June 28, 1955 P. E. KLEINEBERG ET AL 2,711,896

SIGNATURE GATHERING MACHINES

Original Filed June 28, 1947 4 Sheets-Sheet 1

Fig. 1.

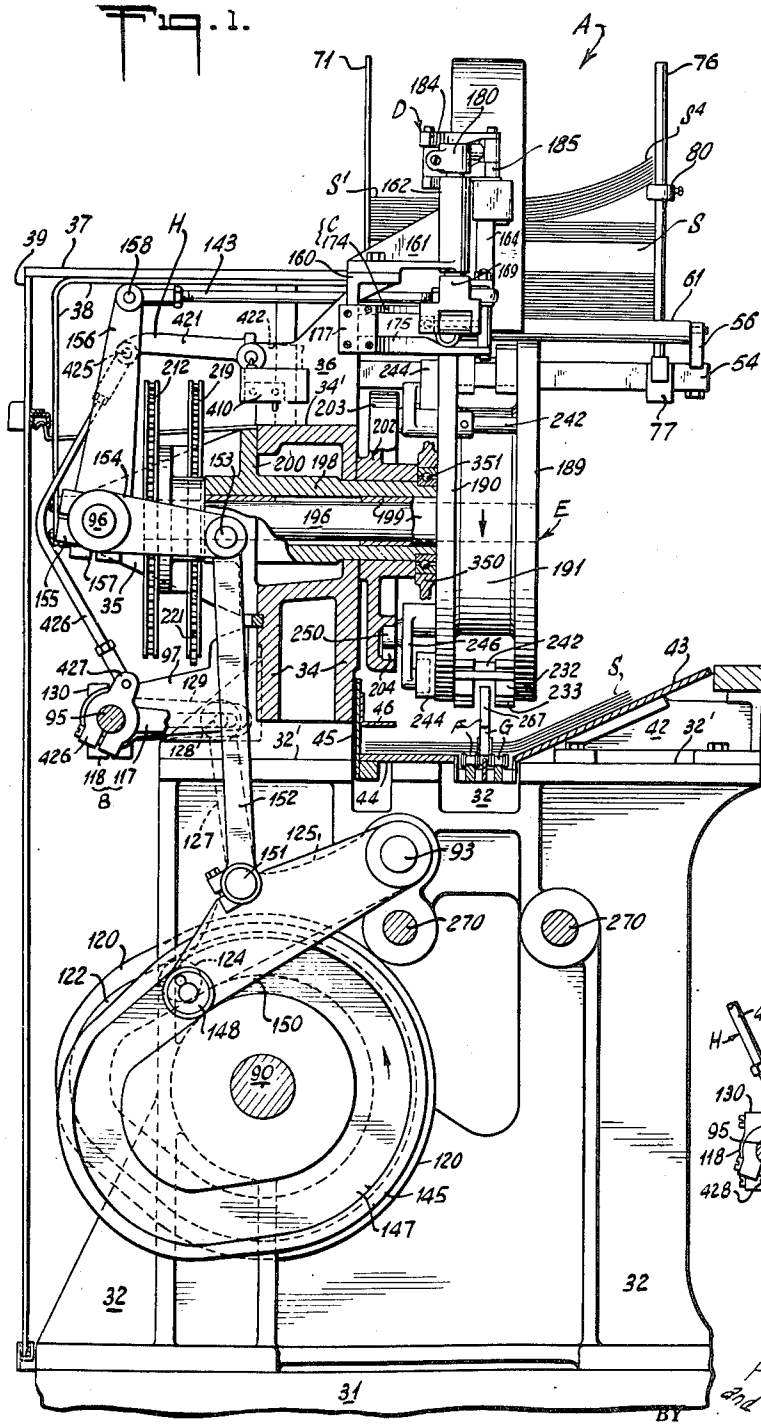

Fig. 2.

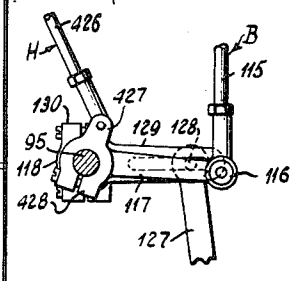

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Fig. 3.

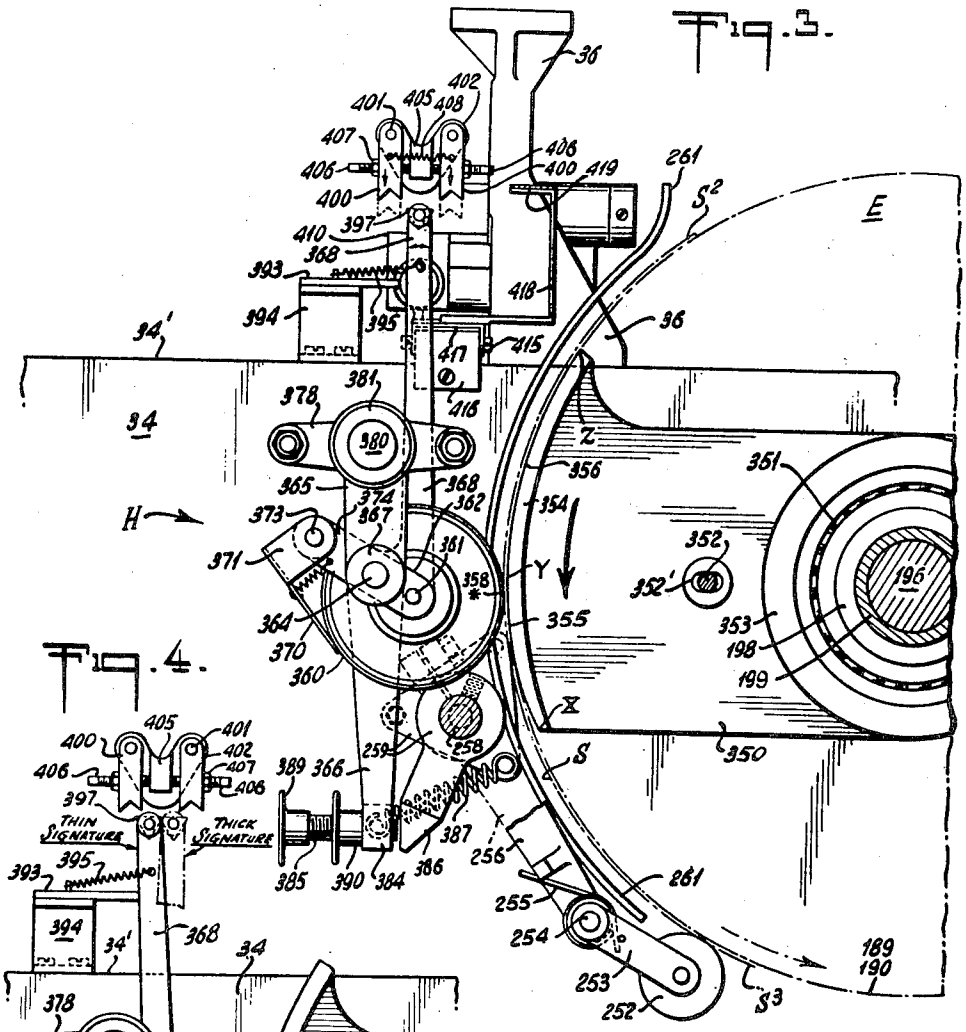

Fig. 4.

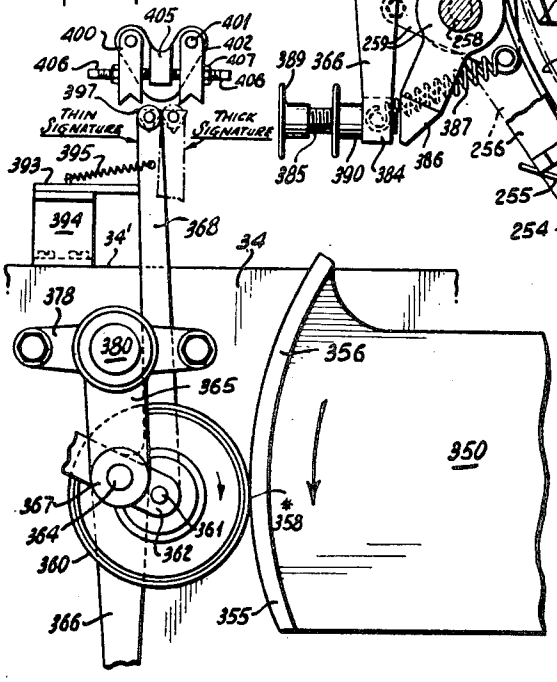

Fig. 4'.

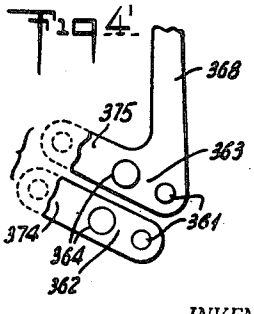

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Fig. 5.

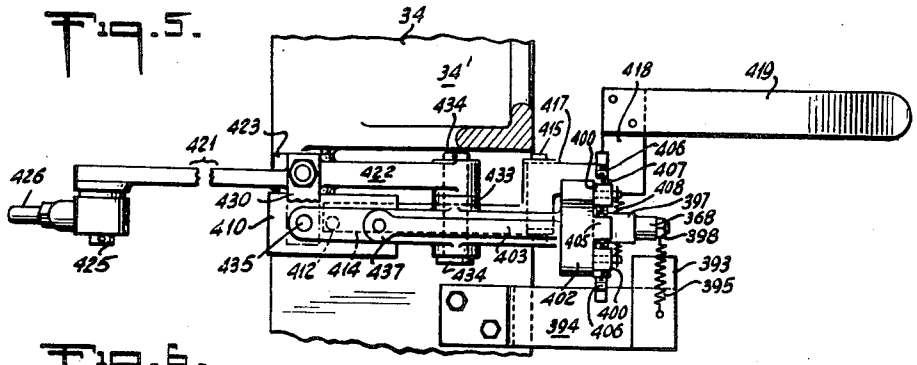

Fig. 6.

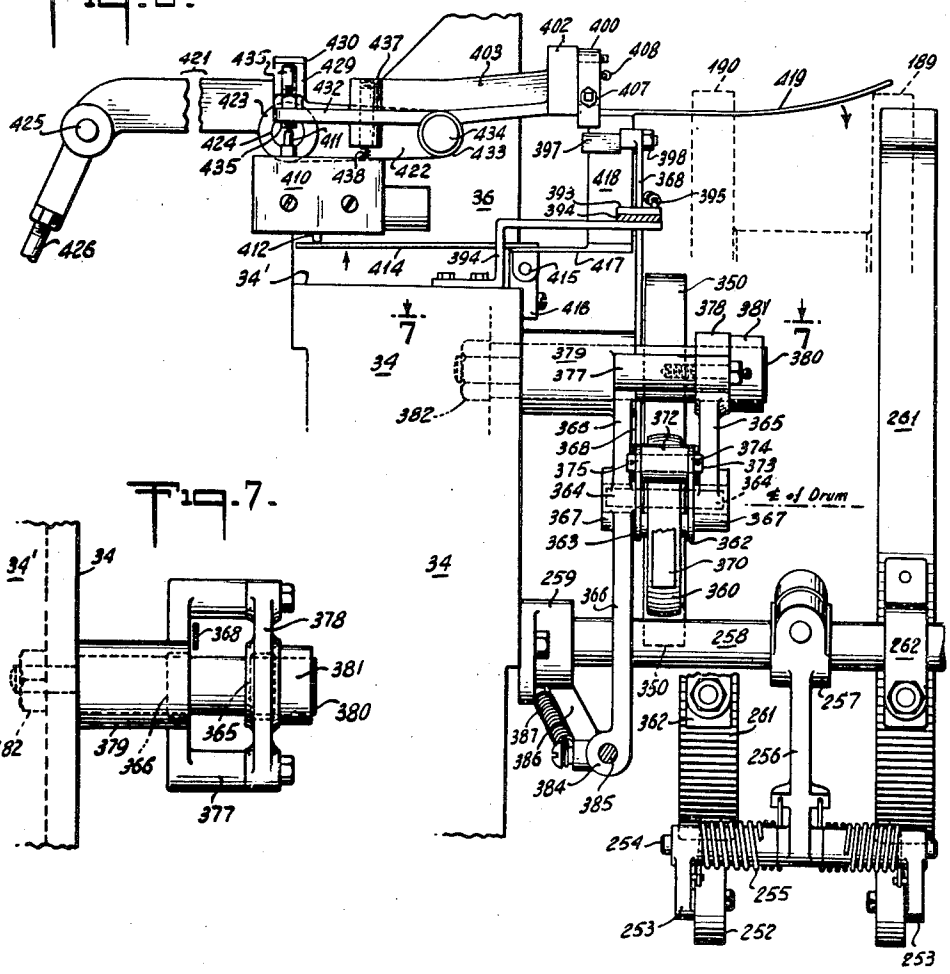

Fig. 7.

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Fig. 9.

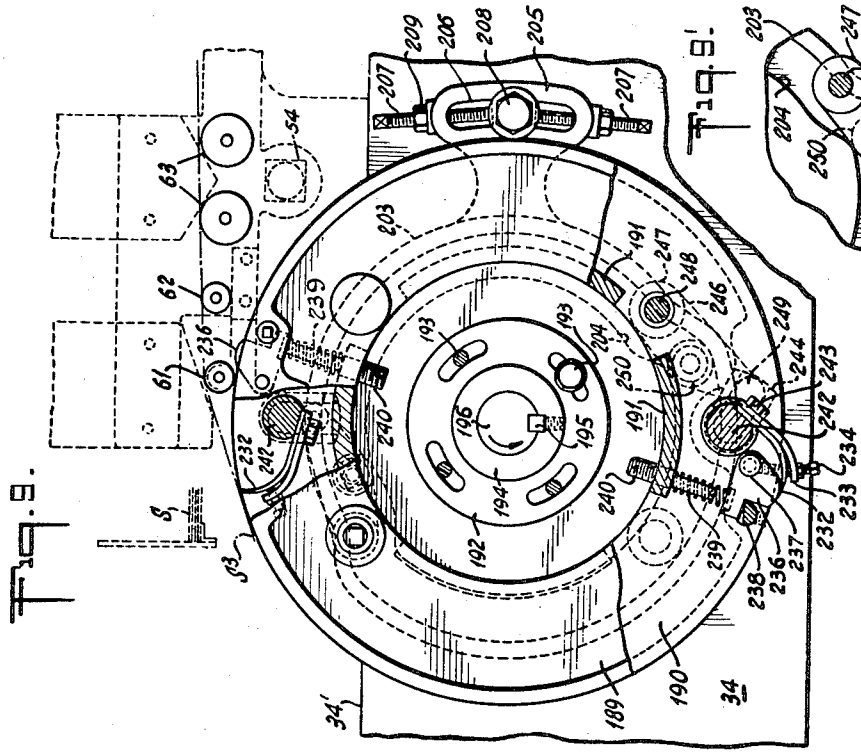


Fig. 9'.

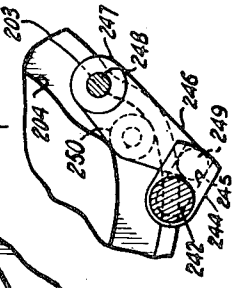
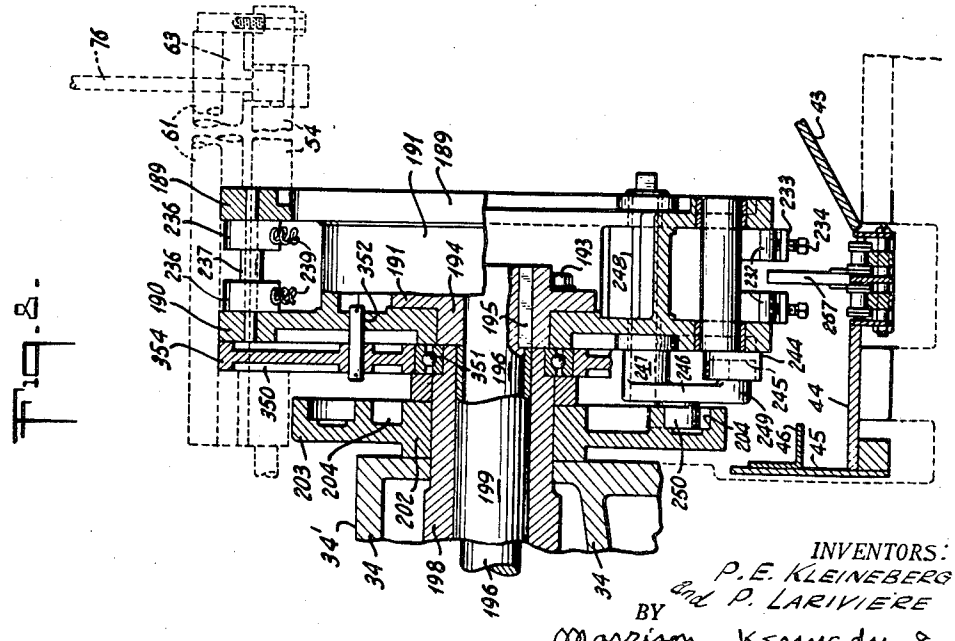


Fig. 8.



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SIGNATURE GATHERING MACHINES

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Original application June 28, 1947, Serial No. 757,846, now Patent No. 2,621,039, dated December 9, 1952. Divided and this application November 4, 1952, Serial No. 318,698

27 Claims. (Cl. 270—56)

This invention is an improved signature gathering machine, adapted for the extraction of signatures, which term includes single sheets, from a succession of stacks with discharge to a continuously advancing conveyor upon which the successive signatures become grouped and travel along to the delivery for further operations, such as attaching or stapling each group, so as to constitute a book or magazine, and in some cases applying covers thereto. This joint application is a division of a parent application filed June 28, 1947, Serial No. 757,846, now U. S. Patent No. 2,621,039, and is directed more particularly to the feature of detecting errors in the signature procession caused by absence of or defects in the signatures; mechanism being provided to this end and novelty being presented both in such mechanism per se and in its cooperation with the general and other features of the total machine. The invention is of special utility for the flatwise type of gathering as contrasted with "insert" or "saddle" gathering wherein the invention meets certain diffiulties. Also the invention is of most value when the extractor drum has two or more sets of grippers and an equal number of gaging segments.

Such mechanisms, for detecting and correcting defects, as by ejecting the erroneous signature groups, most commonly operate by gaging the thickness dimensions of the successive signatures, this means comprising what is known as a caliper, or gaging mechanism, operated or tripped to bring about the desired ejection or other control. In a rotary or drum type of mechanism and action to extract the signatures and transfer or advance them for deposit on the conveyor, the prevailing calipering action has been by means of the rotary drum as one contact and an opposing shiftable contact or roller bearing upon the extracting drum or the signature thereon; but in the long run this has proved unsatisfactory because not sufficiently reliable to meet practical demands.

A general object of the present invention is to afford a flatwise gathering machine of the rotary type having top speed of operation and yet possessing highly efficient detection and correction of defects coupled with long-lasting and reliable accuracy thereof. A particular object is to provide a controlling gage or calipering means of structure and operation obviating the mounting of the pair of gage members with one of them formed upon or attached to the drum; which arrangement could not provide the necessary precision and minute accuracy due to inevitable wear of drum shaft and/or bearings and consequent looseness with disturbance of the gaging contact relationship, so necessary in the handling of paper sheets.

Further objects and advantages will be stated or appear in the following description.

To condense description reference is here made to the parent case in a way to show the place of the calipering mechanism in the total combination. The reference numbers herein correspond with those of the parent case, but only those are specifically recited herein which are of value in describing this divisional case.

The parent case comprises, as drawings, Sheets 1 to 12 containing Figs. 1 to 24; whereas in this case are only Sheets 1 to 4 (1, 6, 7 and 8 of the parent), and Figs. 1 to 9′ (1, 2 and 11 to 17′ of the parent). The signatures and groups when numbered are designated S while the several parts of a single signature, when numbered, are designated S^1 to S^6.

The general frame and fixed parts of the machine, considerably shown in Fig. 1 and much shown in the parent sheets and figures not retained herein, are in general numbered in the number series 31 to 46.

In preliminary outline the machine contains, other than the general parts supra, a number of mechanical element-groups or mechanisms A to H arranged for cooperative action upon the signatures in the stacks and those extracted and those advancing through the gaging place toward the conveyor, to manipulate them into a procession of flatly gathered groups traveling onward toward delivery. These general elements bear numbers in the group 31 to 46, and shafts and other general parts in the group 90 to 99, for the details of which see the parent case.

Mechanism A is the elevated hopper means in each of the sections of the machine, supporting the signatures preferably flatwise; the details being shown in the parent case within the reference number group 49 to 89. Mechanism B is the suction detacher means, of which a full description is in the parent case, bearing references between 100 and 130. Mechanism C+D includes the separating devices by which each detached signature is swung away into reach of the extracting means, with auxiliary devices C and D, all shown in the parent case and bearing numbers from 135 to 187. Mechanism E comprises the extracting means, the rotary drum being thus used for transferring the signatures from the hoppers to the conveyor; and these parts, with the gripping means, drum drive and associated parts, appearing fully in the parent case with reference to numbers 189 to 262. Mechanism F is the traveling means conveying the accumulating groups to delivery; shown in the parent case with numbers 264 to 294. Mechanism G is a means for jogging and lining up the traveling groups, described in the parent case under the numbers 300 to 339.

Mechanism H is the detecting or calipering means described in the parent case and herein, and carrying reference numbers 350 to 438. Said detecting means, operable in each section upon each signature during its passage between hopper and conveyor, with caliper to gage the absence of a signature or a defect in the thickness thereof, is thereby adapted to afford any desired correction or control, such as the stoppage of the machine, together with showing a signal to indicate the location of the defect, or a rejection or sidetracking of the group.

Referring to the accompanying drawings, they comprise four sheets, these being Sheets 1, 2, 3 and 4, corresponding with Sheets 1, 6, 7 and 8 of the parent case. On these four sheets are Figs. 1 and 2 and 3 to 9′, corresponding with Figs. 1 and 2 and 11 to 17′ in the parent case. These four sheets hereof, carrying Figs. 1 to 9′, show an illustrative embodiment of the invention of this divisional case.

On Sheet 1, Fig. 1 is a general lefthand elevation, partly broken away in vertical section through one of the drum shafts; while Fig. 2 is a lefthand elevation of a detail of the Fig. 1 structure.

On Sheet 2, Fig. 3 is a front elevation of the detector means including the calipering mechanism and certain adjacent parts. Fig. 4 is a similar view of the gaging members and the parts immediately actuated through them, showing positions thereof different from those in Fig. 3; while Fig. 4′ is an exploded view of a detail thereof.

On Sheet 3, Fig. 5 is a partial top plan view of Fig. 6, which latter is a lefthand elevation of the detector mechanism, including the parts shown in Figs. 3 to 5 and certain additional parts; and Fig. 7 is a top plan view of a detail thereof.

On Sheet 4, Fig. 8 is a lefthand elevation of the drum, which, as in Fig. 1 is partly broken away in section through one of the drum shafts, showing details of the drum structure; while Fig. 9 is a front elevation thereof partly broken away, and Fig. 9′ is a similar partial view of a detail thereof.

After the separation and extraction of each signature by its leading edge S^3 it is transferred around and down for discharge to the conveyor, so that the conveyed signatures, and the groups thereof, are by this invention pushed advancingly by their trailing head ends S^2, while their back side edges travel or slide along upon the conveyor trough or raceway in contact with a gaging shoulder or wall; so that the back edges S^1 and the head ends S^2 become the gaging or aligning edges for the accumulating signatures in each group, which may be jogged into alignment in each conveyor section thus affording uniformity of assembled condition of the successive groups emerging from the final delivery.

Terms of position or direction, such as front and back, left and right, herein used for facility of description, are not intended as limitations. In Fig. 1 the righthand side of the figure is considered the front, whereat the attendant can best observe the signature and operations; so that Fig. 1 is a lefthand view, partly in section. Likewise, the longitudinal conveyor is designated as traveling rightwise as seen from the front, wherefore the extraction direction is generally the opposite, or leftwise from the stack, although obviously the entire design might be reversed.

Taking Fig. 1 as the main drawing, this shows at least some of the parts of each of the component mechanisms A to H. Thus in addition to the sectional bedplate **31** and other fixed or frame parts, Fig. 1 shows at the top the hopper or stack mechanism marked A, containing supplies of signatures S. A minor portion of the suction detaching mechanism seen in Fig. 1 is marked B; its general principles of action being conventional. The separator means C, D is so marked in Fig. 1 as to its signature edge depressing mechanism C and its stack lifting mechanism D. The extracting drum is well shown in Fig. 1, marked E; and this element appears in other figures, especially Figs. 3, 8 and 9. The conveyor mechanism is marked F in Fig. 1, showing the trough with its rear and front supporting plates and the endless conveyor chain with its group-thrusting pins. Likewise the group-jogging mechanism, marked G, is seen in Fig. 1, cooperatively adjacent to the conveying mechanism. Finally, the detecting or calipering mechanism, marked H, is represented in Fig. 1 by certain of the active parts thereof; and this is shown more completely and with details in Fig. 3 to 9′ inclusive. The parts not fully shown in the figures thus described are more fully shown in the parent case.

Above the bedplate **31** are heavy frame pieces and subordinate fixed members, giving support to various parts and brackets on which are mounted the various mechanisms of the machine. In each gathering unit are two or more upright cross walls **32**, with top supporting surfaces **42′**. Other uprights **33** include frame legs, columns and the like. There are also longitudinal frame members, acting as girders and supports, and extending between and beyond the cross walls; a main one of these in each unit being a hollow longitudinal frame piece or casting **34** resting atop the cross walls, this by its top surface **34′** giving support to various brackets etc. and interiorly carrying the bearings for the shafts of the extractor drums in each unit. To the rear of the horizontal frame piece **34** are triangular extensions **35** serving as rockshaft bearings, while above **34** is an upward extension piece **36**, centrally located to serve as an underlying support to other fixed and movable parts.

Among the longitudinals at the rear is a flat loading shelf **37**, Fig. 1, whereon operatives may preliminarily store and arrange batches of signatures to be transferred to the hoppers A directly in front thereof. The shelf is supported by strips **38**, while at the rear below the shelf is an enclosing panel **39**. A series of brackets **40** is secured atop wall **32** at the front, and these give support to a longitudinal continuous front board **41**, or working shelf, at which operative may effect corrections when errors of operation have caused the stoppage of the machine.

The conveyor comprises usually a trough or raceway **43** together with a traveling chain with pins protruding upwardly at a midway point, comprising opposite fixed continuous plates, the front plate **43** being inclined upwardly frontly while the rear plate **44** may be flatwise, the chain running in the space or slot between them. The accumulating signatures, overlying the supporting plates **43**, **44** have their back edges running longitudinally along the trough back wall **45** as a gage, which wall is preferably upright and carries a series of short angle pieces **46** whose horizontal portions overlie the signature edges and act as guards preventing displacement, the spaces between angle pieces accommodating the discharge of the signatures from the drum to the supporting plates **43**, **44** below. Longitudinally beyond the conveyor may be conventional supports and group advancing means (not shown) conducting the group procession to a binding machine or other destination.

The hopper A is largely shown in the left view Fig. 1. There is but little importance to the hopper details as related to the present invention. The signatures rest flatwise on the hopper floor and are pulled out leftwardly to travel part way around the drum and to discharge; but any fast-operating type will serve.

Coming to the main cam shaft **90**, this is longitudinal and supplies the driving force for the various mechanisms in the several sections or units of the machine. It takes its bearings in the cross walls **32** and **33** near the ends of the machine. This shaft may turn counterclockwise as seen from the left. Above the main shaft, and to the front is an axle **93**, preferably fixed and serving also as a frame rod. Well above shaft **90** and axle **93**, and rearward thereof in each unit, is a longitudinal rockshaft **95**, and somewhat thereabove there is a second rockshaft **96**; these rockshafts constituting parts of different trains of mechanisms. The upper rockshaft **96** takes its bearings in the triangular rear brackets **35** constituting extensions of the heavy longitudinal frame member **34**, while attached rear brackets **97** give bearing to rockshaft **95**. The main shaft is power driven and preferably makes one rotation per cycle, that is, two rotations per second if the output is one hundred and twenty signature groups per minute.

The suction detaching means B here needs no description, being fully described in the parent case as to structure, operation and function.

Coming to the separator mechanism this, as already explained, comprises two separate but closely associated mechanisms, C the signature edge depresser means and D the stack lifting means. The details and operations of these separator elements need no explanation at this point. They place each signature in position to be gripped and extracted by the drum E.

The extractor mechanism E comprises, cooperative with the caliper means to be described, a generally conventional drum of the open or skeleton type, with grippers adapted to grip each lowest signature in the hopper for extraction, transfer and discharge to the conveyor. The drum is built of front and back disks **189** and **190** connected by an interrupted cross web **191**, and it rotates about a transverse axis in counterclockwise direction, looking from the front, so that the extraction is generally leftwise, opposite to the rightwise travel of the conveyor

below. The drum uses the principle of multiple gripper sets, two such sets being mounted oppositely on the drum periphery, which therefore in its drive is geared down to rotate at half the speed of the main shaft. The drum is best shown in Figs 1, 8 and 9, rotated by suitable drive means. Surrounding the drum shaft, but freely rotatable by reason of a ball bearing **351**, is shown a member **350** of the calipering mechanism, adjacently to the rear of the drum, to be further described.

The illustrated open drum structure, for each section of the machine comprises the aforesaid circular side disks **189** and **190** at the front and rear sides, with the cross web **191** interconnecting them about midway between the drum periphery and center. Interiorly arranged, as a separate casting, is a circular or hub member having an outstanding flange **192** which is attached by bolts **193** to the inner side of the rear drum disk **190**; and said circular casting has also a cylindrical flange **194** extending rearwardly where it is firmly connected by a key **195** to the rearwardly extending drum shaft **196**.

The bearing for the rotary shaft **196** comprises a cylindrical cast piece or sleeve **198**, surrounding the shaft, with one or more bushings **199** interposed. The bearing sleeve is formed with an outstanding flange **200** which is bolted against the rear side of the hollow longitudinal frame casting **34**. By way of spacing the drum correctly frontwards of the hollow frame piece **34** there are shown certain spacing members between the frame piece and drum. One of these comprises a hub **202** immediately surrounding the bearing sleeve **198** in front of the frame piece, this conveniently being the hub of a stationary but adjustable gripper operating cam or disk **203** formed with a cam groove **204** at its front side cooperative with the gripper connections yet to be described. Other spacing elements are indicated in Figs. 1 and 8 substantially filling the space between the drum and the frame casting **34**.

For adjusting the fixed position of the gripper cam **203**, thereby to give accurate timing of the gripper closing actions, there is shown in Fig. 9 a radial extension **205**, which is concentrically elongated and formed with a slot **206**, within which slot are located opposite adjusting screws **207** bearing upon a central stud **208** outstanding from the frame wall **34**. By loosening one of the screws **207** and taking up the other, the angular position of the cam member **203** may be set as desired, and the adjustment fixed by means of lock nuts **209** near the outer ends of the adjusting screws.

The driving of the several drum shafts in unison may be in various known ways, such as by the use of bevel gears, which have proven unsatisfactory, and the following disclosure is found to improve the accuracy and efficiency of drive. This mechanism is shown in the parent case and partly herein. Each drum shaft extends through the longitudinal casting **34**, with its ends projecting rearwardly therebeyond. The plan disclosed is a particular use of sprocket gearing; each pair of the two pairs of drum shafts in each unit being thus geared together, this arrangement being supplemented by power drive through a third sprocket gear train operating upon one of the two drum shafts of each of said pairs. See parent case for details. A common drive is preferred for the two pairs of sprocket wheels in each section.

Referring further to the drum and its two gripper sets, Figs. 1, 8 and 9, each gripper comprises its swingable jaw **232** cooperating with a fixed abutment **236**, the jaw being shown open at the upper side of Fig. 9 and closed at the lower side. Means for adjusting the pressure of each gripper jaw when closed against the abutment is desirable but not necessary to describe. The abutment **236** also is adjustable by swinging about a pivot **237**. The abutment is held swung outwardly against its stop stud **238** by means of a strong compression spring **239** extending between the swingable end of the abutment and one of the portions of the cross web **191** of the drum. Further details are explained in the parent. The gripper jaw **232** and its back finger **233**, these are mounted upon a gripper spindle **242**, which extends through both disks **189** and **190** of the drum, in which it takes its bearing. Operating connections are provided for swinging the gripper jaw. Each gripper in each cycle has to be swung through an angle of the order of 135°, the upper gripper being shown in readiness to swing over to the abutment **236** to grip the leading edge of the lowermost signature, as the gripper device passes the gripping point. The gripper swing has to be a quick action, bringing the jaw against the outer surface of the abutment while the signature edge S^3 is between them. These gripper movements, by which the jaws are closed at one point of time and are thereafter opened for the release and discharge of the signature, are herein brought about by means of a cam lever **246** and connections operated therefrom, along with various details not herein described.

The start of each retraction of the jaws of each gripper pair effects the immediate release of the signature leading edge, and this is timed to bring about the discharge of each signature to the proper conveyor section beneath. In order to insure the continuance of the travel of the signatures it is desirable to employ idler rollers **252** pressed resiliently against each signature somewhat short of the discharge point, thus to hold it frictionally against the drum disks, compelling the signatures to continue the advance with the rotation of the drum. An efficient arrangement for this purpose is shown in Figs. 3 and 6. Each of the pair of rollers **252** is mounted at the low end of a swingable arm **253**, and these arms are fulcrumed at the ends of a cross rod **254**, which also gives support to a pair of coil springs **255**, one for each idler roller, to press the arms and rollers toward the drum as described. These parts are shown mounted upon a fixed depending bracket arm **256** which, at its upper end, has a hub **257** clamped upon a fixed transverse stud **258** projecting frontwardly from a socket or collar **259** bolted to the front side of the longitudinal frame casting **34**. A desirable feature associated therewith consists of a pair or set of guide strips **261**, mounted upon any convenient fixed part, such as the stud **258**, these strips being spaced slightly outwardly from the drum, opposite to the respective drum disks **189** and **190**; this expedient insuring that the traveling signatures will not become loose or depart materially from the surface of the drum, in which the idler rollers **252** cooperate. The preceding description of signature and gripper cooperation is of value in view of the close proximity thereof and their cooperation with the calipering mechanism and operation to be described.

The next mechanism of the machine is the signature conveyor means F, including an endless traveling chain with group pushers, shown in Fig. 1 only and in the parent case. As the calipering of each signature has been completed before the discharge from the drum to the conveyor, no detail description appears necessary of the conveyor and its travel. Similar remarks apply to the jogger mechanism G, comprising jogger chains cooperating with the conveyor chains, shown in the parent case. The train of mechanism thus described for the conveyor chain delivers, from the main shaft, the desired steady travel of the conveyor chain at a speed such that each chain section, in front of each pusher pin, will travel the distance between two hoppers or gathering sections in the period of a single cycle of gathering action.

Coming next to the detector mechanism H, both per se and in cooperation with the detacher B, the separator C. D, the extractor E and the conveyor F, and each of these; this comprises essentially a caliper or gaging means for feeling and determining the thickness of each signature which is handled, or the absence of signature; this detecting means operating between the concentric peripheral surface of a wheel, segment or sector turning in cooperation with and adjacently to a drum and to an opposed roller contact; such drum being preferably the rotary ex-

tracting member E, and the effect of the gaging action being transmitted to a responsive means such as a trip device which, when operated or tripped, acts to throw a switch or relay to effect a desired control as the stoppage of the machine and to operate a signal showing the location of the inaccuracy in a signature or group.

The primary or characterizing element of this feeler mechanism may be considered as the contact wheel or sector (or pair of sectors) 350 located adjacently alongside of or coaxially with the rear disk 190 of the extractor drum, shown in Figs. 1 and 8 and referred to in previously describing the drum, the sector being an element apart from the drum itself. This special contact wheel 350, or the concentric sectors which compose it, and their common hub, were described as freely rotatable by the provision of a ball bearing 351 surrounding the drum shaft bearing piece 198 and held in position as one of the spacing elements between the drum rear disk 190 and the frame casting 34. For the substantially complete avoidance of vibration and wear the gaging wheel 350 is thus mounted to rotate independently of the drum; for if the gaging wheel were attached to the drum it would partake of all vibrations and other inaccuracies produced by unbalance or by looseness and wear of the mountings of the drum. At the same time the gaging wheel should rotate substantially with the drum, or at the same mean or average pace, so that each of its peripheral gaging surfaces will travel around in coordination with the drum and with the signature under extraction, for the gaging of such signature. The rotation of the separate segment wheel 350 therefore is effected from the drum or its shaft, by connecting means or links, as by means of a floating short interconnecting pin 352, having an engagement with both the drum and the double segment, which engagement is more or less loose rather than rigid and yet is adequate as a driving means operated by or with the drum to turn the gage wheel, this loose fitting of the parts being indicated in Figs. 3 and 8, the pin operating in a radially elongated slot 352'.

Passing to Figs. 3 to 7, the calipering double segment or wheel 350 is shown as formed with a hub 353 between which and the bearing piece 198 is the ball bearing 351. At its periphery each of the segments has a widened rim 354 of substantial angular extent and this rim may be considered as comprising a tapered extent 355 of approach or outward slant from the point marked X to the point marked Y on Fig. 3, this being smoothly followed by a concentric gaging surface 356 running from the point Y to the point Z, this latter surface being ground to high concentric accuracy, comprising as it does one of the opposed gaging or contact members 350 and 360 of the caliper which must detect the presence or absence of minute thicknesses such as those of paper. The eccentric surface rise 355, merging into the gaging continuation 356, prevents shock as each signature enters between the opposed members. The gaging point 358 is marked with a star, being the point of tangential contact between the segment, or the signature thereon and, outwardly thereof, the gaging roller 360, comprising the other contact element of the gage.

The gaging roller 360 is preferably slightly crowned or convexed, as indicated in Figs. 3 and 6, thus to avoid a too extensive gaging contact, while at the same time avoiding a line contact between the crowned surface of the outer gage member 360 and the cylindrical surface of the inner member 350. The gage roller 360 can turn freely on a central fulcrum or pin 361, and this bearing pin extends not only through the roller but through front and rear short arms 362 and 363, which embrace the roller, and which extend at a downward slant from a fixed pivot pin 364 which in turn extends between a short front drop bracket 365 and a similar but longer rear bracket 366, both of which are stationary during operation although being movable in unison for adjustment purposes as will be explained. Extending upwardly from the rear end of the fulcrum pin 361 of the roller, and attached rigidly thereto is a long upright arm or lever 368, this preferably being an extension of the rear short arm 363, the upper end of the long vertical arm 368 being arranged to take part in the tripping action to be described. See Fig. 4'.

Thus great multiplication of gaging effect is afforded. The fixed axis of pin 364, the axis of pin 361 swingable by the signature, and the top of tall lever arm 368, form a triangle which swings amply at its upper corner so as to operate the trip with but a small difference in signature thickness. The gage roller, ground for high accuracy, is rotated by the travel of the signature against it. The ratio of the length of lever 368 above pivot 364 to the distance the fulcrum 361 lies below 364 may be 16 to 1, representing the multiplication.

Departing from the gaging action, an auxiliary expedient to minimize inaccuray consists in a light scraper 370 that is mounted to bear upon the periphery of the gaging roller 360 thereby to maintain clean the roller surface against the accumulation of lint or other foreign matter. The scraper is shown as a piece of thin strip material, and it is supported by strips or bent portions 371 extending from the scraper to a cylindrical support 372 pivoted by means of a cross-pin 373 upon a pair of arms 374 and 375, front and rear, which are preferably continuations, at an upward leftward slant, of the short arms 362 and 363 between which the fulcrum pin 361 of the gage roller is mounted. The light pressure of the scraper upon the rim of the roller may be maintained by the gravity of its own weight or by an added spring.

Reverting to the mountings of the gage roller 360, and the long upstanding trip lever 368, which latter may be considered as the primary or lower member of the trip device cooperating with the secondary or upper member to be described, the depending bracket arms 365 and 366 have been described as supporting the pivot or axle 364 about which the parts 363 and 368 swing by the action of a signature on the segment 350. The respective drop brackets are formed with opposite bosses 367 in which the horizontal axle 364 takes its bearing. The two drop brackets 365 and 366 are rigidly interconnected as a unit, which unit is stationary during operation, but may be tilted or adjustably swung to predetermine the position of the parts for operation on any given thickness of signature. Thus, as seen in Figs. 3 and 6, and separately in the top view of Fig. 7, a tiltable yoke 377 is provided, from a central part of which the long rear bracket arm 366 depends; and the yoke at its front end is provided with a closing bridge or bar 378, bolt-attached to the yoke, and from which the short front bracket arm 365 depends. The two bracket arms are integral or rigid with the yoke member and bridge arm respectively so that, when tilted, these parts swing as a unit for adjustment purposes. The yoke has a hub 379 in the nature of a sleeve through which and through a corresponding part of the bridge bar extends a fixed stud 380 having a collar 381 at its front end to confine the yoke and having a nut 382 applied to the reduced rear end of the stud to mount it rigidly upon a portion of the frame casting 34.

The importance of the tilting adjustment of the stationary bracket-pair 365, 366, will be understood by considering that the signatures which are supplied to each of the series of hoppers and gathering sections may vary widely in thickness, for example, from a single sheet up to 32 or more thicknesses; whereas any change of thickness tends to dislocate the cooperating members of the trip device. By the tilting adjustment of the drop bracket the entire gaging system, from the roller 360 to the tall trip lever 368, is bodily shiftable from and toward the gaging segment 350 about a fixed axis, being the axis of the stationary stud 380 upon which the drop bracket is tiltably mounted. Taking the case of a gathering section wherein, on a new job, a relatively

thin signature is to be replaced by a relatively thick one, this change itself would tend to throw the trip lever 368 rightwardly from its desired central or neutral position. If now the depending bracket be adjustably shifted slightly toward the left in Fig. 3, this permits the gage roller 360 to shift relatively to the right, causing the short supporting arms 362—363 to swing upwardly or counterclockwise about the pivot pin 364 on the drop bracket, thus adjustably shifting the top end of the trip lever 368 toward the left, permitting it to be brought back into its neutral position, whereat there is no tripping action, with high exactitude.

The illustrated means for thus adjustably tilting the stationary drop bracket 365—366 will now be described. The long or rear drop bracket arm 366 is extended downwardly far beyond the short opposite arm 365, and the long arm at its lower end is formed into a head 384 which is bored and threaded to receive an adjusting screw 385. The adjusting screw protrudes rightwardly from the bracket head 384 and its extremity comes into adjustable contact with a permanently fixed abutment 386. Instead of a positive connection between the adjusting screw and the abutment, their constant contact is secured by means of a strong spring 387 extending from a pin provided at the rear of the bracket head 384 to a pin extending frontwardly from the triangular fixed bracket 259 previously mentioned, which bracket has a frontwardly extending stud 258 taking part in other than the calipering operations. The fixed abutment member 386 is shown as a downwardly projecting part whose upper end is formed with a collar 388 made fast, as by a set screw, with the fixed stud 258. The abutment piece 386 may be considered as permanently fixed with its lower left surface in position for contact by the end of the adjusting screw 385, while the turning of said screw causes changes in the tilted position of the long bracket arm 366, with micrometer fineness of adjustment. The adjusting screw has a thumb piece 389 for operating it, thereby to adjust the gaging mechanism for the signature being handled, while a locking unt 390 is also engaged on the adjusting screw, serving to fix the adjustment thereof by turning the nut 390 against the bracket head 384 through which the screw extends. In practice, to set any one of the detecting mechanisms to operate on the signature in the corresponding section, a specimen of the actual signature will be placed between the gaging surface 356 of the segment 350, allowed to remain stationary for the purpose, and the other gaging member or roller 360. If the top end of the trip lever 368 is in an active position rather than a neutral position then an adjustment must be made to restore it to neutral position so that, with correct signatures, no tripping will occur. The locking nut 390 is first retracted, and thereupon the adjusting screw 385 is turned by its thumb piece, so as to tilt or to change the tilt of the drop brackets upon which the primary trip lever and associated parts are mounted; this operation causing an adjusting swing of the primary trip lever, by which it is readily restored to neutral position, whereupon it is only necessary to tighten the lock nut 390, and the gatherer section is in readiness for operation.

Referring to the right and left swinging movements of the tall trip lever 368, it is desirable to provide a limit plate 393 somewhat to the left near the upper end of the lever. This is preferably spaced away so that in actual operation the leftward swing of the lever will not reach the plate, the stopping of the swing being effected by the contact of the gage roller 360 upon the segment 350 or upon the signature thereon. The limit plate is shown mounted on a bracket 394 upstanding and offset frontwardly from the frame casting 34. Resilient means is desirable to exert a constant yielding pressure of the gage roller toward the gage segment, and for this purpose a spring 395 is conveniently located at a high point on the trip lever 368, extending from a point of attachment upon said lever leftwardly to a point of attachment on the limit plate 393. The pull of this spring normally causes the gage roller to press against the segment.

The tripping device as a whole comprises at least one trip piece or lug 397 upon the swingable tall lever 368, and at least one complementary or upper trip piece upon a movable trip head above, one or the other of the trip members consisting of two trip pieces, spaced apart to produce a gap or gateway between them, while the other trip piece normally passes into and out of said gap, by reason of the regular reciprocation of one or the other of the members, so that normally no cooperative tripping action occurs, whereas when the primary trip member becomes offset by an incorrect or missing signature, the entrance of one trip member into the gap or gateway of the other will be missed, and the mechanical action will occur which can be utilized to bring about the desired control. Specifically there is herein shown a single primary trip piece 397 at the top of the trip lever 368, this member being a triangular prismatic form, with a flat side upwardly, as shown, secured to the lever by a bolt 398, while thereabove is provided a trip member consisting of a spaced apart pair of secondary trip pieces 400, each depending from a pivot 401 and each having its lower end pointed or forked so as to give effective mechanical coaction with the triangular primary trip piece below, when the latter has been offset as by an incorrect signature, thus to bring about the tripping action and the desired control.

The upper or secondary trip member, comprising the left and right pivoted trip pieces 400, comprises also a trip head or block 402, on which the pieces are mounted, and which is reciprocable downwardly and upwardly with the front end of an oscillating carrier or lever arm 403, to be more fully described. The head 402 carries also at its front center a projecting lug or abutment 405, against the opposite sides of which a pair of stop screws 406 contact, one screw being fitted upon each of the trip pieces 400; so that the trip member may be initially set correctly to perform its function. When the trip pieces have been so adjusted, their set screws may be so held by lock nuts 407. To hold the trip pieces toward each other, with the predetermined gap between, a cross spring 408 may be used, pulling upon both pieces, and having the advantage that the pieces may yield outwardly when necessary to avoid breakage. The adjusting screw stops 406 may be initially set to afford an ample gap, with good clearance for the entry of the primary trip member, when relatively thick signatures are to be gaged; whereas for thin signatures the clearance must be smaller for reliable detection of errors; and the described arrangement provides these adjustments in a practical way.

Before completing the description of the control connections it is convenient first to describe the switch 410 through which the calipering means effects the controls including the machine stoppage. The switch may be of conventional kind with first and second buttons or pins 411 above and 412 below and interior circuit makers and breakers, unnecessary to show, being on known principles. A delicately responsive boxed snap switch serves well, such as a marketed one known as Micro-Switch No. BK–RSX, containing a main circuit or relay operated by a main button 411 to control stoppage, and an auxiliary signal resetting circuit operated by a button 412.

The main circuits of all the switches normally remain made or closed, and they are in series, so that an error in any section breaks or opens the circuit which, as by relay, causes the shut-off of driving power, accompanied by a quick braking and stoppage. When in any section the upper button is depressed, and in the manner to be described, the whole machine is thus stopped. The stopping button is preferably self restoring but naturally is held depressed by the prompt stoppage, until the power drive is resumed at will, as by a shunt circuit manually controlled.

The local or signal circuit in each section is normally open, no lamp being operated until the main button is

pressed, which not only opens the power circuit but closes the local circuit and thus lights the lamp; the interior contacts that give this action being of the kind which remain in contact, keeping the signal circuit closed until, after correction, it is restored to open condition by the pressing of the lower button **412**, provided for that purpose. Conveniently the resetting means may here be described. Below the reset button **412** is shown a reset lever **414**, Figs. 5 and 6, this swinging up about a pivot **415**, on a bracket **416**. A front lever extension **417** carries a riser or strip **418** which in turn is joined to a long handle **419** extended frontwardly into easy access. The parts **414** to **419** form a rigid entity, being disposed as described to avoid conflict with other parts. When at any section the handle is depressed the reset button **412** is pressed to reopen the lamp circuit.

Resuming the description of the means by which the tripping device controls or operates the switch **410** for stopping and signaling purposes, the plan is that when the reciprocating trip head **402**, on its oscillating lever arm **403**, is blocked by any abnormal positioning of the primary and secondary trip members, this condition shall result in the pushing or depressing of the switch main or top button **411**. Various mechanical devices may provide such result, an effective one being a combination of two rocklevers or walking beams as shown. The main rocking beam, Figs. 5 and 6, has a rear rockarm or lever **421** and a front arm **422** interconnected by their hub **423** rocking on a fixed stud **424**, constituting a fulcrum for the walking lever or beam **421**, **422**.

To rock the main beam lever **421**, **422** its rear arm at its free end has a pivot **425** connecting it to a long link **426**, see also Figs. 1 and 2, which is bent clear of various other parts; and the lower end of the link is pivoted to the end of a short rockarm **427**, whose clamp-hub **428** is fast on the rockshaft **95**, already described, which is cyclically rocked from the groove **122** of the main shaft cam **120** through the train of parts **124** to **130**. By these parts the rocklever and connections to the upper trip member are given one downward and one upward movement per cycle.

The main walking beam lever **421**, **422**, near its fulcrum **424**, has an attachment or extension **429**, extending substantially upward and thence formed or bent leftward, toward the observer in Figs. 5 and 6, to constitute an upper stop, reaching well above the upper button **411** of the switch therebelow.

The secondary walking beam or rocklever **403**, **432** is shown fulcrumed directly on the first or primary one. Its rear arm **432** may be in one casting with its front arm **403**, which latter carries the trip head **402**. This second rocklever normally has no motion upon the first rocklever, merely partaking of its swing, but abnormally it may swing thereon, for which its hub **433** is fulcrumed on a cross stud **434** at the front end of the front arm of the first rocklever. When, in the downward swing or phase of the front arm **422** and carried lever **403**, **432**, the front end or trip head of the latter becomes blocked due to a signature error, the carried lever becomes converted from an idle to an active lever, its front end coming to a stop, its middle and hub being forced down by the downswing of arm **422**, and its rear arm **432** being forced down for substantially twice the extent of the descent of the hub.

This downswing of the free rear end of arm **432**, near the fulcrum **424** of the main rocklever, is herein utilized to press down the main button **411** of the switch, directly therebelow. The descent of arm **432** acts through a contact screw **435** thereon, which strikes directly upon the button, depressing it to cause prompt stoppage, with the parts holding their stopped position. By adjustment the screw **435** can readily be made to deliver exactly to the button the thrust necessary for its operation when the trip action calls for stoppage. The rear end of arm **432** also carries an adjustable upstanding contact pin or screw, below and adapted normally to bear upwardly against, the flat extension stop **430** on the first rocklever, as a means of determining the normal relation between the two rocklevers. The same screw **435** may serve both purposes, the upper adjustment being through the flat upper stop **430**. The arm **432** at a midpoint is formed with a hollow boss **437** carrying a coil spring **438**, as a resilient means for elevating the arm to normal position, with the contact screw **435** contacting the top extension **430**; the spring bearing downwardly upon any convenient movable or fixed part, such as the top side of the switch box **410**.

Preferred cycle of timed operations

The actions of the component mechanisms that are performed and coordinated through cams or equivalent timing means may be outlined by the following illustrative example, representing a single cycle, caused by one revolution of the main cam shaft and outlining the complete manipulation, in each section of the machine, of each one of the successive signatures. The hopper (A) is a passive element; while the conveyor and jogger chains (F and G), being of continuous operation, do not enter into the cycle, excepting that in the timing of the other mechanisms the cycle is coordinated with the speed of the conveyor, each discharge of a signature in each machine section being into the section or receiving space of the conveyor in front of one of its pusher pins. The timing of the other mechanisms is next set forth, approximately and relatively, as to the manipulation of each signature; and thus are disclosed the rules to be followed for the designing of the respective cams and other timing parts, avoiding the need of describing the physical contours of the several cams.

First will be recited the positions of the mechanisms at the point of time when the actions begin on each lowermost signature S in the hopper (A), and this starting condition is conveniently considered as the zero position of the machine; subsequent positions being describable by the approximate number of degrees (0° to 360°) beyond such zero. In the suction detacher (B), the sucker is initially high, contacting the underside of the triangular corner S^5 which is part of the leading edge S^3 of the bottom (first) signature. At the same time the suction may be considered as already on, or applied, to grasp the signature corner; and since the principles of suction applying and releasing are conventional and well known, the timed valve means for turning on and off the pneumatic suction, are wholly omitted from the drawings, examples thereof being illustrated in various prior patents; the timing however to be as hereinbelow stated. The separator means, comprising (C) the signature depresser and (D) the stack lifter mechanisms, initially stands bodily retracted or outward; the depresser having its blade in its normal or raised position while the lifter has its adjacent blade in its normal or lowered position, with the two blades at approximately the same level, ready to be shifted inwardly. The constantly rotating extractor or drum (E) has its gripper open, but ready to close and grip the signature leading edge; and, the drum being shown of double size and half angular speed, with two opposite gripper sets, the latter take turns on the successive signatures, each thereof being inactive during the action of the other, thus providing a desirably longer travel distance for the signatures, without loss of production.

Coming to the detector means (H), the upper or vertically reciprocating trip member or forked finger pair (**400**) is initially in its raised position, awaiting the action of the caliper upon the other or horizontally adjustable trip member (**397**); while the corresponding calipering member or segment (**350**), revolving adjacent to the drum, is approaching its gaging position opposite to the other gaging member or follower roller (**35**).

Such being the starting positions, the sequence of actions on each signature, the angular timing being stated in parentheses, may be substantially as follows: The sucker swings down (0–50°) and with it the signature corner S^5,

opening a space or entrance gap thereabove. The separator swings inward bodily (10–70°) entering the gap above the detached corner and moving beyond the corner well along the leading edge S^3. The depresser lowers (10–70°), to depress the leading edge against the drum periphery in time to be gripped. At the same time the lifter rises (10–70°), with a pause (30–40°), thrusting upwardly against the stack to ease the frictional pressure on the signature below. The pneumatic suction is now cut off (20–40°); releasing the downswung signature, the sucker remaining lowered. The drum gripper jaw after swinging nearly to its abutment now contacts and grips the signature leading edge (80–100°); thus, by reason of the drum's rotation, starting the extraction of the separated signature. During the following long dwell through which the recited mechanisms, except the extractor, remain idle, the detector actions are performed, as will be later described. In the separating mechanism the depresser rises while the lifter lowers, each to its normal elevation, while the combined separator swings bodily outward to initial position (270–340°); thus clearing the way for the next rise of the sucker while restoring the depresser and lifter for separation of the next signature. The signature having by this time been fully extracted, the sucker now swings up again (300–340°) to act upon the next signature; the suction being turned on again (320–340°) for the sucker to take hold of the next signature for repetition of the cycle. Finally, the gripper starts its opening movement (350–360°); thus at once releasing the signature accurately for its advancing discharge on and beyond the drum to the corresponding traveling section of the conveyor, and the drum gripper thus becoming ready for a new operation, upon the next or second signature following.

Reverting to the detector operations, their timing is not critical, but may be indicated as follows, with reference to each one of the opposite revoluble gaging members or segments **360**. The angular positioning of each of the two sectors or gaging segments relatively to the drum must be well behind the gripping point of the signature, as indicated in Fig. 3, wherein the segment has just reached the commencement of its full gaging position (at the star **358**), with a concentric continuation of its gaging periphery well beyond this point, but rather than continuing the gaging rim **354** clear around the periphery, preferably terminating it at some distance beyond the gaging position while leaving ample periphery for the performance of each calipering action. These matters appear on Fig. 3 in the fact that the signature leading edge has been carried on the drum well beyond the gaging place, the trailing portion of the signature extending along the segment periphery and substantially therebeyond. It is while the other or opposite caliper member, contact or roller **360** is traveling relatively along the concentric periphery of the segment, from the gaging commencement point **358** shown in Fig. 3 to the tail end of the segment surface, whereat preferably the roller runs relatively off the segment, that the tripping devices come into action. According to the presence or absence of the signature on the drum and gaging segment, or the presence of an erroneous or defective signature, the gaging wheel or roller **360** takes minutely different positions, these gaging movements of the contact wheel **360** being multiplied, by the long upright trip arm **368**, to give the described horizontal shiftings of the lower trip member or piece **397**, which thereby either takes a normal position, as in Fig. 3, incurring no tripping action, or takes an abnormal position causing the tripping action and the stoppage or control of the machine, Fig. 3 showing the normal or non-operating position while Fig. 4 shows two abnormal or operating positions, causing stoppage by the control switch **410**. Therefore, the reciprocating descent of the upper trip piece or member **400** is to be timed, in each cycle, by the forms of its actuating cam and connections, so that the operative descent of the upper trip member takes place while the traveling signature lies between the gaging periphery of the calipering segment and the opposed gaging roller. For example, the tripping action may occur at a time slightly later than the conditions seen in Fig. 3, namely, when the revolving segment has traveled a little further so that the wheel will stand somewhere near the middle of the arcuate length of the concentric portion of the segment periphery. The ascending return of the upper trip member may be timed to occur at any convenient point of time after its descent, but preferably well before the other revoluble segment arrive at full gaging position, with the next succeeding signature in place. After any stoppage all actions cease, to resume only after the defect has been cured and the power drive resumed.

On account of differences in terminology the following paraphrased statement of the invention may clarify certain of the claims appended below. The invention in certain aspects may be considered as a signature gathering machine having for each machine section a signature extracting and forwarding mechanism, which includes a rotatably driven gripping drum E having its drum shaft **196** turning in a drum bearing **198** whereby to forward each successive signature upon and from the drum toward a point of discharge upon a traveling conveyor F; and in combination therewith, a first gaging member or rotor **350** rotatable interiorly of the signature path and mounted with a separate rotor shaft **198** turning in a separate rotor bearing **351**, the rotor being in a removed or axially offset location thereby relatively to clear the drum; a second or trip-operating gaging member or roller **360** operable in exterior opposition to the first member, and the two members being mutually cooperative to gage each signature advancing between them; the second member **360** being responsively yieldable bodily from and toward the axis of rotation of the first member **350** as effected by variations in the signature thicknesses to be gaged; the first gaging member **350** and its shaft **198** and bearing **351** being operatively coaxial with those of the drum but being mounted operatively separate from the mountings of the drum whereby any irregularities of drum action are segregated from the first gaging member and its mountings, thereby to assure precision in the gaging of signatures.

There has thus been described a signature flat gathering machine constituting an illustrative example of the principles of the present invention; and since many matters of combination, operation, arrangement and structure may be variously modified without departing from such principles it is not intended to limit the invention to such matters except to the extent set forth in the appended claims.

What is claimed is:

1. In a signature flatwise gathering machine having a longitudinal series of hoppers for stacks of signatures disposed flatwise with their back side edges longitudinal and their transverse leading end edges underneathly exposed at the exit end of the hopper in each section of the machine, a continuously advancing longitudinal conveyor chain with a spaced series of pushers for the accumulating groups, and an extractor or drum below each hopper continuously rotating about a transverse axis with gripper means thereon for gripping each lowermost signature of the stack and drawing it out and transferring it down and around for advancing discharge to the conveyor traveling therebeneath, to be pushed along by its trailing end edge; the combination therewith of a means for detecting errors in or absence of signatures in each section, comprising a gaging caliper wheel or segment separate from but rotating in time with the drum, an exterior gaging contact or roller opposed to said segment to gage the signature being transferred between them, a normally inoperative trip device, connections from the gaging roller to the trip device to cause its operation with abnormal condition, and control

means operated by the trip device to cause a desired control such as stoppage of machine, and timed means for coordinately actuating the conveyor, extractor and detecting means.

2. A signature gathering machine as in claim 1 and wherein the gaging wheel is rotated by a tight connection from the drum and there is a connection which is loose relatively to the wheel bearing separate from that of the drum.

3. A signature gathering machine as in claim 1 and wherein is a multiplying leverage from the roller to the primary trip member, comprising a lever fulcrumed on a bracket, the roller being on a short arm of the lever and taking its position according to the signature thickness to swing the leverage and operate the trip means accordingly.

4. A signature gathering machine as in claim 3, said bracket being adjustable swingably toward and from the gage wheel whereby the leverage may be shifted to set the trip at neutral.

5. A signature gathering machine as in claim 1, and wherein the secondary trip member has a rocklever carrying it and means to rock said lever down and up to reciprocate said trip member, whereby when the signature is abnormal the rocklever is blocked, a relay or switch, and a connection whereby the blocking of the rocklever operates the relay or switch.

6. A signature gathering machine as in claim 5 and wherein is a main rocklever constantly oscillated by cam control, the trip rocklever being mounted on the main rocklever and thereby operated to reciprocate the secondary trip.

7. A gathering machine as in claim 6 and wherein the blocking of the trip carrying rocklever arm causes said rocklever to rock on the main rocklever, whereby the other arm of the trip rocklever receives a multiplied motion for effecting a desired control.

8. A gathering machine as in claim 7 and wherein the control is through a snap switch with protruding button and the rocking of the trip rocklever presses such button to cause stoppage of machine through controlled circuits.

9. A gathering machine as in claim 8 and wherein the switch when thrown closes also a local circuit to light a lamp or operate a signal, to remain operated until reset at will, and means including a second switch button to restore conditions and reset the signal.

10. In a signature gathering machine of the sectional kind having a longitudinal series of hoppers adapted to hold stacks of signatures, and a longitudinally advancing conveyor adapted to receive successive ones of such signatures and accumulate them into successive groups, together with an extracting and transferring mechanism in each section comprising a rotary drum and an extractor means adapted to grip each signature and pull it transversely from the hopper for transfer thence upon the drum and around toward a point of advancing discharge to the traveling conveyor; the combination therewith of a calipering means adapted for detecting errors of signature thickness, comprising an interior gaging caliper member, segment or wheel which in mountings and action is independent of and separate from but rotatable in time with the drum as the signature travels over the drum and the interior caliper member; and a shiftable exterior caliper member or gaging roller opposed to and pressed toward said interior member with the path of the traveling signature between them, whereby the calipering means in each gaging action is responsive to the distance between said gaging members independent of the rotary drum; and tripping means operable from the exterior gaging roller or member to cause tripping action with abnormal signature thickness thereby to cause a desired control action of the machine.

11. In or for a signature gathering machine of the sectional kind having means to present signatures to be extracted and transferred transversely to a longitudinally advancing conveyor, together with a rotary mechanism in each section comprising a drum with an extractor means adapted to pull out each signature for transfer upon the drum and around toward the traveling conveyor; a calipering means for detecting signature errors, comprising a first caliper member or segment mounted and acting independently of the drum as the signature travels over the drum and said first caliper member; and a second caliper member or roller opposed to and pressed toward said first member, with the signature traveling between them, whereby the calipering means in each gaging action is accurately responsive to the spacing of said caliper members independent of the rotary drum; there being a tripping means operable from the second caliper member to cause a tripping action with abnormal signature thickness.

12. A signature gathering machine having hopper means to supply signatures to be extracted and transferred to an advancing conveyor, and a rotary drum with an extractor means adapted to pull out each signature for transfer upon the drum and thence around toward the traveling conveyor; and in combination therewith a calipering means for detecting signature imperfections, comprising a first gaging member or segment mounted and acting coaxially but independently of the drum as the signature travels over both the drum and said first gaging member, so that irregularities in drum surface or operation are not communicated to the first member; and a second gaging member or roller opposed to and pressed toward said first member, with the signature advancing between them, whereby the calipering means is accurately responsive to the spacing of said gaging members independent of the rotary drum; and responsive tripping means operable from the second gaging member to cause a tripping action with abnormal signature thickness.

13. A signature gathering machine as in claim 12 set forth and wherein the first gaging member or segment is rotated by means of a connection from the rotating drum to the segment, which latter is loose with relation to the segment, the segment having a rotary shaft and bearing operatively separate from those of the drum; and the connection being tight upon the drum.

14. A signature gathering machine as in claim 12 set forth and wherein is a multiplying leverage extending from the gaging roller to the primary trip member, this leverage comprising a lever fulcrumed on a bracket, the roller being on a short arm of such lever, and taking its position according to the signature thickness to swing the leverage and thereby operate the trip means accordingly.

15. A signature gathering machine as in claim 14, and wherein said bracket is adjustable swingably toward and from the gage wheel, whereby the leverage may be shifted to set the trip into neutral position.

16. A signature gathering machine as in claim 14, and wherein the tripping means has primary and secondary trip members, and the secondary trip member has a rocklever carrying it, and means to rock said lever down and up to reciprocate said trip member, whereby when the signature is abnormal the rocklever is blocked; a relay or switch, and a connection whereby the blocking of the rocklever operates the relay or switch.

17. A signature gathering machine as in claim 16, and wherein is a main rocklever constantly oscillated by cam control, the trip rocklever being mounted on the main rocklever and thereby operative to reciprocate the secondary trip.

18. A gathering machine as in claim 17 and wherein the blocking of the trip-carrying rocklever arm causes said rocklever to rock on the main rocklever, whereby the other arm of the trip rocklever receives a multiplied motion for effecting a desired control.

19. A gathering machine as in claim 18 and wherein the control is through a snap switch with protruding button and the rocking of the trip rocklever presses such button to cause stoppage of machine through controlled circuits.

20. A signature gathering machine having for each machine section a signature extracting and forwarding mechanism which includes a rotatably driven gripping drum having its drum shaft turning in a drum bearing whereby to forward each successive signature upon and from the drum toward a point of discharge upon a traveling conveyor; and in combination therewith, a first gaging member or rotor rotatable interiorly of the signature path and mounted with a separate rotor shaft turning in a separate rotor bearing, the rotor being in a removed or axially offset location thereby relatively to clear the drum; a second or trip-operating gaging member or roller operable in exterior opposition to the first member, and the two members being mutually cooperative to gage each signature advancing between them; the second member being responsively yieldable bodily from and toward the axis of rotation of the first member as effected by variations in the signature thicknesses to be gaged; the first gaging member and its shaft and bearing being operatively coaxial with those of the drum but being mounted operatively separate from the mountings of the drum whereby any irregularities of drum action are segregated from the first gaging member and its mountings, thereby to assure precision in the gaging of signatures.

21. A signature flat gathering machine having a signature extracting and forwarding rotary drum with a driving shaft and adapted to forward each signature upon and from the drum toward a point of flatwise discharge or reception thereof upon a traveling conveyor; and in combination therewith a gaging rotor rotatably mounted interiorly of the arcuate signature path with a rotor shaft mounted and turning separately from the drum shaft, the rotor being in a removed location relatively to the drum; a trip-operating gaging roller operable in exterior opposition to the rotor, and the two gaging members being mutually cooperative to gage each signature advancing arcuately between them; the gaging roller being responsively yieldable bodily from and toward the axis of rotation of the gaging rotor as caused by variations in the signature thicknesses to be gaged; the gaging rotor and its shaft being operatively coaxial with the drum and its shaft but being mounted operatively separate from the mountings of the drum whereby any irregularities of drum action are segregated from the gaging rotor and its mountings.

22. A signature gathering machine having a signature extracting and forwarding means including a rotary drum on a driving shaft and adapted to forward each signature upon and beyond the drum to a point of discharge upon a traveling conveyor; and in combination therewith a gaging rotor member mounted coaxially on a shaft interiorly of the signature path and said rotor and shaft turning separately and independently from the drum shaft, the rotor being spaced longitudinally relatively along the drum axis; and a trip-operating responsively yieldable gaging roller member operable in exterior opposition to the rotor, and the two gaging members being mutually cooperative to gage each signature advancing between them; whereby any irregularities of drum and shaft action are segregated from the gaging rotor and its mountings so that an accurate gaging operation is assured.

23. In a signature flat gathering machine a driven extracting drum over the periphery of which the successive flat signatures advance toward discharge; a pair of cooperative signature gaging members, interior and exterior, the first being a rotor coaxial with but separate and separately mounted from the drum, and the second member being a shiftable roller yieldable outwardly from the rotor axis with increase of signature thickness; and means separate from and independent of the drum and its mountings for rotating the rotor in synchronism with the drum rotation and signature advance but without transmission of irregularity of actions or rotations from the drum or its mountings to the rotor.

24. In a gathering machine an extracting means comprising a rotor and a signature-advancing rotary drum in combination with a structural mechanism adapted to rotate said rotor, and a responsive gaging means comprising a pair of gaging members other than the drum, the first member being a rotor coaxial with the drum but adjacently axially offset therefrom, whereby the signature may advance upon both the drum and the rotor while both are under continuous rotation; the second gaging member being located exterior to the signature path and fitted to yield outwardly with excess signature thickness and to operate a control or trip means.

25. In a gathering machine an extracting means comprising a signature-advancing rotary drum, and a responsive gaging means comprising a pair of gaging members other than the drum, the first member being a rotor coaxial with the drum but adjacently axially offset therefrom, whereby the signature may advance upon both the drum and the rotor; the second gaging member being a trip-actuating roller shiftably fitted to ride exteriorly upon the rotor with the signatures traveling between said rotor and said roller.

26. In a signature machine an extracting means comprising a relatively heavy signature forwarding rotary drum, and a responsive gaging means comprising a pair of gaging members other than the drum, the first member being a relatively light rotor coaxial with the drum but adjacently axially offset therefrom, whereby the signature may advance upon both the drum and the rotor; the rotor having its own shaft and bearing separate from those of the drum, the second gaging member being a trip-actuating roller shiftably fitted to ride exteriorly upon the rotor with the signatures traveling between said rotor and said roller.

27. In a gathering machine an extracting means comprising a signature-advancing rotary drum, and a responsive gaging means comprising a pair of gaging members other than the drum, the said pair consisting of an interior member and an exterior member, the interior member being a rotor coaxial with the drum but adjacently offset therefrom, and having its shaft and bearing separate from those of the drum, with a loose coupling or link connection between the drum and rotor by which the drum may drive the rotor as the rotor operates upon the exterior gaging member.

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