Aug. 27, 1940. A. COSTELLO 2,212,659

DUPLICATING MACHINE

Filed Aug. 30, 1939 5 Sheets-Sheet 1

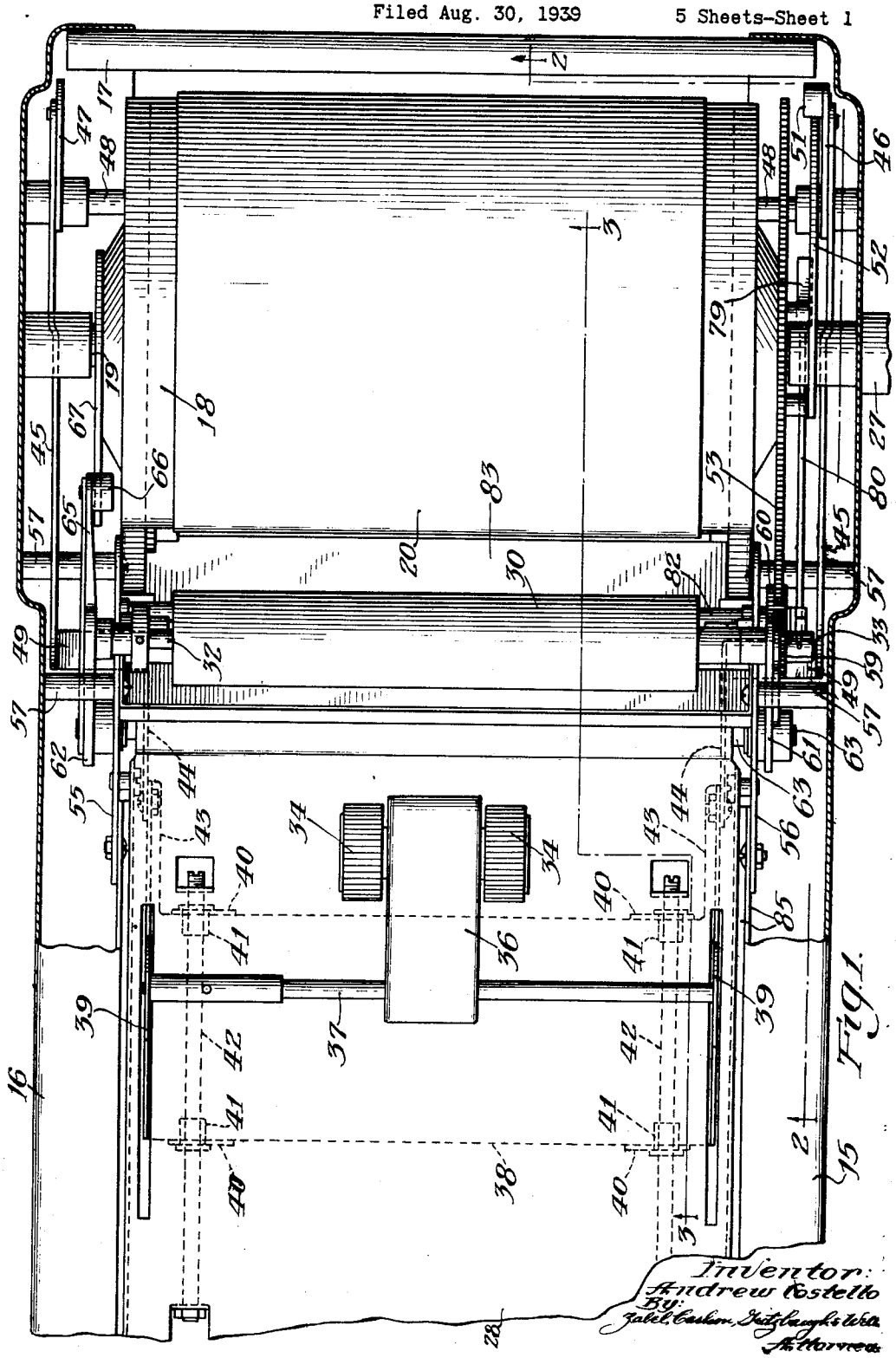


Fig. 1.

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DUPLICATING MACHINE

Filed Aug. 30, 1939 5 Sheets-Sheet 2

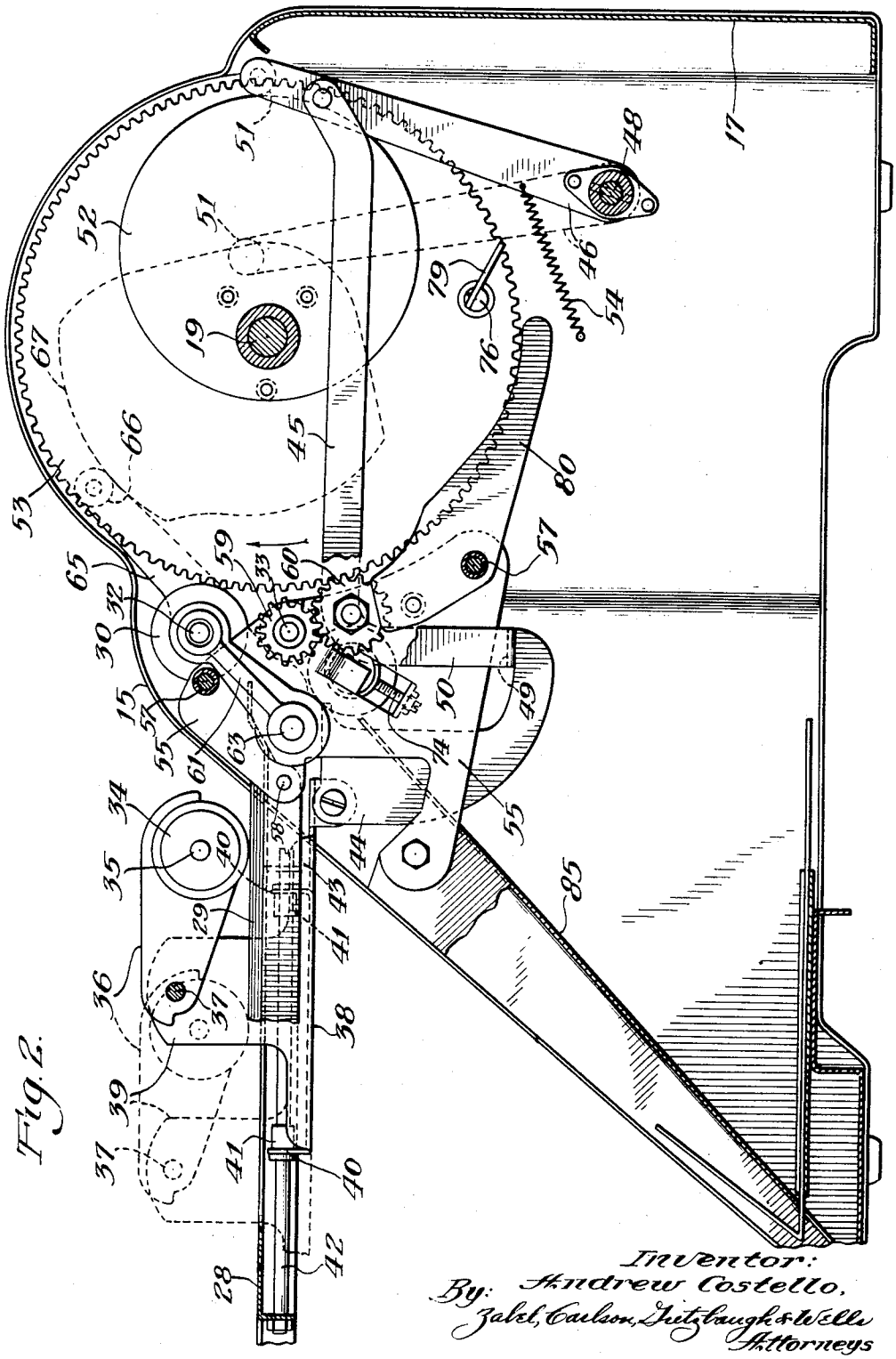


Fig. 2.

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DUPLICATING MACHINE

Filed Aug. 30, 1939 5 Sheets-Sheet 3

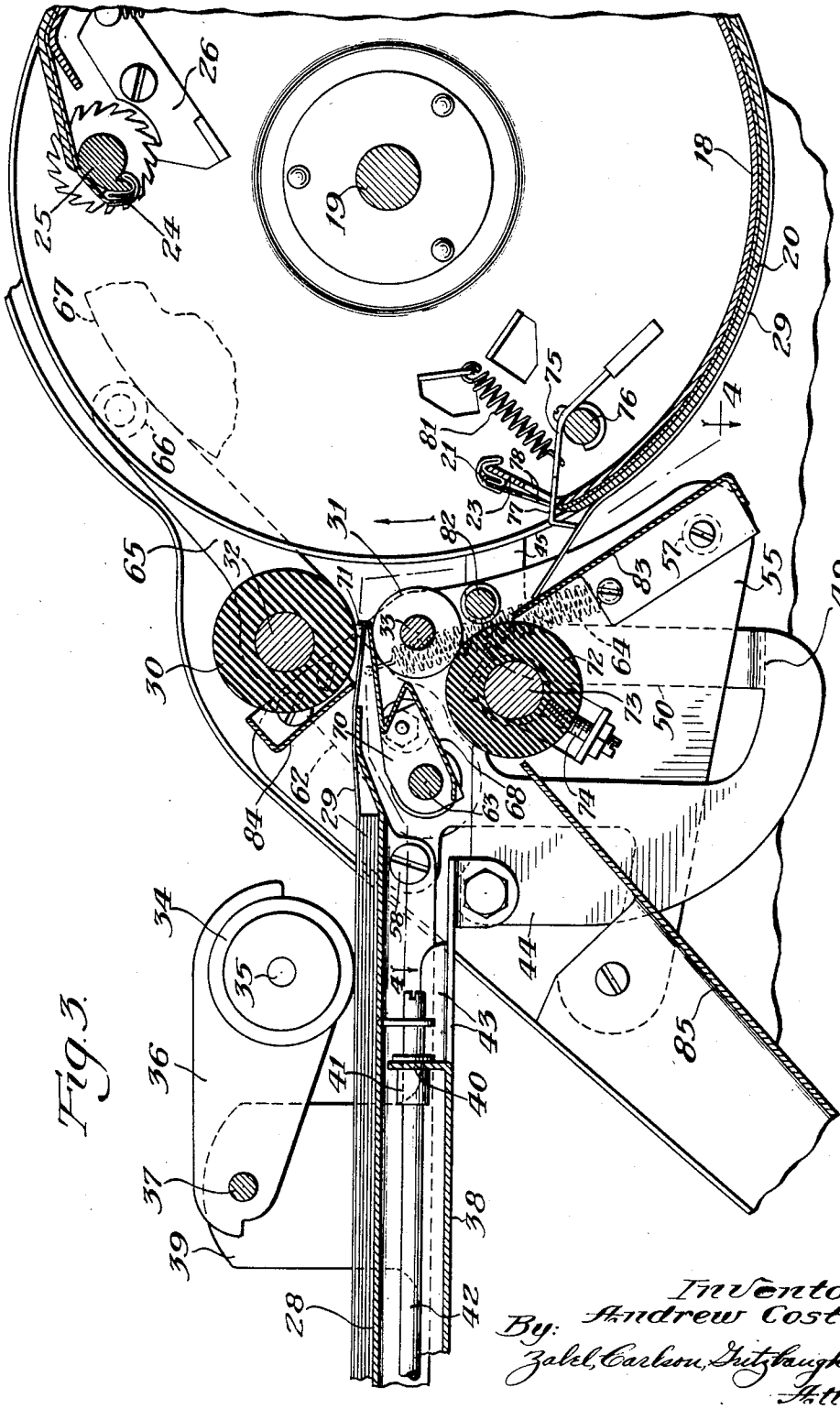


Fig. 3.

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DUPLICATING MACHINE

Filed Aug. 30, 1939 5 Sheets-Sheet 4

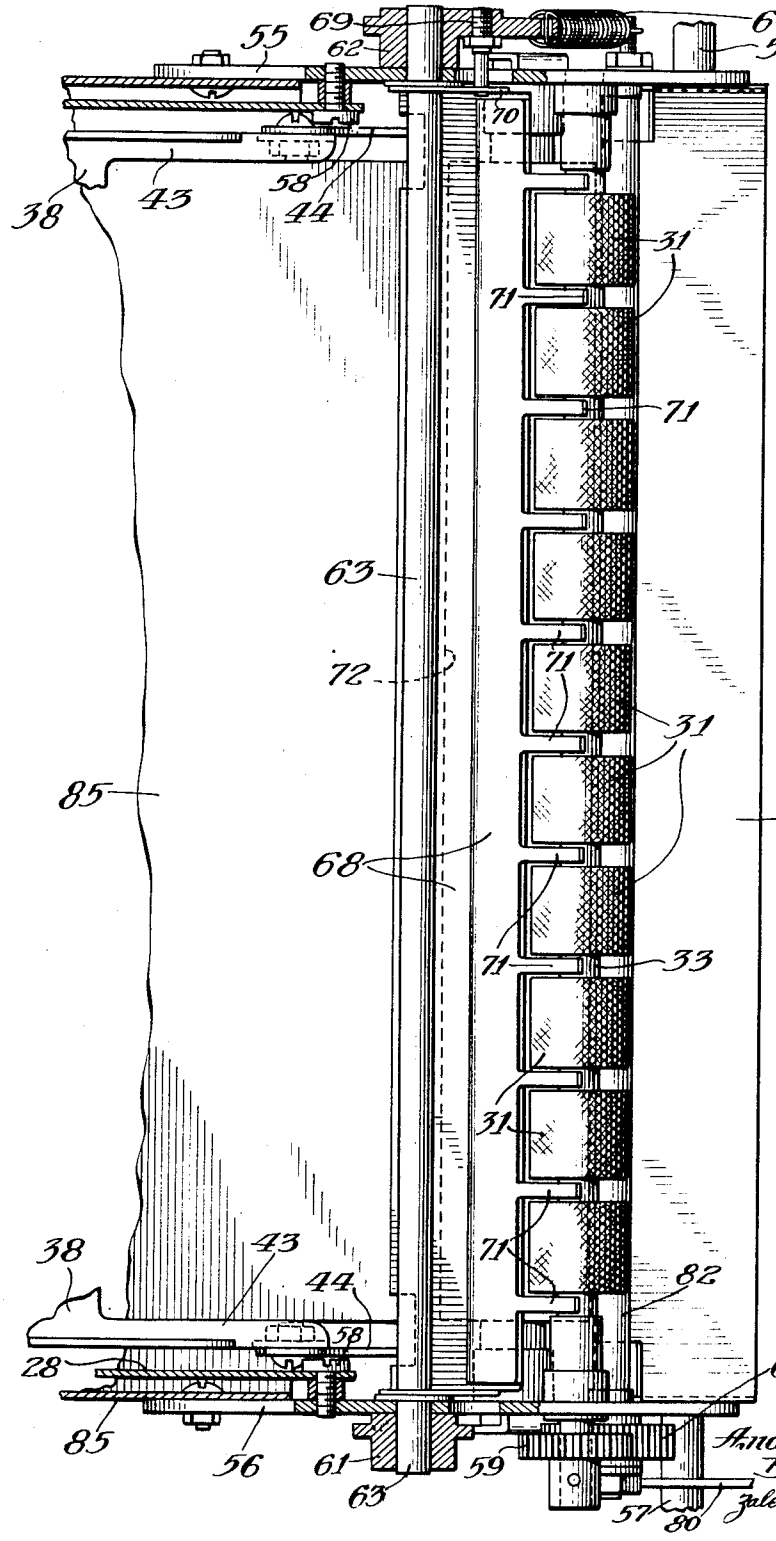


Fig. 4.

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Aug. 27, 1940. A. COSTELLO 2,212,659

DUPLICATING MACHINE

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Fig. 5.

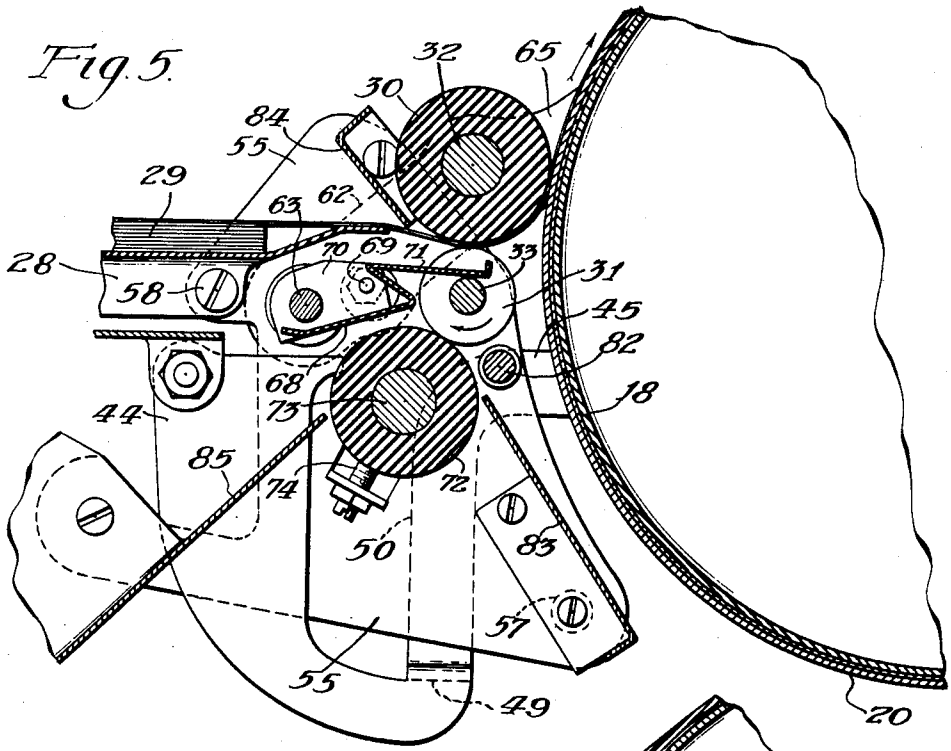
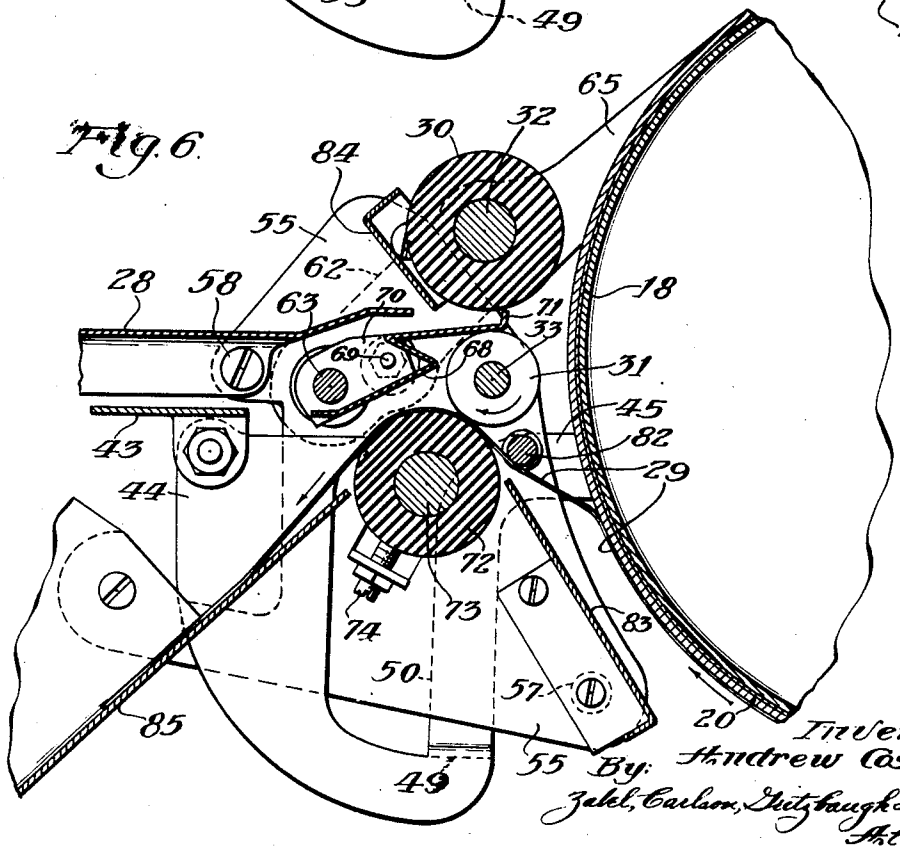


Fig. 6.



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101. PRINTING.

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UNITED STATES PATENT OFFICE

2,212,659

DUPLICATING MACHINE

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Application August 30, 1939, Serial No. 292,663

5 Claims. (Cl. 101—132)

This invention relates to rotary duplicating machines of the gelatin pad type, in the operation of which copy sheets are fed forward one at a time to a drum or other carrier and are pressed into impression relationship with the pad, after which said sheets are stripped from the gelatin pad for delivery. In machines of this type it has been necessary to use great care in the matter of keeping the sheets free of wrinkles or creases, and it is the principal object of this invention to provide an improved arrangement of parts effective for stripping the sheets and delivering them in such manner as to avoid the danger of forming wrinkles or creases in the sheets.

In such machines of this general type heretofore, a single roller has served as one of a pair of feeding rollers for forwarding the copy sheet to the drum and also as one of a pair of stripping rollers for taking the copy sheet from the drum after the printing operation. In such machines, the leading edge of the copy sheet has been directed to the stripping rollers by fingers swingingly mounted on the drum in position to be brought into engagement with the inner face of the leading edge portion of the copy sheet for forcing it outwardly into position to be gripped, and arranged to be swung inwardly promptly after the copy sheet has been gripped by the stripping apparatus so as to clear the impression roller located in close proximity to the stripping mechanism.

The present invention improves such prior machines by the provision of improved means for directing the leading edge portion of the copy sheet into the bite of the stripping rollers, being arranged in such cooperative relation to the associated parts as to cause the sheet to be gripped evenly and smoothly without wrinkles therein. In the arrangement shown, this means for directing the copy sheet to the stripping rollers comprises a round bar rotatably mounted in position below the top stripping roller and between the lower stripping roller and the face of the drum. This rotatably mounted bar is so positioned that the copy sheet in its movement with the drum extends a substantial distance beyond the bar before the fingers are retracted after moving the leading edge portion of the copy sheet outwardly, said bar serving in this position to direct the copy sheet gently and smoothly into engagement with the lower one of the two stripping rollers substantially tangentially of said lower roller at or above the axis upon which said lower roller is rotatably mounted whereby the sheet is fed smoothly into the grip of the two rollers without any danger of having its front edge jammed forcibly against either of the rollers in such manner as to wrinkle the sheet. In this arrangement the lower stripping roller has a distinct smoothing and evening effect on the sheet just prior to its being gripped. Moreover the rollers are so arranged that there is a slight bending of the sheet on a transverse line in its movement past the rotatably mounted bar into engagement with the lower stripping roller. The result of this arrangement is that any tendency of the paper to curl or buckle transversely is effectively opposed at the face of the rotatably mounted bar in close proximity to the bite of the stripping rollers so as to cause the paper to pass smoothly and evenly into the control of the rollers for delivery flat and smooth from the gelatin pad on the drum.

It is another object of this invention to improve arrangements of this type in sundry details hereinafter pointed out. The preferred means by which these objects have been accomplished are illustrated in the accompanying drawings in which—

Fig. 1 is a top plan view of a machine embodying the preferred form of the invention, with parts broken away for clearness of illustration;

Fig. 2 is a vertical cross sectional view taken substantially at the line 2—2 of Fig. 1, and showing by dotted lines a changed position of certain of the parts;

Fig. 3 is a vertical cross sectional view taken on an enlarged scale substantially at the line 3—3 of Fig. 1;

Fig. 4 is a horizontal sectional view taken substantially at the line 4—4 of Fig. 3; and

Figs. 5 and 6 are views similar to a portion of Fig. 3 but showing changed positions of certain of the parts.

Referring now to the several figures of the drawings, in which corresponding parts are indicated by the same reference characters, 15 and 16 indicate the side frame members of the improved machine illustrated, each formed of sheet metal pressed into the form of a housing, said side frame members being rigidly connected to each other by means of transversely extending parts such as the heavy plate 17 (see Fig. 2) and various other supporting and working parts. A drum 18 is rotatably mounted in position between the side frame members by means of a heavy shaft 19, the wall of the drum being cut away at one side portion, as is clearly shown in Fig. 3. In the arrangement shown, a gelatin pad 20 of any approved type is secured in posi-

tion about the cylindrical wall portion of the drum by means of hook members 21 and 22, the hook member 21 being secured upon an inwardly extending plate 23 and the hook member 22 being releasably attached to a flange 24 carried by a shaft 25 held adjustably in position by a latch member 26. A handle 27 is provided on the shaft 19 for giving the drum 18 the desired rotary movement, only a fragmentary portion of the handle being shown in Fig. 1.

The means for feeding copy sheets into impression relationship with the gelatin pad 20 on the drum comprises a cable 28 adapted to support a pile of copy sheets 29 in position opposite to a pair of feeding rollers 30 and 31 rotatably mounted in position by means of shafts 32 and 33, respectively. The copy sheets are fed to the forwarding rollers 30 and 31 by means of fluted rollers 34 rotatably mounted in position above the table 28 by means of a shaft 35 mounted on the free end of an arm 36 carried by the shaft 37. The arrangement is such that when the shaft 37 is carried forwardly (toward the right in Fig. 1) the rollers 34 are held against rotation so as to enable the rollers to carry forward with them the top sheet 29 of the pile of sheets with which said rollers normally stand in engagement, the rollers 34 being formed of rubber or other suitable material for enabling them to exert a grip on the sheet. When the shaft 37 is carried rearwardly the rollers 34 are free to rotate for permitting them to move backwardly along the upper face of the top sheet 29. The means for giving the shaft 37 alternate movements forwardly and backwardly above the table 28 comprises a metal plate 38 slidably mounted on the table as hereinafter described, said plate having upwardly projecting arms 39 between which the shaft 37 extends. As is clearly shown in Figs. 1 and 2, the plate 38 is provided with lugs 40 equipped with bearings 41 slidably mounted on slide bars 42 mounted on the lower face of the table 28, as shown in Figs. 1, 2 and 3. At its forward edge, the plate 38 is provided with forwardly extending arms 43 which are pivotally connected with upwardly extending arm portions 44 of links 45 whose forward ends are pivotally connected with arms 46 and 47 rigidly mounted on a rock shaft 48 rotatably mounted between the side frame members 15 and 16. As is best shown in Fig. 1, the link members 45 comprise laterally extending portions 49 and upwardly extending portions 50 at their intermediate points for permitting effective connection of the links as above described without interference from the adjacent parts. As is best shown in Fig. 2, the arm 46 extends a short distance above the point at which it is connected with the link 45, being provided at its upper end portion with a roller 51 rotatably mounted in position to engage an eccentric cam member 52 fixedly mounted on a large gear 53 which in turn is fixedly connected with the drum 18. By this arrangement the plate 38 and the shaft 37 and rollers 34 connected therewith move forwardly toward the right in Fig. 2 upon each revolution of the drum 18, a spring 54 serving to move said plate 38 and its connected parts backwardly under the control of said eccentric cam member 52 as the rotation of the drum continues from the position as shown in Fig. 2.

The means for mounting the table 28 and the forwarding roller 31 in position as above described comprises frame plates 55 and 56 supported by lugs 57 from the side frame members 15 and 16 (see Fig. 1), the front edge portion of the table being connected directly with said frame plates 55 and 56 by means of bolts 58, as is clearly shown in Fig. 3. The shaft 33 for the roller 31 is journaled directly between the plates 55 and 56, and the roller is preferably formed in sections in spaced relation to each other on the shaft, each of the sections being knurled on its bearing face, as is best shown in Fig. 4. In the arrangement shown, the roller 31 is driven by means of a pinion 59 carried by the shaft 33, which pinion meshes with an idler pinion 60 rotatably mounted on the frame plate 55 in position to mesh also with the gear 53.

The means for mounting the platen roller 30 comprises two arms 61 and 62 in which the shaft 32 of said roller is rotatably mounted, said arms 61 and 62 being fixedly mounted on a rock shaft 63 journaled between the frame plates 55 and 56. A coiled spring 64 connected with the arm 62 (see Figs. 3 and 4) normally holds the rock shaft 63 turned to the limit of its motion in clockwise direction in Fig. 3. As is clearly shown in said figure, the arm 62 is provided with an upward extension 65 provided at its upper end with a roller 66 in position to engage a cam 67 carried by the drum 18. The arrangement is such that the cam 67 serves at each rotation of the drum to lift the roller 30 against the action of the spring 64 into the position as shown in Figs. 3 and 6 so as to be out of engagement with the drum 18 and the forwarding roller 31. At the desired timed interval, however, said cam 67 permits the roller 30 to move downwardly and inwardly into engagement with both the drum 18 and the forwarding roller 31, as shown in Fig. 5. In this position of the parts, the roller 30 serves in cooperation with the roller 31 for forwarding a copy sheet to the drum, and at the same time serves effectively as a platen or impression roller for pressing the copy sheet into operative relationship with the gelatin pad 20.

A stop device for copy sheets fed forward by the rollers 34 is provided, comprising a plate 68 pivotally mounted on the shaft 63. A pin 69 (see Fig. 4) mounted in the arm 62 extends into engagement with a flange 70 rigidly connected with the plate 68 so as to cause said plate 68 to swing with the arm 62 in substantially fixed position with respect to the roller 30. The parts are so arranged that when the roller 30 is in its inoperative position as shown in Fig. 3, the plate 68 is in raised position as shown in Fig. 3 with hooked fingers 71 on the plate in position to engage the forward edge of a copy sheet 29 being forwarded to the drum. When, however, the plate 68 is lowered to the position as shown in Fig. 5, corresponding to the position in which the roller 30 engages the roller 31, the fingers 71 are moved out of engagement with the copy sheet and are dropped into position between the sections of the roller 31. The means for stripping the copy sheets from the gelatin pad 20 comprises a roller 72 mounted in position by means of a shaft 73 so as to engage the roller 31. Adjusting screws 74 carried by the frame plates 55 and 56 serve to press the roller 72 with a variable degree of pressure against the roller 31 so as to cooperate with said roller for stripping the copy sheets from the drum. As is usual in machines of this type, the parts are so timed as to insure that the leading edge portion of the copy sheet is free from the gelatin pad as is clearly indicated in Fig. 3, and means is provided for pushing this leading edge portion of the sheet outwardly into

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engagement with the stripping rollers 72 and 31. This means comprises a plate 75 pivotally mounted on a rock shaft 76 journaled in the drum, said plate being provided with fingers 77 extending through openings 78 in the wall of the drum and the gelatin pad into position opposite said free edge portion of the copy sheet. On its outer end the shaft 76 is provided with a short arm 79 thereon in position to engage a cam plate 80 extending forwardly from the frame plate 55 (see Fig. 2). As the drum 18 rotates in clockwise direction in said Fig. 2, the shaft 76 is rotated in counterclockwise direction for carrying the fingers 77 outwardly into the position as shown in Fig. 3 for forcing the forward edge portion of the copy sheet 29 outwardly against the action of a coiled spring 81 which normally holds said fingers 77 in their inwardly retracted position.

As is well understood in the art, when a copy sheet is pressed firmly against a gelatin pad, it requires the application of some little force to strip the sheet out of engagement with the pad and in the application of such force to the leading edge portion of the sheet there is always a possibility that the sheet will be creased or wrinkled in the process. It is accordingly highly important that the utmost care be employed for assuring that the grip on the sheet shall be effected as smoothly and evenly as possible. For attaining such result a novel arrangement has been provided, comprising a cylindrical bar 82 rotatably mounted between the frame plates 55 and 56, such bar being positioned in close proximity to the gripping point of said rollers. The arrangement is such that when the leading edge portion of the copy sheet is forced outwardly by the fingers 77 such leading edge portion of the sheet is caused to pass between the bar 82 and the roller 72 in such manner that the bar 82 holds said leading edge portion in its outwardly projected position independently of the fingers 77 as the rotation of the drum continues. The arrangement further is such that the bar 82 causes the copy sheet to move smoothly and evenly into engagement with the inner face of the roller 72 substantially tangentially of the roller so as to avoid any harsh or jamming contact of the sheet with any of the parts. With the roller 72 rotating in counterclockwise direction in Fig. 3, it will be appreciated that such roller has a brushing and smoothing effect upon the copy sheet as the forward movement of the sheet continues. Moreover, the position of the bar 82 is such that the sheet 29 is given a substantial bend at the line of contact with the bar 82, and such bending effect has a distinct tendency to straighten the leading edge of the paper at a point closely adjacent to the bite of the rollers just before the sheet passes effectively into the bite of the rollers. When the direction of movement of the paper is changed slightly as the sheet passes the roller 82, there is an appreciable resistance to such change of direction due to the inherent resiliency of the paper, whereby the paper is pressed lightly against the roller 72 so as to increase the straightening effect of the contact between the paper and the roller.

It has been found in extensive use of this construction that the arrangement of the bar 82 as above described in combination with the cooperating parts is highly effective for causing the copy sheet to be smoothed out prior to its being gripped by the stripping rollers 72 and 31 so as to prevent the formation of creases or wrinkles in the paper. The claims are accordingly to be construed to cover broadly the novel arrangement by which the improved operation is effected whether or not the explanation as to the reasons for the superiority of the construction is entirely correct as above set forth.

In the construction as illustrated in the drawings, a guide plate 83 is provided between the frame members 55 and 56 for assisting in the control of the copy sheet for guiding it into the bite of the stripping rollers 72 and 31. A guide plate 84 also is provided for directing the copy sheets from the pile on the table 28 to the stop position between the forwarding rollers 30 and 31. The plate 68 also serves as an auxiliary guiding means for directing the copy sheet from the stripping rollers 72 and 31 to a receiving tray 85 of any approved type.

It is believed to be unnecessary to give any extended explanation as to the operation of the machine in addition to that set forth above. It will be understood that when the drum 18 is rotated with a pile of copy sheets 29 in position on the table 28 the top sheet is fed forward by the rollers 34 to the stop position of the sheet as shown in Fig. 3. In timed relation thereafter, the roller 30 is moved downwardly and forwardly from the position shown in Fig. 3 to the position as shown in Fig. 5 and the stop plate 68 is at the same time moved out of operative stopping position, whereupon the rollers 30 and 31 carry the gripped copy sheet 29 forward to the drum and the roller 30, acting as an impression roller, presses the copy sheet into impression relationship with the gelatin pad 20, with its leading edge portion free of the pad. When the copy sheet in its movement with the drum reaches approximately the position as shown in Fig. 3, the fingers 77 are moved outwardly for carrying the forward edge portion of the copy sheet outwardly so as to pass between the bar 82 and the roller 72. As the rotation of the drum continues, the edge of the copy sheet is pushed upwardly past the bar 82 and is pressed thereby into engagement with the roller 72 and promptly into the bite of the rollers 72 and 31 by which the sheet is stripped from the drum and delivered smooth and even to the tray 85.

While the form and arrangement of the parts as above described are preferred, the invention is not to be limited to the construction illustrated except so far as the claims may be so limited, it being understood that changes might well be made in the form and arrangement of the parts without departing from the spirit of the invention.

I claim:

1. In a machine of the type described, the combination of a frame, a drum rotatably mounted on said frame, means for mounting a gelatin pad on said drum, two stripping rollers rotatably mounted on said frame adjacent to said drum, means for pressing a copy sheet into impression relationship with a gelatin pad on the drum with its leading edge portion free from the pad, means for rotating said rollers for gripping a sheet presented thereto so as to carry the sheet away from the drum, a cylindrical bar rotatably mounted on said frame between said stripping rollers and said drum in close proximity to the gripping point of said rollers and in parallelism with the rollers, and means comprising a member movably mounted on the drum adapted when the leading edge of the copy sheet in its movement with the gelatin pad approaches said stripping rollers to move

said leading edge portion of the sheet outwardly between said bar and said rollers so as to be brought smoothly and evenly into engagement with one of said rollers substantially tangentially thereof, said bar and said rollers being so arranged with respect to each other and with respect to said drum that the leading edge portion of the sheet is given a substantial bend closely adjacent to its free edge portion for straightening said edge portion transversely of the sheet just before the sheet passes into the bite of said rollers.

2. In a machine of the type described, the combination of a frame, a drum rotatably mounted on said frame, means for mounting a gelatin pad on said drum, two stripping rollers rotatably mounted on said frame adjacent to said drum, means for pressing a copy sheet into impression relationship with a gelatin pad on the drum with its leading edge portion free from the pad, means for rotating said rollers for gripping a sheet presented thereto so as to carry the sheet away from the drum, a cylindrical bar rotatably mounted on said frame between said stripping rollers and said drum in close proximity to the gripping point of said rollers and in parallelism with the rollers, and means comprising a member movably mounted on the drum adapted when the leading edge of the copy sheet in its movement with the gelatin pad approaches said stripping rollers to move said leading edge portion of the sheet outwardly between said bar and said rollers so as to be brought smoothly and evenly into engagement with one of said rollers substantially tangentially thereof, said bar and said rollers being so arranged with respect to each other and with respect to said drum that the leading edge portion of the sheet is pressed by its own resiliency against the face of one of said rollers so as to be brushed smoothly and evenly by said roller into accurate alignment transversely just before the sheet passes into the bite of said rollers.

3. In a machine of the type described, the combination of a frame, a drum rotatably mounted on said frame, means for mounting a gelatin pad on said drum, two stripping rollers rotatably mounted on said frame adjacent to said drum at one side face thereof, a third roller rotatably mounted on said frame above the upper one of said stripping rollers and movable into and out of engagement with said upper stripping roller and said drum serving in its operative position to cooperate with said stripping roller for feeding a copy sheet to the drum and serving also to press said copy sheet into impression relationship with said gelatin pad, means adapted when the leading edge of the copy sheet in its movement with the gelatin pad approaches said stripping rollers to force said leading edge portion of the sheet outwardly into position to engage at least one of said stripping rollers, and means for changing slightly the direction of movement of the copy sheet closely adjacent to the gripping point of said rollers for straightening the edge of the sheet as it passes to the bite of said rollers.

4. In a machine of the type described, the combination of a frame, a drum rotatably mounted on said frame, means for mounting a gelatin pad on said drum, two stripping rollers rotatably mounted on said frame adjacent to said drum at one side face thereof, a third roller rotatably mounted on said frame above the upper one of said stripping rollers and movable into and out of engagement with said upper stripping roller and said drum serving in its operative position to cooperate with said stripping roller for feeding a copy sheet to the drum and serving also to press said copy sheet into impression relationship with said gelatin pad, a bar mounted on said frame between said stripping rollers and said drum, and means comprising a member movably mounted on the drum adapted when the leading edge of the copy sheet in its movement with the gelatin pad approaches said stripping rollers to force said leading edge portion of the sheet outwardly between said bar and said rollers so as to be directed smoothly and evenly into the bite of the rollers.

5. In a machine of the type described, the combination of a frame, a drum rotatably mounted on said frame, means for mounting a gelatin pad on said drum, two stripping rollers rotatably mounted on said frame adjacent to said drum at one side face thereof, a third roller rotatably mounted on said frame above the upper one of said stripping rollers and movable into and out of engagement with said upper stripping roller and said drum serving in its operative position to cooperate with said stripping roller for feeding a copy sheet to the drum and serving also to press said copy sheet into impression relationship with said gelatin pad, a cylindrical bar rotatably mounted on said frame between said stripping rollers and said drum in close proximity to the gripping point of said rollers and in parallelism with the rollers, and means comprising a member movably mounted on the drum adapted when the leading edge of the copy sheet in its movement with the gelatin pad approaches said stripping rollers to move said leading edge portion of the sheet outwardly between said bar and said rollers so as to be brought smoothly and evenly into engagement with one of said rollers substantially tangentially thereof, said bar and said rollers being so arranged with respect to each other and with respect to said drum that the leading edge portion of the sheet is given a substantial bend closely adjacent to its free edge portion for straightening said edge portion transversely of the sheet just before the sheet passes into the bite of said rollers.

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