No. 683,707. Patented Oct. 1, 1901.

G. SAGUE & M. A. CLAPP.

SIGNATURE GATHERING MACHINE.

(Application filed Aug. 8, 1900.)

(No Model.) 5 Sheets—Sheet 1.

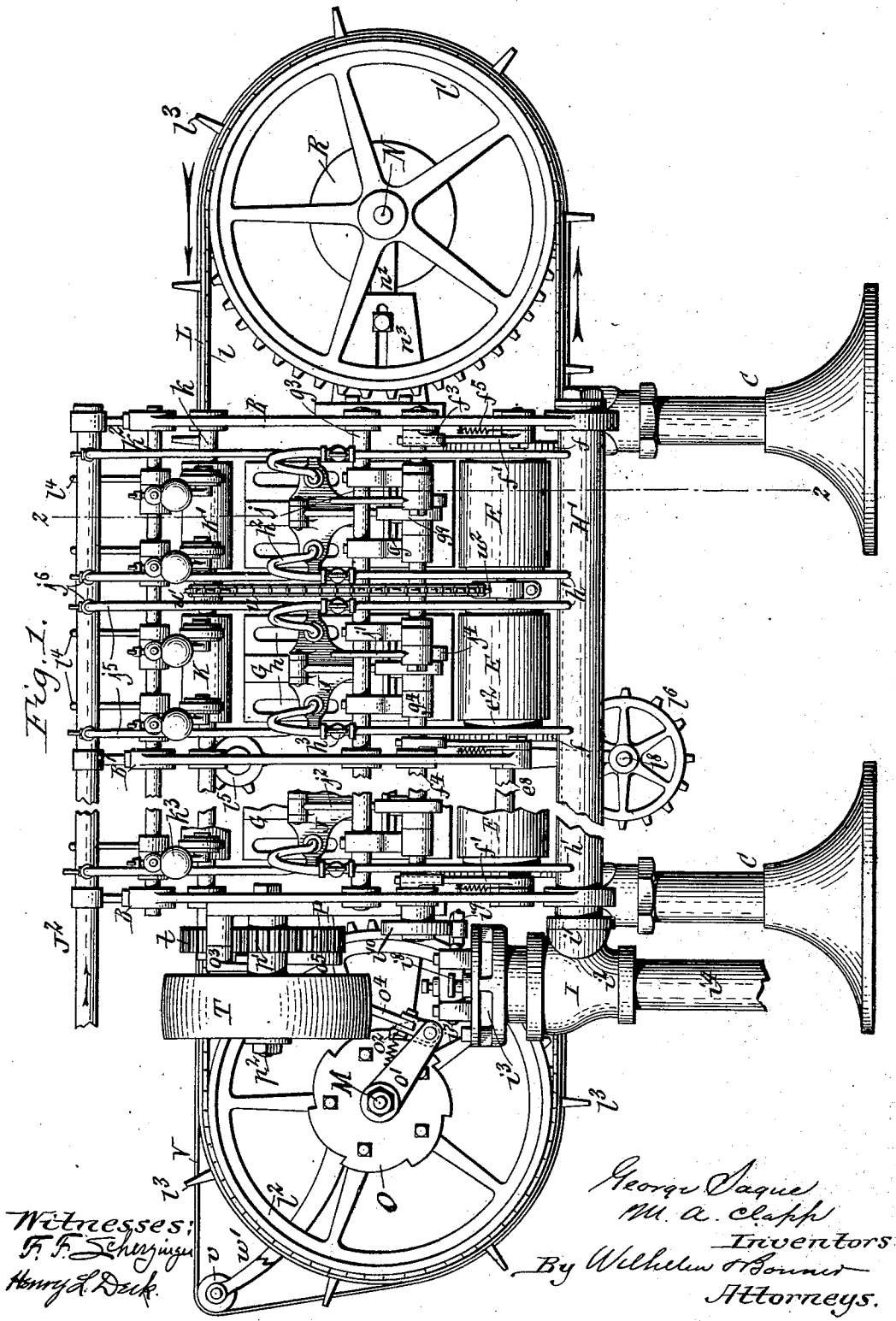

Fig. 1.

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(No Model.) 5 Sheets—Sheet 2.

Fig. 3.

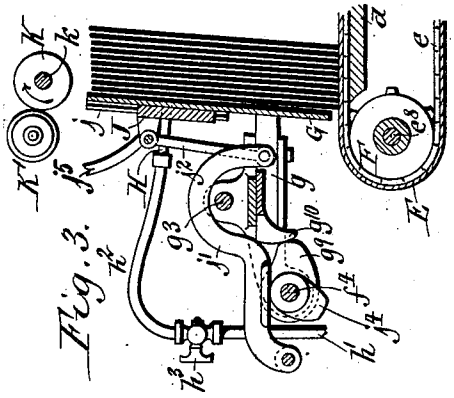


Fig. 4.

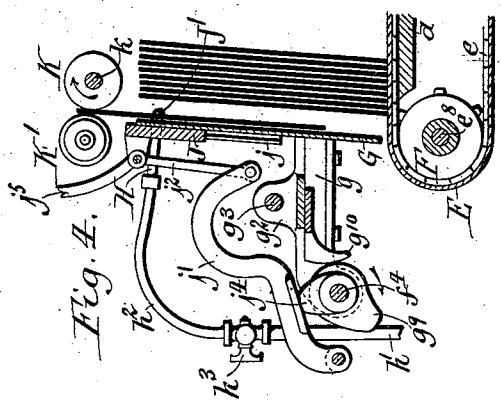
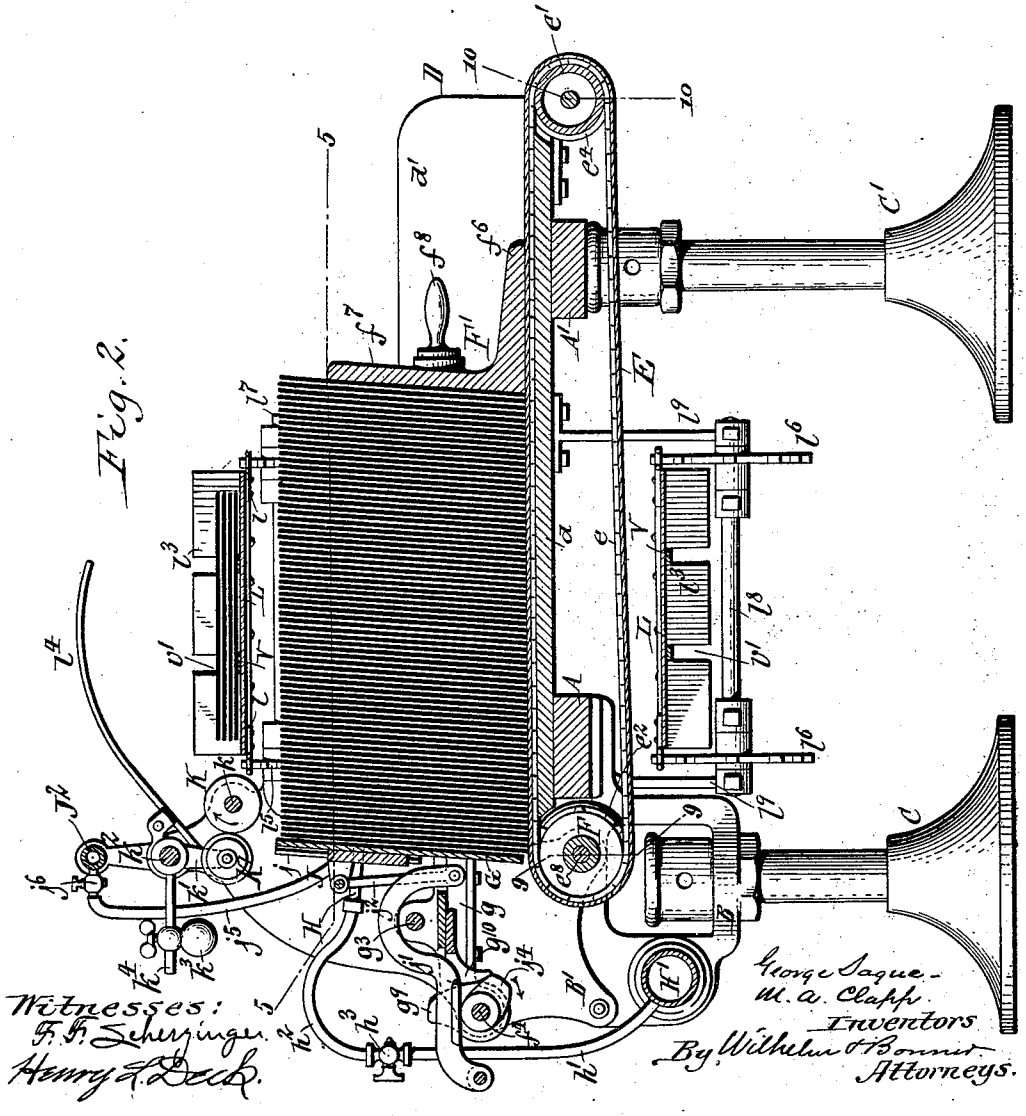


Fig. 2.



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(No Model.) 5 Sheets—Sheet 3.

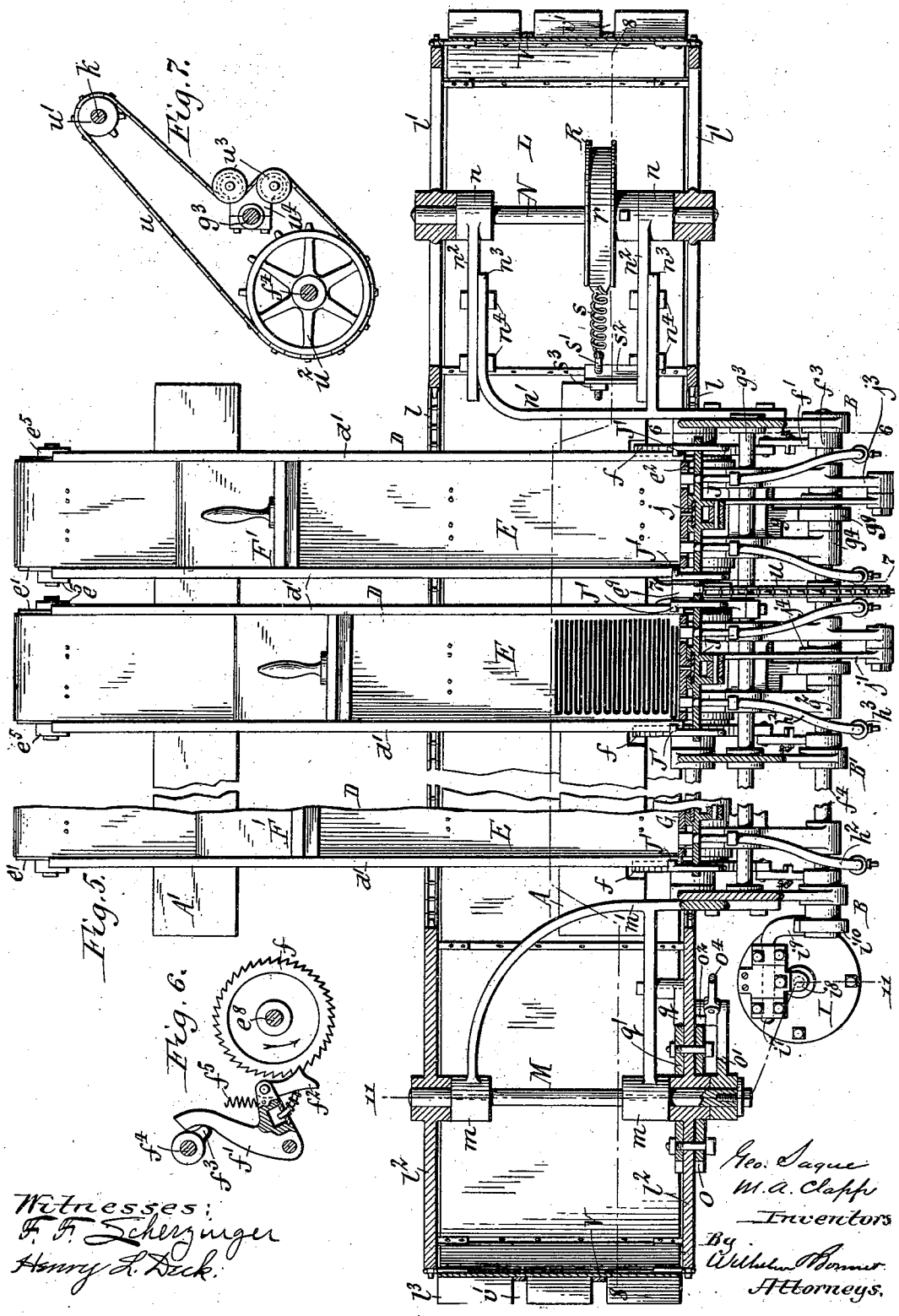

Fig. 7.

Fig. 5.

Fig. 6.

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(Application filed Aug. 8, 1900.)

(No Model.) 5 Sheets—Sheet 4.

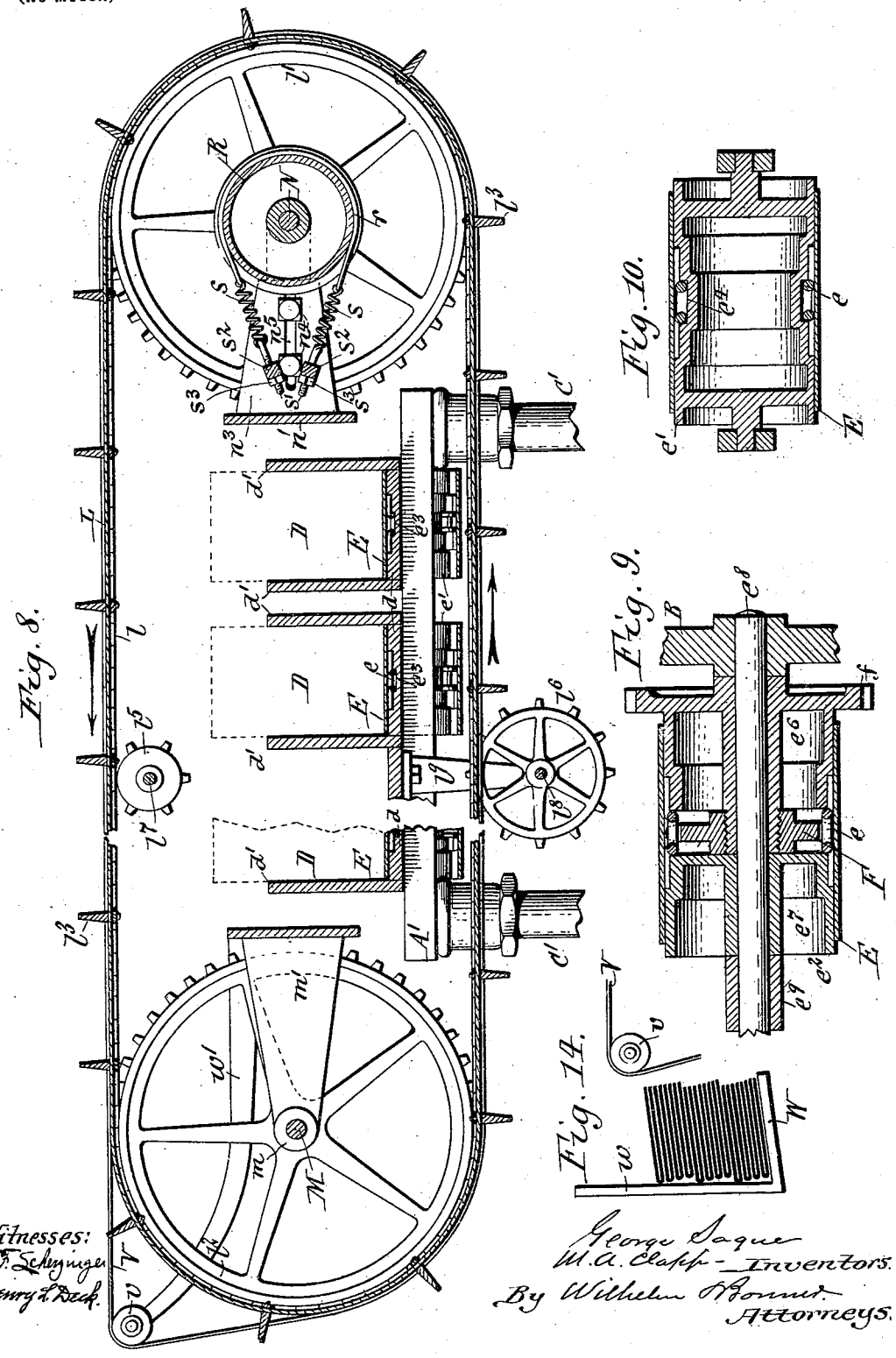

Fig. 8.

Fig. 10.

Fig. 9.

Fig. 14.

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SIGNATURE GATHERING MACHINE.

(Application filed Aug. 8, 1900.)

(No Model.) 5 Sheets—Sheet 5.

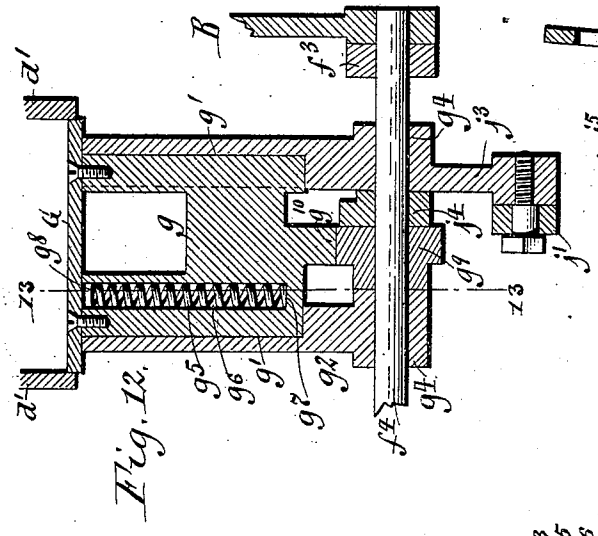

Fig. 12.

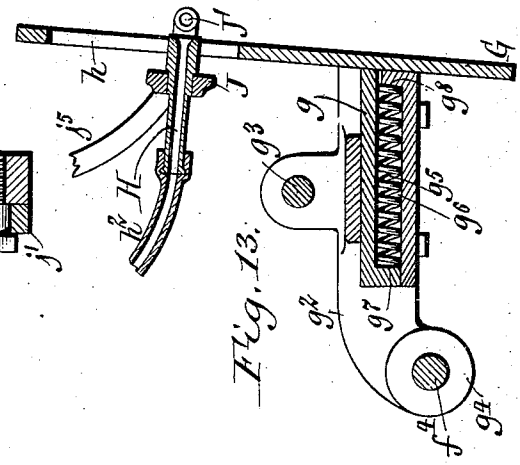

Fig. 13.

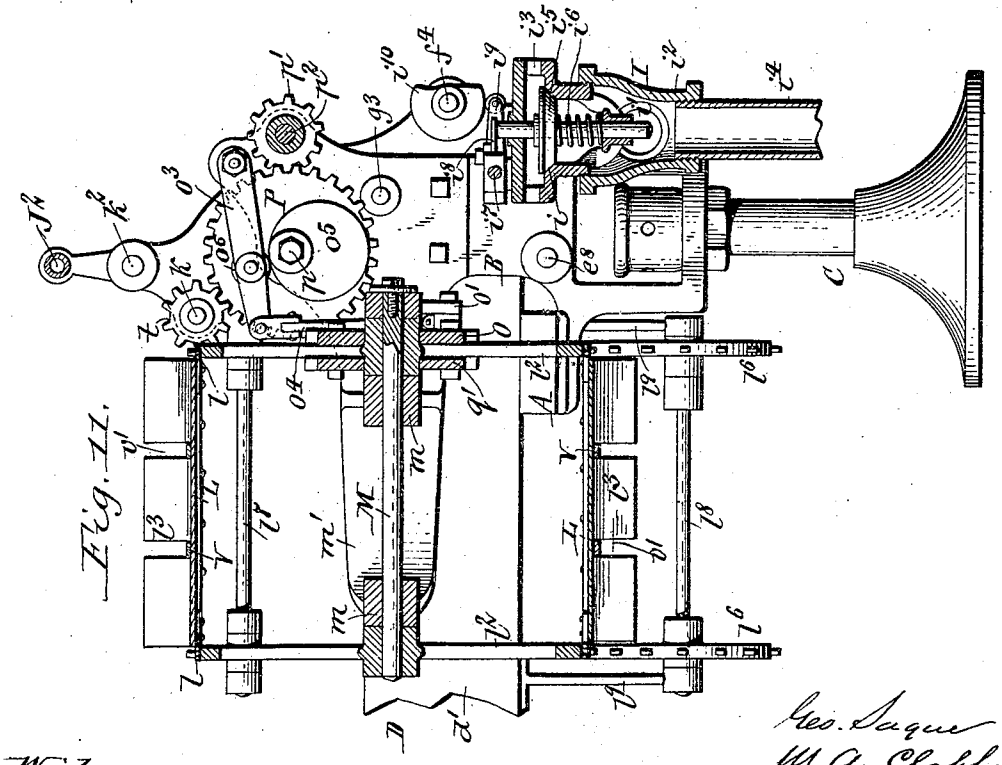

Fig. 11.

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UNITED STATES PATENT OFFICE.

GEORGE SAGUE AND MORTIMER A. CLAPP, OF POUGHKEEPSIE, NEW YORK, ASSIGNORS, BY MESNE ASSIGNMENTS, TO D. H. BURRELL AND COMPANY, OF LITTLE FALLS, NEW YORK.

SIGNATURE-GATHERING MACHINE.

SPECIFICATION forming part of Letters Patent No. 683,707, dated October 1, 1901.

Application filed August 8, 1900. Serial No. 26,268. (No model.)

To all whom it may concern:

Be it known that we, GEORGE SAGUE and MORTIMER A. CLAPP, citizens of the United States, and residents of Poughkeepsie, in the county of Dutchess and State of New York, have invented a new and useful Improvement in Signature-Gathering Machines, of which the following is a specification.

This invention relates to a machine for gathering or collating the signatures or parts of books or pamphlets preparatory to binding the same, and which comprises in its general organization stationary magazines arranged side by side and each containing a stack or pile of one kind of signatures, a receiver which moves past said magazines, and feed devices whereby the signatures are removed one at a time from each of the several stacks or piles and deposited consecutively on the receiver in proper order to be bound into books or pamphlets.

The object of this invention is to produce a machine of this character which is comparatively simple and compact in construction and reliable in its operation and which permits the gathering of signatures of varying thicknesses without requiring any adjustment in the machine for this purpose.

In the accompanying drawings, consisting of five sheets, Figure 1 is a front elevation of our improved gathering-machine with a portion broken away, so as to shorten the machine for convenience in illustrating the same. Figure 2 is a vertical longitudinal section of the machine in line 2 2, Fig. 1. Figs 3 and 4 are fragmentary sectional views taken in line 2 2, Fig. 1, and showing different positions of the mechanism whereby the signatures are separated from the pile or stack. Fig. 5 is a horizontal section in line 5 5, Fig. 2. Fig. 6 is a fragmentary vertical longitudinal section in line 6 6, Fig. 5, showing the mechanism, whereby the pile of signatures is moved forward in the magazine. Fig. 7 is a similar view of a portion of the driving mechanism, taken in line 7 7, Fig. 5. Fig. 8 is a vertical transverse section in line 8 8, Fig. 5, showing the gathering-apron, which receives the signatures from the piles. Figs. 9 and 10 are vertical sections, on an enlarged scale, in lines 9 9 and 10 10, Fig. 2, showing the front and rear supporting-rollers of the pile-feeding belt. Fig. 11 is a fragmentary longitudinal sectional elevation in line 11 11, Fig. 5. Fig. 12 is a fragmentary horizontal section, on an enlarged scale, showing the presser-plate, which moves toward and from the front of the pile of signatures, and its operating mechanism. Fig. 13 is a vertical section thereof in line 13 13, Fig. 12. Fig. 14 is a fragmentary side elevation of the delivery device, whereby the collated signatures are removed from the receiving-apron to the receiving-table.

Like letters of reference refer to like parts in the several figures.

The main frame of the machine consists, essentially, of horizontal front and rear cross-pieces A A′, vertical supporting-heads B B′, connected at intervals with the front cross-piece, and front and rear legs C C′, connected with the heads B and the rear cross-piece A′.

D represents a number of horizontal pile magazines or troughs, which are arranged lengthwise side by side and each of which receives a pile, bank, or stack of one kind of signatures. Each trough consists of a horizontal bottom board *d*, which is secured to the top of the front and rear cross-pieces A A′, and two vertical side boards *d′ d′*, which are secured lengthwise with their lower edges to opposite sides of the bottom board.

E represents feed belts or aprons, whereby the piles of signatures are carried forward in the feed-troughs. Each of the feed-belts is preferably as wide as the inner side of a feed-trough and is attached centrally on its under side to a driving-chain belt *e*. The feed-belt and its drive-chain pass around a roller e' at the rear end of the feed-trough, thence forwardly over the bottom of the trough, thence downwardly around a roller e^2 at the front end of the feed-trough, and thence rearwardly underneath the trough to the place of beginning, as shown in Figs. 1, 2, 5, 8, 9, and 10. The bottom of the trough is provided with a central longitudinal groove e^3, which receives the drive-chain and permits the feed-belt to lie flat on the bottom of the trough on opposite sides of the chain. The rear roller e' is

provided with a groove e^4 for the reception of the drive-chain and is journaled in bearings e^5, secured to the rear end of the trough, as represented in Figs. 2, 5, and 10. The front roller consists of two sections e^6 e^7, which are mounted loosely side by side on a transverse supporting-arbor e^8 and which have abutting hubs, while their peripheral portions are separated by an intervening space, as represented in Fig. 9. The two sections of the front roller are confined against longitudinal movement on the arbor e^8 by the supporting-head B, bearing against the hub of one section, and a bracket e^9, which supports the arbor e^8 and bears against the hub of the other section, as shown in Figs. 5 and 9.

F represents a sprocket-wheel which is arranged between the sections of the front roller and around which the drive-chain of the feed-belt passes. This wheel is secured to the inner end of the hub of the roller-section e^6, preferably by a screw-thread joint, so that this section of the front roller and the wheel turn together.

f represents a ratchet-wheel which is arranged on the outer end of the section e^6 of the front roller and which has its teeth provided with inclined front sides and abrupt rear sides, as shown in Figs. 6 and 9.

f' is a ratchet-lever of elbow form, pivoted on the adjacent supporting-head and provided on its lower arm with a spring-pawl f^2, which engages with the teeth of the ratchet-wheel.

f^3 is a cam which engages with the upper arm of the ratchet-lever for moving the same forward. This cam is mounted on a transverse shaft f^4, which is arranged in front of the pile-troughs and journaled in bearings on the supporting-heads B B'. The backward movement of the ratchet-lever is effected by a spring f^5, connecting the lower arm of the same with the adjacent supporting-head, this movement of the ratchet-lever being limited by its upper arm engaging with the hub of the cam f^3 or some other suitable stop. During each forward movement of the ratchet-lever its pawl engages with the abrupt face of a tooth on the ratchet-wheel and turns the same forward in the direction of the arrow, Fig. 6, thereby intermittently moving the feed-belt and the pile of signatures resting thereon forwardly in the trough. The signatures are placed in a substantially upright position, one behind the other, in each feed-trough, so that they rest with the lower edge on the feed-belt and lean slightly rearward. The back of the pile of signatures is supported by a follower F', consisting of a base f^6, which rests on the feed-belt, a rearwardly-inclined abutment f^7, projecting upwardly from the base, and a handle f^8 on the abutment for manipulating the follower, as shown in Figs. 2 and 5. The follower is held in place upon the feed-belt by its weight and is carried forwardly with the pile as the signatures are feed off from the front of the pile.

When the pile requires replenishing, the follower is removed, a number of signatures are placed in the trough behind those already in the trough, and then the follower is placed upon the feed-belt and against the rear side of the new supply of signatures.

G represents presser-plates which carry the devices whereby the signatures are separated from the front of the piles. One of these plates is arranged in front of each pile. Each of the presser-plates is inclined rearwardly at the same angle as the signatures of the pile and has a horizontally-reciprocating movement toward and from the front of the pile. Each presser-plate is secured to the rear end of a bifurcated carriage g, which slides in guideways g' on a bifurcated guide or supporting frame g^2, as shown in Figs. 2, 5, 12, and 13. The frame g^2 is mounted with its upper portion on a transverse supporting-rod g^3 and provided at its front end with bearings g^4, in which the cam-shaft f^4 is journaled. The presser-carriage is normally held in its forward or retracted position by a spring g^5, arranged in a recess g^6 on one of the branches of the carriage and bearing at one end against a shoulder g^7 on the carriage and at its other end against a shoulder g^8 on the guide-frame, as shown in Figs. 12 and 13. The presser-carriage is moved rearwardly or toward the pile by a cam g^9, arranged on the shaft f^4 and bearing against a lug g^{10} on the front side of the carriage.

H represents pneumatic suction grippers or holders, whereby the signatures are carried away from the front of the pile. Two of these suction-grippers are arranged horizontally in line in front of each pile of signatures and project through vertical slots h in the presser-plate, so that their faces are flush, or nearly so, with the rear side or face of the presser-plate. Each of the suction-grippers is connected by a branch pipe h' with a main suction-pipe H', which is arranged horizontally below the cam-shaft f^4. Each of the branch pipes is provided with a flexible section h^2 to permit the grippers to move, and with an individual hand-valve h^3, whereby the suction of each holder may be regulated. The main suction-pipe H' is connected with an air-exhaust device or pump, which may be of any suitable construction to produce a continuous suction. In order to render the grippers simultaneously effective or ineffective, a vent device is provided, whereby the suction of the exhaust device is alternately connected indirectly with the atmosphere through the grippers or connected directly with the atmosphere. This vent device is shown in Figs. 1, 5, and 11 and is constructed as follows:

I represents a valve-case which is provided with a valve-seat i, an inlet-nipple i', and an outlet-nipple i^2, arranged on one side of the valve-seat, and a vent opening or passage i^3 on the opposite side of the seat. The nipple i' connects with the main suction-pipe H', the outlet-nipple i^2 connects with the suction-

pipe i^4 of the air-pump, and the vent opening or passage i^3 connects the interior of the valve-case with the atmosphere.

i^5 is a vent-valve which moves toward and from the valve-seat i.

i^6 is a spring which tends to lift the valve from its seat.

i^7 is a short rock-shaft journaled on the valve-case and provided with an inner rock-arm i^8, which bears against the stem of the vent-valve, and with an outer rock-arm i^9, which is engaged by a rotary cam i^{10} on the adjacent end of the cam-shaft f^4. When the high or salient part of the cam i^{10} engages with the stem of the vent-valve, the latter is moved against its seat, whereby the suction of the exhaust device is cut off from the vent-passage and causes the same to draw simultaneously through all the grippers. When the low or receding part of the cam f^{10} engages with the stem of the vent-valve, the latter is opened by the spring i^6, whereby the suction of the exhaust device is connected directly with the atmosphere and the suction of the exhaust device upon the grippers is rendered ineffective.

Each pair of grippers is mounted on a vertically-movable carriage J, which slides on a guideway j on the front side of the corresponding presser-plate. The upward movement of the gripper-carriage is effected by a vertically-swinging rock-lever j', which is connected at its rear end with the gripper-carriage by a link j^2. The front end of this rock-lever is pivoted on a forward extension j^3 of the guide-frame g^2, as shown in Figs. 1, 5, and 12.

j^4 is a cam which is mounted on the shaft f^4 and which engages with the under side of the rock-lever j'. During each rotation of the cam j^4 its salient or high part raises the rock-lever j' and the grippers connected therewith, and when the high part of this cam clears the rock-lever the latter, the grippers, and connecting parts drop by their weight.

While the presser-plate is in its foremost position and the grippers are in their lowermost position, the pile feed-belt, together with the pile of signatures resting thereon, is moved forward one space into the position shown in Fig. 2. The presser-plate now moves backward, together with the grippers, while the latter are still in their lower position, whereby the presser-plate and grippers are pressed against the front of the pile of signatures. During the backward movement of the presser-plate and grippers the air is exhausted through the latter, so that they are effective and attach themselves by suction to the foremost signature of the pile. During the subsequent forward movement of the presser-plate the grippers remain in their lowered position and carry the foremost signature forwardly away from the front of the pile. At the end of the forward movement of the presser-plate and grippers the latter are raised by the lifting mechanism, whereby the signature held by the grippers is raised and presented to the delivery mechanism, which is arranged above the separating mechanism and which carries the signature away. After the signature has been delivered by the grippers to the delivery mechanism the grippers drop into their lowermost position and remain in their foremost position, together with the presser-plate, until the pile has been moved forward another space, when the separating or feeding off of the front signature is repeated, as before described. After the delivery mechanism receives the signature and before the grippers begin their downward movement the suction of the exhaust device is diverted from the grippers directly to the atmosphere by the vent-valve, which is opened at this time, thereby detaching the grippers from the signature and permitting the grippers to move down without interfering with the operation of the mechanism which receives the signature from the grippers. Each intermittent forward movement of the feed-belt is greater than the thickness of the thickest signature which the machine is designed to gather, thereby compensating for any looseness between the signatures in the pile and insuring the feeding off of a signature during every feeding movement of the grippers. In the absence of this excess movement of the feed-belt the slack between the several signatures in the pile might be more than the thickness of a signature and cause the feeding-grippers to occasionally miss feeding a signature from the pile. As the foremost signature is carried forwardly from the pile by the grippers a gap is formed between the foremost signature and the next following signature, thereby leaving the foremost signature wholly free from the next following signature and permitting the former to be carried to the delivery mechanism without being retarded by frictional contact with the next following signature. After the presser-plate has pressed the pile backward and carried the first signature forward the compressed pile expands and follows the forward movement of the first signature to a certain extent, thereby narrowing the gap which is formed between the first and second signatures, whereby the feeding off of the first signature is liable to be interfered with, particularly when feeding the thickest signatures for which the machine is designed. In order to insure a complete separation of the foremost signature from the next following signature under all conditions, the distance through which the presser-plate and grippers are moved backward is made greater than the forward movement of the pile feed-belt. This causes the presser-plate to move the pile of signatures backwardly in the feed-trough more or less, according to the thickness of the signatures, and always produces a clearance between the first and second signatures, which

permits the first signature to be carried away without interference from the second signature.

The grippers are preferably arranged so as to grasp the signatures near the upper end thereof, which causes the signature during its forward movement with the grippers to be first tipped forward, thereby admitting air gradually behind the first signature and aiding in its separation from the second signature. The backward movement of the presser-plate and grippers is always the same regardless of whether the pile consists of thick or thin signatures, the only difference being that when separating thick signatures the presser-plate moves backwardly a greater distance before engaging the first signature than when feeding thin signatures. By this means signatures of varying thicknesses may be separated without requiring a change or adjustment of the separating mechanism.

In order to reduce the possibility of feeding off more than one signature at a time from a pile, the signatures are loosened or separated by air-blasts which are delivered against the sides of the pile, at the front end thereof. For this purpose two blast spouts or nozzles J' J' are arranged to deliver two opposing blasts of air transversely into the magazine in rear of the presser-plate. Each pair of blast-spouts is mounted on the adjacent vertically-movable carriage J and is arranged horizontally about in line with the suction-holders thereof, as represented in Figs. 5 and 13. Each blast-spout is connected by a flexible tube j^5 with a main blast-pipe J^2. The latter is mounted horizontally on top of the supporting-heads B B' and is connected with a blast device of any suitable construction, whereby a constant air-pressure is produced in the main pipe J^2 and the nozzles connected therewith. A hand-valve j^6 is arranged in each tube j^5 for regulating the blast of each nozzle. As the presser-plate moves backwardly toward the pile of signatures the nozzles deliver blasts of air against opposite sides of the pile, at the front end thereof, whereby the signatures are loosened and separated and the separation of the foremost signature from the next following signature is rendered more certain. By mounting the blast-nozzles on the carriage J these nozzles move with the suction-holders and continue to deliver a blast of air against opposite sides of the foremost signature while the same is moved forward and upward by the suction-holders to the delivery devices, thereby detaching any signatures which may adhere to the foremost signature. The nozzle arranged at the side of the magazine at which the open or unfolded edges of the signatures are arranged is adjusted so as to deliver a stronger blast of air than the nozzle which is arranged at the opposite side and which faces the closed or folded backs of the signatures. The preponderance of the stronger blast shifts the foremost signature laterally in the magazine, as represented in Fig. 5, whereby the foremost signatures are separated from the next following signatures and the final separation of the foremost signature is facilitated.

The delivery mechanism which receives the separated signatures from the grippers of each separating apparatus consists of a wide rear delivery-roller K and two narrow front delivery-rollers K' K'. The front and rear rollers bear against each other and are arranged transversely above the presser-plate and the ends of the grippers in the foremost position of the same. The rear roller K rotates constantly in the direction of the arrow, Figs. 2 to 4, and is mounted on a transverse shaft k, which is journaled in the upper part of the supporting-heads B B'. Each of the front rollers is mounted on the depending lower arm k' of an elbow-lever which is mounted on a transverse rod k^2. Each front delivery-roller is held yieldingly in contact with the rear roller, so as to turn therewith, by a weight k^3, arranged on the forwardly-projecting upper arm k^4 of the elbow-lever. As the grippers move the signature upwardly the upper end of the latter enters between the front and rear delivery-rollers. The grippers are released from the signature after the same is under the control of the delivery-rollers, and the feeding off of the signature from the pile is then completed by the delivery-rollers.

By arranging the delivery mechanism above the pile-support and feeding the signatures upwardly from the pile to the delivery mechanism gravity aids in separating the second signature from the first, and thus insures the feeding of but one signature at a time. If the signatures were fed downwardly from the pile to a delivery mechanism arranged below the pile-support, gravity would be liable to cause more than one signature at a time to be fed from the pile.

L represents an endless gathering apron or belt upon which the signatures are collected in consecutive or numerical order ready to be bound. This apron is arranged across the front portion of the set of signature magazines or troughs with its upper part above the magazines and its lower part below the same. The signatures are carried upwardly from the magazines or troughs and delivered upon the upper part of the gathering-apron. The latter is provided along both edges with chain belts $l\,l$, which are secured to the apron by rivets or otherwise. The apron and its chain belts run around two parts of sprocket-wheels l' l^2, which are arranged on opposite sides of the set of signature-magazines. The sprocket-wheels l^2 drive the apron by means of the chain belts and are arranged on that side of the set of magazines toward which the upper part of the apron moves, as indicated by the arrows in Figs. 1 and 8. The wheels l' support the apron on the opposite side of the set of magazines. The apron is provided on its outer face or side with a number of trans-

verse wings or cleats l^3, which form compartments or receptacles on the apron. As the separated signatures issue from the upper side of the delivery-rollers of the several separating mechanisms they are directed rearwardly into the compartments on the upper part of the apron by rearwardly-inclined guides l^4. Each of these guides consists, preferably, of rods which are arranged with their front ends over the delivery-rollers of each separating mechanism and with their rear ends over the gathering-apron and are secured near their front ends to the transverse supporting-rod k^2. The upper and lower portions of the gathering-apron are supported between the sprocket-wheels l' l^2 by upper and lower sprocket guide-wheels l^5 l^6, which engage with the under side of the chain belts. These upper and lower guide-wheels are preferably arranged in pairs, and as many pairs of these wheels are employed as may be necessary to properly support the gathering-apron. Each pair of upper guide-wheels l^5 is supported on a horizontal rod l^7, which projects rearwardly from one of the supporting-heads, and each pair of lower guide-wheels l^6 is mounted on a horizontal shaft l^8, which is journaled in hangers l^9, arranged on the under side of the adjacent cross-piece and pile-trough. The head or driving sprocket-wheels l^2 are secured to a shaft M, which is journaled in stationary bearings m on a bracket m', arranged on the left side of the main frame. The tail or loose sprocket-wheels l' are secured to a shaft N, which is journaled in bearings n. Each of the bearings n is connected with a bracket n' on the right side of the main frame by a divided arm, the sections n^2 n^3 of which are adjustably connected by bolts n^4, passing through openings in one section and through a horizontal slot n^5 in the other section, thereby permitting the slack in the apron and its supporting chain belts to be taken up. The gathering-apron is moved forward intermittently to such an extent that each of its compartments stops successively in line with the delivery-rollers of each signature-separating mechanism. The compartment which stands opposite the delivery-rollers of the first magazine, which is that shown on the right of the machine in Figs. 1, 5, and 8, receives a signature from the pile in this magazine. The apron is then advanced one space, which brings this compartment opposite the delivery-rollers of the next following magazine. This compartment now receives a signature from the pile in the second magazine. This operation is repeated in like manner until the compartment has received a signature from each of the magazines, and this operation takes place with reference to each compartment. When the machine is fully in operation, the signatures are fed simultaneously from the several magazines to the compartments of the gathering-apron which are in line with the magazines, and the consecutive piling of signatures in each compartment progresses as each compartment moves from one magazine to another. By arranging the upper and lower parts of the gathering-apron above and below the magazines the machine is rendered very compact and also very convenient, as the arrangement furnishes an unobstructed space above the operative portion of the apron and the rear or receiving ends of the magazines, which affords the operator convenient access to the apron for removing the gathered signatures and to the magazines for supplying signatures to the same.

The intermittent forward movement of the gathering-apron may be effected by any suitable means. We prefer the ratchet mechanism which is shown in Figs. 1, 5, and 11 and which is constructed as follows:

O represents a ratchet-wheel which is secured to the front side of the front sprocket-wheel l^2, and o' is a pawl-arm which is mounted loosely on the shaft M and is provided with a pawl o^2, engaging with the teeth of the ratchet-wheel.

o^3 is a rock-lever which is pivoted at its front end on the adjacent part of the main frame and which is connected at its rear end by a link o^4 with the free end of the pawl-arm o'. The idle or backward movement of the pawl-arm and rock-lever o^3 for engaging the ratchet-pawl o^2 with a new tooth on the ratchet-wheel is effected by gravity. The ratchet-lever and rock-lever are moved forward or upward for advancing the gathering-apron one space by a rotary cam o^5, which engages with the under side of a roller o^6 on the rock-lever o^3. This cam is mounted on a gear-wheel P, journaled on an arbor p on the adjacent part of the main frame. This gear-wheel is driven by a pinion p', which meshes with the front side of the gear-wheel P and which is journaled on an arbor p^2 on the adjacent part of the main frame. Backward movement of the gathering-apron is prevented by a detent-pawl q, pivoted on the bracket m' and engaging with a ratchet-wheel q' on the rear side of the front sprocket-wheel l^2, as shown in Figs. 5 and 11. In order to prevent the gathering-apron when fed forward by the ratchet mechanism from being moved by its momentum beyond the place where it should come to rest, a tension or brake device is provided which retards the forward movement of the gathering-apron and causes the latter to stop with its compartments in correct register with the delivery-rollers of the several separating mechanisms. This brake device, as shown in Figs. 5 and 8, consists of a brake-drum R, secured to the shaft of the tail sprocket-wheels l', a brake-band r, applied to the periphery of said drum, tension-springs s, which connect the ends of the band with adjusting-screws s', posts s^2, which are mounted on one of the movable arm-sections n^2 and which receive the screws, and screw-nuts s^3, arranged on said screws and bearing against said posts.

Power is applied to the machine by a belt passing around a driving-pulley T, mounted on the arbor p^2 and connected with the pinion p'. The shaft k, carrying the rear delivery-rollers K of the several separating mechanisms, is driven by a gear-pinion t, secured to the end of this shaft and meshing with the upper rear part of the gear-wheel P, as shown in Figs. 1 and 11. Motion is transmitted from the roller-shaft k to the cam-shaft f^4 by a driving-chain u, passing around sprocket-wheels u' u^2, arranged on the roller and cam-shafts k f^4, respectively, and around tightening-rollers u^3 u^3. The latter bear against opposite sides of the chain belt u, between its sprocket-wheels u' u^2, and are pivoted on a supporting-arm u^4, which is adjustably secured to the supporting-rod g^3, as shown in Figs. 5 and 7, so as to permit the position of the tightening-rollers to be shifted for taking up the slack in the chain belt u.

After the different signatures of the book or pamphlet have been gathered in the compartments of the gathering-apron the gathered pile of signatures are automatically removed from the apron by a delivery mechanism, which is constructed as follows: V represents delivery-bands, which are arranged upon the outer side of the gathering-apron and pass around a delivery-roller v, arranged beyond the discharge end of the gathering-apron in line with the receiving portion thereof. Each of the wings l^3 of the compartments is divided into sections, which are separated by spaces or notches v', which receive the delivery-bands, and permit the same to lie on the bottom of the compartments of the gathering-apron. The signatures extend over these bands as they are deposited in the compartments of the apron. As the gathering-apron passes, with its front end downwardly, around the driven wheels l^2 it leaves the delivery-bands, which continue on a tangent, whereby the gathered pile of signatures is lifted out of the compartment. Each pile of signatures as it is lifted out of its compartment is engaged by the next following wing l^3 and pushed by the same from the delivery end of the bands upon a receiving-table W, as shown in Fig. 14. The table is preferably slightly inclined in order to cause the piles to rest upon the same and upon each other in such positions that each pile can be readily distinguished and separately removed, as indicated in Fig. 14, in which each pile is composed of four signatures. This table is provided with an abutment w, against which the gathered signatures are piled. After the delivery-bands have passed around the roller v they reëngage with the gathering-apron on the under side of the wheels J^2. The delivery-roller v may be supported in any suitable way—for instance, by brackets w', secured to the main frame, as shown in Figs. 1 and 8.

We claim as our invention—

1. The combination with a plurality of signature-magazines arranged side by side and a gathering-apron, of an intermittently-acting feed mechanism for each magazine adapted to move the signatures toward the front of the magazine, means whereby the feed mechanism is actuated for each signature which is to be fed off and moved forwardly a greater distance than the thickness of the signature, and a separating device which is arranged at the front of each magazine and has a backward and forward movement greater than the intermittent forward movement of said feed mechanism, whereby the signatures in each magazine are alternately moved forward by the feed mechanism and pressed backwardly by the separating device, substantially as set forth.

2. The combination with a plurality of signature-magazines arranged side by side, a feed mechanism whereby the signatures are fed forwardly in each magazine, and a gathering-apron, of a pneumatic gripper arranged at the front of each magazine, actuating mechanism whereby said gripper is moved toward the foremost signature and then backward, and actuating mechanism whereby the gripper is moved upwardly while in its foremost position, substantially as set forth.

3. The combination with a plurality of signature-magazines arranged side by side, a feed mechanism whereby the signatures are fed forwardly in each magazine, and a gathering-apron, of a presser-plate for each magazine which is movable toward and from the foremost signature therein, and a pneumatic gripper which is arranged in the presser-plate and movable in the face of the same, substantially as set forth.

4. The combination with a plurality of signature-magazines arranged side by side, a feed mechanism whereby the signatures are fed forwardly in each magazine, and a gathering-apron, of a presser-plate for each magazine which is movable toward and from the foremost signature therein, a vertically-movable carriage guided on the presser-plate, and a pneumatic gripper mounted on said carriage, substantially as set forth.

5. The combination with a plurality of signature-magazines arranged side by side, a feed mechanism whereby the signatures are fed forwardly in each magazine, and a gathering-apron, of a presser-plate for each magazine which is movable toward and from the foremost signature therein and which is mounted on a reciprocating carriage, a cam and spring whereby said carriage is moved, a vertically-movable carriage guided on the presser-plate and provided with a pneumatic gripper which is adapted to grasp the foremost signature, a rock-lever connected by a link with the gripper-carriage, and a cam whereby said rock-lever is operated, substantially as set forth.

6. The combination with a plurality of signature-magazines arranged side by side, of a gathering-apron having its gathering portion

arranged above said magazines, and separating and conveying mechanisms whereby the signatures are carried upwardly from the magazines to said apron, substantially as set forth.

7. The combination with a plurality of signature-magazines arranged side by side, of a gathering-apron having its gathering portion arranged above said magazines and its return portion arranged below the same, substantially as set forth.

8. The combination with a plurality of signature-magazines arranged side by side, of a gathering-apron arranged with its gathering portion above said magazines, transverse wings arranged on said apron and dividing the same into compartments, and separating and conveying mechanisms whereby the signatures are carried upwardly from said magazines to the compartments of the apron, substantially as set forth.

9. The combination with a plurality of signature-magazines arranged side by side, of a gathering-apron arranged with its gathering portion above said magazines, chain belts secured along the edges of the apron, sprocket-wheels around which said belts pass, and separating mechanisms whereby the signatures are carried from the magazines to said apron, substantially as set forth.

10. The combination with a signature-magazine, of a gathering-apron having its gathering portion arranged above the magazine, a separating device arranged at the front of the magazine, delivery-rollers arranged above the separating device and in front of the gathering portion of the apron, and a signature-guide arranged above said rollers and extending over said apron, substantially as set forth.

11. The combination with a plurality of signature-magazines arranged side by side and their feed-belts, of a gathering-apron which is arranged with its gathering portion above and with its return portion below said magazines, presser-plates which are movable toward and from the foremost signatures, pneumatic grippers which are guided on said plates and grasp the foremost signatures and carry the same upwardly, delivery-rollers which are arranged above the grippers and which receive the signatures therefrom, and guide-rods whereby the signatures are guided from the delivery-rollers upon the gathering-apron, substantially as set forth.

12. The combination with a plurality of signature-magazines, and a gathering-apron, of pneumatic grippers whereby the signatures in the magazines are separated, a main exhaust-pipe connected with each gripper by a branch pipe, an air-exhausting device which applies a continuous exhaust to said main pipe, a regulating-valve arranged in each branch pipe, and a vent-valve arranged in the main exhaust-pipe and adapted to render the several grippers simultaneously effective or ineffective, substantially as set forth.

13. The combination with a plurality of signature-magazines, and a gathering-apron, of pneumatic grippers whereby the signatures in the magazines are separated, a main exhaust-pipe connected with each gripper by a branch pipe, and an exhausting device which applies a continuous exhaust to said main pipe, a regulating-valve arranged in each branch pipe, a vent-valve which is arranged in the main exhaust-pipe and which controls an opening to the atmosphere, a spring whereby said valve is opened, a rock-shaft provided with an inner arm which bears against the stem of the vent-valve, and a cam which engages with an outer arm on the rock-shaft for turning the latter and closing the vent-valve, substantially as set forth.

14. The combination with a plurality of signature-magazines, and a gathering-apron, of a blast device for each magazine arranged to deliver a blast edgewise against the signatures in the same, and means whereby the blast device is moved toward and from the front of each magazine, substantially as set forth.

15. The combination with a plurality of signature-magazines, and a gathering-apron, of a blast device for each magazine arranged to deliver a blast edgewise against the signatures in the same, and means whereby the blast device is moved up and down, substantially as set forth.

16. The combination with a plurality of signature-magazines, and a gathering-apron, of a presser-plate for each magazine, movable toward and from the foremost signatures therein, and a blast device which moves with the presser-plate, substantially as set forth.

17. The combination with a plurality of signature-magazines, and a gathering-apron, of a presser-plate for each magazine, movable toward and from the foremost signature therein, a vertically-movable carriage guided on said plate, and a blast device mounted on said carriage, substantially as set forth.

18. The combination with a plurality of signature-magazines, and a gathering-apron, of a presser-plate for each magazine, movable toward and from the foremost signature therein, a pneumatic gripper arranged in said plate and movable vertically in the same, and a blast device which moves with said gripper, substantially as set forth.

19. The combination with a plurality of signature-magazines, and a gathering-apron, of a presser-plate for each magazine, movable toward and from the foremost signature therein, a vertically-movable carriage which is guided on said plate, and a pneumatic gripper and a blast device, both mounted on said carriage, substantially as set forth.

20. The combination with a plurality of signature-magazines arranged side by side, of a gathering-apron provided with receiving-compartments, delivery-bands which are arranged upon said apron and on the bottom of said compartments, and a delivery-band roller

arranged beyond said apron and in line with its receiving portion, substantially as set forth.

21. The combination with a plurality of signature-magazines arranged side by side, of a gathering-apron having wings provided with band-spaces, delivery-bands which are arranged upon said apron in said spaces of the wings, and a delivery-band roller arranged beyond said apron and in line with its receiving portion, substantially as set forth.

Witness our hands this 1st day of August, 1900.

GEORGE SAGUE.
MORTIMER A. CLAPP.

Witnesses:
HENRY KRIEGER,
E. O. CALDWELL.