

March 21, 1944.

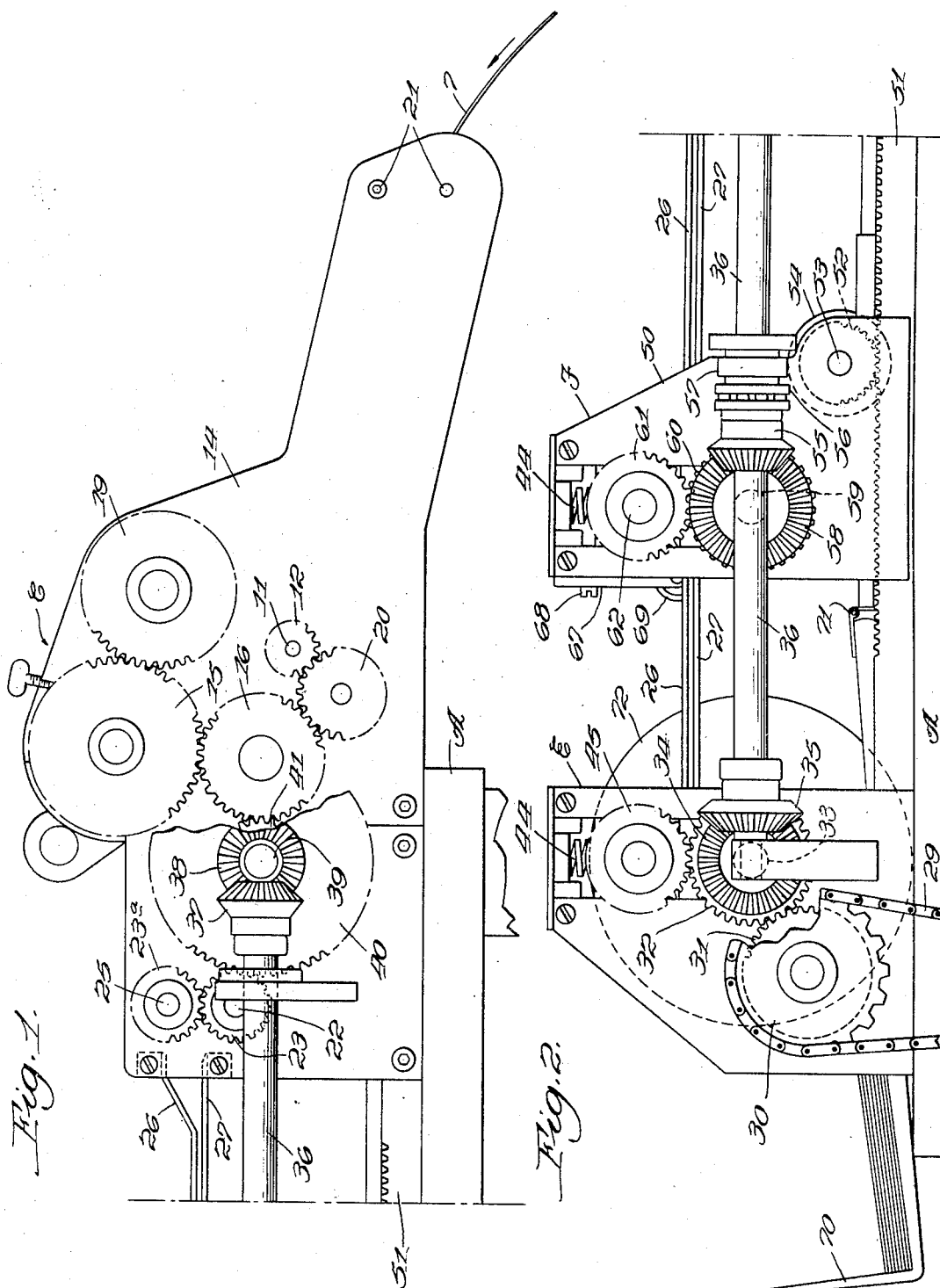
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2,344,720

PRINTING AND BURSTING MACHINE

Filed Oct. 18, 1941

4 Sheets-Sheet 1



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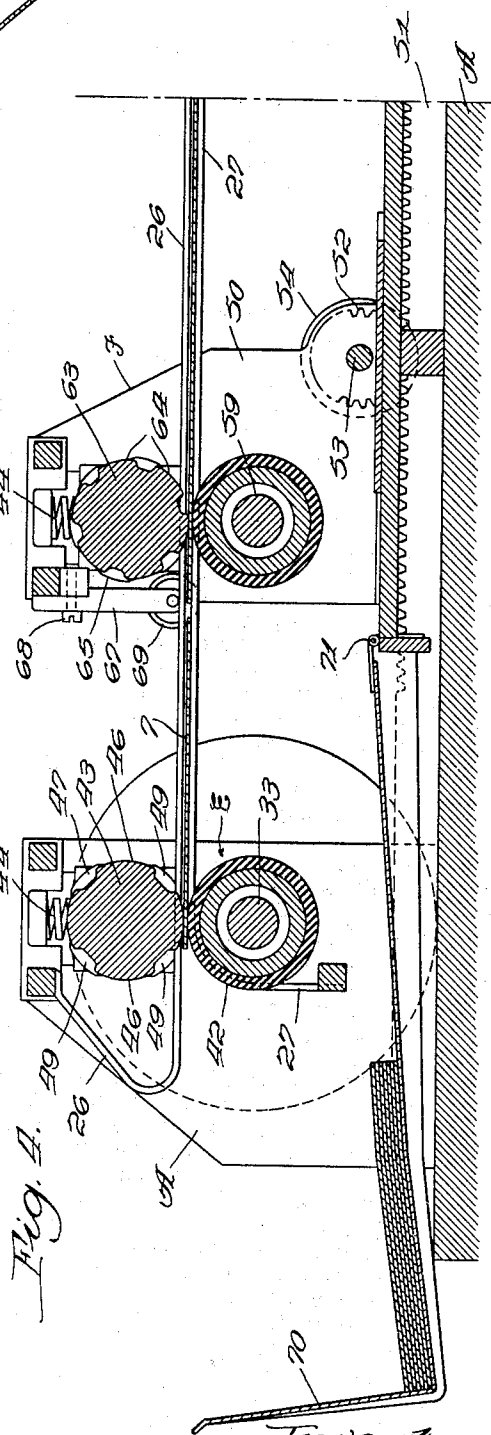
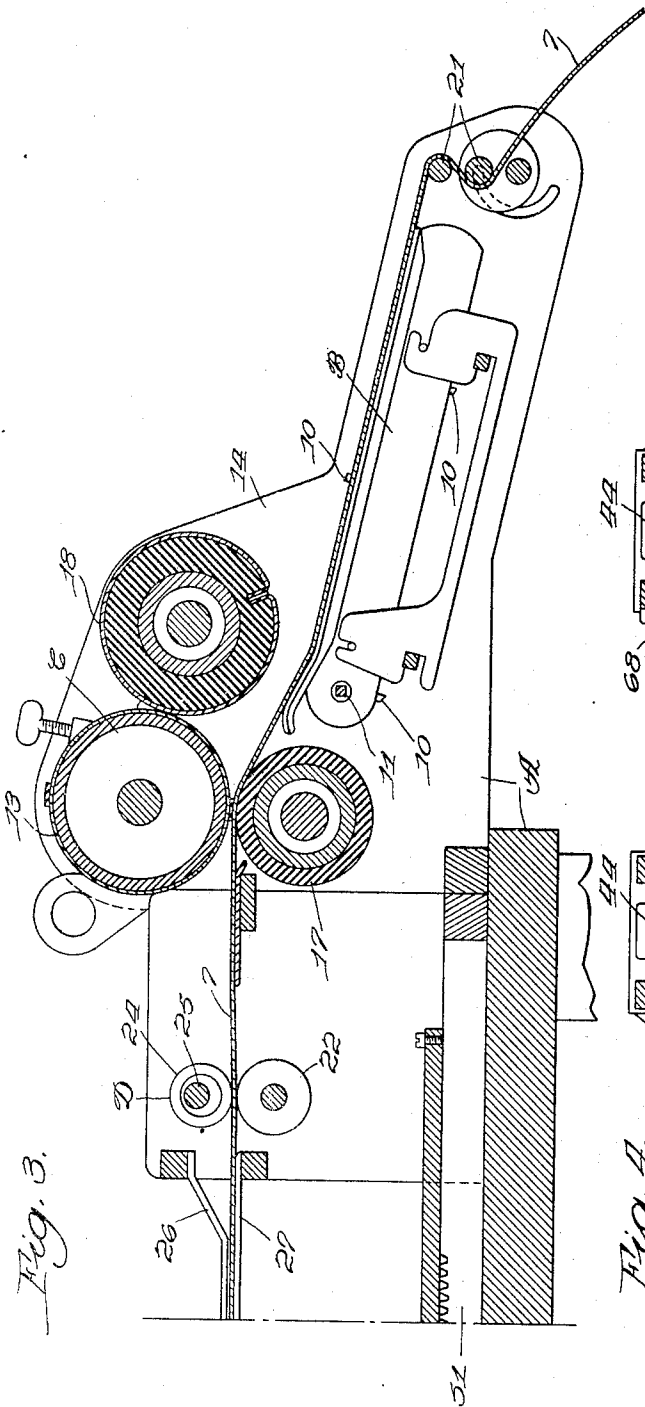
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PRINTING AND BURSTING MACHINE

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4 Sheets-Sheet 2



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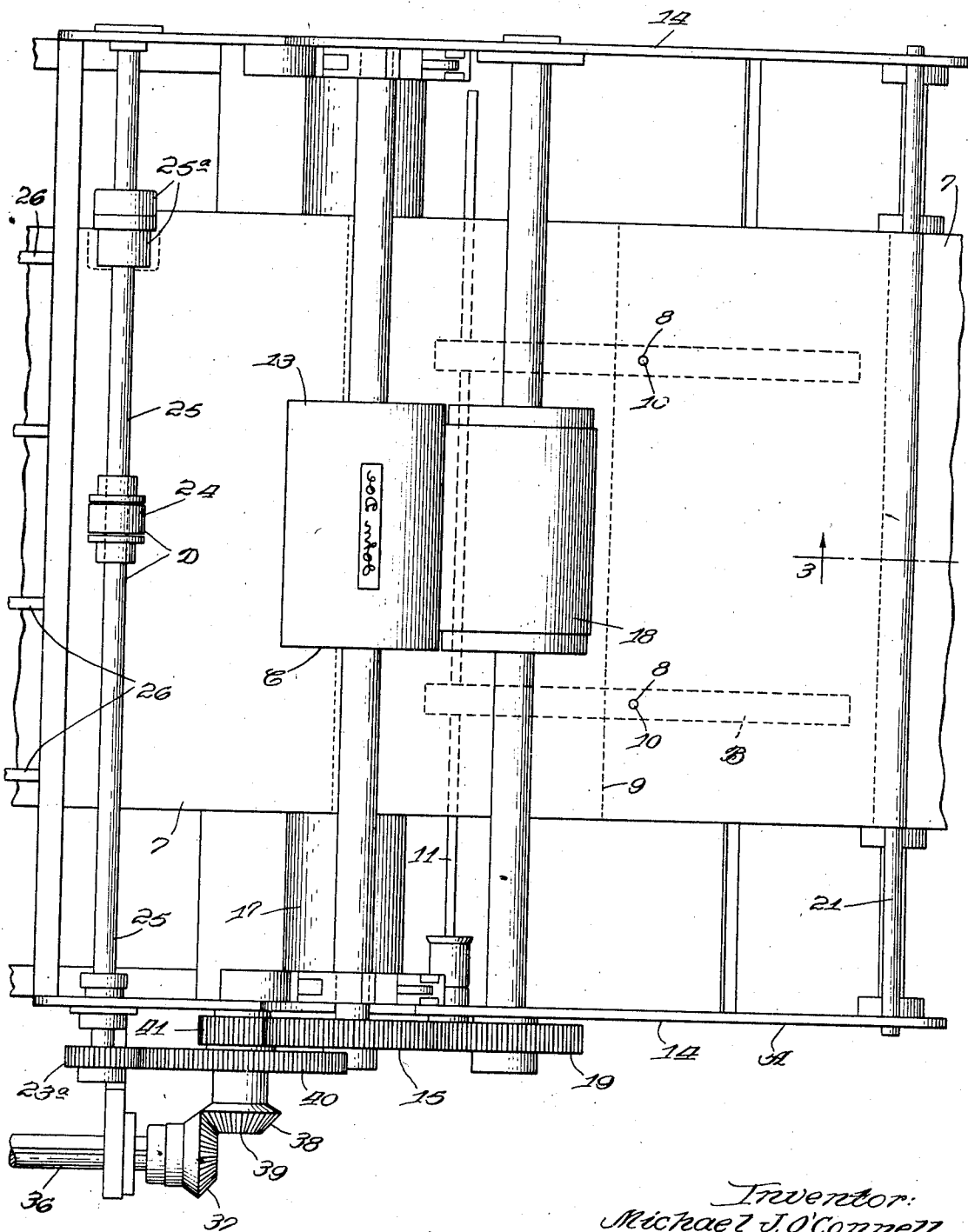
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4 Sheets-Sheet 3

Fig. 5.



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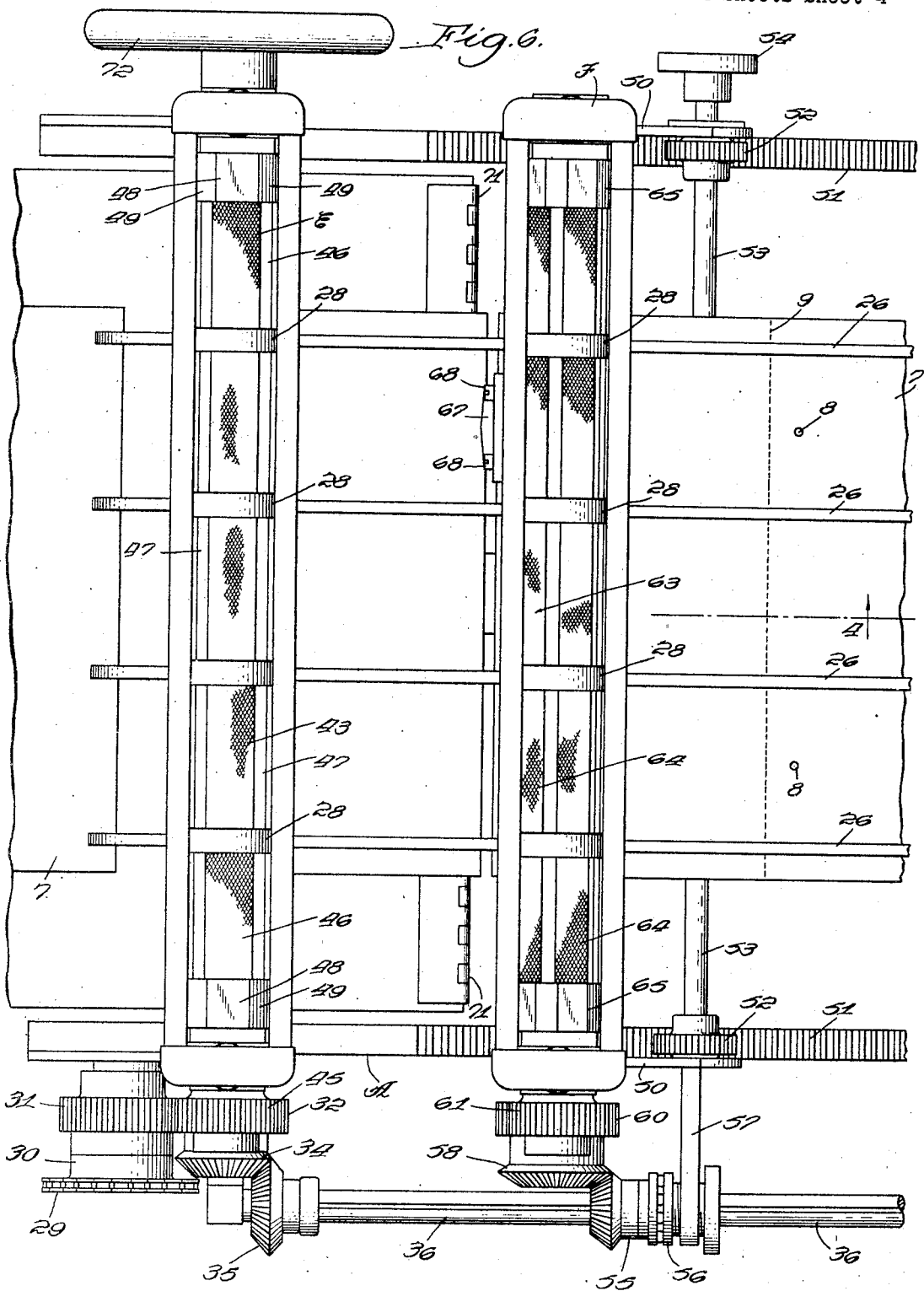
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PRINTING AND BURSTING MACHINE

Filed Oct. 18, 1941

4 Sheets-Sheet 4



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UNITED STATES PATENT OFFICE

2,344,720

PRINTING AND BURSTING MACHINE

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Application October 18, 1941, Serial No. 415,655

9 Claims. (Cl. 101-227)

This invention relates to printing and bursting machines wherein a signature or other notation may be printed on a continuous-form strip of stationery and then have the strip separated into separate forms.

The primary object of the invention is to provide a bursting machine so coordinated and timed with another machine, such as a printing device, that a strip of stationery may be moved continuously, in a direct route, through the bursting machine.

A further object of the invention is to provide improved sets of feed-rolls having gripping segments which periodically grip and release the advancing web, this operation occurring simultaneously in both sets of rolls, although the rear set of rolls is operating at a higher peripheral speed than is the front set of rolls.

Another object of the invention is to provide the ends of serrated gripping rolls with pressure-relieving sectors, so that vibration and chattering of the rolls, due to the periodic gripping action, will be reduced to a minimum.

Another object of the invention is to mount one set of feed-rolls in a shiftable carriage, so that the machine may be readily accommodated to handle various form lengths of continuous-form stationery.

Still another object of the invention is to provide an improved laterally adjustable deflecting guide-finger in the path of the tensioned stationery, so that the separation of the form along the line of weakening may be arranged to start at a desired position.

The invention is illustrated in preferred embodiments, in the accompanying drawings, in which—

Figure 1 is a fragmentary side elevational view showing the front or entry side of the machine containing the positive feeding and printing mechanism; Figure 2, a view similar to Figure 1 showing the rear or delivery portion of the machine; Figure 3, a fragmentary longitudinal sectional view of the front portion of the machine, taken as indicated at line 3 of Figure 5; Figure 4, a longitudinal sectional view showing the rear portion of the same machine with the feed-rollers of the bursting mechanism, taken as indicated at line 4 of Figure 6; Figure 5, a fragmentary plan view of the front end of the machine; and Figure 6, a fragmentary plan view of the rear end of the machine.

In the embodiment illustrated, A designates a main frame; B, a positive stationery feeding

device; C, printing mechanism; D, a frictional feed; E, rear feed-rolls; and F, a carriage containing a set of front feed-rolls.

The main frame A may be of any suitable construction and has a suitable top and standards for supporting the mechanism. The continuous-form stationery 7, which the machine is designed to handle, preferably is provided with feed holes 8 and lines of weakening 9 between forms.

The positive stationery feeding mechanism B is of the general type shown in Jensen Patent No. 2,130,015 in which endless belts provided with travelling feed pins 10 are driven in timed relation to the rest of the mechanism by means of a drive shaft 11 equipped with a gear 12. It will be understood that the pins 10 engage holes 8 in the stationery and completely control the advance of the strip 7 into the printing mechanism.

Machines of this type are particularly useful where it is desirable to perform some final operation on the stationery just before the continuous-strip is separated into separate parts. For example, payroll checks may be signed with an authorized stamp in such a machine, and forms or checks may be numbered as a final notation before being separated into separate parts. For this purpose printing mechanism C may be used.

A printing cylinder 13 is journaled in uprights 14 and is driven by a gear 15 which meshes with a gear 16 provided on the tympan roll 17. A suitable inking roll 18 is also journaled in the uprights 14 and is provided with a drive gear 19 which meshes with gear 15. As shown in Figure 1, the gear 12 of the positive feed mechanism is driven from the gear 16 on the tympan cylinder by means of an idler gear 20. Thus it will be understood that the stationery is drawn through a simple tensioning device 21 by the positive feeding mechanism B and is advanced through the printing mechanism, which periodically engages the stationery, under the complete control of the pins 10.

In order to advance the strip 7 into the bursting machine as quickly as permitted by the feeding device B, the frictional feed D is provided wherein a lower feed-roll 22, driven by gear 23, is provided to loosely engage the underside of the strip. A weighted roller 24 is loosely journaled on a shaft 25 driven by a gear 23a above the roller 22 so as to exert a slight pressure towards the lower roller 22 which is being driven with a greater peripheral speed than the advance of the strip under the influence of pins 10. If desired, shearing rolls 25a may be pro-

vided, as shown in Figure 5, to trim off the marginal edge portion of the strip 7. The friction device pulls the paper constantly and insures its advance when it is not positively gripped by the printing rolls and feeds it into a chute formed by a series of thin narrow strip guides 26, secured to the frame A, and a corresponding set of lower guides 27 which are also fixed to the frame. As will be understood from Figure 6, the feed-rollers of the bursting machine are provided with circumferential grooves 28 to clear the fixed guide strips extending between the rolls.

The rear set of feed-rolls E is driven by a chain 29 from a motor (not shown) which drives a sprocket wheel 30 provided with a gear 31 which meshes with a gear 32 on the lower feed-roll shaft 33. A miter gear 34 is also provided on the shaft 33 and drives a miter gear 35 on a longitudinally extending splined shaft 36 which is equipped at its front end, as shown in Figure 5, with a miter gear 37 which drives a miter gear 38 on a jack shaft 39. The jack shaft 39 is provided with a spur gear 40 to drive the gear 23 on the shaft 22 of the friction feed D. The jack shaft 39 is further provided with a spur gear 41 which drives the gear 16 on the tympan roll shaft.

The lower feed-roll has a yielding resilient surface formed with a coating 42 of rubber, or the like. The upper feed-roller 43 is yieldingly urged towards the lower feed-roll by means of a compression spring 44 in a well known manner. The roll is provided with a driving gear 45 which meshes with the gear 32 on the lower feed-roll shaft 33, so that the rolls operate at the same peripheral speed even though the rolls themselves are of different diameters. The lower roll has a larger diameter, so that the gripping segments 46 of the upper roll will not repeatedly strike the same area of the lower roll and in this way wear is distributed. Preferably, the gripping portions of the metal upper roll are knurled to prevent slippage. As will be seen from Figures 4 and 6, the gripping segments 46 are interrupted by axially disposed cut-away portions 47, and the stationery strips 7 will not be gripped when the grooves 47 are presented towards the lower roll.

In order to reduce chattering, vibration, and noise during operation of the rolls, due to the non-circular surface of the roll 43, pressure-relieving sectors 48 are provided near the ends of the roll. These sectors have segments 49 which bridge the circumferential spaces between the gripping segments 46 of the roll. As the sectors 48 are much narrower than the length of the segments 46, the segments 49 are made to extend outwardly a little beyond the segments 46 and will thereby be subjected to a greater pressure per square inch than are the gripping sectors 46 and will permit the upper roll to rotate more smoothly.

The front feed-rolls F are mounted in a carriage 50 which is adapted to slide along the top of the frame A which is provided with a rack 51 to be engaged by gears 52 on a shaft 53 so that the carriage may be moved to an adjusted position with respect to the rear feed-rolls E by rotation of a hand wheel 54. A miter gear 55 makes a splined connection with the power shaft 36 and bears against a thrust bearing 56 and an extension 57 of the carriage. The miter gear 55 drives a miter gear 58 on the lower feed-roll shaft

59. The shaft 59 is provided with a spur gear 60 which drives a spur gear 61 on the upper feed-roll shaft 62.

The upper front feed-roll 63 is somewhat similar in design to the rear upper feed-roller 43 except that more gripping segments 64 are provided and their contact areas are shorter because the rolls F are driven at a slower rate of speed by the gear 60 than are the rolls E driven by the gear 32. However, the upper feed-rolls are designed so that the segments 64 on the front roll 63 are gripping the strip at exactly the same time that the faster moving segments 46 on the roll 43 are engaging the strip. This difference in speed produces the tension in the strip or web which causes the front form length to become detached along the line of weakening 9. The front upper feed-roll 63 is also provided with pressure-relieving sectors 65 to reduce vibration and chattering, as explained in connection with the sectors 48.

As the advancing strip 7 is periodically released by the segments of rolls 43 and 63, its alignment is controlled by the pins 10 of the positive feeding mechanism B.

It is well known in the art that it requires less force to break apart a pair of forms along the line of weakening if the pressure can be applied so that the tear is started at one edge or the other. In the prior art this has been done by biasing the feed-rollers, by using spirally arranged segments, or by drawing the paper over a fixed guide so that the pressure is first applied at one extreme edge. In the present construction, a deflecting finger 67 is fastened to the carriage and is laterally adjustable thereon by means of screws 68. The finger has a roller 69 at its lower end which projects in the path of stationery travelling between the guides 26 and 27. By simple adjustment of the deflecting finger the tear may be made to start at the center of the sheet, at either edge, or at any point along the transverse line of weakening. This adjustment is particularly desirable because some forms also have a longitudinal line of weakening and it is not desirable to start the tearing at the transverse lines of weakening at the intersection.

As shown in Figure 4, a tray 70 is provided at the rear of the machine to catch the severed forms as they leave the rear feeding rolls. The tray may be hinged at 71 and be longitudinally adjustable to accommodate various form lengths.

As shown in Figures 2 and 6, a hand wheel 72 may be provided on the shaft 33 to permit the various gears to be turned by hand when setting the machine to handle a particular length of form. The feeding device B is readily detachable and may be replaced by a different size feeding device having the proper spacing between the pins 10 to accommodate a desired form length. When the machine is to be used with a different form length, the carriage with the rear feed-rolls is also adjusted so that there is slightly more than a form length of distance provided between the front and rear feed rolls. No other adjustments or settings are necessary unless it is desired to move the deflecting finger 67 to start the tear at a different point.

It will be understood that the printing roll C is readily removable and if it is not necessary to make additional notations on the forms before bursting, the machine will perform that function without the printing roll.

The foregoing detailed description has been

given for clearness of understanding only, and no unnecessary limitations should be understood therefrom for some modifications will be obvious to those skilled in the art.

I claim:

1. A printing and bursting machine of the character set forth: a frame provided with a power driven printing cylinder and tympan cylinder; feed means for positively engaging a strip of stationery and advancing it to said cylinders in timed relation to the rotation of the printing cylinder; a pair of front feed-rolls to grip the stationery advancing from the cylinders and a pair of rear feed-rolls driven in timed relation to said printing cylinder and the rear feed-rolls having a peripheral speed greater than that of the front feed-rolls; means for periodically releasing the grip of the front and rear feed-rolls on the stationery; and a friction feed for continuously urging the strip of stationery from the printing cylinder to the front feed-rolls.

2. A device as specified in claim 1, in which one of the feed-rolls in each pair of feed-rolls has gripping segments to provide the means for periodically releasing the web.

3. A device as specified in claim 1, in which one of the feed-rolls in each pair of feed-rolls has gripping segments disposed with respect to its companion roll and with respect to each other so that both pairs of feed-rolls are simultaneously in gripping or releasing position with respect to an advancing strip.

4. In a machine of the character set forth, a pair of feed-rolls for advancing a strip of material, said rolls being yieldingly urged together and at least one of said rolls being power driven, one of said rolls having a yielding surface and the other having axially extending peripheral gripping segments to engage periodically the yielding surface of the companion roll, and pressure-relieving sectors near the ends of the gripping roll, said sectors having segments extending slightly beyond the gripping segments and bridging the circumferential spaces between said gripping segments to reduce vibration when the rolls are operated.

5. A machine for automatically bursting a continuous web of stationery, advancing from front to rear into separate forms at lines of weakening between forms, comprising: a frame; a pair of front coacting feed-rolls journaled in said frame; a pair of rear coacting feed-rolls journaled in the frame with their axes disposed

parallel to the axes of the front feed-rolls and spaced at least a form-length therefrom; means for driving the rear feed-rolls in timed relation to and slightly faster than the front rolls; and a deflecting guide-finger mounted on said frame slightly in rear of the front feed-rolls and positioned to project through a desired point intermediate of the margins and into the direct path of a tensioned web travelling from the front to the rear feed-rolls and initiate tearing of the web at that point.

6. A device as specified in claim 5, in which the guide-finger is provided at its lower end with a small crowned roller to engage the web.

7. A device as specified in claim 5, in which the peripheries of one of the front and one of the rear feed-rolls are serrated at regularly spaced intervals to form gripping segments, said segments being disposed so that an advancing web will be gripped by a front and rear segment simultaneously.

8. In a machine for the purpose set forth, a frame provided with a pair of front feed-rolls for advancing stationery from front to rear and a pair of rear feed-rolls driven in timed relation with respect to the front feed-rolls and having a slightly greater peripheral speed, said feed-rolls having aligned circumferential clearance grooves, pairs of upper and lower guide members fixed to said frame and extending through the grooves in both sets of feed-rolls to provide a chute for stationery fed through the feed-rolls, and a deflecting guide-finger mounted on said frame, slightly in rear of the front feed-rolls and projecting into the path of stationery travelling through the chute between the marginal portions of said stationery in order to initiate tearing at the deflected portion of the stationery when said stationery is sufficiently tensioned.

9. In a machine for the purpose set forth, a frame provided with a pair of front feed-rolls for advancing stationery from front to rear and a pair of rear feed-rolls driven in timed relation with respect to the front feed-rolls and having a slightly greater peripheral speed, the peripheries of one of the front and one of the rear feed-rolls being provided at spaced intervals with axially extending gripping segments, said segments being disposed so that a web advancing through the chute will be gripped or released simultaneously by both sets of rolls.

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