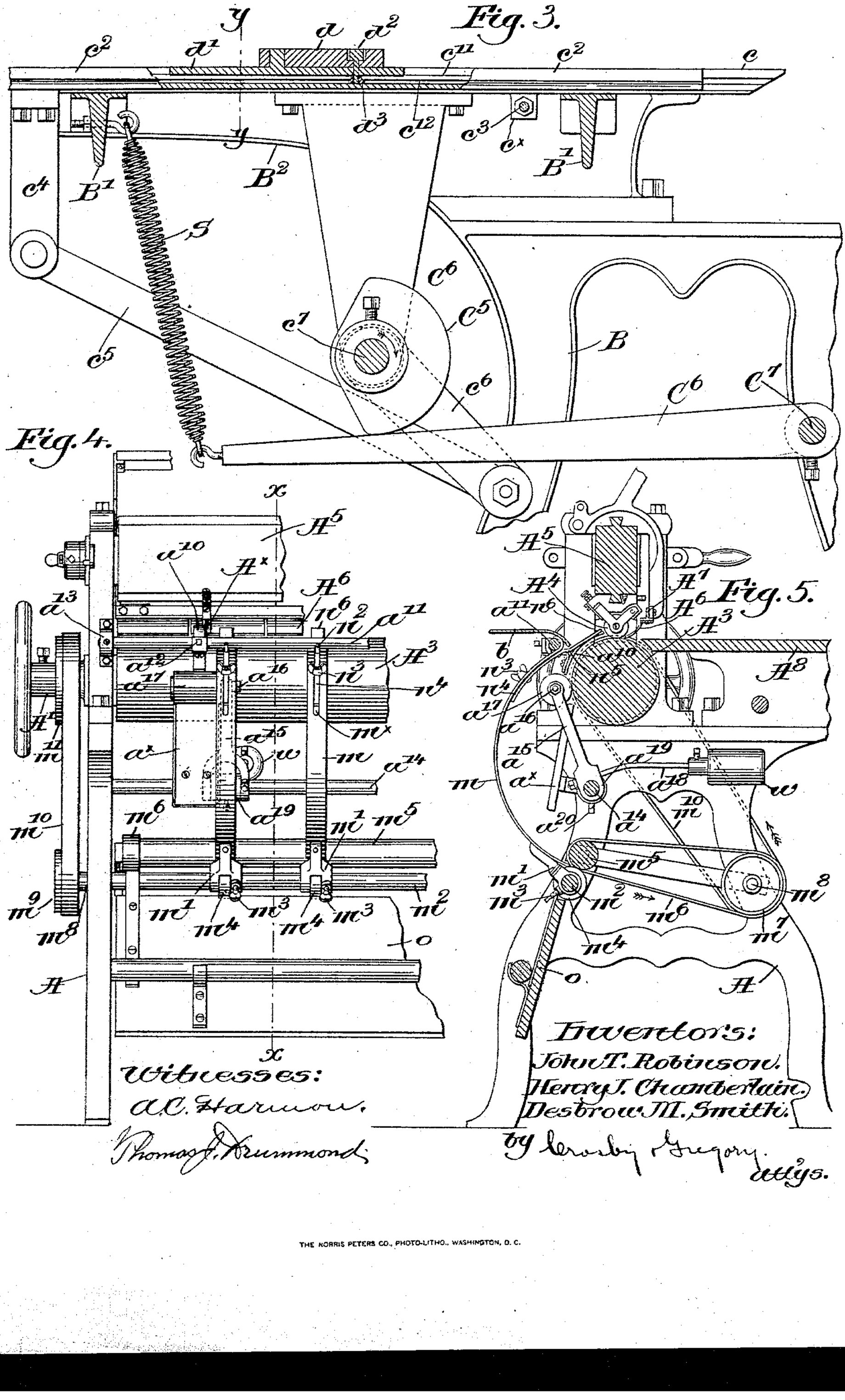

Fig. 4.

Fig. 5.

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(No Model.) 5 Sheets—Sheet 3.

J. T. ROBINSON, H. J. CHAMBERLAIN & D. M. SMITH.

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No. 589,577. Patented Sept. 7, 1897.

Fig. 10.

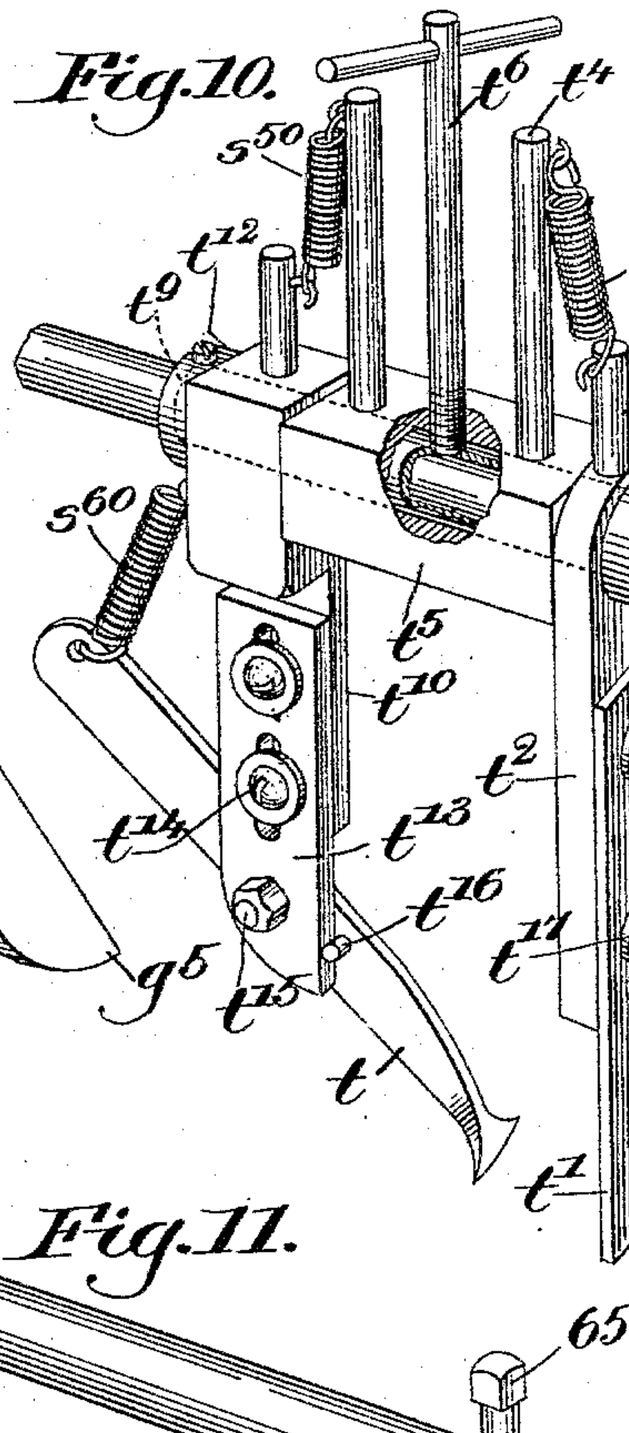


Fig. 9.

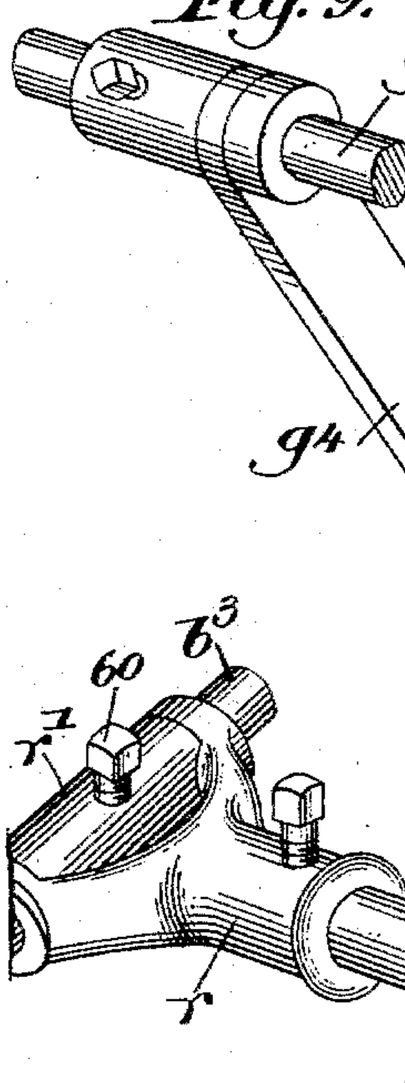


Fig. 8.

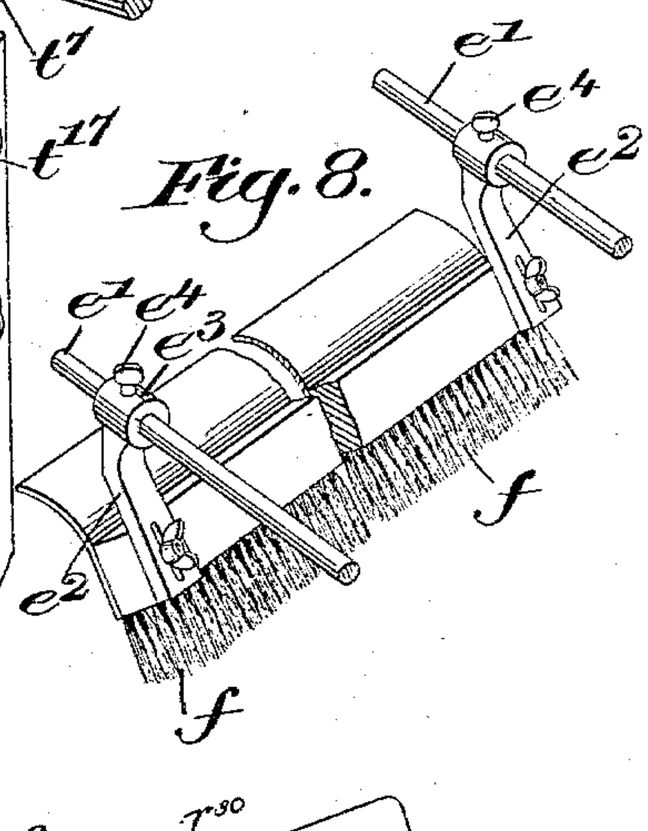


Fig. 11.

Fig. 7.

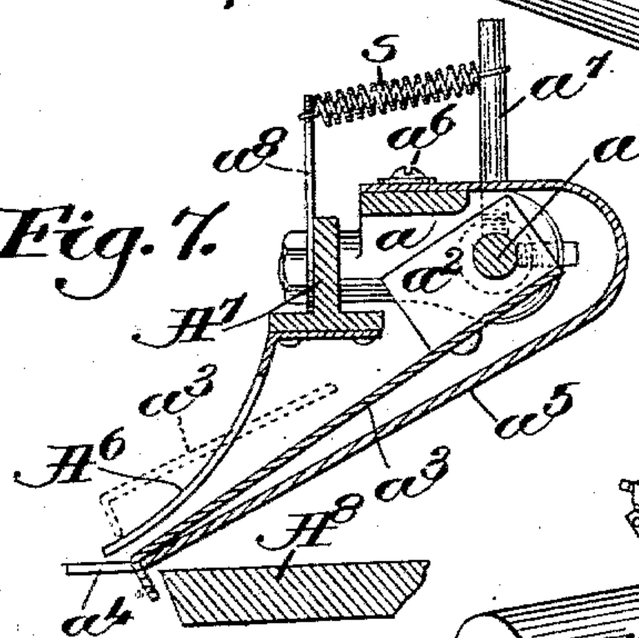


Fig. 6. A^3

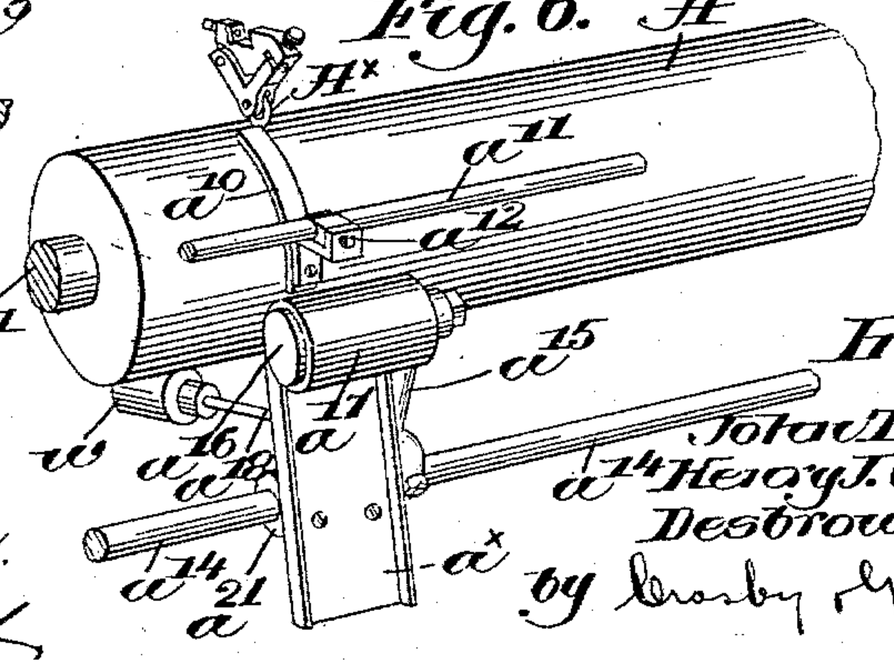
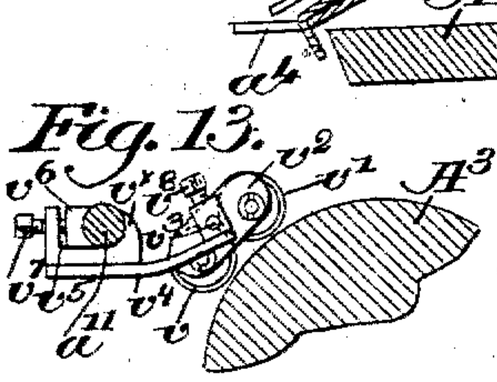


Fig. 13.



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(No Model.) 5 Sheets—Sheet 4

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QUADRUPLE SCORER.

No. 589,577. Patented Sept. 7, 1897.

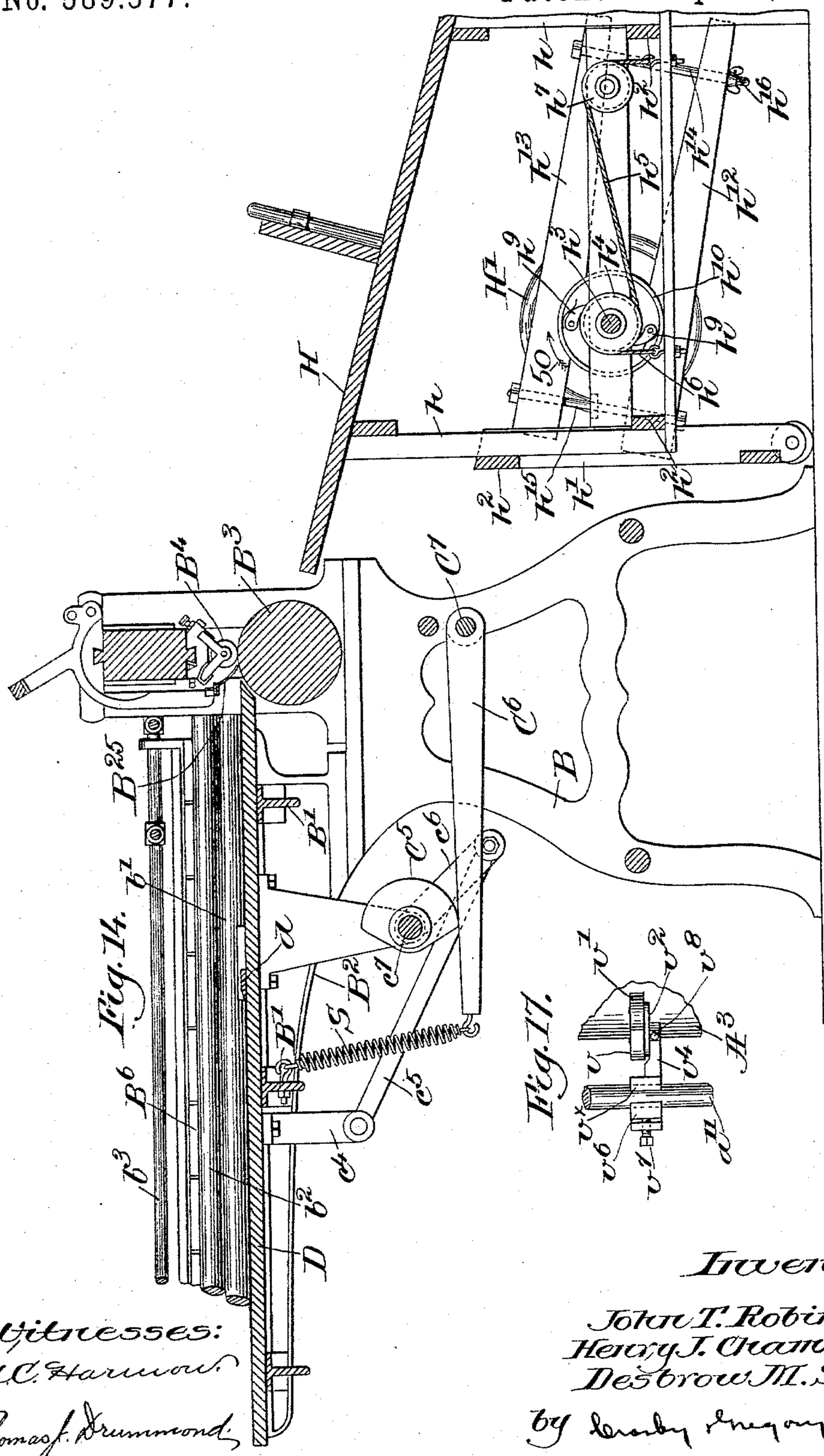

Fig. 14.

Fig. 17.

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(No Model.) 5 Sheets—Sheet 5.

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QUADRUPLE SCORER.

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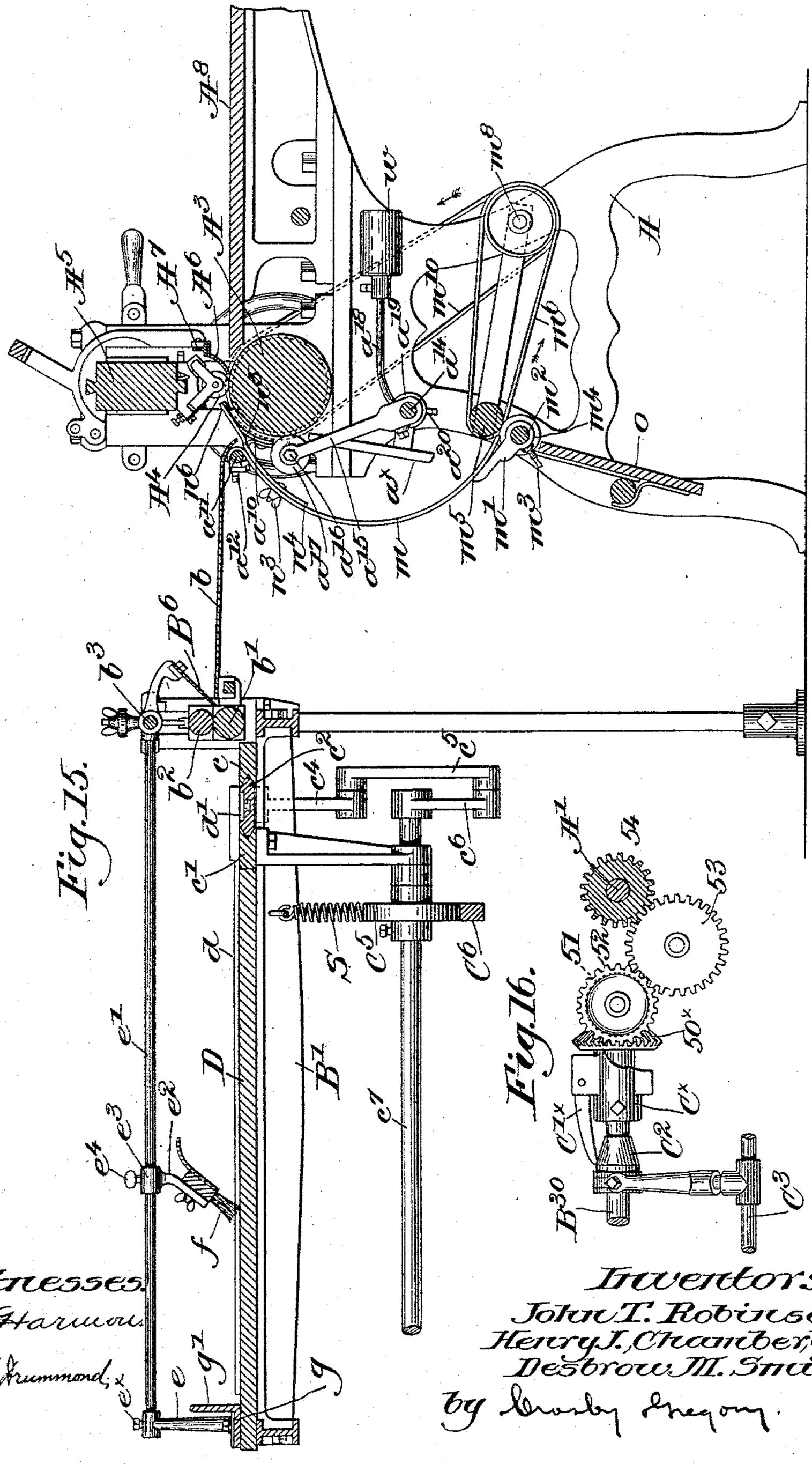

Fig. 15.

Fig. 16.

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UNITED STATES PATENT OFFICE.

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QUADRUPLE SCORER.

SPECIFICATION forming part of Letters Patent No. 589,577, dated September 7, 1897.

Application filed August 7, 1896. Serial No. 602,038. (No model.)

To all whom it may concern:

Be it known that we, JOHN T. ROBINSON and HENRY J. CHAMBERLAIN, of Hyde Park, county of Norfolk, and DESBROW M. SMITH, of Boston, county of Suffolk, State of Massachusetts, have invented an Improvement in Quadruple Scorers, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

This invention has for its object the production of an apparatus for scoring paper to be made up into boxes in such manner that the waste is reduced to a minimum and the two sets of scoring at right angles to each other can be made in a rapid and efficient manner.

In the apparatus to be hereinafter described the sheet of material is fed beneath a series of scorers, which score the surface in parallel lines as it passes thereunder. One or more cutters divide the sheet into separate parts, if desired, as it passes through or beneath the first set of scorers, and as it frequently happens that the size and shape of the sheets of material would cause a great amount of waste if the entire sheet was fed through the second set of scorers we have provided means whereby, when it is so desired, a certain portion of the sheet only will be automatically fed through the second set of scorers to thereby completely score such portion, the other part of the sheet being delivered directly from the first machine at a suitable point and scored in only one direction, or not scored, to be thereafter subjected to the action of a second set of scorers, arranged or set according to the size of the severed portions of the sheet and according to the size and shape of the box which is to be made therefrom. The part of the sheet which is to be automatically fed through the second set of scorers, or in some instances it may be the whole sheet, is delivered upon a table or support, from which it passes to the second set of scorers, and in order that the feed to the latter set may be effected with great rapidity and without interfering with the following sheet we have located the support or table below the plane of the delivery from the first machine, whereby as a sheet is being delivered from the first set of scorers the next preceding sheet is being fed at right angles thereto and beneath it to the second set of scorers.

In accordance therewith our invention consists in the construction and arrangement of parts to be hereinafter fully described, and particularly pointed out in the claims.

Figure 1 represents in perspective an apparatus embodying our invention, partly broken out, viewed from the side at the left of the feed end of the machine. Figs. 1ª and 1ᵇ are details to be described. Fig. 2 is a view similar to Fig. 1, taken, however, from the opposite side of the apparatus and showing the intermediate support or table whereby the direction of movement of the sheet is changed. Fig. 3 is an enlarged detail, partly in section, of the feed-gage-operating mechanism and actuating device for the sheet-feed of the first or primary scoring device. Fig. 4 is a partial end elevation of the sheet-separating and waste-controlling devices mounted to coöperate with the first set of scorers and with the intermediate table or support omitted. Fig. 5 is a vertical sectional view taken on the line *x x*, Fig. 4, looking toward the left. Fig. 6 is a perspective detail of the waste-controlling device shown in Figs. 4 and 5. Fig. 7 is an enlarged detail, partly in section, of the sheet-feed-controlling mechanism located at the feed end of the machine. Fig. 8 is a perspective detail, enlarged, of the downhold for the sheet as it is moved into position to be fed to the secondary scoring device. Fig. 9 is also a perspective view, enlarged, of the stop-gage for the sheet prior to its change of direction. Fig. 10 is a perspective view, partly broken out, of a modified form of stop-gage and detent to be described. Fig. 11 is an enlarged perspective view of a modified form of downhold and stop-gage adapted to be used in connection with the stop-gage and detent shown in Fig. 10. Fig. 12 is a cross-section of the raceway and gage-actuating cross-head, taken on the line *y y*, Fig. 3. Fig. 13 is a partial sectional detail view of a modified form of waste-controller. Fig. 14 is a vertical sectional view of the apparatus, taken in the plane of the section-line *y' y'*, Fig. 1,

looking to the right. Fig. 15 is a vertical sectional view of the apparatus, taken in the plane of the section-line $y^2\,y^2$, Fig. 2, looking toward the left. Fig. 16 is an enlarged detail view of the connecting mechanism between the two bed-rolls, and Fig. 17 is a detail plan view of the waste-controlling device shown in Fig. 13.

Referring to the drawings, we have shown the operative parts as mounted upon two frames A B, of suitable shape, to provide bearings for the working parts, said frames being connected by a substantially rigid casting C, for a purpose to be described.

The frame A is provided with bearings for the main shaft A′, provided with a suitable pulley A^2, herein shown as loose on the shaft and adapted to be brought into engagement therewith by a suitable clutch mechanism, although it is obvious that in lieu thereof fast and loose pulleys might be substituted provided with a usual belt-shipper of well-known construction.

The main shaft has fast thereon or forming a part of it a bed-roll A^3, over which the sheet of paper or other similar material is fed to be acted upon by the scorers A^4, which are and may be substantially as shown in United States Patent No. 273,394, dated March 6, 1883, the scorers being mounted upon a scorer-support A^5, adapted, as in said patent, to receive a series of scorers upon its upper and lower edges, whereby by rotating the support in its bearings one series of scorers, laterally adjusted according to the work to be done, may be substituted for a second series of scorers at the other side of the support.

A guide-plate A^6, of usual construction, is mounted above the bed-roll A^3 at the feed side of the scorers to direct the leading edge of the sheet beneath the scorers, and, as shown in Figs. 1 and 7, we have arranged a feed-controlling device to permit the entrance of a sheet to be scored at the proper time.

Brackets a are secured to the cross-girth A^7, preferably toward the left-hand side of the feed-table A^8, to form bearings for a rock-shaft a', to which are secured blocks a^2, having fast thereon detents a^3, shown as bent over or hooked at their lower ends to normally project through slots a^4 in edge-guides a^5, shown as inclosing the detents, and bent upward and over the tops of the brackets and secured thereto, as by suitable screws a^6. (See Fig. 7.)

The rock-shaft has secured thereto a post or stud a^7, to which one end of a spring s is attached, the other end of the spring being secured to an upright a^8 on the cross-girth A^7 or other fixed part of the apparatus, the tendency of the spring being to normally maintain the detents in the position shown in Figs. 1 and 7, with their hooked lower ends projecting through the edge-guides a^5 and preferably below the edge of the feed-table A^8 and in the path of the sheet to be fed.

It will be obvious from the foregoing that whenever the rock-shaft a' is partially rotated until the detents are moved into dotted-line position (shown in Fig. 7) the sheet of paper may be fed forward beneath the guides a^5 and upon the bed-roll A^3 to be scored, the releasing movement of the detents being timed, as will be described, to deliver the sheet upon the intermediate table at the proper time. As the scored sheet passes from the bed-roll A^3 it is to be delivered altogether upon an apron b to and to be engaged by a pair of delivery-rolls $b'\,b^2$, Figs. 2 and 15, or a part of it will pass over said apron to the delivery-rolls, and another part will be directed beneath the frame A to a suitable point. As the sheet is fed over the bed-roll A^3 each of its longitudinal edges is trimmed by suitable trimming-cutters mounted on the support A^5, one of such trimmers, as $A^\times$, being shown in Figs. 4 and 6, and just beyond the trimmers and at their outer sides we have mounted strip-guides a^{10}, shown as curved pieces of metal adjustably secured to a cross-rod a^{11}, as by set-screws a^{12}, so that the said strip-guides may be adjusted laterally with the trimmers $A^\times$, the supporting-rod a^{11} being mounted in suitable supports a^{13} (see Fig. 2) at the sides of the frame A.

In order to feed, as it were, the severed waste strips positively away from the bed-roll and strip-guide a^{10}, we have mounted upon a rod a^{14} a rocker a^{15}, Figs. 4, 5, and 6, having at its upper end a stud a^{16}, upon which is mounted a roll a^{17}, held in contact with the bed-roll A^3 by suitable means, herein shown as a weight w on the end of an arm a^{18}, secured to the rocker, the latter being bifurcated to straddle an adjustable collar a^{19}, held in fixed position on the rod a^{14} by a suitable set-screw a^{20}, so that the rocker is free to swing upon the rod, but is held from lateral movement thereon. A chute $a^\times$, having secured thereto a hub or sleeve a^{21}, is supported on the rod a^{14} in such manner that the mouth of the chute will be beneath the point of contact of the rolls A^3 and a^{17}, and in the operation of the device the waste strip as it is cut from the sheet enters beneath the strip-guide a^{10} and is guided thereby underneath the auxiliary roll a^{17}, and by the continued rotation of the bed-roll A^3 the severed or waste strip is directed positively into the chute $a^\times$, from which it is discharged at the front of the machine. It is to be understood that one of these waste-controlling devices will be located at each side of the sheet if each side is to be trimmed. Were it not for the auxiliary roll a^{17} the waste-strip would be liable to crowd into and jam the space between the bed-roll and the strip-guide a^{10}, from which it would have to be cleaned from time to time.

Supposing now that the entire sheet as it is delivered from the rolls $b'\,b^2$ is to be scored by a second set of scorers at an angle to the first score-lines made, the sheet is delivered upon an intermediate table or support D, over which it is to be moved as it is fed

to the second set of scorers. At the longitudinal edge of the table B, beneath the delivery-rolls b' b^2, is located a raceway composed, as herein shown, Figs. 2, 12, and 15, of two separated sides c and c', longitudinally grooved at their inner faces to form a track for a cross-head c^2, reciprocable therein, the said sides being secured to cross-girths B', (see Figs. 3 and 15,) forming a part of the extension B^2, which supports the table D.

Referring to Figs. 3 and 12, the two parts of the raceway have depending therefrom suitable ears $c^\times$, through both of which is loosely extended a rod c^3, threaded at its ends to receive check-nuts n n', whereby the sides of the raceway are maintained in parallelism, and wear may also be compensated for, one such connection being located, preferably, at each end of the raceway and outside of or beyond the throw of a depending foot c^4, (see also Fig. 15,) secured to or forming a part of the cross-head c^2, pivotally connected by a link c^5 to a crank-arm c^6 on a cam-shaft c^7, mounted in suitable bearings in the frame B, and having fast thereon a pulley c^8, rotation being transmitted thereto by means of a suitable belt c^9, passed over a pulley c^{10} on the bed-roll shaft B^3 of the second series of scorers to be described.

The cross-head c^2 is longitudinally grooved in its upper face at c^{11} to receive therein the tongue d' of a feed-gage d, suitably secured thereto, the tongue being at right angles to the gage, the said gage being held in adjusted position on the cross-head by means of an adjusting-screw d^2, the shank of which extends through the gage and tongue d' and into a square-sided T-nut d^3, held in an undercut groove c^{12} of the cross-head, the head of the set-screw d^2 entering a counterbored hole in the gage, as best shown in Fig. 3. Turning the set-screw to screw it into the T-nut draws the latter against the top of the groove c^{12} and pulls the gage and tongue tightly against the cross-head.

It will be evident that the cross-head has a constant throw or stroke, but that by varying the position of the feed-gage d upon the cross-head relatively to the ends of the latter the said gage is adapted to feed paper of different widths, and such adjustment is effected by loosening the set-screw d^2 and then sliding the gage along the cross-head to desired position, after which the set-screw is tightened.

The feed-gage is extended laterally over the auxiliary table D and rests thereupon in its movement back and forth, and as a sheet is delivered from the rolls b' b^2 it passes beneath the downhold, to be described, and over the feed-gage d, which at such time is in the forward part of its stroke, feeding the preceding sheet to and to be acted upon by the second set of scorers.

Upon the feed-table D we have mounted standards e, one near each corner of said table, and on a rod b^3, supported in the delivery-roll stands $b^\times$ and $b^{\times\prime}$, are mounted collars b^4, to which are attached in any suitable manner, herein shown as hollow bosses or hubs, one end of the rods e', the other ends of said rods being held in the tops of the standards e by suitable set-screws $e^\times$. The cross-rods e' form supports for the downhold for the sheet as it is delivered from the rolls b' b^2. As the leading edge of the sheet is delivered from the rolls b' b^2 it is necessary to direct it out over the table D in such manner that the sheet will lie flat thereon when the feed-gage d engages one of its trimmed sides to feed the sheet forward to the second set of scorers, and it is also necessary to prevent retrograde movement of the sheet after it leaves the delivery-rolls, and all this we have accomplished by supporting above the sheet and to act upon it a flexible downhold, which permits the passage thereunder of the sheet as it is fed forward over the table D to a stop-gage, to be described, but which prevents retrograde movement of the sheet, the construction of the downhold being such that the gage d is free to reciprocate back and forth beneath it.

We have herein shown the downhold as composed of a brush f, extended parallel to the delivery-rolls and suspended from the cross-rods e' by fingers e^2, depending from collars e^3, held in adjusted position on the rods by suitable set-screws e^4, and with large sheets it is preferable to use two or more such downholds, according to the size and shape of the sheet and the material of which it is composed. The brush is preferably composed of bristles or fibers inclined at an angle to the plane of the table D, the leading edge of the sheet moving under the fiber or bristle and being thereby smoothed or pressed out flat upon the table, while it will be obvious that the feed-gage may move back and forth beneath the fibrous or bristle portion of the brush in the subsequent operation of feeding a sheet.

The brush-like downhold presents little obstruction to the forward movement of the sheet thereunder, but acts to prevent its retrograde movement as the points of the bristle or fiber then take hold of the surface, and the friction exerted thereby is sufficient to hold the sheet in place.

A gage-rest g is secured to the table, the upturned lip g' forming a longitudinally-extended support for a slide-block g^2, in which is mounted one end of a stop-gage support, shown as a rod g^3, the other end of the said rod resting on the supporting-rod b^3, which latter also supports a binder B^6, located just back of the delivery-rolls b' b^2, Figs. 2 and 15, and acting upon the top of the sheet as it moves across the apron b to the said delivery-rolls.

Referring to Figs. 2 and 9, the stop-gage is shown as an arm g^4, mounted to swing on the support g^3 and of such length that its lower end or foot normally bears upon the surface of the table D, the stop-gage being inclined

at an angle of about thirty degrees to the horizontal to rock as the feed-gage passes beneath it, and also if the leading edge of the paper is very rough, the corners g^5 of the gage nearest the second set of scorers being upturned or curved to permit the movement thereunder of the feed-gage d as it is retracted to engage the trimmed edge of the sheet, the leading edge of the sheet as it is fed across the table D by the delivery-rolls being engaged by the flat side of the stop-gage g^4.

It sometimes happens that the leading edge of the sheet is not true or continuous, and in order to avoid presenting the sheet improperly to the second set of scorers, as would be the case if the stop-gage were of considerable extent, we make use of the comparatively narrow stop-gage g^4, which acts upon only a small part of the leading edge of the sheet, permitting the sheet to be turned about such engaging portion when the feed-gage d engages its true-trimmed edge sufficiently to straighten or true the sheet before the feed-gage moves it forward to the second set of scorers. Supposing now that a sheet has been delivered from the rolls b' b^2 upon the feed-table, passing beneath the yielding downhold described and against the stop-gage, the feed-gage d as it is moved toward the outer end of the table D will slip from under the edge of the sheet, allowing the latter to rest upon the surface of the table, and at the next forward reciprocation of the feed-gage the sheet will be moved forward between the bed-roll B^3 and the second series of scorers, two only of which are shown in Fig. 2 at B^4, to be scored at right angles to the first scoring imparted to the sheet. While this sheet is being fed forward the feed-controlling detents a^3 have been operated to permit the entrance of another sheet between the bed-roll A^3 and the scorers A^4, and such second sheet will be delivered by the rolls b' b^2 above the first sheet and while the feed-gage is feeding it forward, the yielding downhold permitting the second sheet to slide thereunder and over the first sheet, the bite of the delivery-rolls preventing displacement of the second sheet, due to the feeding motion of the first one underneath it.

The second sheet is not released from the delivery-rolls b' b^2 until the next preceding sheet has been removed from beneath it.

The scoring mechanism of the second set of scoring devices is substantially a duplication of what has been hereinbefore described.

Referring to Fig. 1, the box-like connection C is broken out to show therein an intermediate shaft B^{30}, (see Fig. 16,) which is fast to the bed-roll B^3 of the second scoring mechanism, said shaft having thereon one member, as $C^{\times}$, of a clutch adapted to be brought into engagement at times with the other member, $C'^{\times}$, of the clutch, provided with a bevel-gear $50^{\times}$ in mesh with a second bevel-gear 51, (see dotted lines, Fig. 16,) the latter having a gear 52 thereon in engagement with an intermediate gear 53, which in turn meshes with a gear 54, connected with the hub of the belt-pulley A^2. The two members of the clutch are brought into engagement by a usual cone C^2 on a slide-rod C^3, controlled by a hand-lever C^4, so that the operator may throw the second scoring mechanism into or out of operation, as desired. The cam-shaft c^7, Figs. 3 and 14, has fast thereon a cam C^5, adapted to act upon a lever C^6, secured to and to rock a shaft C^7, mounted in bearings in the two frames A and B, said rock-shaft having a toe C^8, Figs. 1 and 1^a, movable beneath an ear or offset C^9, secured to a slide-plate C^{10}, having a pin 20 thereon to bear against and lift an arm C^{12}, fast on the rock-shaft a' when the slide-plate C^{10} is raised, the said plate being guided by suitable headed studs 25, extended through longitudinal slots in the plate and into the frame of the machine. The lever C^6 is held against the cam C^5 by a suitable spring S, and the rotation of the cam causes the feed-controlling detents a^3 to be operated at the proper time to permit the feed of the sheet into the first set of scorers. The box-like connection C also has within it a train of gears G^{50}, Fig. 1, between and connecting the gears 54 and 504, the latter being fast on the inner end of the lower delivery-roll b', said roll at its other end (see Fig. 2) having thereon a gear 505 in mesh with a gear 506 on the adjacent end of the upper roll. As the sheet is passed through and acted upon by the second scoring mechanism it is delivered therefrom upon a delivery-table H, a binder B^{25}, of usual construction, preventing the sheet from rising and maintaining it flat as it is subjected to the action of the second scoring mechanism, as best shown in Figs. 1 and 1^4.

The delivery-table H is shown best in Fig. 14 as inclined downwardly away from the scoring mechanism to receive thereon the successive sheets, and said table is mounted upon a series of posts h, adapted to slide vertically within a frame formed by corner-posts h' and braces h^2. A drum-shaft h^3 is mounted in the frame and provided with drums h^4, (see Figs. 1, 2, and 14,) about which are wound flexible connections h^5 and h^6, secured, respectively, at points adjacent the front and rear supporting-posts of the table H, the connections h^6 passing directly therefrom to and about the drums, while the connections h^5 pass over intermediates h^7 on the braces h^2, and thence to the point at which their outer ends are secured.

From the foregoing it will be seen that rotation of the drum-shaft in the direction of the arrow 50, Figs. 1 and 14, will elevate the table H, and this may be done by means of a suitable hand-wheel H' on the projecting end of the shaft. The said shaft is provided (see Fig. 1^b) with a ratchet-wheel h^8, adapted to be engaged by pawls h^9, pivoted on the interior of a flanged friction-pulley h^{10}, and rotatable with the drum-shaft when the latter is rotated

in the direction opposite the arrow 50, Figs. 1 and 14.

The periphery of the brake member h^{10} is partially embraced by the stationary brake member, herein shown as consisting of two parts h^{12} and h^{13}, connected at opposite sides of the flanged member by bolts h^{14} and h^{15}, one or the other of said bolts being provided with a suitable thumb-nut h^{16}, whereby the friction between the two members of the brake may be varied according to circumstances.

Supposing that the table II is elevated, as shown in Figs. 1, 2, and 14, and the friction-brake adjusted, as the sheets are delivered upon the said table their increased weight will cause the table to gradually fall, thus permitting the sheets to form a pile automatically, while the fall is so gradual that the top of the pile will be below and near the point of delivery of the sheet, and when the movement of the table has been completed the sheets of paper thereon may be removed, and rotation of the hand-wheel in the direction of the arrow will elevate the table to normal starting position, the pawls h^9 at such time slipping over the teeth of the ratchet h^8 ready for a new load of scored sheets.

It is sometimes not only convenient but necessary that only a part of a sheet be passed through the second scoring mechanism, and it is desirable that the other part of the sheet be delivered automatically at another point without interfering with the operation of the machine. To accomplish this, we have provided the framework A with a sheet-turning device located below the table B, said sheet-turning device consisting of a series of curved guides m, secured each to a bifurcated support m', embracing a cross-rod m^2, and held rigidly in place thereon from lateral movement by a suitable set-screw m^3, each support straddling a roll m^4, mounted to rotate on the cross-rod m^2, and held from lateral movement by the adjacent support. These rolls m^4 bear against the surface of and are driven by the paper as it passes between them and a roll m^5, extended across the framework A below and parallel to the bed-roll A^3, said roll m^5 being positively driven by a belt m^6, passed around a pulley m^7, (see Fig. 5,) fast on a short shaft m^8, extended through the frame, and having thereon a pulley m^9, driven by a belt m^{10} from a pulley m^{11} on the main shaft A'. Each of the curved guides m is longitudinally slotted at its upper end, as at $m^\times$, Fig. 4, to receive therein a pin n^2 and the shank of a set-screw n^3, both mounted in a switch-plate n^4, curved for a part of its length to correspond to the curvature of the guide m, the upper end of each switch-plate being bent or offset at n^5 to permit the tip n^6 of the switch to clear the down-turned end of the apron b, which projects over the cross-rod a^{11}. When the switches are in the position shown in Figs. 4 and 5, the portion of the sheet which engages them will be turned or deflected downward thereby, and, such portion of the sheet following the curve of the guides m, it will be turned and led between the rolls m^4 m^5 and delivered beneath the machine onto a truck or other suitable receptacle if desired.

It is to be understood that the cross-rod m^2 will be provided with as many sheet-turning guides m as are necessary, and that said guides will be located only in the path of that part of the sheet which is to be deflected below the apron b by means of the switches described, and obviously, if desired, the whole sheet can be deflected as it leaves the first scoring mechanism and delivered beneath the apparatus, as described.

If the sheet is cut into two parts as it receives its first scoring, one part of each sheet can be delivered to the second scoring mechanism, as hereinbefore described, and the other part of the sheet deflected and delivered below the machine. This adaptability of the apparatus is a very valuable feature, as it saves a great amount of waste and increases the output of the machine, for it will be evident that if the sheets are to be severed and one part doubly scored, the two parts of the sheet may be scored differently by the first scoring mechanism—that is to say, at different distances apart—so that one part of the sheet is adapted for boxes of one kind or size and the other part of the sheet for another box.

A shield o, located at the front of the frame A, prevents the sheets as they are delivered thereunder from sliding or jumping toward the front of the apparatus and underneath the intermediate table D, and also keeps the said delivered sheets separated from the waste.

While we prefer to use the downhold and stop-gage heretofore described with some classes of work, a modification of both parts may be used with good effect, such modified forms being illustrated in Figs. 10 and 11.

The downhold shown in Fig. 11 consists of a bifurcated support r, adapted to be mounted upon the cross-rod b^3, and held from longitudinal movement thereon by means of a collar or hub r', maintained in position by a set-screw 60, the said support being adapted to receive therein a preferably hollow shank r^2, into which is telescopically extended and held in adjusted position by a set-screw 65 a rod r^3, upon the outer end of which is secured a forked bearing r^4 for the journals r^5 of a roll r^6, preferably having a cover r^7 of rubber, felt, or other suitable material, the said roll being adapted to rest upon the surface of the sheet as delivered from the rolls b' b^2 and parallel to its path of movement therefrom. The weight of the roll and its telescope connection with the support r is sufficient to maintain proper friction upon the sheet to press it down upon the table D when the feed-gage d is removed from thereunder, and it will be noticed

that while the paper may be fed from the rolls b' b^2 beneath the roll r^6 with but little friction, rotating said roll, the paper cannot be moved at right angles to said roll unless positive force be used, such as the movement of the feed-gage d. A skeleton frame r^{30} is secured to the rod r^3 and upwardly curved at its ends, the feed-gage as it passes under said frame lifting it, so that the gage can move easily beneath the roll r^6.

The leading edge of the sheet as it passes under the roll r^6 moves under a detent t, Fig. 10, and against a stop-gage t', shown as a thin plate adjustably mounted on an arm t^2, depending from the support g^3, the detent t preventing backward movement of the sheet. The arm t^2 is pivotally mounted and is automatically returned to vertical position by a spring s^{40}, secured at one end to a pin t^3 on the arm and at its other end to a pin t^4 on a sleeve t^5, held in fixed position on the support g^3 by a set-screw t^6. The sleeve is reduced and extended in tubular form at one end to form a bearing t^7 for the arm t^2, retained in place by a collar t^8, and a second bearing t^9 is formed at the other end of the sleeve for the arm t^{10}, which carries the detent. The arm t^{10} is centered by a spring s^{50}, similarly to the arm t^2, and a collar t^{12} retains it on its bearing. A plate t^{13} is adjustably secured to the arm t^{10} by clamp-screws t^{14}, said plate having the detent t pivoted thereon at t^{15}, the said detent having a stop t^{16} on it to prevent undue movement by a spring s^{60}. The stop-gage t' is also adjustably mounted on its arm t^2 by means of set-screws t^{17}, so that the detent and stop-gage can be adjusted for wear, in order that they will always assume the proper position relative to the table.

It is sometimes found desirable to supplement the action of the flexible downhold herein described by a roll, as 96, mounted on an arm 97, secured to the rod e' (see Fig. 2) near the inner end of the downhold, the roll rotating as the work comes from the primary scoring device, but presenting its side to and preventing any retrograde movement of the work as the feed-gage is retracted from the secondary scoring device, the said roll 96 acting precisely as has been described for the roll r^6. (Shown in Fig. 11.)

Instead of using the waste-controlling devices shown in Figs. 4, 5, and 6, we may use the devices shown in Figs. 13 and 17, wherein two rolls v and v' are mounted in a yoke v^2, pivoted at v^3 on an arm v^4, the latter being cut out at v^5 to receive a bearing-block v^6 and form an abutment $v^\times$. By means of a set-screw v^7 the block is clamped up against the shaft a^{11} to hold the arm v^4 rigidly thereon, thus enabling the arm to be readily applied to or removed from the shaft without disturbing the latter.

The rolls v and v' are adjusted to direct the waste by the set-screw v^8, and then the rolls will operate in conjunction with the bed-roll A^3.

Our invention is not restricted to the precise construction and arrangement herein shown, as the same may be altered or rearranged without departing from the spirit and scope of our invention.

Having described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. In an apparatus of the class described, two sets of scoring devices to act successively upon the work, means to feed the work and change its direction of movement between the scorers, to present it to the second scorer, a stationary flexible downhold parallel to the first scorer and beneath which the work passes, the downhold engaging and maintaining the work flat between the sets of scorers and preventing its retrograde movement, and a roll between the two sets of scorers with its axis at right angles to the path of the work delivered from the first set of scorers, to permit passage of the work under said roll and to prevent retrograde movement of the work in a direction parallel to the axis of the roll, substantially as described.

2. In an apparatus of the class described, two sets of scoring devices located at substantially right angles to each other, means to feed the work and to change its direction of movement between the two sets of scorers, a stationary downhold substantially parallel to the first set of scorers and comprising a series of fibers or flexible tines to rest upon the work and bent in the direction of its feeding movement as it passes from the first set of scorers, said fibers or tines engaging with and preventing movement of the work toward the first set of scorers as it is fed to the second set, a stop-gage to coöperate with the leading edge of the work and act as a fulcrum therefor as its direction of movement is changed, and a roll having its axis at right angles to and near the second set of scorers to permit passage of the work thereunder from the first set of scorers, and to prevent its retrograde movement in a direction parallel to the axis of the roll, substantially as described.

3. In an apparatus of the class described, two sets of scoring devices located substantially at right angles to each other, means to feed the work and to change its direction of movement between the two sets of scorers, a downhold to engage and maintain the work smooth between the sets of scorers, and a roll mounted at the inner end of the downhold, having its axis at right angles to the path of the work delivered from the first set of scorers, to permit passage of the work thereunder and to prevent its retrograde movement in a direction parallel to the axis of the roll, substantially as described.

4. In an apparatus of the class described, two sets of scoring devices located substan-

tially at right angles to each other, means to feed the work and to change its direction of movement between the two sets of scorers, a downhold to maintain the work smooth between the scorers, and a narrow stop-gage to coöperate with the leading edge of the work and act as a fulcrum therefor as its direction of movement is changed, substantially as described.

5. In an apparatus of the class described, two sets of scoring devices located substantially at right angles to each other, means to feed the work and to change its direction of movement between the two sets of scorers, and a roll mounted between the two sets of scorers and having its axis at right angles to the path of the work delivered from the first set of scorers to permit passage of the work under said roll and to prevent retrograde movement of said work in a direction parallel to the axis of the roll, substantially as described.

6. In an apparatus of the class described, two sets of scoring devices located substantially at right angles to each other, means to feed the work and to change its direction of movement between the two sets of scorers, a pivotally-mounted stop-gage to bear against the leading edge of the work as it passes from the first set of scorers, and a roll having its axis at right angles to said set of scorers, to permit passage of the work under the roll and to prevent retrograde movement of the work in a direction parallel to the axis of the roll, substantially as described.

7. In an apparatus of the class described, two sets of scorers at right angles to each other, means to feed the work to the scorers, and a pivotally-mounted stop-gage to bear against a portion of the leading edge of the work as it passes from the first set of scorers, substantially as described.

8. In an apparatus of the class described, two sets of scorers at right angles to each other, means to feed the work to the scorers, a downhold to maintain the work smooth as its direction is changed, and a pivotally-mounted stop-gage to bear against a portion of the leading edge of the work as it is delivered from the first set of scorers, substantially as described.

9. In an apparatus of the class described, two sets of scorers at right angles to each other, means to feed the work to the scorers, a flexible downhold extended parallel to the first set of scorers, and a stop-gage pivotally mounted beyond the downhold, to swing in a plane parallel to the length of the downhold, to coöperate with the leading edge of the work as it passes under the downhold, and when its direction of movement is changed to yield or rock to irregularities in said edge, substantially as described.

10. In an apparatus of the class described, two sets of scorers at right angles to each other, means to feed the work to the scorers, a downhold extended across the path of the work as it is delivered from the primary scoring device, supports upon which the downhold is adjustable, a stop-gage for the edge of the work, and an independent support therefor upon which it is pivotally mounted, substantially as described.

11. In an apparatus of the class described, primary and secondary scoring devices, a cutter operating with the primary device, to sever the work, an apron to receive a portion of the work, a reciprocating feed-gage to engage and present one portion of the work to the secondary scoring device, and delivery mechanism, including adjustable deflecting-switches, adapted to be moved above the end of the apron to deflect the other portion of the work from the said secondary device and to deliver it at a predetermined point, substantially as described.

12. In a paper-scoring apparatus, a bed-roll, scoring devices and a cutter coöperating therewith, rolls to deliver the scored paper, deflecting-switches to turn one portion of the paper from said rolls, guides to control the passage of the deflected portion, and a delivery mechanism at the extremities of the guides, substantially as described.

13. In a paper-scoring apparatus, a bed-roll, a cutter to trim the edge of the sheet, and a waste-controller to engage and remove the waste from the bed-roll, said controller comprising a curved guide adjacent the bed-roll, and a rotating guide-roll at the lower end of said guide, to engage the waste strip as it emerges from the guide and to positively draw it therefrom, substantially as described.

14. In a paper-scoring apparatus, a bed-roll, a cutter to trim the edge of the sheet, and a waste-controller, comprising a curved strip-guide adjacent the bed-roll, a guide-roll, and a delivery-chute having its entrance below the guide-roll, to receive the waste, substantially as described.

15. In an apparatus of the class described, a vertically-movable delivery-table adapted to maintain the top of the pile of work thereon at substantially the same level as the work accumulates, a drum-shaft, flexible connections between it and the table, to raise the latter when the shaft is rotated in one direction, a friction-controller to regulate the speed of rotation of said shaft in the opposite direction, and a clutch intermediate the shaft and controller, substantially as described.

16. In a paper-scoring apparatus, a bed-roll, a coöperating cutter, a pair of waste-strip guide-rolls, an arm on which they are adjustably mounted, said arm having a recess therein, a clamp-block in said recess, and means to adjust the clamp-block, to thereby secure the arm to its support, substantially as described.

17. In a paper-scoring apparatus, an arm,

guide-rolls adjustably mounted thereon, and an open supporting-bearing for the arm, comprising a fixed abutment on the arm, a coöperating clamp-block, and means to adjust it, whereby the arm may be readily secured to or removed from its support, substantially as described.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

JOHN T. ROBINSON.
HENRY J. CHAMBERLAIN.
DESBROW M. SMITH.

Witnesses:
JOHN C. EDWARDS,
AUGUSTA E. DEAN.