Oct. 12, 1943. H. E. SEELEY 2,331,351

UNIT FEED PRINTING MACHINE

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Fig. 1.

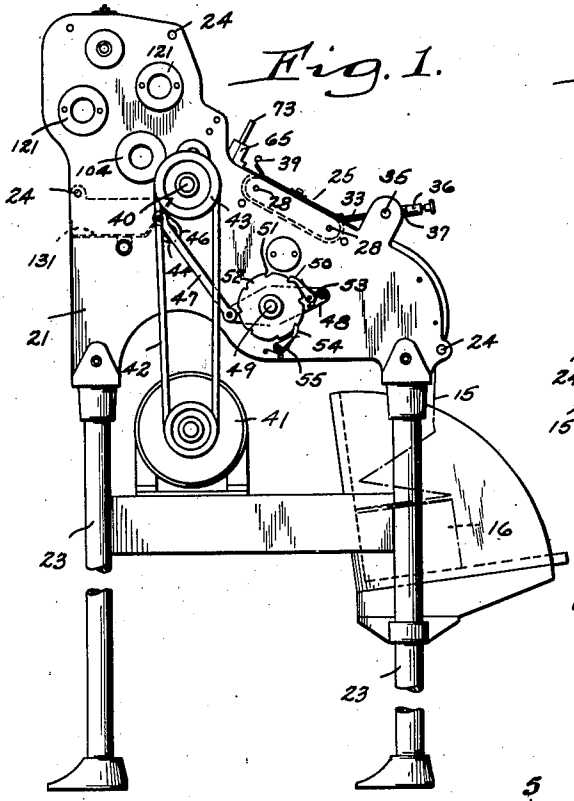
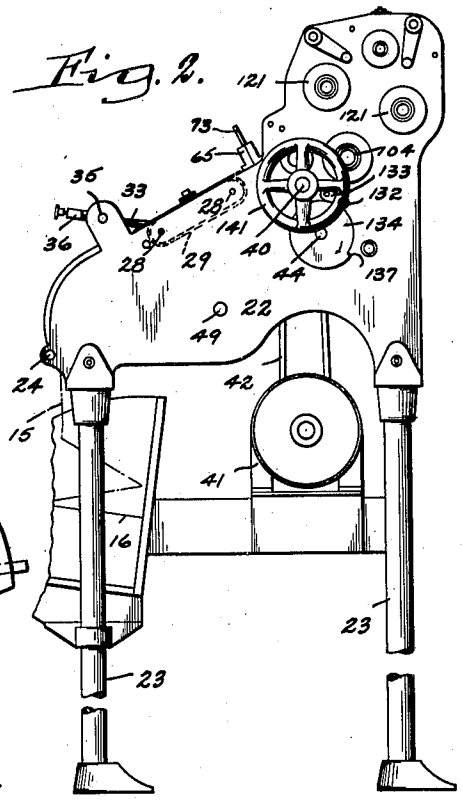


Fig. 2.



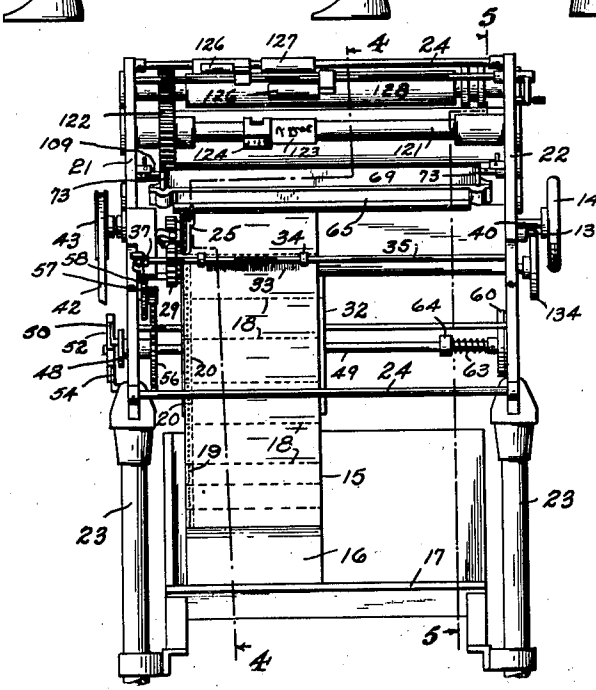


Fig. 3.

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Fig. 13.

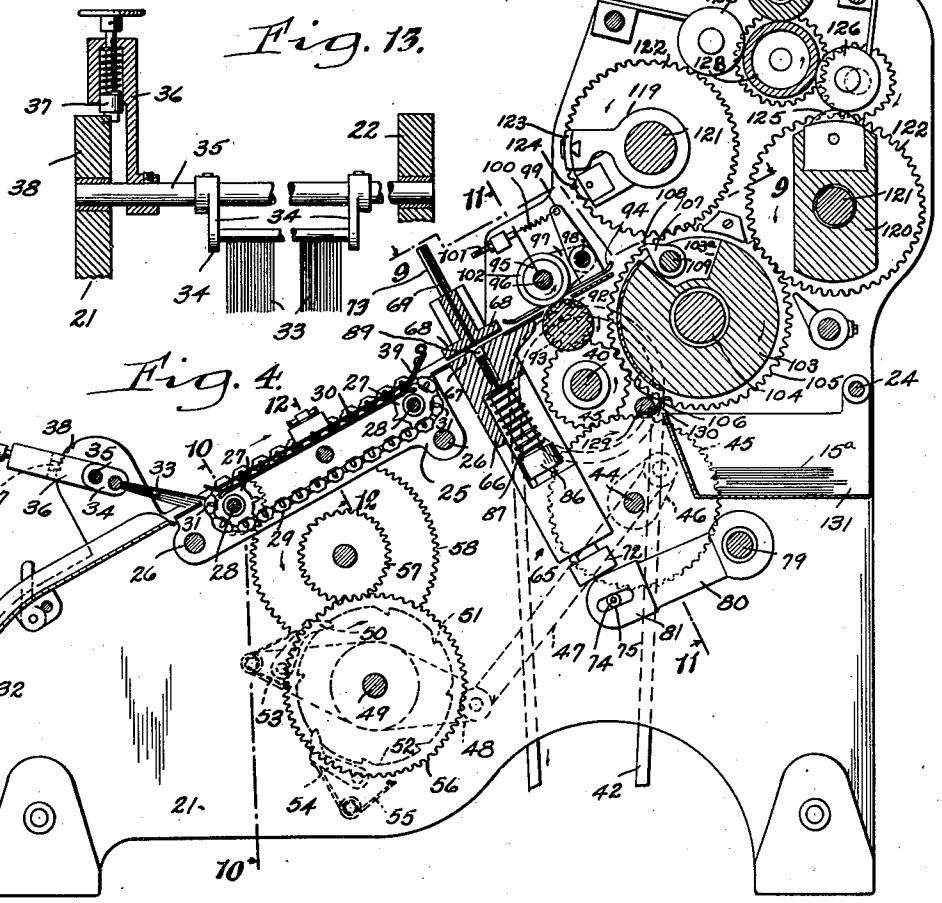
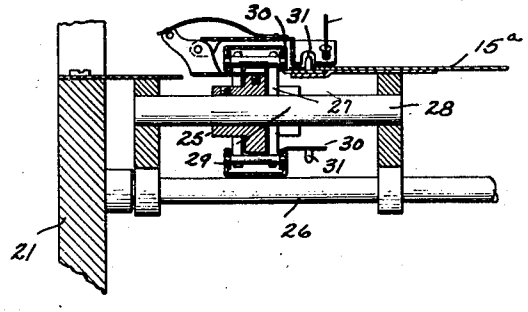


Fig. 4.

Fig. 12.



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Fig. 5.

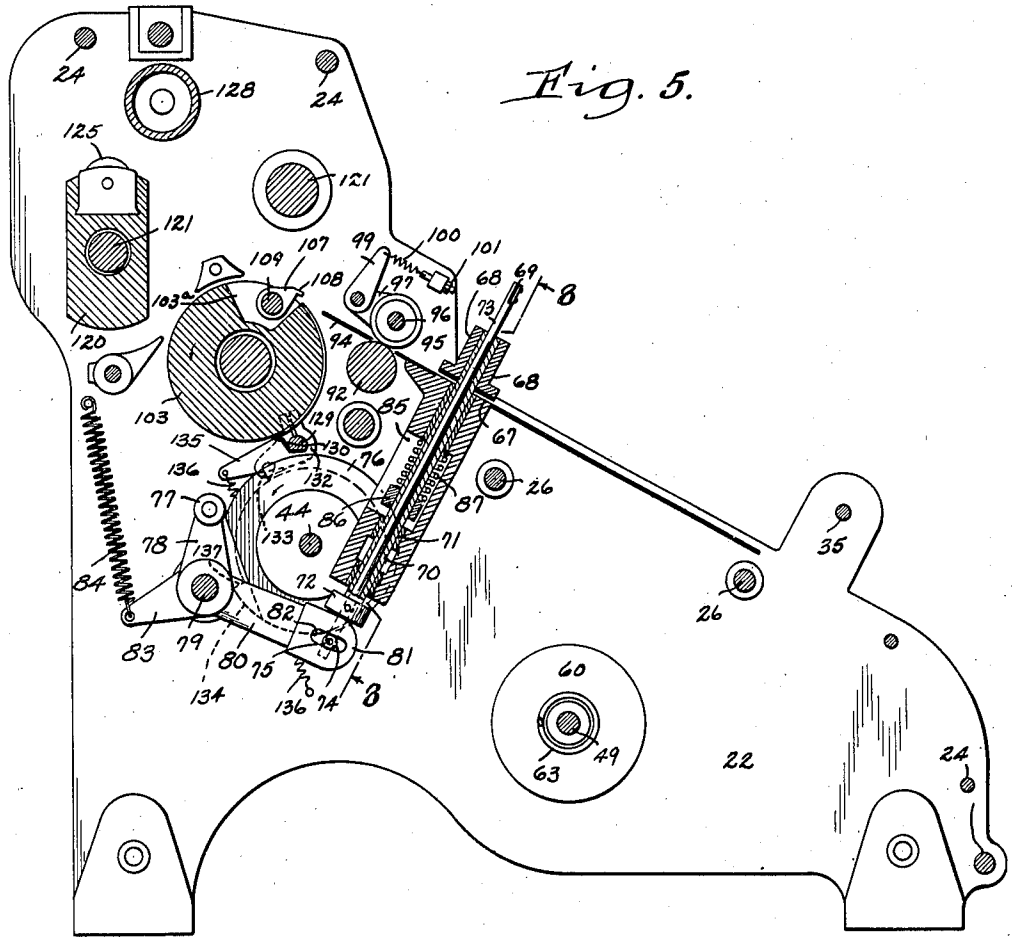
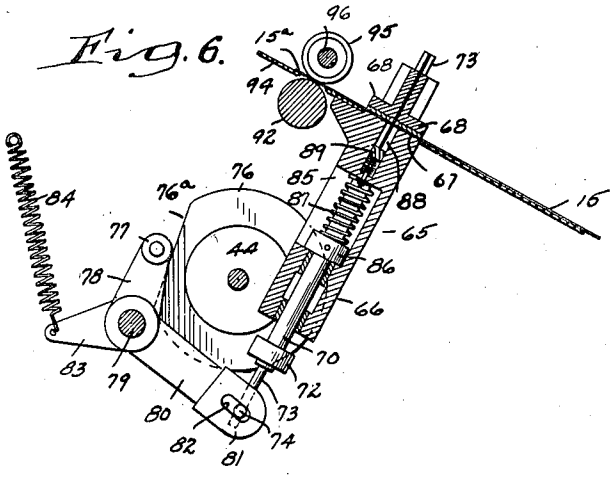


Fig. 6.



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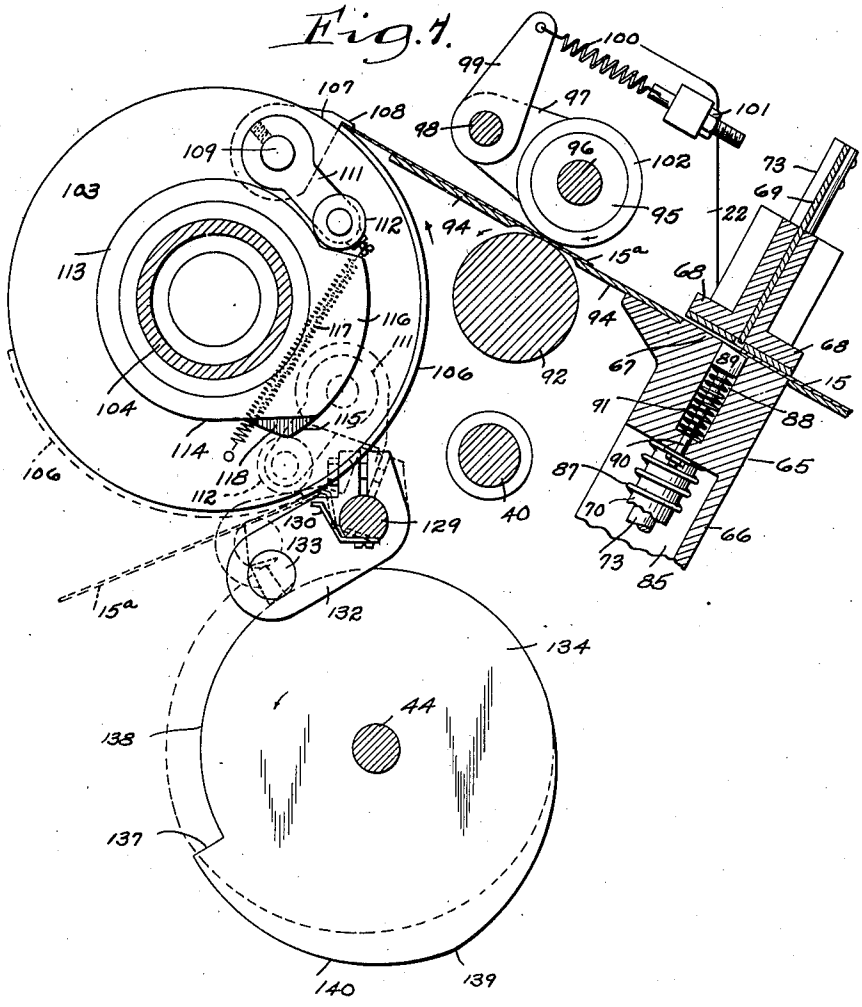
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Fig. 7.



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Fig. 8.

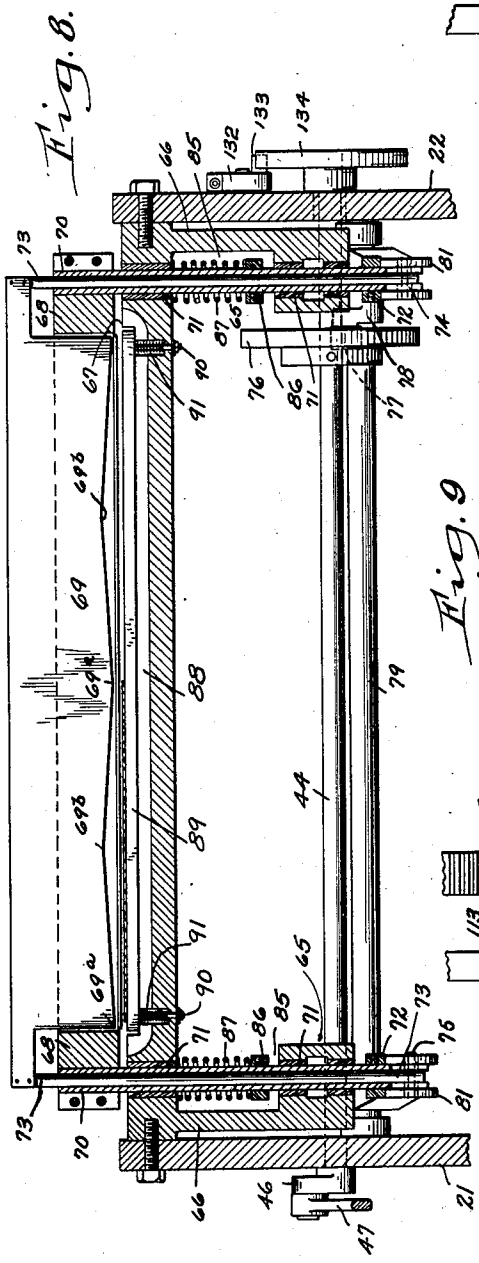
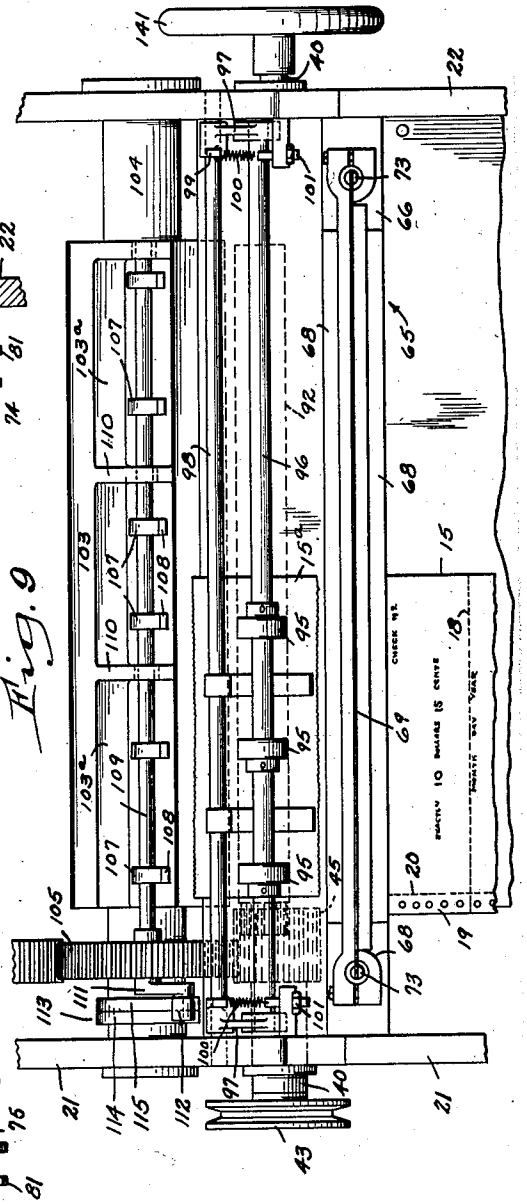


Fig. 9



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Fig. 10.

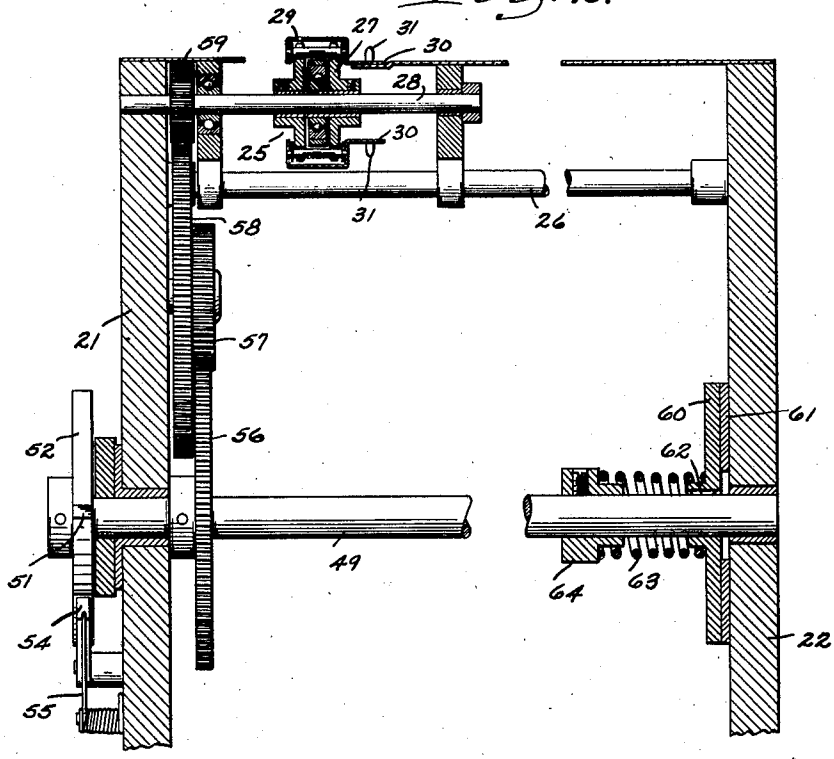
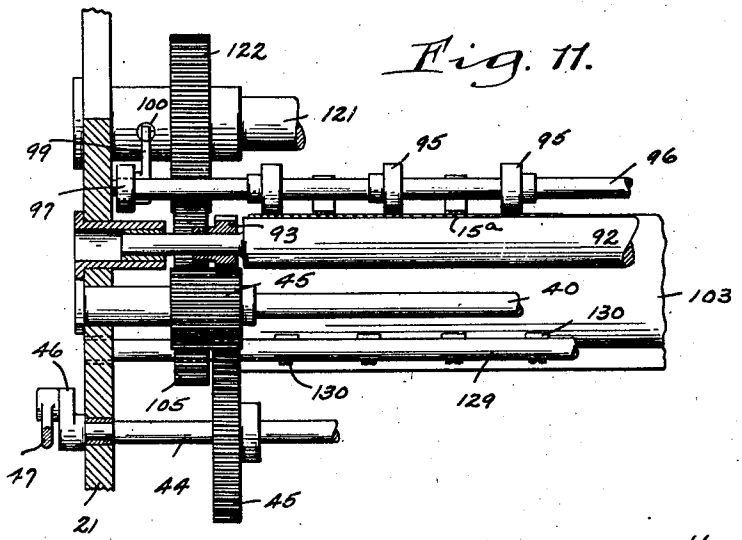


Fig. 11.



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Patented Oct. 12, 1943 2,331,351

UNITED STATES PATENT OFFICE

2,331,351

UNIT FEED PRINTING MACHINE

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Application May 21, 1940, Serial No. 336,413

25 Claims. (Cl. 164—84.5)

This invention relates to improvements in machines for operating upon long continuous strips of paper and like material, and intended to be divided into units of substantially equal length and to receive printed data and having blank spaces or blank forms for receiving the same. More particularly in some of its aspects the invention relates to improvements in machines for feeding the record strips and for severing them into unit lengths or checks and delivering the latter sequentially to an impression cylinder and holding them in position thereon during the application of certain printed data, such as the signature, date, and numbers ordinarily applied to checks, drafts and the like.

It is a general object to provide in a machine of the class mentioned, an improved mechanism for accurately feeding the record strip of checks or like units and separating it into unit lengths after which the desired impressions are printed upon the checks.

A further object is to arrange and combine in an improved manner a strip feeding mechanism with a strip gripping and separating mechanism to separate the strip into units, the separation being effected intermittently in synchronism with step-by-step advancement of the strip. The strip feeding mechanism is adapted to feed the strips with precision in definite unit lengths so as to bring predetermined parts thereof into correct position for operation thereon of the strip separating means.

A further object is to provide an improved separating means for separating the strip into substantially equal sections or units, even with slight variations in the strip lengths advanced by the strip feeding mechanism.

Still another object of the invention is to provide an improved strip separating or strip breaker mechanism that will function effectively and with certainty in separating the continuous strip into sections or units of predetermined length.

A further object is to provide in machines of the class mentioned an improved auxiliary strip feeding or strip delivery mechanism operating in coordination with the breaker mechanism to deliver the units or checks quickly and easily as soon as they are released from the breaker mechanism.

Another object is to provide an improved strip gripping and holding mechanism for holding the units or checks in impression receiving position upon an impression cylinder and operating in coordination with the delivery mechanism for receiving the units delivered by the latter.

Another object is to provide an improved arrangement for the printing elements operating in conjunction with the impression cylinder for applying the printed data to the blanks or checks that are gripped and retained in impression receiving position upon the cylinder.

Other objects and advantages of the invention will be in part pointed out in the following detailed description of an illustrative but preferred embodiment of the invention, and will be in part obvious as the disclosure proceeds.

The invention accordingly comprises the features of construction combination of elements, and arrangement of parts, which will be exemplified in the construction hereinafter set forth and the scope of the application of which will be indicated in the claims.

For a more comprehensive disclosure of the nature, objects and advantages of the invention reference is made to the following detailed description and to the accompanying drawings in which:

Fig. 1 is a side elevation of a machine embodying the invention;

Fig. 2 is a similar view of the opposite side of the machine;

Fig. 3 is a front elevation of the machine shown in Figures 1 and 2;

Fig. 4 is an enlarged vertical section showing parts of the mechanism in elevation, the section being taken approximately on the line 4—4 of Fig. 3 looking in the direction of the arrows;

Fig. 5 is an enlarged section taken approximately on the line 5—5 of Fig. 3 looking in the direction of the arrows;

Fig. 6 is a fragmentary section and elevation showing the strip gripping mechanism and associated parts in different positions from those shown in Fig. 5;

Fig. 7 is an enlarged fragmentary sectional and elevational view of the strip gripping and separating element and the mechanism for delivering the separated units or checks to the impression cylinder;

Fig. 8 is a fragmentary sectional view showing the strip breaker mechanism, the section being located substantially on the line 8—8 of Fig. 5 looking in the direction of the arrows;

Fig. 9 is a fragmentary plan view of parts positioned below the line 9—9 of Fig. 4, the parts above this line being omitted;

Fig. 10 is a fragmentary sectional view showing details of the strip feeding mechanism, the sec-

tion being taken substantially on the line 10—10 of Fig. 4 looking in the direction of the arrows;

Fig. 11 is a fragmentary sectional and elevational view of the auxiliary feeding or delivery mechanism, the section being located substantially on the line 11—11 of Fig. 4 looking in the direction of the arrows;

Fig. 12 is a fragmentary section and elevation on the line 12—12 of Fig. 4 showing details of the strip feeding mechanism, and

Fig. 13 is a fragmentary sectional and elevational view showing details of the strip smoothing and tensioning device.

Prior to the detailed description of the illustrative embodiment it will be helpful to give a general outline of the various operating mechanism and the functions thereof. These are outlined as follows:

A strip feeding mechanism feeds the long continuous strip of checks or similar units that are separated by transverse weakened severance lines. The feeding mechanism is preferably of the pin feed type having pins entering strip apertures and feeding the strips with accuracy. Intermittent drive for the pin feed mechanism advances the strip with a step by step movement by unit or check length intervals.

Just beyond the pin feed mechanism is the strip separator or breaker embodying a strip clamping device having two closely spaced gripper bars actuated intermittently to grip the strips at opposite sides of the transverse weakened lines thereof upon the halt or cessation of strip advancement by the feed mechanism. The strip is thus held in its gripped position during the separation or breaking along the weakened lines thereof. A unit separator or breaker blade moves between the clamping bars in substantial alignment with the weakened lines of the strip. The weakened lines need not be in exact alignment with the edge of the separator blade because there is a space in the bed of the gripper in the vicinity of the weakened line so that the strip will be separated or broken even though the blade is somewhat out of alignment with the weakened line.

After the breaking of the check or unit from the strip along the weakened line, an auxiliary feed or delivery mechanism becomes operative immediately upon release of the gripper to advance and deliver the check into position for subsequent processing, as upon an impression cylinder. The cylinder is provided with gripping mechanism operated synchronously with the delivery mechanism so as to grip the check in position upon the cylinder to retain it in impression receiving position thereon. Although the impression cylinder rotates continuously the gripping mechanism thereon is operated in timed sequence or synchronism with the intermittent delivery of the units or checks by the delivery mechanism. Rotation of the impression cylinder brings the checks held in impression position thereon into impression receiving relation with the printing mechanism for printing the signature, dates, numbers, etc.

For a detailed description of the illustrative embodiment of the invention reference is had to the accompanying drawings. As there shown, the strip 15 as seen in Figs. 3 and 9 ordinarily embodies a long continuous strip of paper or similar material folded into a zigzag pack 16 that may be conveniently supported as by a housing and protecting shelf 17 attached to the frame of the machine. The strip shown is divided into units of substantially equal length by transverse weakened severance lines 18, the weakening being by any well known means such, for example, as slitting, perforating and the like. These units in the illustrative embodiment are intended to be used for checks, drafts and the like and may have the usual printed data thereon with spaces or blank forms for receiving additional data such as the signatures, dates, numbers, amounts, etc. A feed band 19 preferably integral with the strip, as shown, extends along one longitudinal margin of the strip and is provided with a series of pin feed apertures for cooperation with the feed pins of the feed mechanism. This feed band is separated from the body of the strip by a longitudinal weakened severance line 20 formed by slitting, perforations, etc., thus providing for easy separation of the feed band after it has served its feeding function.

The operative mechanism of the machine is mounted in a suitable frame which, as shown, may include longitudinally disposed plates or frame members 21 and 22 and mounting legs or pedestals 23 so that the machine can be mounted upon a floor or platform. Transverse frame members or tie rods 24 extend between the frame members 21 and 22 to support them firmly in position.

The strip feeding mechanism, best shown in detail in Figs. 4, 10 and 12 embodies a unit or frame 25 supported on transverse bars or rods 26 mounted in machine frame. Feed sprockets 27 longitudinally spaced apart are mounted upon rotary shafts 28 running in bearings in the feed unit, one of these being a drive shaft for the feed mechanism.

Mounted upon the feed sprockets 27 is an endless flexible feed chain 29 carrying pin supporting brackets 30 on which the feed pins 31 are respectively mounted. As shown in Fig. 10 the brackets 30 are positioned to mount the feed pins at or below the pitch line of the chain 29, which is ordinarily constructed of a series of pivotally connected links. This arrangement of the feed pins functions to feed the strips accurately so as to bring the severance lines 20 of the strip into definite positions for operation thereon as later brought out more clearly. Since the construction, operation and advantages of this feed mechanism are fully set forth in the Mabon Patent No. 2,171,003, issued August 29, 1939, it is unnecessary to describe it further here, and reference is made to this patent for a full disclosure of the feed mechanism.

At the rear of the feeding mechanism there is a paper table or guide 32 mounted between the frame members 21 and 22 and adapted to guide the strip from the supply 16 to the feeding mechanism. A strip guiding tensioning and smoothing device is preferably mounted to engage the strip immediately to the rear of the feed unit. As shown best in Figs. 4 and 13, this smoothing and tensioning device includes bristle brush tensioning units 33 mounted for swinging adjustment upon supporting arms 34 carried by a rotary shaft 35 mounted in suitable bearings and carrying an adjustment arm 36 for adjusting the pressure of the bristle tensioner upon the strip. A manually controllable spring pressed pawl 37 cooperates with the teeth of a locking segment 38 to hold the tensioner in adjusted position. This tensioning device smooths and tensions the strip as it passes to the feed unit so as to assist in effecting proper engagement of the feed pins in the feed apertures of the strip.

Preferably mounted upon the feed unit 25, toward the forward end thereof, is a slitter or slitting needle 39 adapted to engage the strip along the longitudinal weakened severance line 20 so as to sever during strip feeding movement the feed band 19 from the strip near the point of emergence thereof from the feeding mechanism.

The main drive shaft 40 of the machine extends transversely being rotatably mounted in bearings in the longitudinal side frame members 21 and 22 This drive shaft is driven in any convenient manner as by a driving motor 41 connected through a belt 42 to a pulley 43 fixed to the shaft. The various operating units including the strip feed mechanism, above described, are driven through connections to the main drive shaft.

As best shown in Figs. 1, 4 and 10 the pin feed mechanism, above described, is driven intermittently for advancing the strip in a step by step movement. The mechanism is adjusted to advance the strip the length of one of the units or checks at each feeding interval or step. A transverse rotary shaft 44 driven by intermeshing gears 45 mounted respectively upon the drive shaft 40 and the shaft 44, carries a crank arm 46 connected by a rod or pitman 47 with a reciprocating driving arm 48. The pawl arm is mounted for rotary reciprocation upon a rotary shaft 49 and carries a driving pawl 50 pivotally connected thereto and engageable at its free end with the teeth 51 of a driving disk 52 affixed to the shaft 49. The driving pawl 50 is yieldingly urged into operative position by a tensioned spring 53. A locking pawl 54 is pivoted to the frame member 21 and yieldingly urged by a spring 55 to cause its free swinging end to engage the teeth 51 thereby to prevent retrograde movement of the shaft 49.

Interposed between the intermittent rotary shaft 49 and the driving shaft 28 of the pin feed mechanism, is a train of intermeshing toothed gears 56, 57, 58, 59, the gear 56 being attached to the shaft 49 and the driving pinion 59 to the drive shaft 28. The toothed gears 57 and 58 are idlers rotating as a unit upon a spindle or bearing attached to the frame 21. Through these driving connections the pin feed mechanism is driven intermittently through action of the driving pawl 50 to feed the strip 15 intermittently in steps of equal length. In cases where it is desired to feed the strip in different step lengths, this may be accomplished by installing feed gears of different ratio or by a different length of pawl arm 48 and driving disk 52, or by other means.

Since the driving shaft 49 operates intermittently, continually starting and stopping to effect the intermittent driving action of the pin feed mechanism, it is desirable to control its operation to prevent overthrow of the feeding mechanism due to inertia and other causes. An effective control is accomplished by a friction device best shown in Fig. 10 and embodying a friction disk 60 rotatable with the shaft 49, but longitudinally slidable therein and frictionally engageable with companion disk or member 61 attached in stationary position upon the frame member 22. The rotary friction disk 60 is constrained to rotate with the shaft 49 through a lug 62 running in a longitudinal groove in the shaft, and is yieldingly urged into frictional engagement with the disk 61 by a spiral compression spring 63 bearing against a collar 64 firmly attached to the shaft. This friction control device functions to check the feeding action of the pin feed mechanism substantially at the point that the forward feeding impulse exerted by the driving pawl 60 ceases. In this manner the accurate feeding of the strip in definite strip or unit lengths is promoted, this being important to effect the satisfactory severance or breaking of the units from the strip as later described.

Positioned just beyond the feeding unit in the direction of strip feed is the strip breaker or separator unit indicated generally at 65 and operating in timed sequence with the feeding mechanism for separating the strip in units. This breaker unit, as best disclosed in Figs. 4, 5, 6, 7 and 8, embodies a relatively heavy metallic cross bar or frame unit 66 extending transversely of the machine and securely attached to the frame plates 21 and 22. The cross bar 66 is formed at its upper edge with a flat bed 67 having its upper surface in alignment with the path of strip feed and forming a gripper bed upon which the strips are held during separation of the strip units. Reciprocating grippers or gripper bars 68 are mounted in opposing relation to the bed 67 so that the path of strip feed lies between the bed and the grippers. The two gripper bars 68 extend transversely of the machine and are preferably spaced apart slightly longitudinally of the strip path forming a space or passageway for receiving the strip breaker or breaker blade 69. But the gripper bars are firmly connected together in a unit and may be integral with each other if desired, and their gripping surfaces are preferably faced with yielding material such as sheets of rubber as shown.

As best seen in Fig. 8, the gripper bars 68 are mounted for reciprocation upon the cross bar 66 by means of hollow sleeve rods 70 slidably mounted in bearings 71 in supporting formations at the opposite ends of the cross bar 66. These sleeve rods are firmly attached at their upper ends to the opposite ends of the gripper bars 68 so as to move as a unit therewith. At the lower ends, the sleeve rods 70 protrude from the cross bar 66 and are provided at their terminals with collars 72 secured thereto and functioning as operating elements. By means of these sleeve rods the gripper bars 68 are mounted for sliding reciprocation in the cross bar 66.

The breaker blade 69 is also mounted for sliding reciprocation upon the cross bar 66 but can move independently of the gripper bars 68. For this purpose reciprocating mounting rods 73 extend through the inner openings of the sleeve rods 70, which thus provide bearings for slidably mounting them. They extend at the lower ends beyond the sleeve rods where they are provided with operating connections including operating rollers 74 rotatably mounted upon cross pins 75 secured to the lower ends of the rods. The blade 69 is connected at its opposite ends to the upper ends of the operating rods 73. It will be noticed that the breaker blade 69 is positioned intermediate the gripping surfaces of the gripper bars 68, the purpose of which is later set forth. As appears in Fig. 8 the active or lower edge of the breaker blade has crests 69*a* and depressions 69*b* longitudinally spaced therealong forming a wavy edge to assist in the strip breaking action. Also, this edge is preferably dull or blunt as seen in Fig. 7, so as to effect strip separation by a breaking action as distinguished from a cutting action.

For operating the gripper bars and breaker blade a cam mechanism is used, as best shown in Figs. 5 and 6, embodying a disk cam 76 secured

on the shaft 44 for rotation therewith. A cam roller 77 engages the periphery of the cam 76 and is mounted upon an arm 78 affixed to a shaft 79 rotatably mounted in suitable bearings in the frame. Also, affixed to the rotary shaft 79 is a pair of longitudinally spaced actuating arms 80 each having a bifurcated terminal 81 underlying the corresponding operating collar 72, and provided with opposing elongated slots 82 in its terminal branches for receiving the rollers 74 that are attached to the operating rods 73 for the breaker blade 69. The upper surface of each bifurcated terminal 81 is adapted to contact with the under surface of the corresponding collar 72 for controlling the operation of the gripper bars 68. The cam 76 has a flattened peripheral surface 76a cooperating with the roller 77 for effecting reciprocation of the actuating arm 80. A control arm 83 is also fixed to the shaft 79 and a tensioned sprial spring 84 anchored to the frame is connected to the outer end of the arm 83 for controlling the operation of the cam driving mechanism.

Each of the sleeve rods 70 extends through a recess 85 formed in the frame unit or cross bar 66, and secured in position upon the sleeve rod in each recess is a control collar 86 normally seated against one end of the recess. A spiral compression spring 87 bears upon the upper surface of each collar 86 and at its opposite end against the upper wall of the recess 85, the springs being compressed to tend to urge the sleeve rods, together with the gripper bars 68, into strip gripping position. When the cam roller 77 engages the circular surface of cam 76, as shown in Fig. 5, the breaker blade 69 is raised through the actuating rods 73 and the actuating arms 80, while at the same time the bifurcated terminals 81 of the actuating arms engage the operating collars 72 of the sleeve rods to raise the grippers 68 to non-gripping position. During this operation the collars 86 in the recesses 85 are raised from their seats to compress the spiral springs 87. When the cam roller 77 engages the flattened surface 76a of the cam 76, the actuating arms 80 are retracted by operation of the springs 84, as shown in Fig. 6, thus sliding the actuating rods 73 downwardly in their mountings and adjusting the breaker blade 69 into its downward operative position as seen in Fig. 6. During this movement, the bifurcated terminals 81 move away from the terminal collars 72 whereupon the compression springs 87, through the collars 86 and sleeve rods, move the gripper bars 68 into gripping position.

As shown in detail in Figs. 7 and 8, there is an elongated recess 88 in the cross bar 66 opening through the surface of the gripper bed 67 and substantially aligned with the edge of the breaker blade 69 and in which the blade is received during the severing operations. A breaker or separator block or bar 89 is mounted for yielding retraction in the recess 88 and has an outwardly directed flat surface cooperating with the blunt edge of the blade 69. This flat surface, as shown in Fig. 7, may be inclined slightly to the surface of the bed in a rearward direction so as to promote the strip severing operation. The breaker bar 89 is secured in operative position in the recess by means of slide rods 90 anchored to the bar and slidably mounted in apertures extending through the lower part of the cross bar 66 and preferably provided with securing nuts at their lower ends as shown. Compression spiral springs 91 are mounted upon the slide rods 90 and are stressed to urge the bar 89 upwardly into its normal operative position as shown in Fig. 7.

An auxiliary feed mechanism is positioned just beyond the breaker mechanism for continuing the feed of the checks or units after they have been separated from the strip 15. As best shown in detail in Figs. 4, 5, 7, 9 and 11, this auxiliary feed mechanism includes a continuously operating feed or pull roll 92 rotatably mounted in the frame and driven continuously by a spur gear 93 meshing with the toothed gear 45 mounted on the drive shaft 40. The feed roll 92 has an uninterrupted peripheral friction surface for its entire length extending in frictional engagement with the lower side of the units or checks 15a through an opening in a plate or table 94 attached to the forward edge of the gripper bed 67 and forming a smooth uninterrupted continuance of the latter.

Pressure rollers or trucks 95 are mounted upon a swinging rotary shaft 96 rotatable in bearings carried by swinging arms 97 attached to a supporting shaft or bar 98 suitably mounted for oscillatory rotation in the frame. An arm 99 is attached to the shaft 98 and one or more control springs 100 are attached to the arm 99 to regulate the pressure of the rolls or trucks 95 upon the upper surface of the strip or checks. An adjusting device 101 is provided for adjusting the tension of the spring 100 so as to control the pressure of the truck rolls 95 against the strip. The truck rolls 95 are preferably faced with friction material, such as rubber bands 102 or the like positioned to bear against the strip surface. It will be noticed that the feed roll 92 rotates continuously so as to exert a continuous pull upon the strip as held by the grippers 68 while the trucks 95 rotate only during check advancement. The tension of the trucks 95 is so adjusted that this constant pull of the feed roll 92 is insufficient to sever or damage the strip but functions to advance the separated units or checks 15a immediately upon release thereof by the grippers 68 following severance of the checks from the continuous strip by the blade 69. During the time that the units are held by the grippers the pressure rolls or trucks 95 do not rotate but continue to exert pressure upon the strip against the feed roll 92. The trucks 95 and mountings therefor are light with little inertia and antifriction bearings are provided for mounting the same.

Positioned beyond the auxiliary feed mechanism is a receiving cylinder 103 to which the separated checks or units 15a are delivered by the auxiliary feed mechanism. This receiving cylinder with associated mechanism is best shown in detail in Figs. 4, 5, 7 and 9. While the receiving cylinder 103 may be utilized for different purposes in processing the separated units or checks 15a, it is herein disclosed as a rotary impression cylinder upon which the checks are received and supported during the reception thereon of printed data.

The impression cylinder 103 is suitably rotatably mounted on a shaft or support 104 carried by the frame and is driven by a toothed gear 105 meshing with the drive gear 45. The impression cylinder is preferably provided with an impression bed or blanket 106 for receiving the checks or units 15a, the bed being preferably of resilient or yielding material, such as the sheet of rubber shown. The rubber bed 106 is secured upon the periphery of the cylinder in position

for receiving the separated units as they are delivered by the auxiliary feeding mechanism.

Rotary gripper jaws 107 having gripping extensions 108 for engagement with the forward edges of the checks are fixed to a supporting shaft 109 rotatably mounted in bearings provided in supporting flanges or walls 110 formed in a recess 103a opening through the surface of the cylinder 103 in which the shaft 109 is disposed. As best seen in Fig. 7, the jaws 107 with the gripping extensions 108 are positioned to receive and grip the forward edges of the separated units 15a against the forward edge of the bed 106 as they are delivered thereto by the auxiliary feeding mechanism. It will be noted that the gripping extensions 108 of the gripper jaws 107 are so disposed relatively to the center of rotation of the mounting shaft 109 that they will be retracted peripherally of the impression cylinder from gripping position when the jaws are open to release the grip upon the strip. Similarly, when the jaws are closed into gripping position the gripping extensions 108 advance toward the edge of the strip and pass thereover into gripping position overlying the strip edge which is adjusted into this position by means of the auxiliary feeding mechanism. When the grippers 107 have been rotated into releasing position, as seen in Figs. 4 and 5, the gripping extensions 108 have been retracted along the periphery of the cylinder so as not to overlie or interfere with the edge of the strip or unit as it is advanced into position to be gripped on the cylinder by the auxiliary feeding mechanism.

At one of its ends the gripper shaft 109 has an extension carrying an operating crank arm 111, having a roller 112 engaging the periphery of a cam 113 supported in stationary position upon the support 104 of the impression cylinder. This cam preferably includes two cam plates or disks 114 and 115 that may be angularly adjustable with reference to each other so as to vary the gripping and releasing operations of the grippers 107. As seen in Fig. 7, the lobe 116 of the cam plate 114 cooperates with the arm 111 to open or release the gripping jaws 107 at a definite period in the rotation of the impression cylinder 103, while the jaws are moved into gripping position by means of a tension spring 117 immediately upon passage of the roller 112 beyond the lobe 116. The cam lobe 118 of the cam plate 115 is utilized for releasing the grip of the grippers upon the units at the time of unit ejection as later described.

While the separated checks or units 15a are gripped in impression receiving position upon the bed 106 of the impression cylinder 103, they are carried to receive their printed impressions past rotary printing units 119 and 120 notably mounted by shafts or supports 121 mounted in the frame. The printing units 119, 120 are driven by toothed gears 122 meshing with the gear 105 of the impression cylinder. While any desired data may be printed upon the units or checks, in the embodiment shown the rotary printing element 119 carries a signature plate 123 and a date plate 124. The signature and date plates may be of any desired construction and arrangement and need not be described here in detail. The rotary printing unit 120 carries a numbering plate 125, also of any desired construction and arrangement. As the check or unit 15a is carried on the bed of the impression cylinder, the signature, date and numbering plates are moved in synchronism and the impressions are printed on the check in appropriate spaces provided therefor. Inking mechanism embodying inking rolls 126 is mounted for applying ink to the surfaces of the printing plates. An ink carrying roll 127 deposits ink upon the surface of a vibrator roll 128 from which it is transferred to the inking rolls 126 and thence to the printing plates. This inking mechanism may be of any desired known construction and arrangement and need not be described in detail.

Ejector mechanism is provided for stripping and ejecting the checks or units from the impression cylinder after the processing is completed and for depositing them in a suitable receptacle. This mechanism, as best shown in Figs. 4, 5 and 7, embodies an ejector shaft 129 rotatably mounted in the frame and carrying one or a plurality of ejector fingers 130 preferably made of think strong metal and having free terminal ends shaped for engagement with the edges of the checks or units so as to impart an impulse thereto to strip them from the impression cylinder and to deposit them in the receptacle 131 mounted on the frame adjacent to the impression cylinder. These ejector fingers 130 are provided with attaching shanks engaging a flattened side of the shaft 129 and detachably secured in position by attaching screws or similar means.

Operating means for the unit ejector or stripper include an operating arm 132 attached to the ejector shaft 129 and having a cam roller or pin 133 at its free swinging end, positioned for engagement with the peripheral cam surface of a cam disk 134 fixed in operative position upon the rotary shaft 44. A control arm 135 is attached to the ejector shaft 129 and a tensioned coil spring 136 is stressed to tend to cause the shaft 129 to rotate in a counter-clockwise direction, as viewed in Figs. 5 and 7. The cam 134 has a shoulder or stepped portion 137 and a surface 138 of gradually increasing radius leading from the inner or lower edge of the shoulder 137. The radius of the surface 138 gradually increases substantially to the point 139 and the surface 140 beyond this point is substantially concentric with the shaft 44.

The operation of the improved mechanism is partially included in the above detailed description, but is herewith briefly summarized in order to set out the various operations in coordinated sequence. The strip 15 is threaded into the pin feed mechanism and over the gripper bed 67 and beneath the gripper jaws 68. The machine may be operated slowly for short distances by hand through the hand wheel 141 attached to the main drive shaft 40. Thus the machine may be operated by hand to raise the gripper bars slightly from the bed, as shown in Fig. 4, whereupon the strip can be threaded beneath the bars with the forward edge or unit thereof between the feed roll 92 and pressure rolls 95 of the auxiliary feed mechanism. The driving motor can then be started.

Due to the step by step action of the pin feed mechanism above described, strip 15 is fed forwardly intermittently a distance equal to the length of a check or unit 15a at each step or feeding impulse. During the interval of feeding movement the grippers 68 are raised from the bed 67 to permit passage of the strip and also the separator blade 69 is raised, as shown in Figs. 4, 5 and 8. At the end of each feeding impulse or at the halt in feeding, one of the weakened severance lines 18 of the strip will be aligned in

position directly above the retractable separator block 89 and approximately at the mid-position between the forward and rearward edges of the recess 88 in the gripping bed 67. The pin feed mechanism, as described, is designed to feed the strip in exact graduated lengths to bring each successive weakened line substantially in mid-position above the recess 88. Slight variations in this feeding movement will not interfere with the effective separation along the weakened lines, because the breaker blade will operate effectively to break the strip along the lines even though the edge of the blade engages the strip slightly in advance or slightly to the rearward of the lines as well as directly at the lines. As soon as the strip feed halts the gripper bars 68 are caused to descend by their operating cams 76 and the actuating springs 87 to grip the strip both forwardly and rearwardly of the severance lines and forwardly and rearwardly of the recess 88 in the gripper bed.

When the strip is thus gripped (see Fig. 6) coninued descent of the breaker plate 69 through operation of the actuating arms 80 and rods 73 causes the serrated or wavy blunt edge of the blade to engage the strip opposite to the breaker block 89 and the recess 88 and approximately at a weakened line 13. As the blade descends into the recess, as seen in Fig. 6, the block 89 is caused to retract into the recess and stress is placed upon the strip at the severance line sufficient to break the strip along this line. It will be noticed that this is a breaking action rather than a cutting action and the crests and depressions along the edge of the blade 69 assist in effecting a clean severance, the crests engaging the strip first so as to create localized stress areas resulting in initial severance at these areas. The breaking will be equally effective when the breaking contact is made directly at the weakened line or forwardly or rearwardly thereof within the limits of the recess 88.

During the period of breaking the strip, just described, the forward edge portion of the unit 15 is disposed between the continuously operating tractor feed roll 92 and the pressure rolls or trucks 95. But the feeding effort of these rolls is ineffective to feed the unit because held by the grippers 68, and it is of insufficient force to tear or mar the strip or to have any other effect. The surface of the feed roll 92 merely slides on the strip surface and the trucks 95 remain idle. But just as soon as the grip of the bars 68 is released by actuation of the operating mechanism including the cam 76, arms 80 and terminal blocks 81 engaging the heads or collars 72 of the sleeve rods 70, the feed roll 92 and pressure rolls 95 immediately become effective to advance the severed unit as indicated in Fig. 7. The release of the grippers 68 is effected synchronously or in timed sequence with operation of the feeding mechanism and with operation of the grippers 107 of the impression cylinder. The tractive effort of these auxiliary feed rolls can be adjusted by means of the spring 100 to provide the best tension to accomplish the desired result.

By the feeding action of the auxiliary feeding mechanism the check or unit 15a is advanced to introduce its forward edge into position on the bed 106 of the impression cylinder 103 so as to be gripped by the gripper jaws 107 of said cylinder. Just as soon as the unit is thus introduced the gripper jaws 107 are caused to close, because at this moment the cam roll 112 passes beyond the cam lobe 116 and the jaws are closed by action of the tension spring 117. It will be noticed that the forward edge of each unit is positioned by action of the auxiliary feeding mechanism substantially even with the forward edge of the bed 106 of the impression cylinder and flush with the adjacent wall of the recess 103a of the cylinder. During this introduction of the unit the gripper jaws 107 and the gripping extensions 108 thereof are in their retracted positions as seen in Figs. 4 and 5, so that the unit edge can be introduced into its final position in which it is gripped without any obstruction by the gripping jaws or the gripping extensions. This position of the operative element permits the rate of unit advancement by the auxiliary feed mechanism to be substantially the same as the peripheral speed of the impression cylinder and of the grippers 107; this is an advantageous operating condition. It will, of course, be understood that the impression cylinder rotates continuously and that the introduction of the units into position upon this cylinder and the gripping thereof in such position is effected during cylinder rotation. The release of each severed unit by the breaker grippers 68 is effected in timed sequence with rotation of the impression cylinder and with operation of the grippers 107 thereof, so that the forward edge of each unit, as soon as introduced into position on the cylinder is immediately gripped and held by the actuation of the grippers 107, as shown in Fig. 7. The continued feed of the unit is then effected by the rotation of the impression cylinder 103 on which it is held by the grippers 107. Continued rotation of the impression cylinder carries the check 15a past the rotary printing units 119, 120 so as to impress the signature, date, numbers, etc., thereon.

When the printed matter has been applied the completed check or unit is carried substantially to the position indicated in dotted lines in Fig. 7. At this point the cam roller 112 engages the releasing cam lobe 118 to release the grip of the gripping jaws 107 upon the unit 15a. Substantially at this moment the cam roller 133 of the ejector mechanism passes over the abrupt shoulder 137 of the cam 134 whereupon the ejector fingers 130 are given a quick ejecting action by operation of the ejector spring 136. At the instant of initiation of this ejecting action the free terminals of the ejector fingers 130 are positioned so as to engage the forward edge of the unit adjacent to the recess 103a of the cylinder as seen in dotted lines in Fig. 7. Due to this quick action the completed unit is stripped from the impression cylinder and ejected into the receptacle 131 as appears in Fig. 4. Following this ejection the ejector fingers 130 are gradually returned to their normal position for engagement with the unit jaw, shown in dotted lines in Fig. 7, by the cam surface 138 of increasing radius. It is held in this operative position by the concentric surface 140 until the cam shoulder 137 comes again into operative position.

Since certain changes may be made in the above construction and different embodiments of the invention could be made without departing from the scope thereof, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

Having described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In a machine of the character described, in

combination, means for feeding a long continuous strip with a step by step movement, intermittent gripping means for gripping and releasing the strip intermittently and holding it against longitudinal movement at periods corresponding to halts in the feeding movement, means for separating the strip into separate units during the intermittent periods of strip grip by said gripping means, and a continuously operating friction feeding means engaging the units beyond said gripping means so as to deliver the units upon release thereof by said gripping means.

2. In a machine of the character described, in combination, means for feeding a long continuous strip with a step by step movement, said feeding means including an intermittently driven series of feed pins which are engageable in apertures in the strip, means for gripping and releasing the strip intermittently and holding it against longitudinal movement at periods corresponding to halts in the feeding movement, including intermittent grippers positioned to engage and grip the strip at longitudinally spaced parts thereof, means for breaking the gripped strip at points thereof between said spaced grippers so as to form separate strip units, and means for delivering said separate units one after another upon release thereof by said gripping means.

3. In a machine of the character described, in combination, means for feeding with a step by step movement, a long continuous strip having longitudinally spaced transverse weakened severance lines, means for gripping and releasing the strip intermittently and for holding it against longitudinal movements at periods corresponding to halts in the feeding movement, including intermittent grippers positioned to engage and grip the strip at longitudinally spaced parts thereof and at opposite sides of the respective transverse weakened severance lines, a strip breaking element positioned between said grippers, and means for operating said breaking element to break the strip along said weakened lines between the grippers into units when held by said grippers.

4. In a machine of the character described, in combination, means for feeding a long continuous strip with a step by step movement, means for gripping the strip intermittently at periods corresponding to halts in the feeding movement, including grippers positioned to engage and grip the strip at longitudinally spaced parts thereof, a strip breaking element positioned between said grippers, a bed opposed to said grippers and having an elongated recess positioned transversely of the strip path and aligned with said breaking element, an elongated breaker block mounted for yielding retraction in said elongated recess, and means for operating said breaking element into engagement with the gripped strip opposite to said elongated breaker block to effect separation of the strip into units.

5. In a machine of the character described, in combination, means for feeding with a step by step movement a long continuous strip having longitudinally spaced transverse weakened severance lines for dividing it into units, means for gripping and releasing the strip intermittently and for holding it against longitudinal movements at periods corresponding to halts in the feeding movement, including intermittent grippers positioned to engage and intermittently grip the strip at longitudinally spaced parts thereof, a strip breaker positioned between said grippers, and means for operating said breaker in timed sequence with the grippers to separate the strip at the weakened lines thereof when held by said grippers.

6. In a machine of the character described, in combination, means for feeding with a step by step movement a long continuous strip having longitudinally spaced transverse weakened severance lines for dividing it into units, means for gripping the strip intermittently at periods corresponding to halts in the feeding movement, including grippers positioned to engage and grip the strip at longitudinally spaced parts thereof, a strip breaker positioned between said grippers and having a blunt breaking edge, a bed opposed to said grippers and having an elongated recess positioned transversely of the strip path and aligned with said breaker for receiving the edge thereof, and means for operating said breaker edge into strip breaking engagement with the gripped strip near the severance lines thereof and opposite said elongated recess to effect strip separation.

7. In a machine of the character described, in combination, means for feeding with a step by step movement a long continuous strip having longitudinally spaced transverse weakened severance lines for dividing it into units, means for gripping the strip intermittently during halts in the feeding movement, including grippers positioned to engage and grip the strip at longitudinally spaced parts thereof, a strip breaker positioned between said grippers, means for operating said breaker in timed sequence with the grippers to separate the strip at the weakened lines thereof when held by said grippers, and a separator block mounted for yielding movement in said elongated recess and cooperating with said breaker edge to effect strip separation.

8. In a machine of the character described, in combination, means for feeding a long continuous strip with a step by step movement, means for gripping the strip intermittently at periods corresponding to halts in the feeding movement, including grippers positioned to engage and grip the strip at longitudinally spaced parts thereof, a strip separating element positioned between said grippers, a bed opposed to said grippers and having an elongated recess positioned transversely of the strip path and aligned with said separator element, means for operating said separator element into engagement with the gripped strip opposite to said elongated recess to effect separation of the strip into units, and a continuously operating friction feed means engaging the units beyond said gripping means so as to deliver the units upon release thereof by said gripping means.

9. In a machine of the character described, in combination, pin feed mechanism having a longitudinal series of traveling feed pins for feeding engagement with feed apertures of a long continuous strip having longitudinally spaced transverse weakened severance lines for dividing it into units, means for driving said feed mechanism intermittently to effect step by step strip feed in steps corresponding to the spacing of said severance lines, intermittent gripping means for gripping the strip intermittently and holding it against longitudinal movement during halts in the feeding movement, and means for engaging and separating the strip along the respective severance lines into separate units during periods of strip grip by said gripping means.

10. In a machine of the character described, in combination, pin feed mechanism having a longitudinal series of traveling feed pins for feed-

ing engagement with feed apertures of a long continuous strip having longitudinally spaced transverse weakened severance lines for dividing it into units, means for driving said feed mechanism intermittently to effect step by step strip feed in steps substantially equal to the spacing of said severance lines, intermittent gripping means including longitudinally spaced grippers positioned to grip the strip, means for intermittently operating said grippers for gripping the strip forwardly and rearwardly of the severance lines and holding said strip against longitudinal movement during periods of halt of the feed mechanism, and means for engaging and separating the strip along said severance lines when gripped by said grippers.

11. In a machine of the character described, in combination, pin feed mechanism having a longitudinal series of traveling feed pins for feeding engagement with feed apertures of a long continuous strip having longitudinally spaced transverse weakened severance lines for dividing it into units, means for driving said feed mechanism intermittently to effect step by step strip feed in steps substantially equal to the spacing of said severance lines, intermittent gripping means including longitudinally spaced grippers positioned to grip the strip, means for intermittently operating said grippers for gripping the strip forwardly and rearwardly of the severanec lines and holding said strip against longitudinal movement during periods of halt of the feed mechanism, a strip separating element positioned between said grippers, and means for operating said separating element to separate the strip at the respective severance lines thereof into units when held by said grippers.

12. In a machine of the character described, in combination, pin feed mechanism having a longitudinal series of traveling feed pins for feeding engagement with feed apertures of a long continuous strip having longitudinally spaced transverse weakened severance lines for dividing it into units, means for driving said feed mechanism intermittently to effect step by step strip feed in steps corresponding to the spacing of said severance lines, gripping means including longitudinally spaced grippers positioned to grip the strip, means for operating said grippers for gripping the strip forwardly and rearwardly of the severance lines and holding said strip against longitudinal movement during periods of halt of the feed mechanism, a strip separating element positioned between said grippers, a bed opposed to said grippers and having an elongated recess positioned transversely of the strip path and aligned with said separating element, and means for operating said separating element into engagement with the gripped strip opposite to said elongated recess to effect separation of the strip at the weakened lines thereof.

13. In a machine of the character described, in combination, pin feed mechanism having a longitudinal series of traveling feed pins for feeding engagement with feed apertures of a long continuous strip having longitudinally spaced transverse weakened severance lines for dividing it into units, means for driving said feed mechanism intermittently to effect step by step strip feed in steps corresponding to the spacing of said severance lines, intermittent gripping means including longitudinally spaced grippers positioned to grip the strip, means for intermittently operating said grippers for gripping the strip forwardly and rearwardly of the severance lines and holding said strip against longitudinal movement during periods of halt of the feed mechanism, a strip breaker positioned between said grippers, and means for operating said breaker to cause separation of the strip at said severance lines when gripped by said grippers.

14. In a machine of the character described, in combination, pin feed mechanism having a longitudinal series of traveling feed pins for feeding engagement with feed apertures of a long continuous strip having longitudinally spaced transverse weakened severance lines for dividing it into units, means for driving said feed mechanism intermittently to effect step by step strip feed in steps corresponding to the spacing of said severance lines, intermittent gripping means including longitudinally spaced grippers positioned to grip the strip, means for intermittently operating said grippers for gripping the strip forwardly and rearwardly of the severance lines during periods of halt of the feed mechanism, a strip breaker having a blunt breaking edge with crests and depressions thereon and positioned between said grippers, and means for operating said breaker to cause separation of the strip at said severance lines when gripped by said grippers.

15. In a machine of the character described, in combination, means for feeding a long continuous strip with a step by step movement, means for gripping the strip intermittently and holding it against movement at periods corresponding to halts in the feeding movement, means for separating the strip into separate units during periods of strip grip by said gripping means, and a continuously operating friction feed means including a constantly operating friction feed roll and an idler pressure roll for pressing the units against said friction roll, said friction feed means being positioned beyond said gripping means so as to deliver the units upon release thereof by said gripping means.

16. In a machine of the character described, in combination, means for feeding a long continuous strip with a step by step movement, means for gripping the strip intermittently and holding it against movement at periods corresponding to halts in the feeding movement, means for separating the strip into separate units during periods of strip grip by said gripping means, a continuously operating friction feed means including a constantly operating friction feed roll and an idler pressure roll having a strip engaging facing of friction material for pressing the units against said friction roll, said friction feed means being positioned beyond said gripping means so as to deliver the units upon release thereof by said gripping means.

17. In a machine of the character described, in combination, means for feeding a long continuous strip with a step by step movement, means for gripping the strip intermittently and holding it against movement at periods corresponding to halts in the feeding movement, including grippers positioned to engage and grip the strip at longitudinally spaced parts thereof, means for separating the gripped strip at points thereof between said spaced grippers so as to form separate strip units, and a continuously operating friction feed means including a constantly operating friction feed roll and an idler pressure roll for pressing the units against said friction roll, said friction feed means being positioned beyond said gripping means so as to de-

liver the units upon release thereby by said gripping means.

18. In a machine of the character described, in combination, means for feeding a long continuous strip with a step by step movement, means for gripping the strip intermittently at periods corresponding to halts in the feeding movement, including grippers positioned to engage and grip the strip at longitudinally spaced parts thereof, a strip separating element positioned between said grippers, a bed opposed to said grippers and having an elongated recess positioned transversely of the strip path and aligned with said separator element, means for operating said separator element into engagement with the gripped strip opposite to said elongated recess to effect separation of the strip into units, and a separator block mounted for yielding movement in said elongated recess and cooperating with said separating element to effect strip separation.

19. In a machine of the character described, in combination, means for feeding with a step by step movement a long continuous strip having longitudinally spaced transverse weakened severance lines for dividing it into units, means for gripping the strip intermittently at periods corresponding to halts in the feeding movement, including grippers positioned to engage and grip the strip at longitudinally spaced parts thereof adjacent to said severance lines, a strip breaker positioned between said grippers and having a blunt breaking edge, a bed opposed to said grippers and having an elongated recess positioned transversely of the strip path and aligned with said breaker for receiving the edge thereof, means for operating said breaker edge into breaking engagement with the gripped strip near to a severance line and opposite said elongated recess to effect strip separation, and a separator block mounted for yielding movement in said elongated recess and cooperating with said breaker edge to effect strip separation.

20. In a machine of the character described, in combination, feed mechanism for feeding a long continuous strip having longitudinally spaced transverse weakened severance lines for dividing it into units, gripping means including longitudinally spaced grippers positioned to grip the strip, means for operating said grippers for gripping the strip forwardly and rearwardly of the severance lines during periods of halt of the feed mechanism, a strip breaker blade mounted for reciprocation between said grippers, a bed opposed to said grippers and having an elongated recess positioned transversely of the strip path and aligned with said breaker blade, means for operating said breaker blade into engagement with the gripped strip opposite to said elongated recess to effect strip separation along a weakened line thereof, and a separator block mounted for yielding movement in said elongated recess and cooperating with said breaker blade to effect strip separation.

21. In a machine of the character described, in combination, feed mechanism for feeding a long continuous strip including a traveling series of feed pins which are engageable in apertures in the strip to feed the same, gripping means having a spring to yieldingly urge it to grip said strip, a strip severing blade mounted for movement into severing engagement with the strip adjacent to said gripping means, and unitary operating mechanism controlling said gripping means to yieldingly grip the strip under influence of said spring and to subsequently move said severing blade to sever the strip, said unitary operating mechanism including differentially movable concentrically mounted links respectively operatively connected to said severing blade and to said gripping means.

22. In a machine of the character described, in combination, intermittent feeding means for feeding a long continuous strip with a step by step movement, a continuously operating feed mechanism having sliding frictional engagement with the strip and continuously operative for exerting a feeding pull on said strip, a strip severing device including a reciprocating severing blade interposed between said intermittent feeding means and said continuously operating feed mechanism and means for reciprocating said severing blade to exert intermittent severing pressure on the strip transversely of the plane thereof for severing the strip into separate units.

23. In a machine of the character described, in combination, intermittent feeding means for feeding a long continuous strip with a step by step movement, said feeding means including a traveling series of feed pins which are engageable in apertures in the strip to feed the same, a continuously operating feed mechanism continuously operative for exerting a feeding pull on said strip, a strip severing device interposed between said intermittent feeding means and said continuously operating feed mechanism for severing the strip into separate units, a strip gripping device adjacent to said strip severing device, and means for intermittently and sequentially operating said gripping device and said strip severing device.

24. In a machine of the character described, in combination, intermittent feeding means for feeding a long continuous strip with a step by step movement, a continuously operating feed mechanism continuously operative for exerting a feeding pull on said strip, a strip severing device including an elongated strip separating element interposed between said intermittent feeding means and said continuously operating feed mechanism, a bed opposed to said separating element and having an elongated recess substantially aligned with the separating element, means for operating said separating element into engagement with the strip during halts in strip feed caused by said intermittent feeding means for separating the strip into units, and a separator block mounted for yielding movement in said elongated recess and cooperating with said separating element to effect strip separation.

25. In a machine of the character described, in combination, intermittent feeding means for feeding a long continuous strip with a step by step movement, a continuously operating feed mechanism continuously operative for exerting a feeding pull on said strip, a strip severing device including an elongated strip separating element interposed between said intermittent feeding means and said continuously operating feed mechanism, a bed opposed to said separating element and having an elongated recess substantially aligned with the separating element, a separator block mounted for yielding movement in said elongated recess and cooperating with said separating element to effect strip separation, a strip gripping device adjacent to said strip separating element, and means for intermittently and sequentially operating said gripping device and said strip separating element for severing the strip into units.

HARRY E. SEELEY.

CERTIFICATE OF CORRECTION.

Patent No.2,331,351. October 12, 1943.

HARRY E. SEELEY.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 7, first column, line 24, claim 2, after "for" insert --engaging and--; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 7th day of December, A. D. 1943.

Henry Van Arsdale,
Acting Commissioner of Patents.

(Seal)