Feb. 26, 1946. L. L. MATTHEWS 2,395,490

SHEET-FEEDING-AND-MARKING METHOD AND MACHINE

Filed July 21, 1941 4 Sheets-Sheet 1

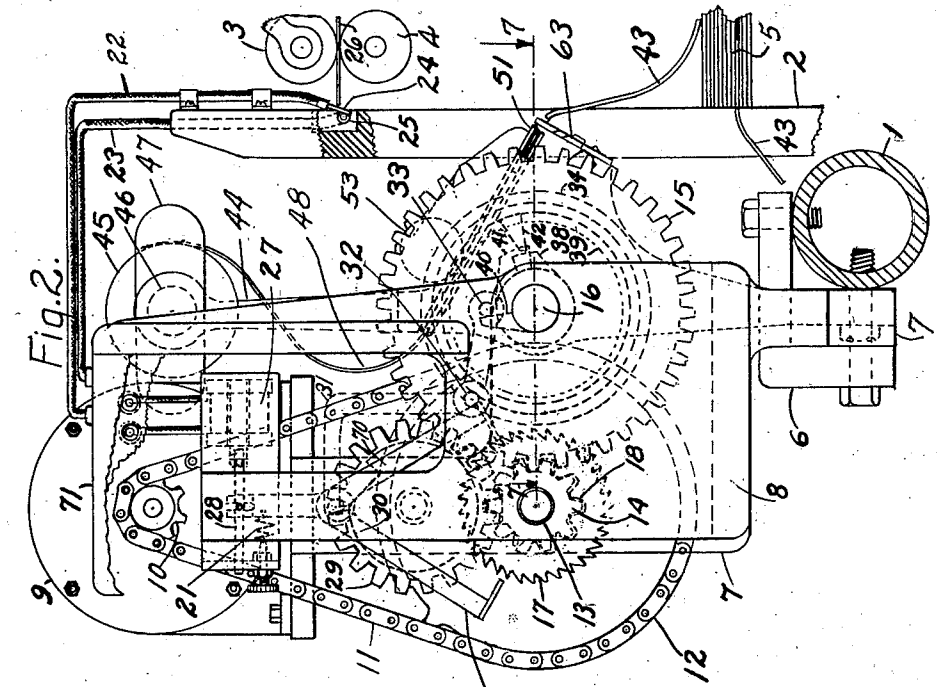


Fig. 2.

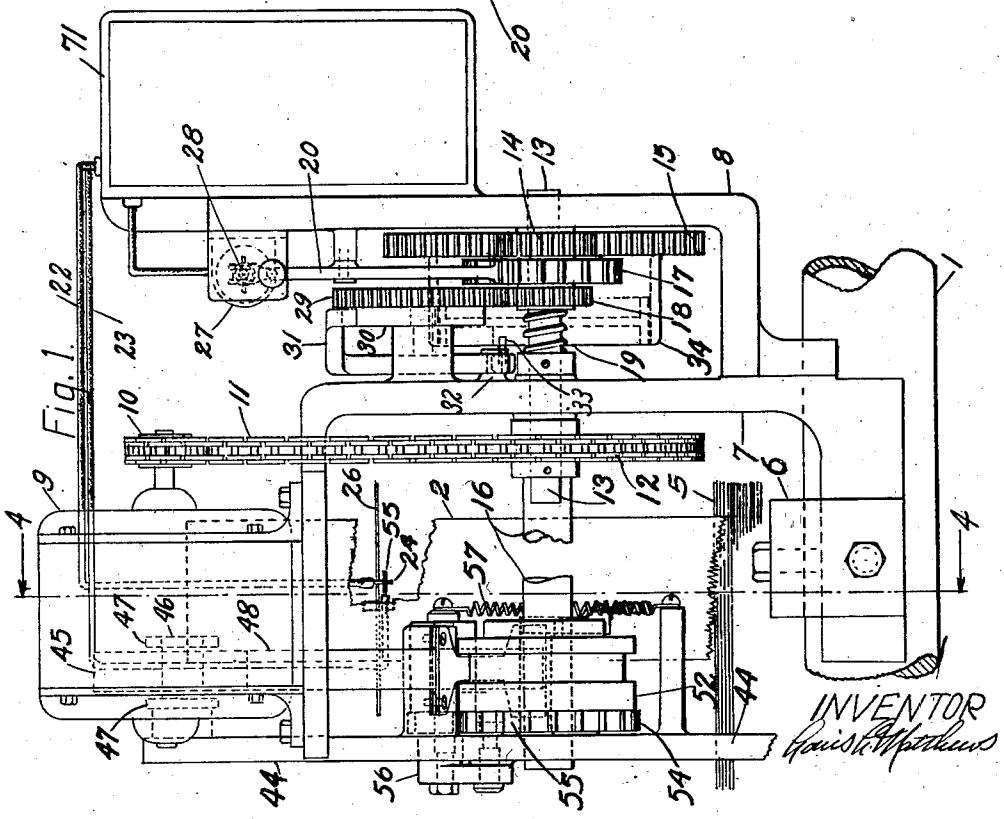


Fig. 1.

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SHEET-FEEDING-AND-MARKING METHOD AND MACHINE

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Fig. 3

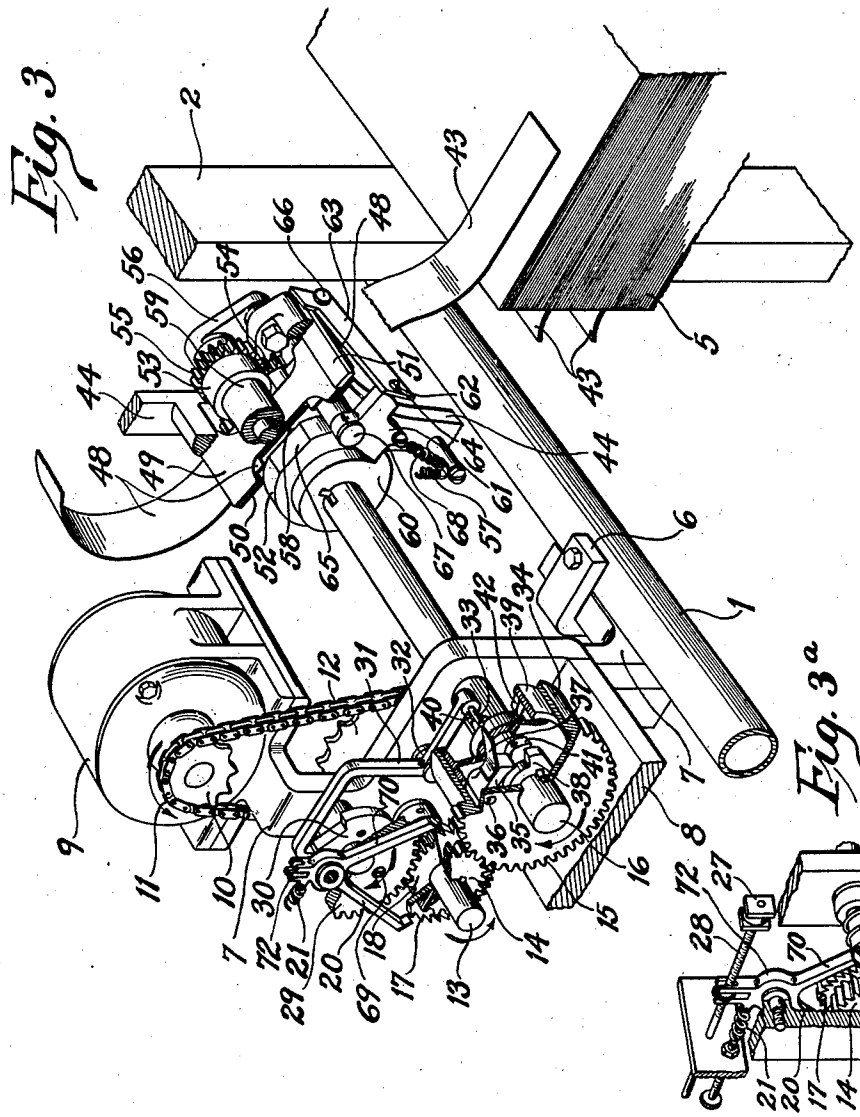


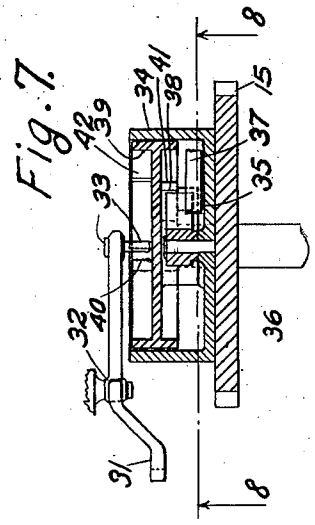
Fig. 3a

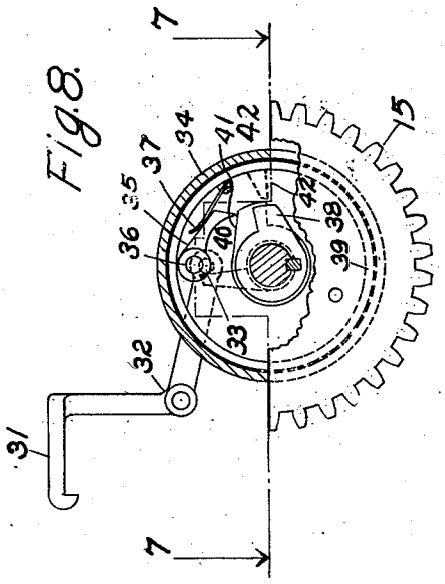
INVENTOR
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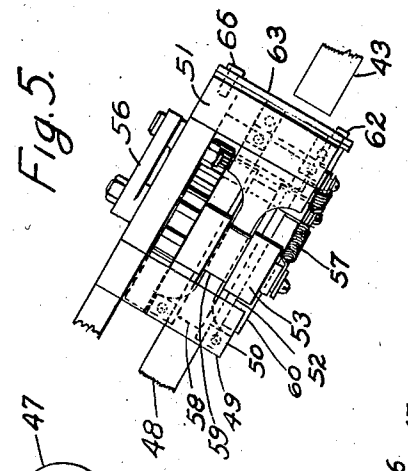
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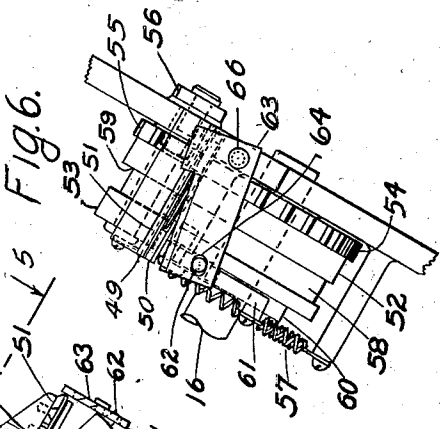
SHEET-FEEDING-AND-MARKING METHOD AND MACHINE

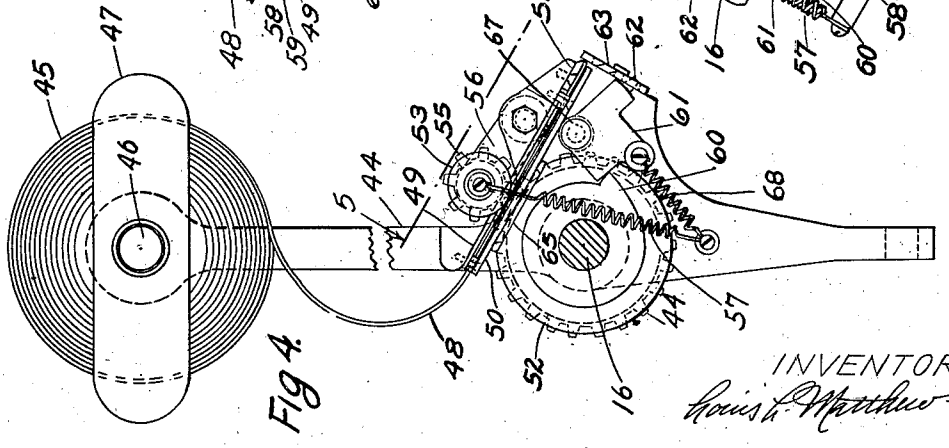
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SHEET-FEEDING-AND-MARKING METHOD AND MACHINE

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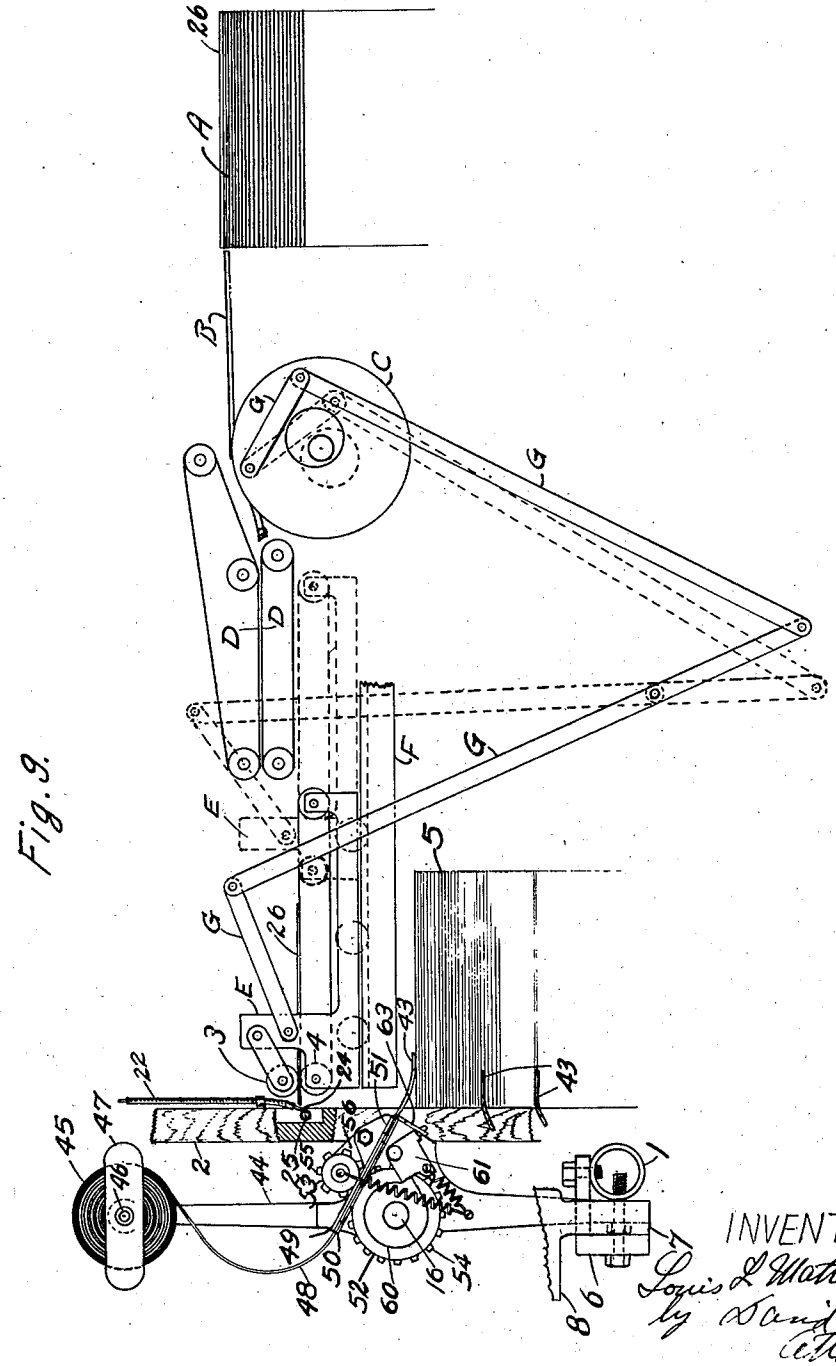


Fig. 9.

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2,395,490

SHEET-FEEDING-AND-MARKING METHOD AND MACHINE

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Application July 21, 1941, Serial No. 403,348

7 Claims. (Cl. 93—93)

The present invention relates to methods of and machines for feeding and delivering sheet material, and more particularly to feed-and-delivery attachments for sheet-feed printing presses. From a more specific aspect, the invention relates to presses provided with traveling carriages of the "drop-delivery" type.

The sheets, as they leave a printing press of this character, may be advanced by feed mechanism to a table, upon which they are stacked or piled. This feed mechanism usually comprises a pair of gripping feed rolls mounted over tapes upon the movable carriage. The rolls are actuated toward each other to grip the head end of the sheet when the carriage occupies its rearward limit of movement, nearest the press. The carriage is then advanced over the table, away from the press, taking the head end of the sheet with it. After the carriage reaches its limit of forward movement, it retraces its path. On the return stroke of the carriage, the rolls travel away from the sheet, permitting the sheet to fall on the stack beneath.

The said limit of forward movement, that is, the front end of the stack, or the end farthest from the press, is always fixed in sheet-feed printing presses of this character. The position of the rear end of the stack, that is, the end nearest the press, varies, therefore, with the length of the sheets.

Many proposals have heretofore been made for counting sheets deposited on a stack, and for marking or separating the sheets so deposited into bundles having predetermined numbers of sheets. The marking or separating means have been usually positioned at the rear end of the stack. An adjustable rear end, however, such as obtains with stacks of different-length sheets delivered from a printing press, renders prior-art devices of this character very inconvenient. The top tapes of the carriage, moreover, periodically occupy the space that might otherwise be devoted to parts of the operating mechanism.

It is accordingly an object of the present invention to provide a novel method of and machine for marking a stack of sheets from the front.

A further object is to provide a novel counting mechanism for counting the sheets and a novel mechanism for controlling the marking or separation from this counting mechanism.

Another object is to provide a novel method of and machine for feeding and delivering paper sheets, and for marking or separating the sheets so delivered into bundles each containing a predetermined number of the sheets.

Other and further objects will be described hereinafter and will be particularly pointed out in the appended claims.

The invention will now be described in connection with the accompanying drawings, in which Fig. 1 is an end elevation, with parts broken away, illustrating a preferred embodiment of the novel counter-and-marker attachment of the present invention, the attachment being shown disposed in front of a printing-press stacking mechanism; Fig. 2 is a corresponding side elevation; Fig. 3 is a corresponding enlarged perspective, parts being shown omitted, other parts broken away, and several parts in section, for clearness; Fig. 3a is a detail perspective of part of the mechanism of Fig. 3, but showing parts not visible in Fig. 3; Fig. 4 is a vertical section, upon a larger scale, taken upon the line 4—4 of Fig. 1, looking in the direction of the arrows, and showing more particularly details of the flagging head; Fig. 5 is a horizontal section of the flagging head, taken upon the line 5—5 of Fig. 4, looking downward in the direction of the arrows; Fig. 6 is a corresponding elevation of the flagging head, looking from the right of Fig. 4; Fig. 7 is a horizontal section, taken upon the line 7—7 of Fig. 2 or Fig. 8, looking downward, in the direction of the arrows, showing more particularly a preferred control mechanism for feeding out separating tags at the proper time; Fig. 8 is a vertical section of the same, taken substantially upon the line 8—8 of Fig. 7, looking in the direction of the arrows; and Fig. 9 is a view diagrammatically illustrating a drop-delivery printing press, with the invention embodied therein.

The top sheet 26 of a pile A of paper sheets is fed over a feeder board B to a printing cylinder C of a printing press. Cooperating tapes D then carry the sheet from the cylinder C to a reciprocating carriage E that rolls back and forth on a guide F. This back-and-forth rolling of the carriage E is brought about by means of connecting rods G, designed to produce one stroke for each revolution of the cylinder C.

In printing-press extension deliveries of the above-described character, the traveling carriages are each provided with a top tape wheel or roll 3 and lower wheels or rolls 4, with tapes disposed around the lower wheels or rolls 4. These carriages may travel back and forth between the press and a front-stop board 2 on the press piler or stacker, shown disposed adjacent to a pipe girt or tie rod 1 at the front end of the piling or stacking mechanism.

At the time that a sheet 26 leaves the cylinder C to arrive at the tapes D, the carriage E occu-

pies the dotted-line position illustrated in Fig. 9. The sheet therefore becomes deposited by the tapes D on the tapes of the carriage E, with the head of the sheet positioned between the wheels 3 and 4 and the tapes D. The carriage E is now ready to make its forward stroke, away from the press and its cylinder C, and toward the front stop-board 2.

During this forward stroke of the carriage E, with the sheet 26 carried thereby, in machines of this character, the tapes D and the wheels 3 and 4 are held against movement. The carriage E therefore advances with the head of the sheet 26 gripped between the wheels 3 and 4 and the tapes D, until it assumes its full-line position, over a pile or stack 5 of sheets. The pile or stack 5 is usually portably supported on the bed or other base support of the machine. In this full-line position of the carriage E over the pile or stack 5, the head of the sheet 26 may contact with the front stop-board 2.

The tapes D and the rolls 3 and 4 are set into motion again just prior to the return or back stroke of the carriage E toward the press and its cylinder C, from the full-line to the dotted-line position of the carriage E. During such return stroke of the carriage E, the rolls 3 and 4 and the tapes D are caused to be actuated, so as not only to release the sheet 26, but also to feed it positively forward with respect to the retreating carriage E. The sheet 26 thus drops on to the pile or stack 5 below. The speed of this actuation, during this return stroke of the carriage E, is such that the head of the sheet 26 may maintain its position near the front stop-board 2.

First, therefore, the head of the sheet 26 drops on to the pile or stack 5, and then the successive body portions of the sheet, until the whole sheet becomes deposited on the pile or stack 5. The sheets 26 become thus stacked in the pile or stack 5, each on top of the previously fed sheet, with the underface of each sheet in face-to-face contact with the upper face of the previously fed sheet.

As the sheets are thus delivered to the stack or pile 5, they are automatically counted; and thin paper marking tags 43, relatively very small compared to the size of the sheets 26 of the stack 5, are automatically inserted between predetermined adjacent sheets 26 at the completion of each count to separate or mark the bundles of sheets so delivered and counted.

The improved counting-and-marking mechanism, a preferred embodiment of which is illustrated and described herein, is shown mounted upon a support or side bearing 8 that is integral with, or bolted to, a side bracket 7. The bracket 7, which is bolted to the press girt 1 by a clamp 6, supports also a motor or other power source 9, as well as other mechanism. The shaft of the motor 9 carries a sprocket 10 that is connected by a sprocket chain 11 to a sprocket 12 upon a shaft 13. The shaft 13 is thus constantly driven from the motor 9. A gear 14, that is fixed to the shaft 13, meshes with a gear 15 that is loosely mounted upon a shaft 16. The gear 15 thus constitutes a constantly rotating portion of an outer disc or shell mechanism 34 that, normally rotating loosely about the shaft 16, is employed to time the feeding out of marking tags between adjacent sheets of the stack, as hereinafter more fully described.

The gear 14 is the only element that is fixed to the shaft 13. A ratchet wheel 17 is mounted loosely on the shaft 13 adjacent to the gear 14 to operate as an ordinary escapement. The ratchet wheel 17 is actuated step by step by a fork-shaped pendulum 72, one leg 20 of which is normally held in engagement with a tooth of the ratchet wheel 17, to prevent rotation of the ratchet wheel by a spring 21. The pendulum 72 may, however, be swung over, in opposition to the action of the spring 21, as hereinafter described, to release the tooth of the ratchet wheel 17 that the said leg 20 of the pendulum happens to engage. The other leg 70 of the pendulum will then engage a tooth of the ratchet wheel, as illustrated.

During this disengagement of a tooth of the ratchet wheel 17 by the one leg 20 of the pendulum 72, and the engagement of another tooth by the other leg 70, the ratchet wheel 17 has been permitted to rotate to the extent of one-half tooth, and one-half tooth only. When the spring 21 is permitted to restore the pendulum 72 to its normal position, the said other leg 70 of the pendulum will release the ratchet wheel 17 and the first-named leg 20 will re-engage it. The ratchet wheel 17 will thus again be permitted to advance to the extent of a half-tooth and a half-tooth only.

The pendulum 72 may be actuated in opposition to the action of the spring 21, in any desired manner; as hereinafter described this may be effected by means of an electric-relay switch mechanism 71 that is equipped with normally non-contacting feeler probes 24 and 25. The feeler probes 24 and 25 are shown positioned slightly in advance of the limiting position of advance of the rolls 3 and 4 in the paths of advance of the heads of the sheets 26. It is preferred to employ a relay that passes very little current through the probes. As illustrated, the probe 25 is horizontally disposed in a recess of the board 2, and the probe 24, also supported by the board 2, normally hangs vertically in front of the probe 25, a short distance away. This normal position corresponds to the normal position of the pendulum 72 described above, in which the leg 20 thereof engages a tooth of the ratchet wheel 17, under the influence of the spring 21.

The switch mechanism 71 may be bolted to the side bearing 8. It is shown provided with a casing from the interior of which conducting wires 22 and 23 extend to the probes 24 and 25.

Each time that a sheet 26 is carried forward by the rolls 3 and 4 of the press delivery, to the full-line position of Fig. 9, the head of the sheet, shown protruding somewhat in front of the rolls 3 and 4, engages the vertically hanging probe 24 to actuate it toward the left, as viewed in Fig. 2, into contact with the horizontally disposed probe 25. The circuit of a solenoid 27 becomes thereupon closed. The resulting electrical impulse actuates, to the right, as viewed in Figs. 2 and 3a, into the solenoid 27, an armature attached to a rod 28 that is connected to the pendulum 72, and which actuates the pendulum through a half-stroke, as before described, in opposition to the action of the spring 21. Upon the disengagement of the probes 24 and 25, the spring 21 restores the pendulum to its normal position, as before described. The pendulum 72 is thus actuated back and forth, step by step, to advance the ratchet a tooth at a time, in one direction by the spring 21, and in the other electromagnetically.

The press-delivery carriage E, with its wheels 3 and 4, thereupon retracts, as before described, permitting the sheet 26 to drop on to the pile 5. The probe 24 becoming thus released, it separates from the probe 25, opening the circuit of the

solenoid 27. The spring 21 becomes thereupon enabled to return the pendulum 72 to its normal position.

The ratchet wheel 17 becomes thus rotated through an angle corresponding to one tooth, corresponding to each complete oscillation of the pendulum, each time that the head of a sheet 26 engages the probe 24. Upon the completion of the feeding of the sheet, and to each consequent engagement of the probes 24 and 25, there corresponds a unit count of the counter.

If, through some error, the rolls 3 and 4 fail to grip a sheet, the delivery carriage will still advance, but there will be no sheet for causing engagement of the probes 24 and 25. Only those sheets can be counted, therefore, that are actually delivered to the stack 5.

A gear 18, loosely mounted, like the ratchet wheel 17, on the shaft 13, is held frictionally and yieldingly against the side of the ratchet wheel 17 by a spring 19, coiled about the shaft 13, as more particularly shown in Figs. 1 and 3*a*. The frictional side tension thus produced by the spring 19 upon the ratchet wheel 17 by contact with the gear wheel 18 results in a tendency for the gear 18 to rotate with the ratchet wheel 17. In effect, therefore, the gear 18 is fastened to the ratchet wheel 17, so as to rotate therewith, a step at a time.

The side tension on the gear 18, caused by spring 19, also presses the ratchet 17, through the gear 18, against the gear 14. As the gear 14 is constantly turning, this side friction not only makes the gear 18 follow the ratchet 17, but it makes the ratchet 17 always try to follow the gear 14, so that the ratchet tooth is thus held with a little pressure against the one leg of the pendulum. This provides an easy load, so that a very delicate pendulum 72 may be employed, yet permitting the ratchet always to follow when released by the pendulum leg 20.

Assuming, for purposes of illustration, that it is desired to tag every 50 sheets, the ratchet wheel 17 may, for example, be provided with 25 teeth and the gear 18 with 10 teeth. The gear 18 may mesh with a gear 29 having 20 teeth. When the ratchet wheel 17 has made two revolutions, therefore, corresponding to a count of 50 sheets, the gear 18 will likewise have made two revolutions, but the gear 29 only a single revolution. The tag-inserting mechanism should, therefore, be actuated once to every rotation of the gear 29. This actuation of the tag-inserting mechanism is effected through the medium of a cam 30, having a single drop-off point, and fastened at 69 to, so as to rotate with, the gear 29.

One end of a bell-crank lever 31, intermediately pivoted at 32, is in continuous engagement with the cam 30. When the said drop-off point of the cam 30 becomes engaged under the said one end of the lever 31, a pin 33 at the other end of the lever rises. The raising of this pin 33 controls the setting into operation of the tag-inserting mechanism.

A pawl 35 is pivoted about a stud 36 disposed at one side of the before-mentioned outer disc or shell mechanism 34 that constantly rotates loosely about the shaft 16 with the gear 15. The pawl 35 is normally biased about its pivotal stud 36 by a spring 37, as more particularly illustrated in Figs. 3, 7 and 8, into engagement with a lug 41 that is normally maintained on the opposite side of the shell 34.

The outer shell 34 is loosely provided interiorly with an inner shell 39 that is normally prevented from rotating in the outer shell 34 by the pin 33 engaging a lug 40. The lug 40 is integral with the inner shell 39. At this time, the lug 41 is disposed alongside a lug 38, that is fastened to the shaft 16, thus preventing the pawl 35 from engaging the lug 38.

When the drop-off point of the cam 30 becomes positioned under the said one arm of the bell-crank lever 31, however, permitting raising of the pin 33, the shell 39 becomes rotated, by frictional contact with the outer shell 34 in which it is disposed, until the lug 42 strikes the pin 33. This enables the pawl 35 to engage the lug 38, forcing the shaft 16 to make a three-quarters turn. This results in feeding out rapidly over the top sheet of the pile 5 the end of a strip or web 48 from a roll 45 of paper. The roll 45 of paper is shown more particularly in Figs. 4, 5 and 6 as mounted upon a stud 46 between side plates 47 of a flagging head comprising a side bracket 44. The free end of the web or strip 48 is automatically intermittently advanced, at the proper time, by feed rolls 52 and 53, into the flagging head, between two thin metal confining strips or guide tongues 49 and 50, and in between a stationary knife 51 and a movable knife 63. The feed rolls 52 and 53 are provided with matching grooves 58 and 59, respectively, to receive the confining tongues 49 and 50. The grooves 58 and 59 are narrower than the width of the web 48, which enables the feed rolls 52 and 53 to grip the web along the margins. This obviates danger of the web 48 sticking between the guide tongues 49 and 50. The tongues 49 and 50 are disposed just far enough apart so that the web 48 shall travel smoothly through between them, without doubling up or crinkling.

Notwithstanding that the free end of the web 48 has thus been advanced into contact with the upper face of the uppermost sheet 26 of the stack 5, and prior to the stacking of the next-following sheet 26 into face-to-face contact with the said uppermost sheet, it is still too early to sever the web 48, as either the severing or the said next-following sheet 26 might pull the severed end of the web 48 out of place. After a few more sheets 26 have been deposited upon the top of the pile or stack 5, however, their combined weight will serve to hold the free end of the strip 48 steady in place. During this time, the shaft 16 is held in the position that it assumed at the time that the web 48 was first fed out, a three-quarters turn away from its normal position. After these several additional sheets 26 have been deposited on top of the pile or stack 5, serving to steady the said free end of the web 48, the time is ripe to sever the said free end, to form a tag 43.

The desired operation is brought about because, during the time when the pin 33 is holding against the lug 42, the lug 41 is protecting the lug 38 in its new position, so that it cannot become engaged by the pawl 35. In due course, the cam 30, which has meanwhile been advanced, step by step, with the gear 29 to which it is fastened, has reached a position such that the lever 31 becomes again raised. This results in releasing the pin 33 from the lug 42, whereupon the inner shell 39 is caused, by friction with the outer shell 34, to rotate through its remaining quarter turn, resulting in the knives 51 and 63 severing the end of the strip 48.

The severed end of the strip 48, as before stated, constitutes a tag 43. A tag 43 is thus inserted at the end of every 50 contacts between the probes 24 and 25, in contact with the uppermost face

of the sheet 25 over which the free end of the web has been fed, and with the underface of the next-following sheet 26.

The upper roll 53 is mounted upon a pivoted bracket 56 so as to be held yieldingly in engagement with the lower roll 52 by a spring 57. The paper web 48 is thus maintained tightly between the feed rolls 52 and 53. The lower roll 52 is provided with a gear 54 that meshes with a gear 55 upon the upper roll 53. It is sufficient, therefore, in order to feed the web 48, to rotate intermittently the lower feed roll 52 only through the shaft 16, the upper feed roll 53 being rotatably actuated with it through the intermeshing engagement of the gears 54 and 55, and the two feed rolls 52 and 53 together positively pulling the web 48 rapidly through between them at the proper time.

The feed roll 52 is provided at its side with a cam 60 that, at a predetermined point in its rotation, operates a lever 61, intermediately pivoted at 67, by engaging the lever 61 on one side of the pivot 67. The cam 60 then actuates the lever 61 about the pivot 67, in opposition to the action of a spring 68. A pin 62 at the end of the lever 61 on the other side of the pivot 67 thereupon engages the walls of an opening 64 in the knife 63 in which it is disposed to pivot the knife 63 upward about its pivot 66. The knife 63 is thus caused to cooperate with the stationary knife 51 to sever the end of the strip 48 to produce a tag 43.

During the operation of the knife 63, the portion of the web 48 that is disposed between the feed rolls 52 and 53 rests still upon a flattened portion 65 provided upon the feed roll 52. At this time, the flattened portion 65 is disposed opposite to the feed roll 53. This prevents feeding the strip further during the cutting operation of the knife 63.

The knife 63 is thus operated in timed relation to the operation of the feed rolls 52 and 53 by the shaft 16, which first operates through about three-quarters of a revolution to cause the feed rolls 52 and 53 to feed the end of the web 48 over the pile 5, and then remains stationary until the desired number of sheets has been fed over the end of the web 48 on the pile 5, and which pivotally operates through the remaining quarter revolution to cause the knife 63 to sever the end of the web to produce a tag 43.

Modifications will occur to persons skilled in the art, and all such modifications are considered to fall within the spirit and scope of the invention, as defined in the appended claims.

What is claimed is:

1. A machine of the class described having, in combination, means for gripping the head of each of a plurality of sheets, means for advancing the gripping means to feed the sheets, means for limiting the advance of the gripping means, means disposed in advance of the limiting position of the gripping means in the path of advance of the heads of the sheets so as to be engaged by the heads of the sheets, and means controlled by the last-named means for counting the sheets.

2. A machine of the class described having, in combination, means for gripping the head of each of a plurality of sheets, means for advancing the gripping means to feed the sheets, means for limiting the advance of the gripping means, means disposed in advance of the limiting position of the gripping means in the path of advance of the heads of the sheets so as to be engaged by the heads of the sheets, means controlled by the last-named means for counting the sheets, means for stacking the sheets, and means controlled by the counting means for inserting a tag between adjacent predetermined counted sheets of the stack at the head ends of the adjacent sheets.

3. A method of feeding and stacking sheets and marking the stacked sheets that comprises feeding a plurality of sheets with the head ends of the sheets disposed forward in the direction of feed, stacking the sheets each on top of the previously fed sheet with the underface of each sheet in face-to-face contact with the upper face of the previously fed sheet, and inserting a relatively small tag compared to the size of the sheets at the head ends of the sheets into contact with the upper face of one of the sheets prior to the stacking of the next-following sheet into face-to-face contact therewith, whereby the tag becomes positioned between the said one sheet and the said next-following sheet at the head ends thereof in contact with the upper face of the said one sheet and the underface of the said next-following sheet.

4. A method of feeding and stacking sheets and marking the stacked sheets that comprises feeding a plurality of sheets with the head ends of the sheets disposed forward in the direction of feed, stacking the sheets each on top of the previously fed sheet with the underface of each sheet in face-to-face contact with the upper face of the previously fed sheet, inserting the end of a strip at the head ends of the sheets into contact with the upper face of one of the sheets prior to the stacking of the next-following sheet into face-to-face contact therewith, and severing the inserted end of the strip, whereby the severed end of the strip becomes positioned between the said one sheet and the said next-following sheet at the head ends thereof in contact with the upper face of the said one sheet and the underface of the said next-following sheet.

5. A machine for feeding and stacking sheets and marking the stacked sheets having, in combination, a support, means for feeding a plurality of sheets with the head ends of the sheets disposed forward in the direction of feed each from one position to a second position over the support and for thereupon depositing the sheets at the second position each upon the previously fed sheet to stack each sheet upon the support with the underface of each sheet in face-to-face contact with the upper face of the previously fed sheet, and means for inserting a tag at the head ends of the sheets into contact with the upper face of one of the sheets prior to the stacking of the next-following sheet into face-to-face contact therewith, whereby the tag becomes positioned between the said one sheet and the said next-following sheet at the head ends of the sheets in contact with the upper face of the said one sheet and the underface of the said next-following sheet.

6. A machine for feeding and stacking sheets and marking the stacked sheets having, in combination, means for gripping the heads of each of a plurality of sheets, means for advancing the gripping means to feed the sheets with the head ends of the sheets disposed forward in the direction of feed each from one position to a second position, means for limiting the advance of the gripping means at the second position, means disposed in advance of the limiting position of the gripping means in the path of advance of the heads of the sheets so as to be engaged by the heads of the sheets at the second position, means for stacking the sheets each on top of the previ-

ously fed sheet with the underface of each sheet in face-to-face contact with the upper face of the previously fed sheet, and means controlled by the sheet-engaging means for inserting a tag at the head ends of the sheets into contact with the upper face of one of the sheets prior to the stacking of the next-following sheet into face-to-face contact therewith, whereby the tag becomes positioned between the said one sheet and the said next following sheet at the head ends of the sheets in contact with the upper face of the said one sheet and the underface of the said next-following sheet.

7. In a printing press, printing mechanism, a support, a carriage, means for feeding sheets from the printing mechanism to the carriage, means for gripping the sheets on the carriage, means for actuating the carriage forward away from the printing mechanism to a position over the support to feed the sheets with the head ends of the sheets disposed forward in the direction of feed and then rearward toward the printing mechanism, means for releasing the gripping means when the carriage occupies the said position to cause the sheets to become deposited each upon the previously fed sheet to stack the sheets upon the support with the underface of each sheet in face-to-face contact with the upper face of the previously fed sheet, and means for inserting a tag at the head ends of the sheets into contact with the upper face of one of the sheets prior to the stacking of the next-following sheet into face-to-face contact therewith, whereby the tag becomes positioned between the said one sheet and the said next-following sheet at the head ends of the sheets in contact with the upper face of the said one sheet and the underface of the said next-following sheet.

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