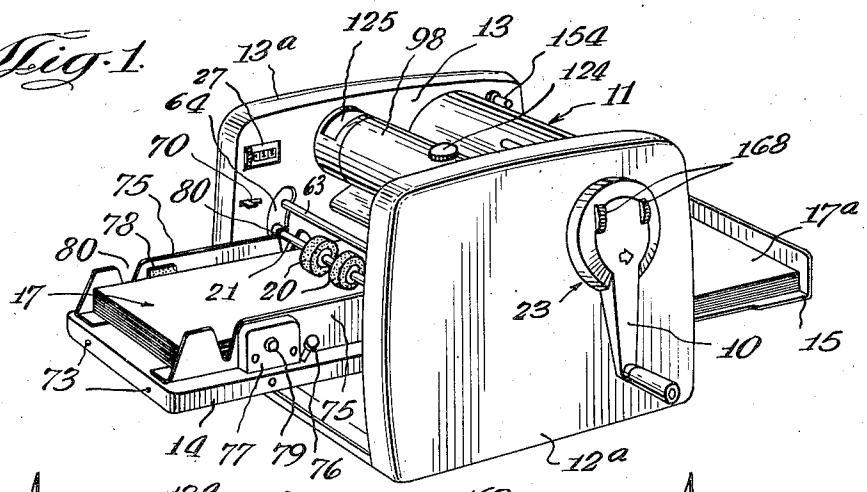
April 15, 1958 E. M. SPRINGER ET AL 2,830,534

DUPLICATING MACHINE

Filed April 1, 1954 10 Sheets-Sheet 1

Fig. 1.



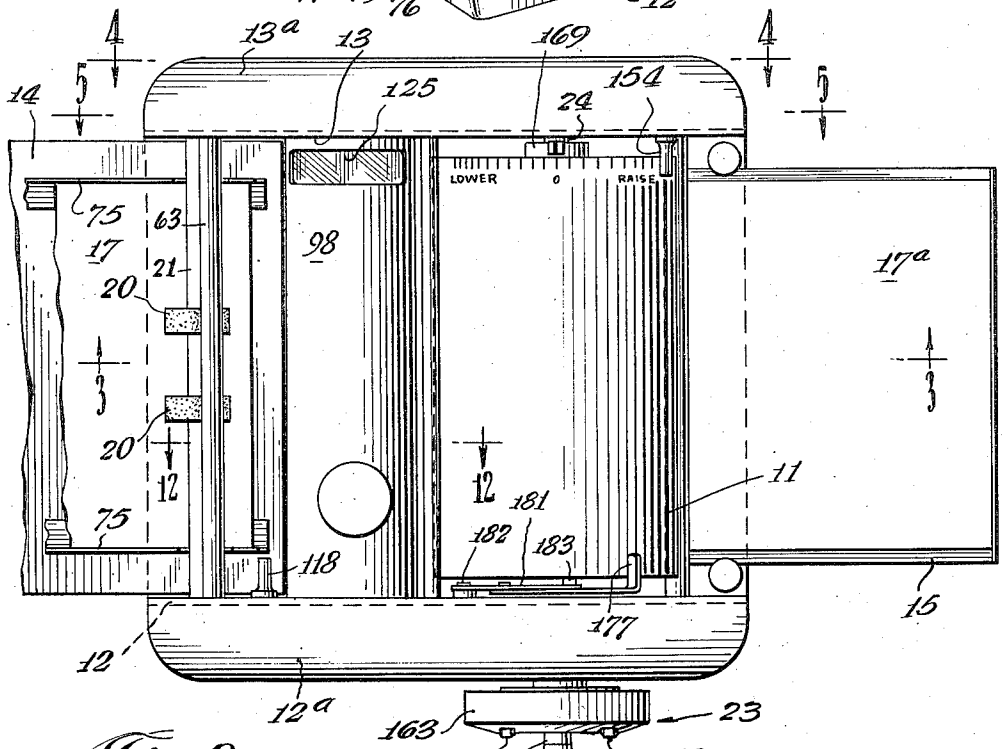


Fig. 2.

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April 15, 1958 E. M. SPRINGER ET AL 2,830,534

DUPLICATING MACHINE

Filed April 1, 1954 10 Sheets-Sheet 2

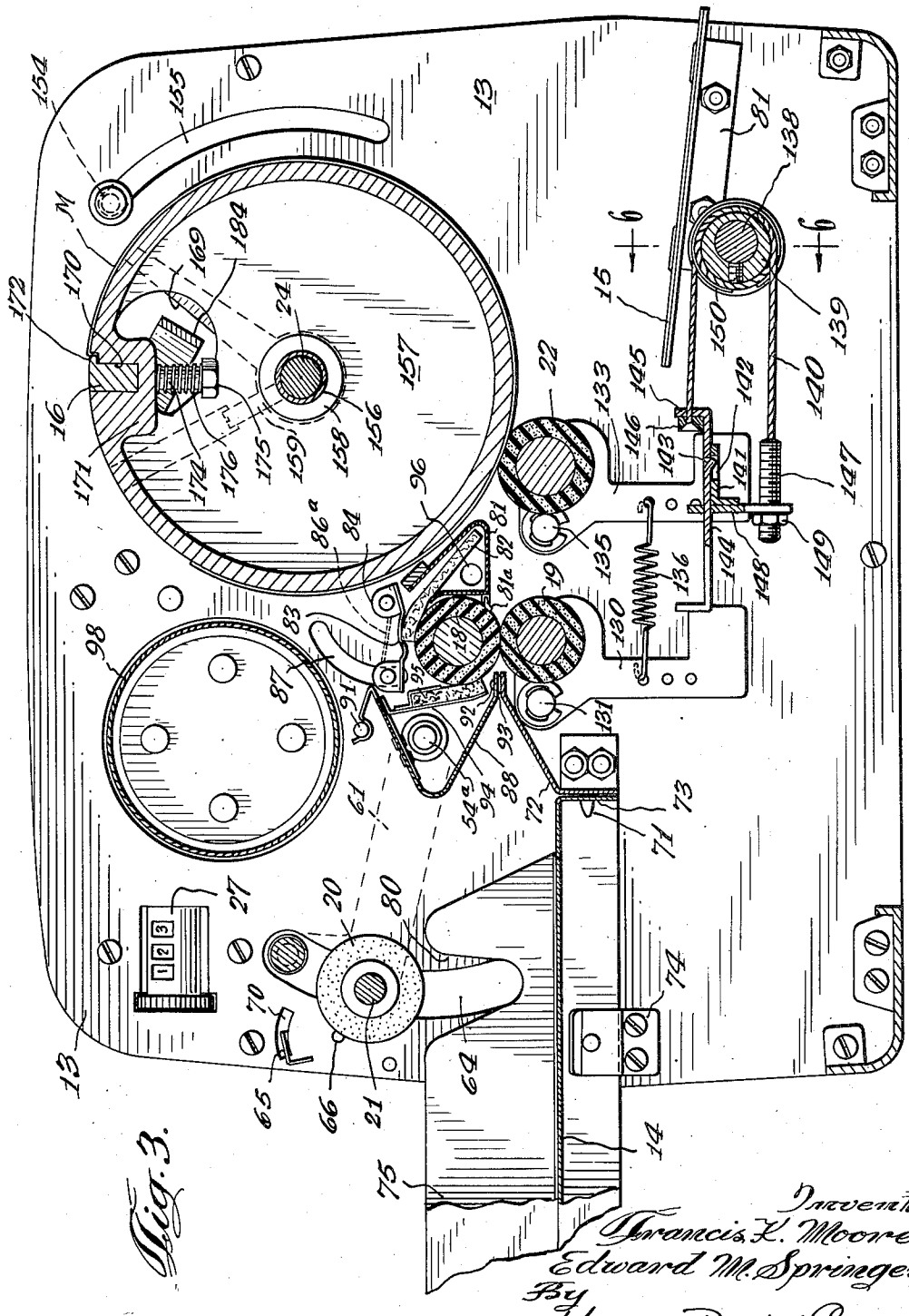

Fig. 3.

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DUPLICATING MACHINE

Filed April 1, 1954 10 Sheets-Sheet 3

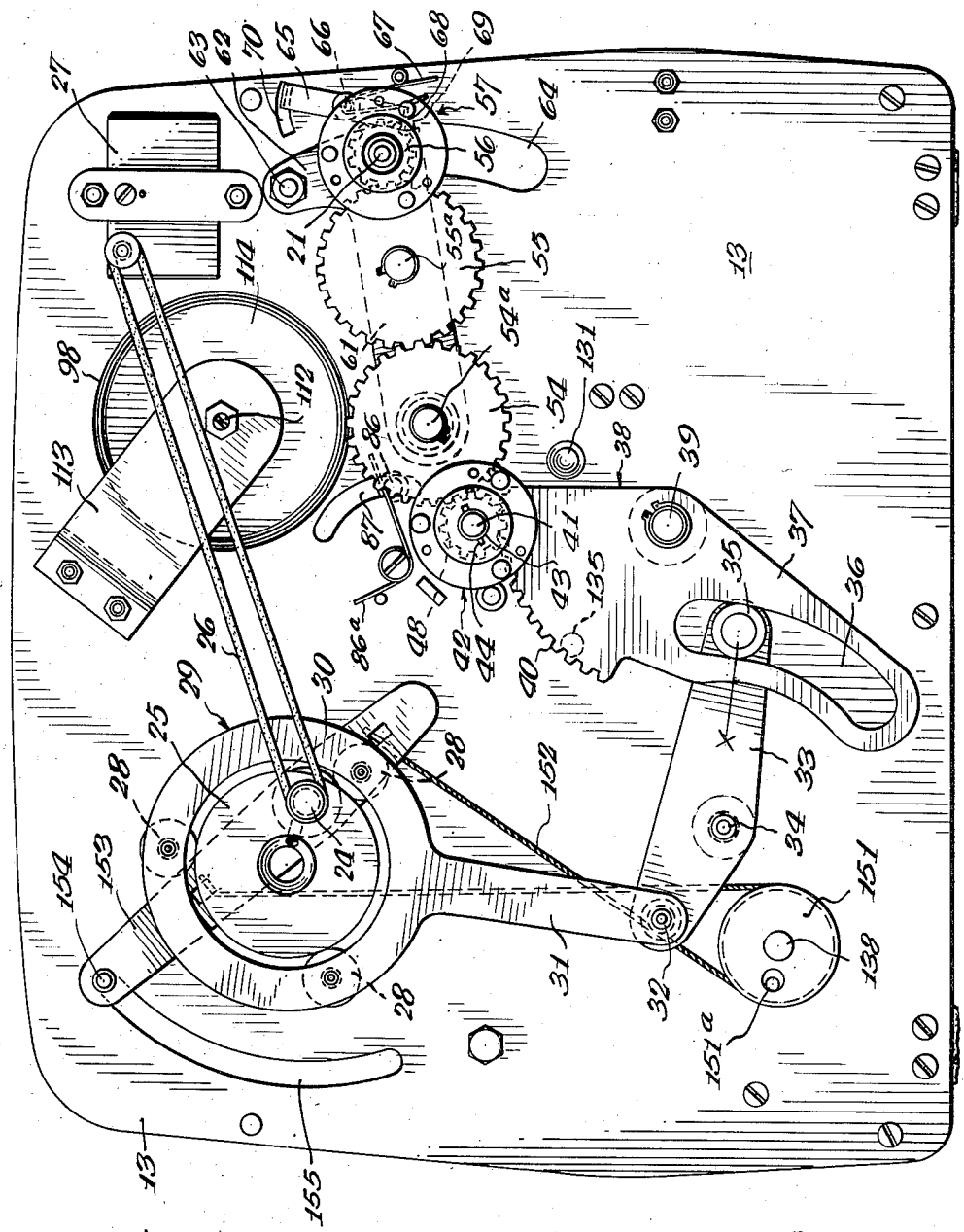

Fig. 4.

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April 15, 1958 E. M. SPRINGER ET AL 2,830,534

DUPLICATING MACHINE

Filed April 1, 1954 10 Sheets-Sheet 4

Fig. 5.

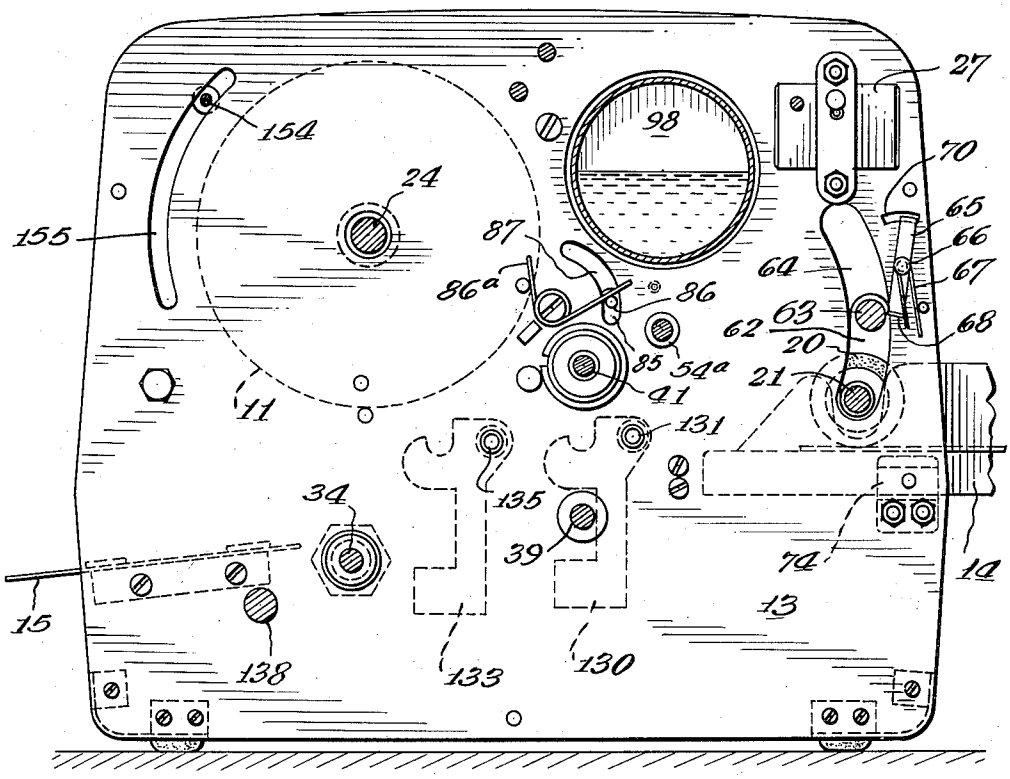


Fig. 6.

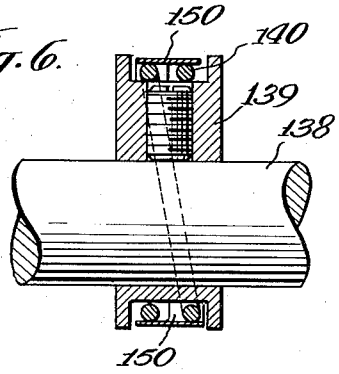


Fig. 7.

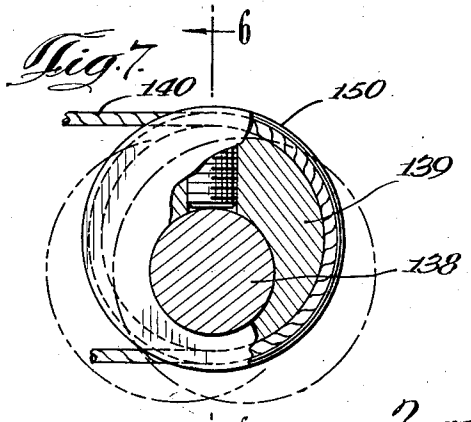
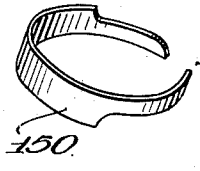


Fig. 8.



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April 15, 1958 E. M. SPRINGER ET AL 2,830,534

DUPLICATING MACHINE

Filed April 1, 1954 10 Sheets-Sheet 5

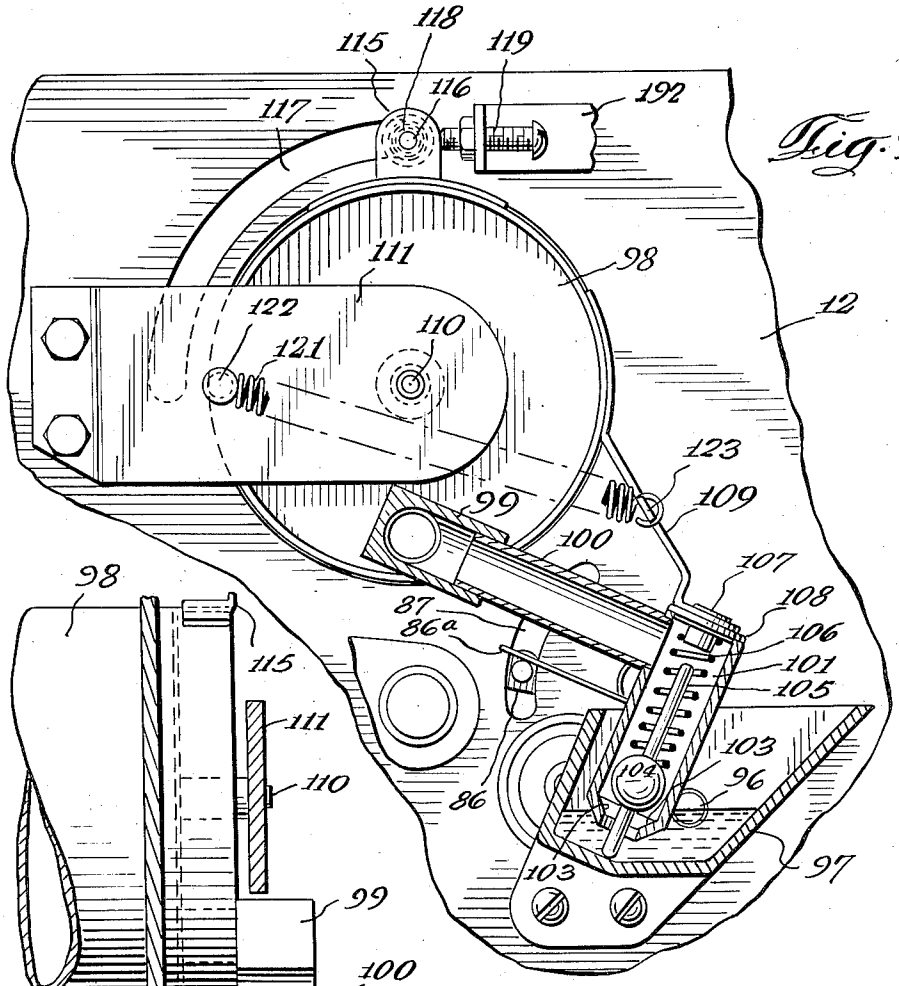

Fig. 9.

Fig. 10.

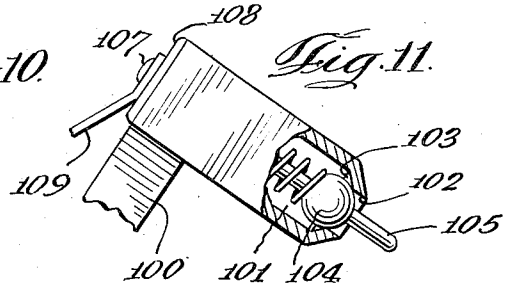

Fig. 11.

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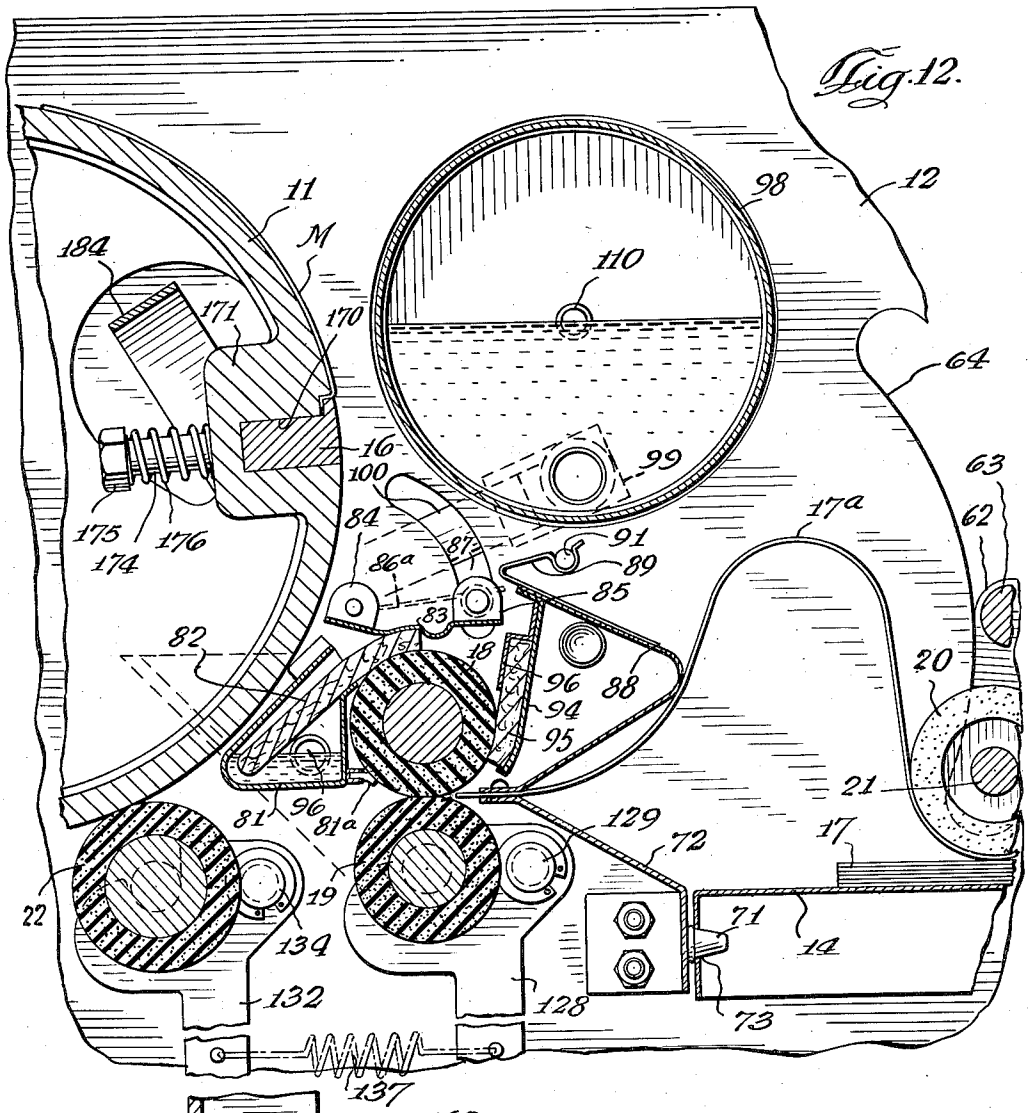
April 15, 1958 E. M. SPRINGER ET AL 2,830,534

DUPLICATING MACHINE

Filed April 1, 1954 10 Sheets-Sheet 6

Fig. 12.



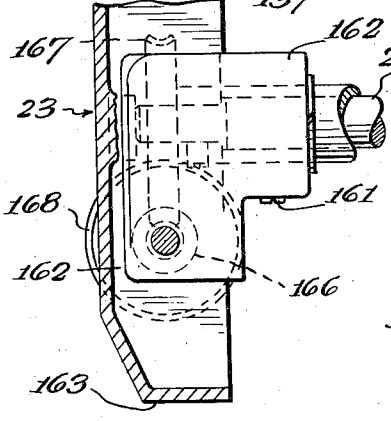


Fig. 17.

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April 15, 1958 E. M. SPRINGER ET AL 2,830,534

DUPLICATING MACHINE

Filed April 1, 1954 10 Sheets-Sheet 7

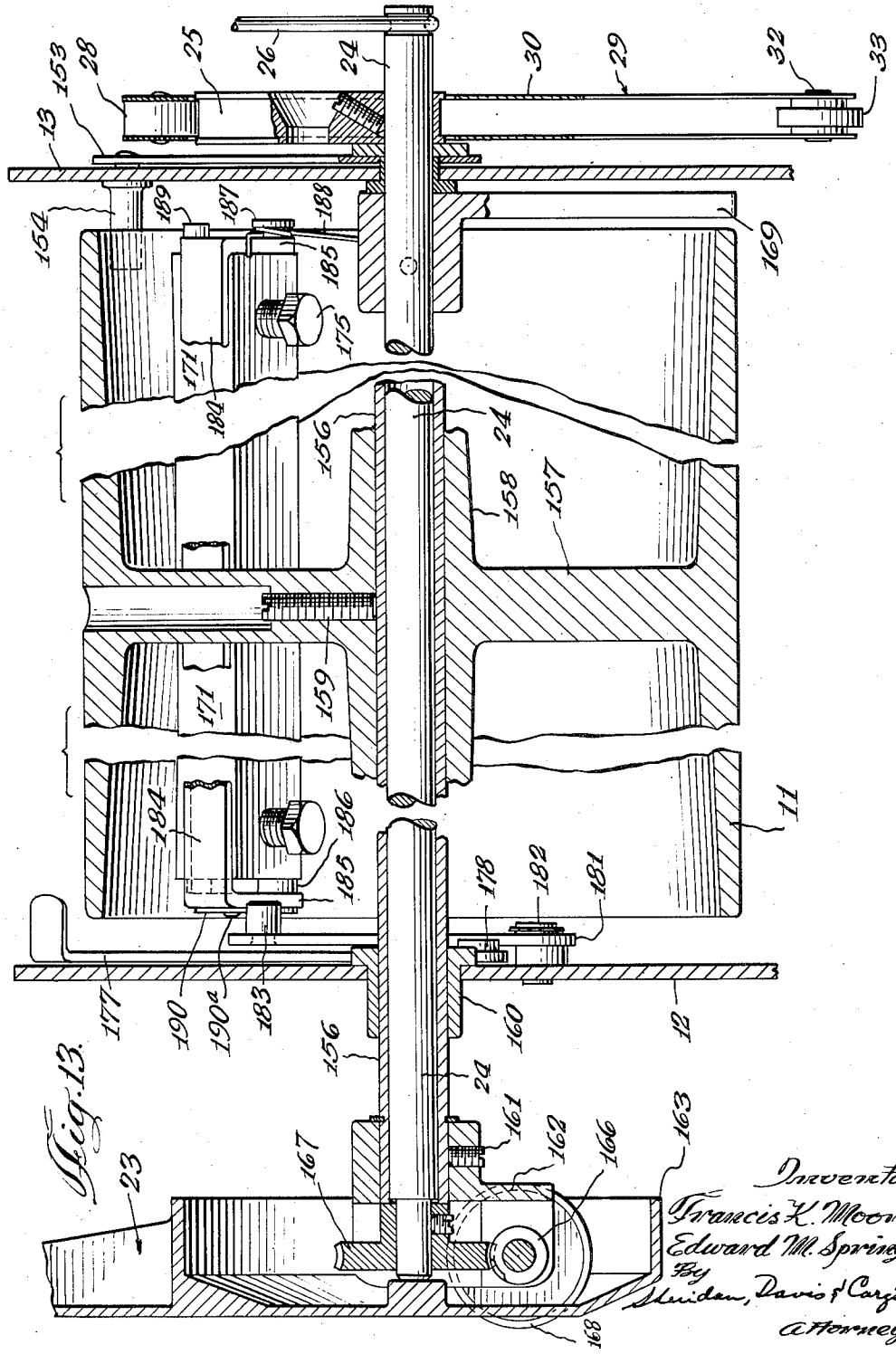

Fig. 13.

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April 15, 1958 E. M. SPRINGER ET AL 2,830,534

DUPLICATING MACHINE

Filed April 1, 1954 10 Sheets-Sheet 8

Fig. 14.

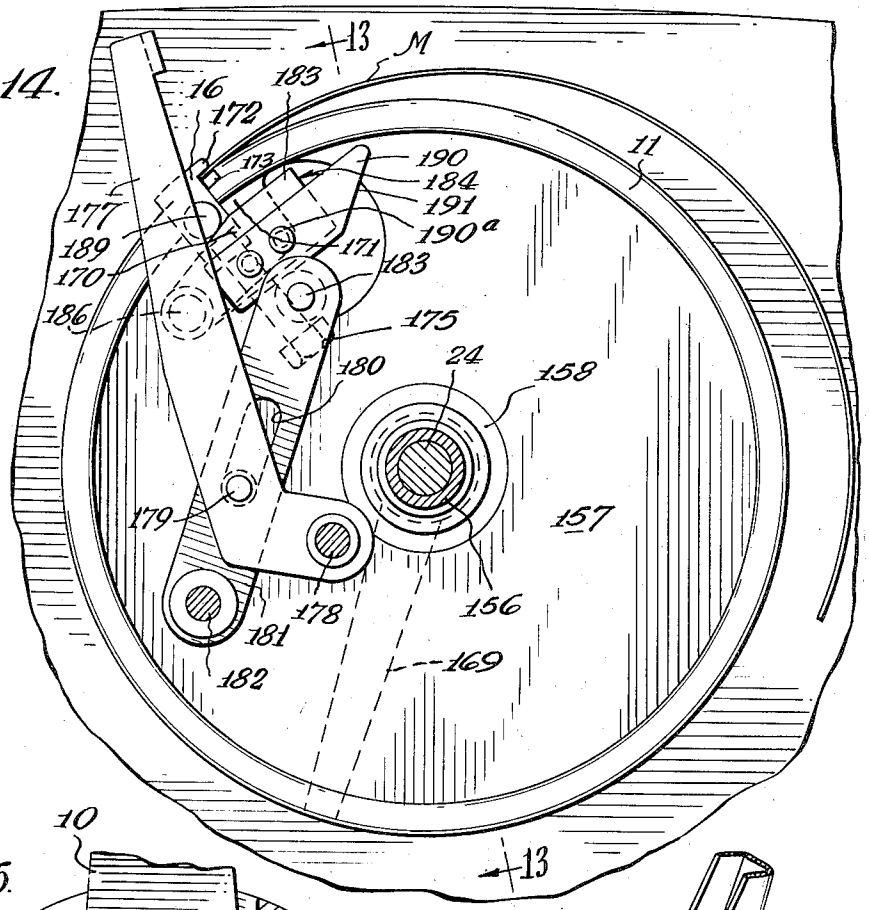


Fig. 15.

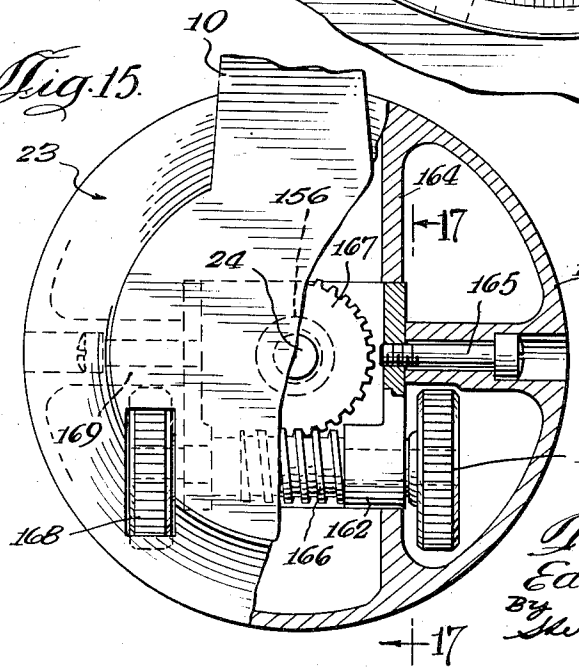
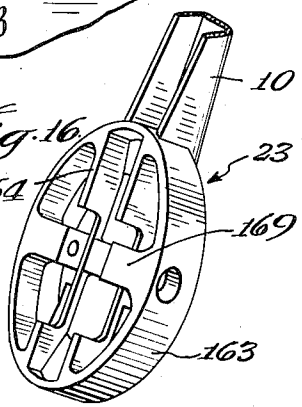


Fig. 16.



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DUPLICATING MACHINE

Filed April 1, 1954 10 Sheets-Sheet 9

Fig. 18.

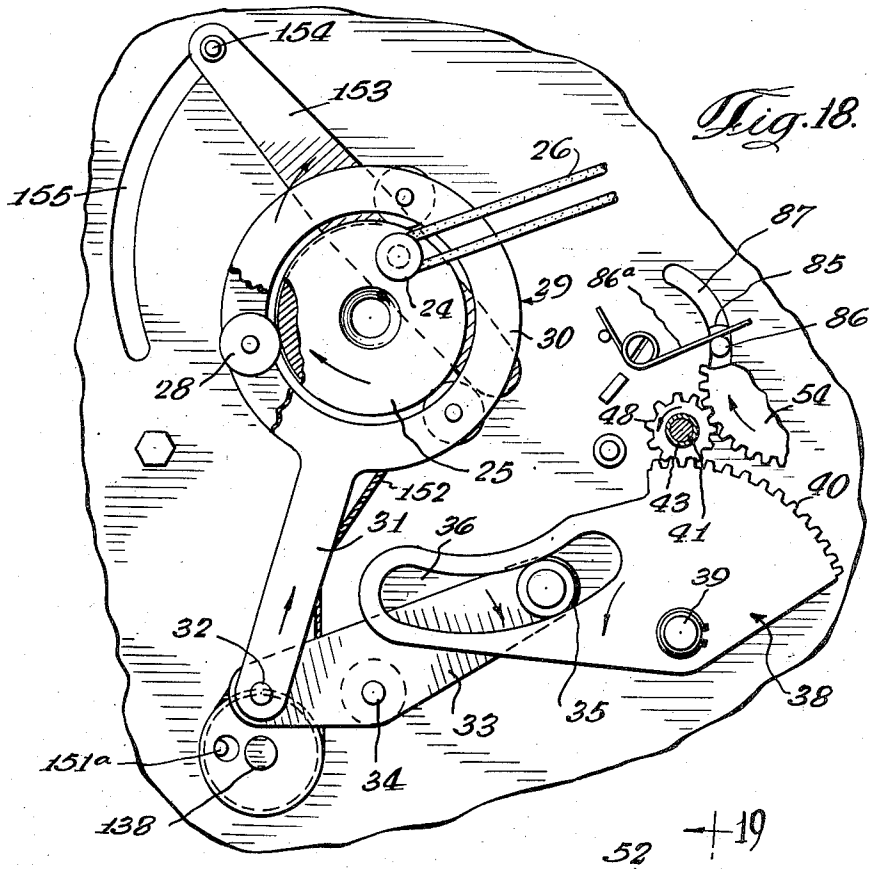


Fig. 19.

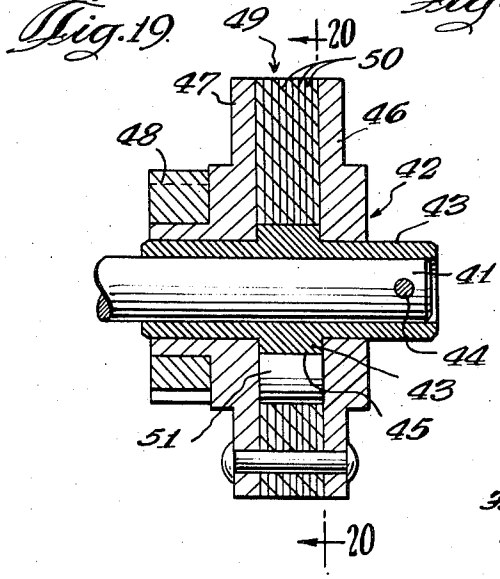
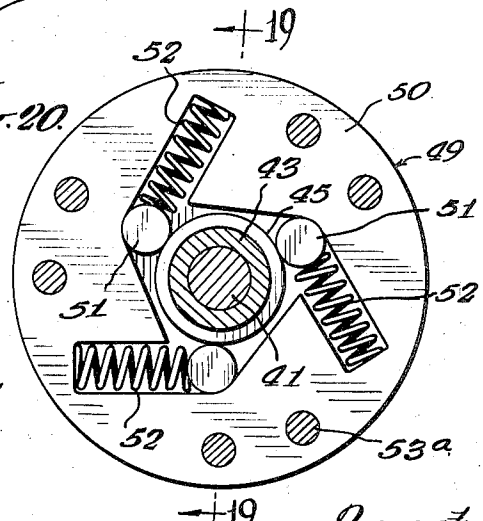


Fig. 20.



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Filed April 1, 1954 10 Sheets-Sheet 10

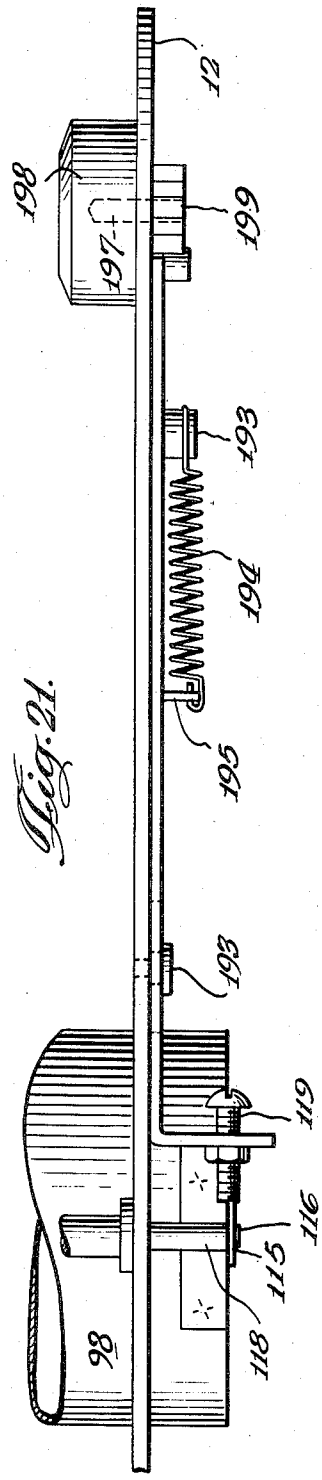

Fig. 21.

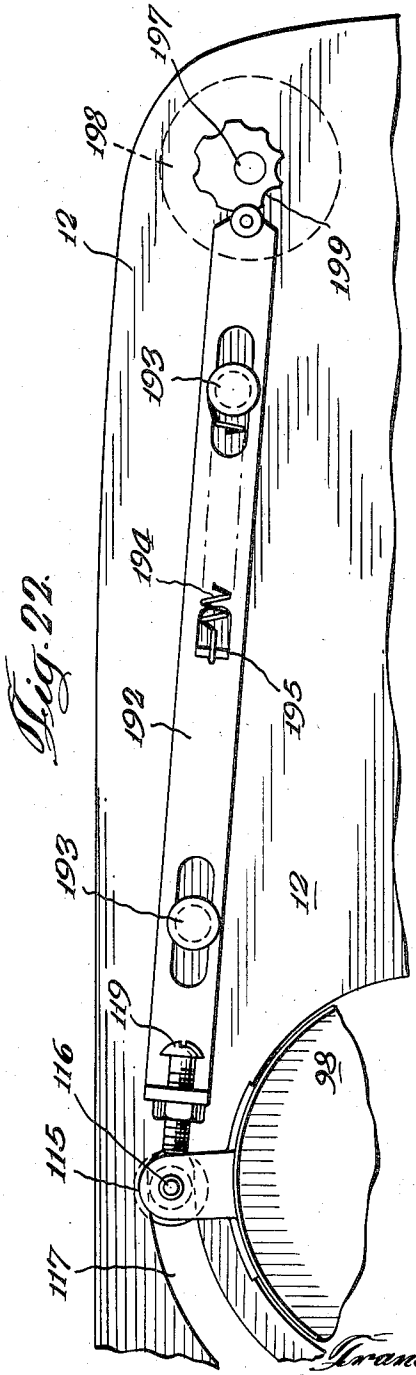

Fig. 22.

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United States Patent Office 2,830,534 Patented Apr. 15, 1958

2,830,534

DUPLICATING MACHINE

Edward M. Springer and Francis K. Moore, Chicago, Ill., assignors to The Heyer Corporation, Chicago, Ill., a corporation of Illinois

Application April 1, 1954, Serial No. 420,232

6 Claims. (Cl. 101—132.5)

This invention relates to improvements in duplicating machines.

One object of the invention is to provide an improved duplicating machine of the fluid type comprising a master carrying drum and a cooperating impression roll for pressing copy sheets against the master as the drum is rotated and means whereby the drum and the master thereon, can be adjusted arcuately through a suitable arc upon the driven shaft thereof for effective placement of the imprinted matter upon the copy sheets at a selected spacing of the printed matter from the upper ends of the sheets. Such adjustment or calibration of the drum upon the shaft enables the operator of the machine to produce copies of neat, balanced appearance, including adequate spacing of the imprinted matter from headings, or other matter previously printed on the copy sheets without changing the location of the master sheet upon the drum.

Another object of the invention is to provide a duplicating machine comprising a rotatable master carrying drum and an impression roll cooperating with the drum in pressing copy sheets against the master and means for varying the pressure exerted by the roll in pressing copy sheets against the master during a period of operation of the machine. Thus as the imprinted material on the copy sheets becomes less intense or fainter after a period of use of the master, the pressure of the impression roll against the drum can be increased from time to time by the operator for maintaining substantial uniformity in the intensity of the duplicated matter upon the copy sheets. By using less pressure between the roll and master when the latter is fresh and increasing the pressure from time to time as the printing of a large number of copies progresses, substantial uniformity in the intensity of the imprinted matter through the entire run can be obtained. The pressure varying means can be operatively disconnected readily to release the pressure of the impression roller against the drum and to release the pressure of a presser roller against a moistening roller also to avoid a tendency of the rolls to become flattened when the machine is to remain idle for a period, as overnight or weekends.

An additional object of the invention is to provide a novel drive and control mechanism for operative parts of the improved machine which during each cycle of operation of the master carrying drum produces properly coordinated action between a copy sheet feed means for feeding during each operative rotation of the drum one sheet from a stack thereof into the bight of a then stationary pair of presser and moistening rolls, thereupon interrupting the driving action of the feeding rolls but rendering them free to rotate in the feeding direction and effecting the driving of the presser and moistening rolls for advancing the sheet, as it is progressively moistened, into the bight of the cooperating drum and impression roll and thereupon interrupting the driving action of the presser and moistening rolls but rendering them

free to rotate for moistening the remainder of the sheet as it is positively advanced by the drum and impression roll during the imprinting operation. The improved drive and control mechanism above mentioned accomplishes certain desirable results during the passage of each copy sheet from the stack of such sheets through the machine. For example, the sheet feeding means is positively driven in feeding a sheet from the stack into the bight of the presser and moistener roll through a distance less than the length of the sheets but is rotatable in the same direction by the driving action of the remaining length of the sheet as the latter is advanced and moistened by the cooperating presser and moistening rolls. Thus as the sheet passes beyond the sheet feed means the latter stops rotating and thus does not begin to feed the next sheet forwardly until the sheet feed means is again positively driven at the beginning of the ensuing cycle of operation of the drum. Likewise the cooperating moistening and presser rolls being operable only after a sheet is fed into the bight thereof and until the sheet has passed therethrough avoid the waste of liquid by transfer from the moistener roll to the presser roll and applies it only to the surface of the sheet which is to receive the imprint as the sheet next passes between the master and the impression roll during the imprinting operation.

An additional object of the invention is to provide, in a machine of the class described, an improved liquid holding tank which is located in horizontal position adjacent the top of the machine for easy access in filling but within the confines of the machine frame and which tank provides for ready visual inspection for determining the quantity of fluid therein and is provided with means for supplying fluid as required to a moistening roll moistening means during operation of the machine but which tank is adjustable to an inoperative position for interrupting the liquid feed action during periods of non-use of the machine for avoiding excessive loss of liquid by evaporation.

Another object of the invention is to provide a convenient mechanism for varying the level of liquid in a wick moistening trough for varying the quantity of liquid applied to the copy sheets as they pass through the machine for thus controlling the intensity of the duplicated matter imprinted on the sheets.

Other objects of the invention relate to various features of construction and arrangement of parts which will be apparent from a consideration of the following specification and accompanying drawings wherein,

Figure 1 is a perspective view of a machine which is illustrative of the present invention, the figure showing side ornamental plates or housings which enclose certain operative parts of the mechanism;

Fig. 2 is a broken elevational view of the machine shown in Fig. 1;

Fig. 3 is a broken vertical sectional view taken on line 3—3 of Fig. 2;

Fig. 4 is a side elevational view of the driving and timing mechanism for the driven rolls viewed along line 4—4 of Fig. 2, but with the respective ornamental cover or housing plate removed;

Fig. 5 is a sectional elevation view taken along the line 5—5 of Fig. 2, the cover plate being not shown;

Fig. 6 is a broken sectional view of an eccentric cable tensioning structure taken on line 6—6 of Figs. 3 and 7;

Fig. 7 is a broken elevational view of the eccentric structure shown in Fig. 6;

Fig. 8 is a perspective view of a detached spring collar which in use embraces the convolutions of the cable on the eccentric as shown in Figs. 6 and 7;

Fig. 9 is a broken end elevational view of a rockable

fluid supply tank and a sectional view of an associated automatically operable control valve which when in the lowered position illustrated, is opened to supply fluid to a transverse fluid holding tank;

Fig. 10 is a broken elevational view of the fluid discharge end portion of the tank and of the control valve;

Fig. 11 is a broken elevational view of the control valve shown in longitudinal section in elevated, closed position;

Fig. 12 is a broken transverse sectional elevation taken on line 12—12 of Fig. 2 and showing a copy sheet being advanced from the feed table into the bight of a moistening and cooperating presser roll;

Fig. 13 is a broken transverse vertical sectional view taken axially of the drum and drive shaft.

Fig. 14 is a vertical elevational view of the left-hand end of the drum as viewed in Fig. 2 and manually operable means mounted on the adjacent side frame member for effecting elevation of the master clamp carried by the drum;

Fig. 15 is a broken end elevational view of the hub structure of the crank including manually operable adjusting means for adjusting the drum relative to the shaft and crank for varying the position at which the master, carried by the drum, contacts the copy sheets whereby the location or calibration of the imprinted matter upon the sheets can be varied longitudinally of the sheets;

Fig. 16 is a detached broken perspective view of the crank hub as viewed from the inner face thereof;

Fig. 17 is a broken sectional view taken on line 17—17 of Fig. 15;

Figure 18 is a broken elevational view of a portion of the driving mechanism shown in Fig. 4 but in a relatively different operating position;

Figure 19, taken on line 19—19 of Fig. 20, is an axial sectional view of one of the two one-way clutches shown in Fig. 4 which is operative only when driven in one direction and permits the driven element to continue rotation in that direction independently of the clutch;

Fig. 20 is a sectional view of a clutch member taken along line 20—20 of Fig. 19;

Fig. 21 is a longitudinal sectional view similar to Fig. 9, but illustrating a modified means for selectively adjusting the tank between several operative positions for varying the level of the liquid in the wick-moistening trough and thus varying the quantity of fluid applied to the copy sheets; and

Fig. 22 is a broken top plan view of the tank adjusting means shown in Fig. 21.

Reference is made to copending applications, divisions of the present application and claiming subject matter disclosed herein as follows: Serial No. 660,545, filed May 21, 1957, and Serial No. 660,546, filed May 21, 1957.

The machine shown in the drawings is of the hand operable type having a crank 10 for rotating a drum 11 which is journalled in the opposed side frame members or plates 12 and 13, which are connected by transverse tie rods and other elements for giving rigidity to the structure but which, not being specifically relevant to the invention hereinafter claimed, are not described in detail. The machine as shown in Figs. 1 and 2 has ornamental side casing members 12*a* and 13*a* which cover mechanism mounted on the outer surfaces of the frame members 12 and 13 respectively. The members 12*a*, 13*a* need not be further described nor illustrated.

At one end of the machine is a feed table 14 for holding a supply of copy sheets which are fed automatically, in succession into the machine as it is operated, the rate of feed being one sheet to each cycle of operation of the drum. At the other end of the machine is a receiving trap 15 for receiving the imprinted sheets issuing from the machine. The drum 11 is provided with a clamp bar 16 located within a channel or groove formed in the drum for clamping the end portion of a master sheet M to the drum, the master carrying the imprinted matter to be duplicated in hectographic or copying ink, the matter being typed, written or drawn, in reverse, as usual. The initial portion of a cycle of operation of the drum while the machine is in operating condition effects the forward feeding of the topmost sheet of the stack of copy sheets 17 on the feed table 14 until the advancing end of the sheet is pressed into the bight of a pair of contacting upper and lower rolls 18 and 19, which at that instant are stationary. Rolls 18 and 19 are respectively a moistening roll and a presser roll. The feeding of the sheets in succession from the stack is effected by feed means shown as comprising a pair of rubber feed wheels 20 on a shaft 21 which is driven positively at the beginning of a cycle of operation of the crank 10 from a starting or initial position to advance the top sheet until the forward end is firmly fed into the bight of the rolls 18 and 19, whereupon the feed wheels 20 become inactive or non-driven by the mechanism but can free-wheel in the same rotative direction as the sheet is advanced by the rolls 18 and 19. Following the interruption in positive feed of the feed wheels 20 and shaft 21 the rolls 18 and 19 become positively driven during the succeeding portion of the same cycle of operation of the drum and advance the sheet between said rolls and into the bight between the drum 11 and a subjacent contacting impression roll 22. The roll 18 applies moisture to the upper surface of the sheet as it advances between the rolls 18 and 19. As the forward end of the sheet passes into initial engagement between the rotating drum 11 and impression roll 22, the rolls 18 and 19 are de-clutched from the drive mechanism as later explained but are rotatable in the same direction by the remainder of the sheet being drawn forwardly by reason of the engagement thereof by the drum and impression roll. Hence moisture is applied to the sheets as they pass in contact with roll 18 but as a sheet has passed out of engagement of the rolls 18 and 19, their rotation halts until positively driven during the corresponding portion of the next cycle. The interruption of the operation of the rolls 18 and 19, as stated, avoids the needless and dis-advantageous application of fluid by the moistener roll 18 to the subjacent roll 19 and thus not only conserves the fluid supply, but avoids the application of fluid to roll 19 and by the latter to the rear surface of the sheets passing between said rolls.

From the foregoing brief general description of operation of the machine it will be seen that at the beginning of an imprinting operation, the drum 11 is rotated as by the crank 10 or by power means if desired, and that during the first portion of a complete rotation of the drum, the feed wheels 20 on shaft 21 are positively driven to feed forwardly the top sheet of a stack 17 of copy sheets to a position where the forward end of the copy sheet is within the bight of the moistener and presser rolls 18 and 19 as indicated in Fig. 12. During the next or second portion of the rotation of the drum the rolls 18 and 19 are positively driven to advance the sheet into the bight of the drum 11 and the master M thereon and impression roll 22 while during the third or last portion of the cycle the drum and impression roll advance the sheet and deposit it upon the receiving tray 15. Due to the improved driving mechanism of the parts as later described, the feed rolls 20 are positively driven a distance to feed the sheet into the position shown in Fig. 12 whereupon the actual feeding movement of the rolls 20 ceases but the rolls become "free-wheeling" as the balance of the top sheet is drawn forwardly from the stack by the then driven rolls 18 and 19. Hence after the sheet has been fed from the stack, the feed wheels 20 become inactive until, during the next cycle or rotation of the drum they again are positively driven. The feed wheels thus do not advance a sheet from the stack except during the first portion of each cycle of

the drum. The moistening roll **18** and presser roll **19** provide a positive feed of the top sheet until the sheet has been advanced into the bight of the drum **11** and impression roller **22** whereby the rolls **18** and **19** cease rotation as the sheet completes its passage therebetween. Hence the moistener roll **18** does not needlessly or disadvantageously apply moisture to the surface of the cooperating pressure roller **19** as stated. The drive mechanism by which the functional operation of the parts is effected as above described is shown in Fig. 4, but in describing such mechanism reference will be made to other figures also. The crank **10** is secured to a shaft **24** which is journalled in the side frame members **12** and **13** and supports the drum **11** as shown in Fig. 13. At the side of the machine opposed to the crank **23**, the end of the shaft **24** which extends through the frame side member **13** has secured thereto an eccentric **25** in the form of a wheel or disc as shown in Fig. 4 which rotates with the shaft. The extreme end of the shaft drives a belt **26** which operates a counter **27** secured to the frame **13** which indicates the number of drum revolutions and so will indicate the number of sheets fed into and through the machine during a period of use following the re-setting of the counter to a given position and thus readily enables the operator of the machine to produce only a selected number of copies from a master on the drum. Journalled on the periphery of the wheel or eccentric **25**, as by means of rollers **28** is an operating member indicated generally by reference numeral **29** and comprising a ring shaped portion **30** carrying the rollers **28** and a radially directed lever arm **31**. The arm **31** at its lower end is operatively connected by pivot **32** to one end of a rock lever **33** which is pivotally mounted at **34** to the side frame member **13**. The other end of the lever is provided with a roller **35** which operates in a slot **36** provided in the lever-like extension **37** of an oscillatory gear member indicated generally by number **38** which is pivotally mounted at **39** to the side frame member **13**. The member **38** has a segmental gear section **40** described about the axis of the pivot **39**. As the shaft **24** is rotated in a clockwise direction as viewed in Figs. 4 and 18, the eccentric disc **25** moves the ring portion **30** of the operating member **29** about the shaft **24** as a center and effects rocking of the lever **33** about the pivot **34**. The roller **35**, on the end of the lever, during a portion of the arcuate movement thereof, effects rocking movement of the gear member **38**. Viewing Fig. 4, it will be observed that in the relative positions of the member **38** and roller **35** therein shown, the portion of the slot **36** below the roller is concentric with the axis of the pivot **34** and that downward movement of the roller **35** arcuately about the pivot **34** will not actuate the gear **38**. The return or upward movement of the roller **35** with the lever **33** through the lowermost just mentioned position to the position shown in Fig. 4 will not rock the gear member **38**. As shown in Fig. 4 the upper portion of the slot, that is, from the portion embracing the roller **35** upwardly deviates slightly to the right, as shown in said figure and as the roller **35** is moved above the position illustrated, or is swung downward to that position, the gear member will be rocked or swung, in the first instance in a clockwise direction and in the second instance in a counterclockwise direction. During the movement of the roller **35** downwardly from the position shown in Fig. 4 and upwardly to that position, the gear member is not driven, thus providing a period of inaction as to the mechanism, including the feeding means and the moistening means, which are driven by said gear member **38**. This period or non-driving action by the gear member **38** occurs after a copy sheet has been fed by feed rolls **20** into engagement with the moistening roll couple **18—19** and after said couple has advanced the sheet into engagement by the drum **11** and impression roll **22** and the imprinting action or duplication on said sheet is being effected.

The moistening roll **18** is mounted on and fixed to a shaft **41** journalled in the side frame members **12** and **13** and extending beyond the latter and provided at the said end with a clutch member indicated generally by numeral **42** as shown in Fig. 4. The clutch is of the type which drives only in one direction, that is, it drives shaft **41** in the clockwise direction as the clutch is driven in the clockwise direction. As the clutch is driven in the counterclockwise direction it slips and is not effective to drive the shaft **41** which may, however, actually be rotated independently in the clockwise direction.

The clutch **42** is of the roller driven type shown in Figs. 19 and 20. As shown in said figures the clutch comprises a core or hub member **43** which is pinned to the shaft **41** at **44**, the hub having a control roller engaging portion or race **45**. The faces of the clutch are formed of outer end plate **46** and inner end plate **47** to the latter of which is fixed a pinion **48**, which, as shown in Fig. 4 constantly meshes with the teeth of the arcuate rack **40** of member **38**. Intermediate the plates **46** and **47** is a laminated member **49** formed of a plurality of metal plates **50** of such gauge that they can readily be stamped to like configuration and assembled as shown. The plates **50** are shaped during the stamping operation to provide cavities for the rollers **51** (three being shown in Fig. 20) and recesses for the springs **52**. The springs each tend to urge a roller forwardly into binding engagement between the race-way **45** and the plates **50** to effect one-way driving engagement with the hub **43** and thus with the shaft **41**. Thus when the clutch is driven through pinion **48** in the counterclockwise direction as viewed in Fig. 20, the rollers are effective to drive the hub and shaft but upon the reverse rotation of the pinion **48** the rollers are freed from the driven engagement with the hub and the shaft is free to remain idle or to be rotated independently of the clutching mechanism.

The individual plates **50** constituting the laminated portion **49** of the clutch are identical and are provided with openings for bolts or rivets **53** for securing the assembled plates **50** and end plates **46** and **47** together and complementary partial extrusions **53*a***, the extruding portions of each plate fitting in the corresponding cavities of another plate to enable the group of plates to be assembled accurately in the assembly of the clutch parts.

A second one-way clutch similar in all respects to that above described, is used on the feed shaft **21** as later described. Such second clutch functions in like manner and hence the description of Figs. 19 and 20 may be considered as a description of the details of such second clutch.

As shown in Fig. 4, the pinion **48** of the clutch **42** is in engagement with the teeth of the rack or gear section **40** and will be driven in the counterclockwise direction as the gear member **38** is swung clockwise, and is driven clockwise as the gear member **38** is swung counterclockwise. It is the movement of the pinion **48** in the clockwise direction only which drives the shaft **41** and the moistening roll **18** carried thereby while movement of the pinion in the counterclockwise direction effects the above described de-clutching or non-driving action and enables the shaft to be rotated clockwise as viewed in Fig. 4 independently of the pinion **48** by a copy sheet after engagement thereof by the drum and presser roll.

The pinion **48** also meshes with the teeth of gear **54** which in turn meshes with the teeth of a similar gear **55**, both of which are journalled on stub shafts **54*a*** and **55*a*** respectively. Shaft **54*a*** is carried by the side plate **13** while shaft **55*a*** is journalled in a swingable arm of feed roller carrying means later described. Gear **55** meshes with a pinion **56** which is a portion of a second clutch member indicated generally by number **57** and is secured to the end of the shaft **21** which carries the sheet feed means such as the two wheels **20**, as above stated, (see Figs. 1 and 2). The wheels **20** preferably are of rubber having serrated peripheries. The clutch member

57 is the second clutch member referred to above and is identical with clutch member 42 as illustrated in Figs. 19 and 20. The clutch 57 drives the shaft 21 as the pinion 56 is driven clockwise, as viewed in Fig. 4, but is released or stops as the pinion 56 is driven counterclockwise and so enables the shaft 21 to be rotated clockwise by other means as the pinion 56 is driven by the gear 55 in the counterclockwise direction.

Figures 4 and 18 illustrate the gear 38 in its two opposed extreme positions and since it is constantly in mesh with the pinion 48 it drives the gear train including the pinion 48, gears 54, 55 and pinion 56 during the active portions of its movements between the two extreme positions. Referring to Fig. 4 it will be noted that in the position shown the portion of the arcuate slot 36 below the line X is concentric with the axis 34 of the lever 33 and hence when the gear 38 is in the position shown in said figure the movement of the roller 35 to an extreme lowermost position and back to the illustrated position the gear 38 will remain stationary. The line indicated by X in Fig. 4 indicates the upper extreme of the concentric portion of the slot when in said position, while the portion of the slot above the line X is non-concentric with axis 34 and diverges in a more upright direction. Hence as the roller 35 moves upwardly from the position of Fig. 4 it begins to swing the gear 38 clockwise about the axis of the pivotal support 39. As the gear member 38 is turned clockwise by lever 33 as the lever swings counterclockwise, the roller 35 will move relatively a slight distance toward the base of the slot as the gear 38 approaches its maximum clockwise position as will be clear from examination of Fig. 18. Thus the rocking of lever 33 as described causes the roller 35 to travel within the slot 36 and in its movement upwardly above the line X of Fig. 4 it swings the gear 38 clockwise as indicated in Fig. 18 while return movement of the lever 33 from the position shown in Fig. 18 to that shown in Fig. 4 swings the gear 38 counterclockwise to the position shown in Fig. 4. However, as the lever 33 continues its downward or clockwise swing from the position of Fig. 4, and returns to that position the gear 38 remains stationary and hence likewise does the gear train driven by the rack 40. This interval of non-driving action of the feed roll and the moistening means occurs during each cycle after the copy sheet has been engaged by the drum 11 and cooperating impression roll 22 and the sheet is being imprinted.

At this point a brief description of the copy sheet feeding operation, the sheet moistening operation and the imprinting or duplication functions of the machine during a single rotation of the drum 11 will make clear the sequential functioning of the mechanism shown in Fig. 4. Assume that a stack of copy sheets 17 has been placed in proper position on the feed table 14 and that the feed rollers 20 and shaft 21 have been released from the elevated inoperative position shown in Fig. 4 to enable the rollers 20 to rest upon the stack as shown in Figs. 1 and 12.

Rotating the crank 23 through 180° of arc in the counterclockwise direction as viewed in Fig. 1 will rotate the shaft 24 and cam 25 through the same arc and thus will raise the cam follower lever 29 during the first 90° of movement of the cam and during the succeeding 90° of movement will lower the cam follower lever to the same elevation as shown in Fig. 4 but shifted to the right. During such movement of the lever 29 the lever 33 will have been rocked first clockwise from, and then counterclockwise, to the same position shown in Fig. 4. The parts of the mechanism may then be said to be in a starting position of a cycle about to be described since initial movement of the cam 25 from the assumed position will cause the lever arm 31 to move downwardly and rock the lever 33 counterclockwise from the position of Fig. 4 to the position shown in Fig. 18. Such movement of the lever 33 as stated causes the gear member 38 to swing from the position of Fig. 4 to that of Fig. 18 and in so moving drives the pinion 48 of the clutch 42 in a counterclockwise direction. Such movement of the pinion, as described above, causes the clutch to slip and the shaft 41 will remain idle as will also the moistening roll 18 cammed by the shaft. The described driven movement of the pinion 48 will rotate the gear 54 clockwise, the gear 55 counterclockwise and the pinion 56 of clutch 57 clockwise, all as viewed in Fig. 4. Such clockwise rotation of the pinion 56 causes the clutch to drive the shaft 21 and the feed wheel or wheels 20 thereon in a clockwise direction and thus to feed a copy sheet from the stack 17 of such sheets as viewed in Fig. 12. The copy sheet, designated 17*a* in Fig. 12, is advanced sufficiently by the described driving action of the feed wheels 20 to move the forward end of the sheet into the bight of the then stationary moistening and presser rolls 18 and 19 and to bulge the intermediate portion of the sheet upwardly as indicated in Fig. 12 to cause the forward end of the sheet to tend to move into the bight of the rolls. The crank 10 will have moved about 90° of arc from the starting position during this portion of the cycle. During the next portion of the cycle of crank movement of approximately 90° of arc the eccentric disc or cam 25 moves the follower lever 29 from the position shown in Fig. 18 upwardly to the position of Fig. 4 and thus by swinging lever 33 clockwise to the position of Fig. 4 the gear 38 is swung counterclockwise to the position shown in said figure. Such counterclockwise movement of the gear 38 from the position shown in Fig. 18 to the position of Fig. 4 causes the teeth of the rack 40 to drive the pinion 48 of the clutch 42 in a clockwise direction which as explained above effects the driving of the shaft 41 of the moistening roll 18. Such clockwise movement of the roll 18 and the companion contacting presser roll 19 which is driven by the roll 18, feeds the sheet 17*a* forwardly into the bight of the drum 11 and the impression roll 22 which latter is driven by contact with the drum. The moistening roll 18, in feeding the sheet 17*a* forwardly as just described applies moisture to the upper surface of the sheet as will be described later. It will be seen that the movement of the gear member 38 from the position shown in Fig. 18 to the position shown in Fig. 4 drives the pinion 48 clockwise which causes the clutch 42 to drive the shaft 41 and so drives the roll 18 in the clockwise direction. Such clockwise movement of the pinion 48 effects, through the motion transmitting gears 54 and 55, counterclockwise movement of the pinion 56 of the clutch 57 on the feed roll shaft 21 but such counterclockwise movement causes a de-clutching effect of said clutch and hence as the bottom portion of the sheet 17*a* is pulled from beneath the feed wheels 20 by the rolls 18 and 19 said wheels and the shaft 21 are free to be moved clockwise by that portion of sheet 17*a* still under the wheels. It will be seen that the clutches 42 and 57 are effective to drive these respective shafts 41 and 21 as the drive pinions 48 and 56 are driven clockwise but are de-clutched as the respective pinions are driven counterclockwise as viewed in Fig. 4. In other words, as the gear member 38 moves clockwise from the position of Fig. 4, clutch 42 is inactive while clutch 56 is driven clockwise to feed a sheet from the stack into the bight of the moistening and presser rolls 18 and 19. As the gear 38 is swung from the position of Fig. 18 back to the position of Fig. 4, the clutch 42 is driven clockwise to drive the moistening roll 18 and the companion presser roll 19 to feed the sheet into engagement with the drum 11 and impression roll 22, the clutch 57 meanwhile being de-clutched by the counterclockwise driven movement of the pinion 56.

The sheet 17*a* is advanced by the rolls 18 and 19 during this second portion of the cycle of the drum and at or about the time that the forward portion of master M in the drum reaches the bight of the drum 11 and presser roll 22, the forward end of the sheet 17*a* will enter the

bight and be engaged by the drum and impression roller to continue the forward advance of the sheet. It will be understood that the upper surface of the sheet is moistened by the roller **18** and that it will be pressed into firm contact with the master M and imprinted by the master as the sheet passes between the drum and presser roll. The imprinted sheets **17***a* are deposited in the tray **15** indicated in Figs. 1 and 2.

When a sheet **17***a* has been advanced during the said second portion of the cycle of the drum until the advancing end of the sheet is engaged by the drum and impression roll as described above, the cam **25** and associated driven parts of the roll actuating mechanism will be in the relative positions shown in Fig. 4. During the succeeding 90° of the rotation of the drum the action of the cam **25** effects clockwise movement of the lever **33** and moves the roller **35** downwardly within the portion of the slot **36** which, in the position of the gear member **38** shown in Fig. 4 is concentric with the lever pivot **34**. Hence the gear **38** remains stationary during this third portion of the cycle of rotation of the drum as well as during the fourth or final portion of rotative cycle of the drum since during such fourth portion the roller **35** moves upwardly from a lowermost position (short of the lower end of the slot **36**) to the position shown in Fig. 4. During the last half cycle of rotation just described, the copy sheet is imprinted, having picked up the necessary liquid from the roller **18**. Succeeding rotative cycles of the drum each effects performance of similar functions in the sequence described, thus first, the feed rolls **20** are actuated to feed the top sheet from the stack until the advancing end is pressed into the bight of the then inactive rolls **18** and **19**; the rolls **18** and **19** then become active to feed the sheet (and currently moisten the top surface thereof) into engagement with the rotating drum **11** and impression roll **22** which imprint the sheet and deposit it upon the tray **15**. As the rolls **18** and **19** become active to advance and moisten the sheet, the feed rolls **20** become non-driven by the mechanism but are rotated by the action of the remainder of the sheet being drawn forwardly by the rolls **18** and **19** and hence stop rotating as the sheet passes from beneath the feed rolls to avoid advancing the next sheet in the stack until the beginning of the next cycle of the drum. Likewise, as the sheet is engaged and drawn forwardly by the drum **11** and impression roll **22**, the moistening roll **18** becomes non-driven by the mechanism but by reason of the action of the clutch **42** the roll is rotatable by the balance of the sheet as it is drawn forwardly from beneath the roll **18** by the drum **11** and roll **22**. The mechanism shown in Fig. 3 thus drives the feed and moistening rolls in sequence during a cycle of operation of the drum and effects the orderly progress of the sheets, in properly timed relation, from the stack on the feed table and through the machine.

In Fig. 3 the feed rolls **20** are shown in an elevated inoperative position to which they may be raised manually by the operator when the machine is to be unused for a period, to avoid deformation of the rolls. In Fig. 5 the rolls are shown released from the inoperative position in which they rest upon the top sheet of the stack. They lower by gravity as the stack is reduced in height.

Referring to Fig. 4, it will be seen that the shaft **21** which carries the feed wheels **20** is journalled in a swingable frame including two end plates or arms **61** (see also Fig. 3), which arms are pivotally journalled on the stub shafts **54***a* and mounted in the respective side frames **12** and **13**. Stub shaft **55***a* of the gear **55** is carried by the adjacent arm **61** and hence the gear **55** remains constantly in mesh with the gear **54** as well as in mesh with pinion **56** in all positions of the supporting frame carrying the feed rolls **20**. The arms **61** are generally similar and each is provided with an upwardly extending portion **62** between which portions is a tie rod **63** which gives rigidity to the frame. The frame arms **61** are located outwardly of the side frame members **12** and **13** which are provided with arcuate openings **64** to accommodate the shifting movements of the shaft **21** and the tie rod **63**.

When the frame carrying the feed rolls or wheels **20** is elevated to move the rolls to inoperative position, a spring actuated latch **65**, pivotally secured at **66** to the side frame member **13** is swung clockwise by the spring **67** to move a detent **68**, which is integral with the latch, to engage within a notch **69** provided in the adjacent arm **61** for releasably retaining the feed frame in an elevated inoperative position. The upper end of the latch **65** extends laterally through a slot **70** in the frame member **13** to render the latch manually operable to release the feed rolls **20** from inoperatvie or elevated position. See Fig. 3.

The feed tray **14** above referred to is of sheet metal and has depending end and side walls and, as indicated in Fig. 3, is adapted to be removably supported in operative position by studs **71** carried by a transversely extending sheet guide member **72** attached to the side frame members **12** and **13**. The depending end walls of the tray each is provided with openings **73** which receive the studs **71** when the respective end wall of the tray is placed in the stud receiving position. Supporting clips **74**, secured to the side frame members **12** and **13**, engage the depending side walls of the tray as shown in Fig. 3 which together with the studs **71** releasably secure the tray in position. Stud receiving openings **73** are provided in both depending end walls of the tray, as stated, whereby the tray can be mounted with either end in the forward position for the purpose subsequently described.

The tray **14** is provided with opposed laterally adjustable sheet guide rails **75** which can be adjusted to accommodate therebetween the sheets M to be used. Each rail can be locked in laterally adjusted positions by a threaded latch member **76**. Likewise, each rail **75** carries a sheet restraining member consisting of a housing **77** of sheet metal attached to the outer face of the rail nearer the rear ends of the rails than the forward ends as shown in Fig. 1. Within each housing is a soft rubber block or pad **78** which is spring pressed outwardly of the housing by spring means located therein when the tension on the springs is released by operation of a manually releasable knob **79**. When the springs of the pads are compressed by proper rotation of the knobs **79**, the rubber pads are moved inwardly of the rails but upon rotation of the knobs to spring relasing positions the pads are moved outwardly and contact opposed side edges of a stack of sheets between the properly adjusted side rails for offering a slight but adequate restraint to retain the stack of sheets against creeping movement on the feed table or tray **14** as the machine operates. Hence in use, the paper restraining pads restrain the advance or other dis-array of sheets in the stack although the topmost sheet can be moved forwardly by the positive action of the feed rolls **20** when actuated as previously described.

The feed table or tray **14** can be reversed end-for-end when such becomes desirable by reason of the length of copy sheets being used. When sheets of normal correspondent lengths or longer are being used, the feed table **14** normally is employed in the position shown in Fig. 1, but when sheets of shorter length are employed it may be found advisable to reverse the table end-for-end so as to locate the pads **78** somewhat forwardly of the position shown in Fig. 1 to enable them to provide adequate restraint to forward or rearward creeping action of the sheets as the machine is being operated.

The side rails **75** are provided with opposed notches **80** at the forward and rearward portions thereof for accommodating in either position of the table the free descent of the shaft **21** to enable the feed rolls **20** to act upon even the lowermost sheets of the stack.

The feed table **14**, as is made apparent from the fore-

going description, is readily removable from an operative position for placement on the top of the machine or otherwise in packaging the machine for shipment or for storage while the receiving tray 15, which is supported at the opposed end of the machine while in use can be removed if desired or slid inwardly to an out-of-the-way position when desirable. Such receiving tray 15 is supported normally for in and out adjustment by supports 81, one secured to each side frame of the machine. The supporting members are disposed for supporting the tray 15 in a suitably inclined position as indicated in Fig. 3.

Reference has been made above to the moistening roll 18 and presser roll 19 and the means for driving the rolls in sequence with respect to the feed rolls 20 during a cycle of operation to effect the advance of sheets to the drum and impression roll. While the sheets pass between the rolls 18 and 19, the top surfaces of the sheets are moistened by the roll 18. The means for supplying the moistening fluid to the roll 18 will now be described.

Located forwardly of the roll 18 is a transverse fluid holding trough 81 as shown in Fig. 3 which is suitably attached at the ends to the side frame members 12 and 13. Extending from the trough 81 is a felt or like wick 82 of a length substantially that of the roll 18 and of a width to overlie an upper portion of the roll. The upper edge of the wick is held in suitably firm contact with the roll preferably, as by a presser plate 83 which extends transversely of the machine and at each end has an upturned ear 84 by means of which the plate is pivotally attached to the side frames 12 and 13. The opposite ends of the other edge of the plate are provided with ears 85 which are provided with studs 86 which extend into arcuate slots 87 of the side plates 12 and 13. Springs 86*a* engage the studs to hold the plate down upon the wick 82. This construction enables the plate to be swung up against the action of the springs 86*a* to release the wick when re-adjustment, or removal for cleaning or renewal becomes desirable. Before removing the wick it is necessary to remove an upper sheet guide 88 which normally cooperates with the lower guide 72 in directing the forward ends of copy sheets to the bight of rolls 18 and 19 as the sheets are advanced, as above described, by the feed wheels 20.

The guide 88, in the form illustrated as in Figs. 3 and 12, is of sheet metal and at the ends is provided with leaf springs 89 having depressions 90 which engage studs 91 projecting inwardly from the frame members to hold the guide in operative position. The lower edge of the guide is provided with end recesses to engage studs 92 located at the ends of the forward edge of the guide 72, intervening spacer members 93 at the ends effecting the spacing apart of the adjacent edges of the guides between which the copy sheets pass. It will be seen that by pulling back on the upper portion of the guide 88 to release the springs 89 from the studs 91, the guide can be lifted from the studs 92 and removed, thereby rendering access to the presser plate 83 for releasing the wick 82 for adjustment or removal.

The upper guide 88 has a depending, transversely extending wing section 94 which carries a second wick 95 held in position by a clip 96 and a lower forwardly turned lower edge of the wing 94. The wick or wiper 95 bears against the roll 18 and distributes or spreads the liquid on the roll picked up thereby by contact with the wick 82. A wiper wick 81*a* attached to the tank 81 is shown in Fig. 12 for removing lint from roll 18.

Fluid is supplied to the trough 81 through a horizontal duct 96 extending from one end of the trough through the side frame member 12 to a cup or receptacle 97 secured to the outer face of the frame member. Into the cup 97 fluid is released from a fluid holding tank 98 for maintaining a selected fluid level in the trough while the machine is in an operable condition or in use, the tank being arcuately adjustable to an inoperable position to avoid needless replenishment of fluid in the trough during periods of non-use of the machine. As shown in Fig. 12, the tank 98 is disposed horizontally and transversely of the machine above the sheet guide 88, and is mounted at the ends for rotative movement to and from a fluid feeding position. In Figs. 9 and 10 one end of the tank is shown extending through an opening in the frame member 12 and at said end is provided with gravity feed means comprising a connector member 99 through which fluid from the tank can flow into a tubular section 100 and thence into a valve chamber member 101. The lower end of the member 101 has a fluid outlet passage 102 and a surrounding valve seat 103. A ball valve 104 in the chamber is secured on a valve stem 105 which extends through a diametrical passage in the ball. The lower portion of the stem 105 below the ball valve projects through the outlet opening 102 and in contacting the base of the cup 97, will lift the ball from the seat to permit the flow of fluid into the cup. On the upper portion of the valve stem 105, above the ball valve, is a compression spring 106, the lower end of which seats on the ball and the upper end of which is centered in the member 101 by suitable means, as the head of a rivet 107 in the cap 108 of the member 101. The rivet secures a brace 109 to the fluid discharge structure to rigidify it, the other end of the brace being attached to the tank 98. The stem 105 is of such length that when the tank 98 is rocked clockwise to the position shown in Fig. 9, the stem 105 engages the bottom of the cup 97 and unseats the valve against the action of the spring 106 whereby fluid from the tank can flow into the cup and from the cup through the duct 96 into the trough 81. The flow of fluid from the tank will be interrupted when the fluid in the tank and cup cover the discharge opening 102. As the fluid in the trough 81 is consumed in use or by evaporation, the level of fluid in the trough is restored by automatic discharge from the tank while the tank is in the position shown in Fig. 9. Upon counterclockwise rotation of the tank from the position shown in Fig. 9 toward an inoperative position, the spring 106 will close the valve to prevent evaporation of fluid from the tank until the tank is returned to the operative position shown in Fig. 9.

As stated, the tank is mounted for limited pivotal movement on its longitudinal axis. At the side of the machine shown in Fig. 9 the tank is pivotally supported by an axial stud 110 supported by a bracket 111 which is secured to the outer face of the frame member 12, the stud extending into a bushing secured to the end wall of the tank. At the other end of the tank, which extends into an opening in the frame member 13, an axial stud 112 carried by a bracket 113 on the outer face of the frame member 13 (see Fig. 4) extends into a bushing secured to the adjacent tank end wall 114 and provides a supporting pivot. The tank is thus rockable about the longitudinal axis on the pivots 110 and 112.

For the purpose of facilitating the movement of the tank between the operative fluid delivering position shown in Fig. 9 to an inoperative position wherein the valve is in the position shown in Fig. 11, the end of the tank shown in Fig. 9 has a radially extending arm or bracket 115 which carries a stud 116 extending inwardly of the machine through an arcuate passage 117 in the frame member 12 and has a finger piece 118 thereon whereby when the side frames 12 and 13 of the machine carry the ornamental casing members 12*a* and 13*a* as shown in Figs. 1 and 2, the tank 98 can be operated conveniently. The finger piece 118 is shown in Fig. 2.

When the tank is in the operative position shown in Fig. 9 the bracket 115 is adapted to abut an adjustment screw 119 carried by a bracket 120 secured to the outer face of the frame member 12. By adjustment of the

screw the operative position of the tank can be varied for raising or lowering the level of fluid in the trough. By raising the fluid lead in the trough the wick 82 will apply more liquid to the roller 18 and thence to the copy sheets. In Figs. 21 and 22 a more convenient mechanism for adjusting the tank for varying the level of fluid in the trough is shown and will be later described.

A helical spring 121 is shown in Fig. 9 which is attached at one end to bracket 111 as by a stud 122 and to a lateral projection 123 of the bracket 109. The tension line of the spring between the points of attachment of the ends of the spring is below the pivotal axis of the tank when the latter is in the operative position shown in Fig. 9 and hence tends to hold the tank in the operative position. As the tank is being manually rotated toward the inoperative position for the purpose of shutting off the feed of fluid to the trough, at the position where the projection 123 passes counterclockwise to a position above a straight line through the pivotal axis of the tank and the stud 122 at the other end of the spring 121, the spring acts to continue the counterclockwise movement of the tank until the stud 116 seats at the other end of the slot 117. The structure described constitutes a quick snap-over mechanism which tends to hold the tank in the operative position of Fig. 9 or the fully inoperative position suggested by Fig. 11. By simply swinging the finger piece 118 arcuately as described, the flow of fluid from the tank to the trough is prevented and the fluid in the tank is conserved against evaporation during periods of non-use of the machine.

The tank 98 which is formed primarily of brass or other non-corrosive metal is provided with a filler opening normally closed by a screw cap 124, (see Fig. 1). The tank also preferably is so constructed as to provide one or more sight openings which reveal visually the amount of fluid remaining in the tank for the convenience of the operator and so reduces the chance that the fluid in the tank will become exhausted during use of the machine. One sight opening is indicated by the numeral 125 and is formed by providing an opening in the cylindrical wall of the metal tank. A glass cup-like receptacle 126 is inserted in the corresponding end of the tank with the side wall of the receptacle extending over the sight opening or openings. The receptacle is cemented in place within the tank to prevent leakage, the bottom of the receptacle being disposed inwardly of the adjacent metal end wall 114 of the tank which is secured in place, as by solder, following the insertion and cementing of the receptacle.

The foregoing subject matter, including the fluid tank and means for coating the roll, is claimed in application Serial No. 660,545, referred to above.

For the purpose of enabling the operator of the machine to vary the pressure of the rolls 19 and 22 against the respective moistening roll 18 and the drum 11 as may be desirable from time to time in the operation of the machine, mechanism is provided for effecting such results by movement of a single manually operable member.

Viewing Fig. 12 it will be seen that an end journal of the axial shaft of roll 19 is supported in an open recess in the upper end of a supporting member 128 which is pivotally attached at 129 to the frame member 12. Referring to Fig. 3 it will be seen that a mating supporting member 130 is pivotally supported at 131 to the frame wall 13. The supporting members which are located at the inside walls of the frame members 12 and 13 are in opposed positions for supporting the presser roll 19 normally in contact with the moistening roll 18. Viewing Fig. 3 it will be seen that swinging the supporting members 128 and 130 forwardly or to the right, the roll 19 will be pressed more firmly against the roll 18. When the members 128 and 130 are swung in the opposite direction the pressure of the roll 19 against roll 18 will be relieved and that by swinging said members 128 and 130 sufficiently to the left, the roll 19 can be lifted from the members for removal for cleansing or renewal.

The impression roll 22 is similarly supported in members 132 and 133, which are pivotally secured at 134 and 135 respectively to the opposed side frame members 12 and 13. Swinging movement of the members 132 and 133 to the right, as viewed in Fig. 3 will increase the pressure of roll 22 against the drum while reverse swinging movement will relieve the pressure and if through an adequate arc will enable the roll 22 to be lifted from position for cleansing or renewal.

As shown in Fig. 3 a spring 136 is releasably secured in openings in the members 130 and 133, while in Fig. 12 a similar spring 137 is attached to the members 128 and 132 at the opposite side of the machine. The springs may be re-located in other openings provided in the members as shown in Fig. 3 for varying the pressure exerted by roll 19 against roll 18 relative to the pressure exerted by impression roll 22 against the drum as the roll 22 is swung forwardly or to the right as viewed in Fig. 3.

The means for swinging the rolls 19 and 22 for varying the pressure exerted thereby against the roll 18 and drum 11 respectively comprises a transverse shaft 138 journalled in the side frame members 12 and 13. The shaft has secured thereto intermediate the frame side plates 12 and 13 a flanged eccentric cable-tensioning drum 139. A cable 140 has one or two convolutions around the drum 139 and the ends extend rearwardly into attachment with means which insure concurrent movement of the members 132 and 133. As shown in Fig. 3, the opposed members 132 and 133 are slotted to receive the ends of an L shaped cross bar 141. The horizontal flange of the bar is slotted at 142 to receive a depressed dog or tongue 143 of a bar 144 having a forward up-turned end 145 which is apertured to receive one end of the cable 140. The end of the cable has an anchoring member 146 thereon. The other end of the cable 140 has attached thereto a threaded member 147 which extends through a vertical plate 148 having a transverse slot receiving the rear of the horizontal bar 144 and abutting the rear of the cross bar 141. A nut 149 on the threaded member 147 provides means for adjusting the tension of the cable. A flexible washer under the nut is effective to maintain the tautness of the cable in use even after limited expansion thereof. Arcuate adjustment of the shaft 138 from the position shown in Fig. 3, will move the cable runs forwardly and thus swing the supports 132 and 133 forwardly or clockwise and press the roller 22 more firmly against the drum. When such movement is imparted to the members 132 and 133 the springs 136 and 137 will swing the supports 128 and 130 in the same direction and increase the pressure of the presser roll 19 against the moistening roll 18. In Fig. 3 the cam 139 is shown in a position for exerting minimum pressure of the rolls 19 and 22 against the cooperating roll 18 and drum 11 but, during periods of non-use, as overnight or weekends, it may be desirable to free the rolls 19 and 22 from contact with the roll 18 and drum 11 respectively to avoid the deformation of the rolls. This can be accomplished by lifting upwardly on the right-hand end of the bar 144 to free the tongue 143 from the slot 142. The brackets which carry the rolls 19 and 22 are thus freed from the holding action of the cable and can swing out of contact with the moistening roll and the drum as will be obvious. By grasping the bar 148 with the fingers and exerting pressure with the thumb on the up-turned end of the bar 144, the tongue 143 can be caused to be re-latched within the slot 142 in restoring the parts to operative position. Various cable tensioning positions of the drum 139 are shown in Fig. 7. A guard 150 about the convolutions of the cable on the drum 139 is shown in Figs. 6 and 7 also but is detached in Fig. 8.

The foregoing subject matter, including the means for

tensioning the rolls 19 and 22, is claimed in application Serial No. 660,546, referred to above.

For the purpose of adjusting the shaft 138 and eccentric drum 139 for varying the pressure exerted by rolls 19 and 22 against the moistener roll 18 and drum 11 as above described, one end of the shaft extends through the frame member 13 and bears a flanged drum 151. See Fig. 4. A cable 152 has one or two convolutions about the drum 151 and is intermediately anchored thereto at 151*a* and the end portions, being crossed, extend into engagement with a lever arm 153 which is pivotally mounted on the end of the shaft 24 which carries the drum 11. One end of the arm bears a finger-piece or knob 154 extending through an arcuate slot 155 in the frame member 13 where the knob is accessible to an operator of the machine. The operator can increase the pressure of the rolls 19 and 22 against the copy sheets passing through the machine for varying the intensity of the imprints by adjusting the knob 154 within the slot 155. In the upper position of the knob within the slot as indicated in Fig. 4, the rolls 18 and 22 exert minimum pressure against the roll 18 and drum 11, whereas by lowering the knob, the pressure is increased. Increasing the pressure by lowering the knob intensifies the imprinting result.

As previously described, rotation of the shaft 24 by the crank 23 effects the rotation of the drum 11 as well as the gear train shown in Fig. 4 which effects the sequential positive driving movement of the feed rolls 20 and the moistening roll 18. The drum carries a master M during the functioning operation of the machine. Such masters may vary in the disposition upon the same of the copyable matter which they bear. A master may have the copyable matter beginning near the top of the master sheet while it may be desirable to locate such matter relatively lower on the copy sheets, as where such sheets are in the form of letterheads for example. In some instances the reverse of the above may be desirable in producing copies which are of well balanced design or arrangement. Hence the present invention provides means for arcuately adjusting the drum 11 upon the drive shaft 24 whereby the copyable matter on a master M will be imprinted on the copy sheets in relatively higher or lower positions. For effecting the adjustment of the drum 11 upon the drive shaft 24 for accomplishing the results above adverted to, the drum, while carried by the shaft 24 is not positively secured directly to the shaft but is secured to a tube 156 which is mounted on the shaft as shown in Fig. 13. The drum 11 has a central transverse web 157 and an integral hub 158 through which the shaft 24 and the tube 156 extend. A set screw 159 secures the drum to the tube against relative rotation with respect thereto. The tube 156 extends outwardly through a bushing 160 provided in an opening in the frame member 12 and has secured thereto, by a set screw 161, a hub portion of a worm gear support 162 which is located within an enlarged hub-like casing portion 163 of the crank 10. The casing 163 is generally hollow as shown in Figs. 15, 16 and 17 but is provided with strengthening ribs 164 which engage the support 162 for cooperation with a screw 165 in holding the support in position within the hub-like casing. The support 162 carries a worm 166 which meshes with a worm gear 167 secured to the reduced outer end of the shaft 24. On the ends of the shaft of the worm are two manually operable adjustment wheels 168 which extend partially through openings in the end wall of the casing 163 as shown in Figs. 1, 2 and 13 to enable the wheels or one of them to be manually operated in either direction. By rotation of the wheels 168 while holding the crank 10 against movement, the gear 167 and shaft 24 will be rotated relative to the drum 11 or if the wheels are rotated without holding the crank against rotation the drum will be rotated relative to the shaft. Such relative adjustment between the drum and shaft can be effected in either direction simply by rotating the adjustment wheel or wheels 168 in a correlative direction.

Adjacent the other end of the drum 11, the shaft 24 has secured thereto a pointer 169, the outer end of which is adjacent the peripheral edge of the drum 11 which carries graduations 170 thereon located on opposed sides of a central zero or other indicia as shown in Fig. 2. As viewed in said figure, if the wheels 168 are rotated in a direction to produce movement of the drum 11 clockwise relative to the shaft 24 or to the right as viewed in Fig. 2, the degree of such relative movement with reference to the zero marking the center of the graduations will be shown. Such movement of the drum relative to the shaft will move the master with it and so move the master to a position requiring further rotative movement of the drum before the master contacts the copy sheet moving through the machine. The result of such adjustment of the drum on the shaft will be to lower the location of the matter imprinted on the copy sheets while adjustment of the drum in the opposite direction will locate the imprinted matter higher on the copy sheets.

If an operator notes on the master the position of the drum on the shaft by reference to the graduations, the same relative setting of the drum can be effected by operating the wheels 168 when such master is again employed in the making of copies and thus similar location of the imprinted matter upon the copy sheets will be obtained.

The master clamp bar 16 which holds the upper end of a master M upon the drum can be raised by suitable mechanism to release a master on the drum or to raise it for receiving a master. Such mechanism is shown in Fig. 14. The master clamp bar 16 is located in a slot or passage 170 provided in the cylindrical face of the drum and in a rib portion 171 as shown in Fig. 12. As shown in Figs. 12 and 14 the bar has a master engaging extension or lip 172 which when the bar is in seated position clamps the end of master M to the drum. A shallow lip receiving recess 173 receives the lip and the clamped upper edge of the master. The clamp bar 16 is provided with a pair of studs 174 which extend through suitable passages in the base of the rib 171 and are provided with nuts 175 on the ends between which and the base of the rib are compression springs 176 which normally seat the bar in the clamping position shown in Fig. 12.

In Figs. 13 and 14 a lever 177 is shown which is pivotally mounted at 178, to side frame 12 and carries a roller 179 disposed in a slot 180 in a second lever 181 which is pivotally mounted at 182 to said frame member 12. The lever 181 at its upper end portion carries a roller 183 which projects inwardly. A U-shaped lever 184 extends through an opening in the web 157 of the drum and has the ends 185 pivotally connected to the ends of the rib 171 on an axis defined by the two mounting studs 186 and 187. A wire spring 188 mounted on the stud 187 tends to hold the U-shaped lever 184 upwardly although the stronger springs 176 can depress the lever when the clamp bar is seated thereby.

The ends of the clamp bar 16 carry studs 189 which project from the bar through the open ends of the slot 170 in the rib 171 for engagement with the ends 185 of the swingable lever 184. The end 185 of the lever shown in Fig. 14, which is the left-hand end shown in Fig. 13, has secured thereto, as by rivets 190*a* a cam member in the form of a plate 190, the right-hand end of which, as viewed in Fig. 14 has an inclined cam edge 191.

In Fig. 14 the lever 177 is shown in a position in which the clamp bar 16 is elevated to a position for receiving a master M or for removing such a master. If the lever 177 is swung manually clockwise as viewed in Fig. 14, the stud 179 operating in the slot 180 of lever 181 will cause such lever also to swing in a clockwise direction and thus move the roller 183 out of engagement with the cam plate 190 and permit the springs 176 to restore the clamp bar 16 to a seated position in the slot 170 and thus

to clamp the edge of a master sheet M to the drum. When the levers **177** and **181** have been so swung they do not interfere with the rotation of the drum.

When it is desired to elevate the clamp bar **16** to release a master or preparatory to attaching a master, the lever **177** is swung counterclockwise from the described inoperative position to swing the cam operating roller **183** of the lever **181** into the rotative path of the cam **190**. The drum **11** is then rotated clockwise from an assumed position not shown to move the cam edge **191** into engagement with the roller **183** whereby the cam **190** swings the U-shaped lever **184** counterclockwise, as viewed in Fig. 14, and causes the upper edges of the arms **185** to engage the studs **189** to lift the clamp bar as illustrated in said figure. Upon insertion of the edge of a master M under the lip **172** of the clamp bar as shown in Fig. 14, clockwise movement of the lever **177** permits the springs **176** to restore the bar to clamping relation.

In Fig. 14 it will be noted that when the levers **177** and **181** are in the elevated positions shown, the relation of the stud **179** of the lever **177** to the pivot **178** of the lever **177** is such as to firmly support the lever **181** in the operative position illustrated. Hence the operator preparatory to elevating the clamp bar may merely move the lever **177** to the operative position shown and then rotate the drum clockwise to move the cam into the elevating position on the roller **183** of the lever **181**. It thus is not necessary to manually retain the lever **177** in the clamp-bar elevating position which arrangement leaves both hands of the operator free in inserting a master in clamping position under the lip **172** of the clamp bar. Suitable indicia preferably is stamped on the edge of the drum **11** indicating a preferred rotative position of the same before the lever **177** is swung to the operative position, after which positioning of the lever, the drum is moved to the position shown in Fig. 14 for elevating the clamp bar. However, should the drum be in the rotative position shown in Fig. 14 when the lever **177** is swung to the operative position, the clamp bar will be elevated as shown. The clamp bar elevating mechanism acts on both ends of the bar in elevating it while the springs **176**, which are located adjacent the ends of the bar exert adequately distributed pressure on the bar to provide firm clamping action upon a master in operative position on the drum.

Figures 21 and 22 show structure which can conveniently be operated for effecting the arcuate adjustment of the tank **98** for varying the elevation of the discharge outlet **102** of the valve chamber **101** within the cup **97** for varying the level of fluid within the trough and thus varying the amount of liquid supplied by the wick **82** to the moistening roll **18** and by the latter the amount applied to the sheets of copy paper passing through the machine. In said figures there is shown a slidable bar **192** which is attached by the headed studs **193** to the inner surface of the frame member **12**. A spring **194**, attached at one end to one of the studs **193** and at the other end to a stud **195** projecting from the bar inwardly of the machine, slides the bar to the right into contact with a rotatable stop member **196** mounted on a shank **197** journalled in the side member **12**. The outer end of the shank is provided with a wheel or knob **198** by means of which the member **196** can be adjusted to move any of the several depressions or recesses **199** of the edge into operative relation with the adjacent end of the bar **192** which is shaped to seat in any of the recesses. The scalloped edge of the stop member **196** is eccentric with respect to the axis of rotation and hence by adjusting the knob to move any recess **199** into contact with the end of the bar, the latter will be adjusted to the right by the spring or to the left by the eccentric, depending on the radial distance of the receiving recess from its axis of rotation.

The opposed end of the bar **192** which is turned inward of the machine carries a screw **200** and nut **201**, the end of the screw abutting the ear or bracket **115** of the tank. By adjusting the knob 198 from a given position, the bar

192 can be shifted by the cam **196** to the left or the latter will permit the spring **194** to shift the bar to the right and so move the end of screw **200** to the left or right for varying the fluid discharge position of the tank. By adjusting the cam **196** to shift the bar **192** the maximum distance to the left as viewed in Fig. 21, the valve chamber **101** will be in the highest operating position within the cup and the flow of fluid into the trough will not be shut off until the level in the trough is approximately at the top of the duct **96**. With the fluid in the trough at such high level, the wick can supply more fluid to the roll **18** than will be the case if the cam **196** is adjusted to the position wherein the bar **192** is shifted the maximum distance to the right wherein the level of liquid in the trough will be at a lower level. Different fluid levels in the trough are indicated in Fig. 22.

Preferably the knob **198** and the adjacent portion of the frame member **12** bear indicia to indicate the positions of the knob which provide high, low and intermediate levels of liquid in the trough.

While the improvements shown in the drawings and above described are illustrative of the invention, it will be apparent that various changes in details thereof may be made without departure from the scope of the invention defined by the appended claims.

We claim:

1. In a duplicator comprising spaced apart side frame members, a transverse shaft rotatably supported thereby, an arcuately adjustable sleeve on the shaft, a drum axially mounted on the shaft and sleeve and secured to the sleeve for arcuate adjustment with the sleeve relative to the shaft, an operable crank for the shaft at one end thereof and having a hub provided with a worm therein, said hub being connected to said sleeve, a manually operable adjusting wheel secured to the worm, and a worm wheel secured to the shaft within the hub and meshing with said worm whereby the crank effects rotation of the shaft and drum in unison whereas rotation of said adjusting wheel effects relative angular adjustment in a correlative direction of the drum relative to the shaft.

2. In a duplicating machine, a pair of spaced apart side frame members, a transverse shaft rotatably supported thereby, an arcuately adjustable sleeve on the shaft, a drum axially mounted on the shaft and sleeve and secured to the sleeve for arcuate adjustment thereof with said sleeve relative to the shaft, a crank for rotating the shaft and sleeve and provided with a hub receiving the end of each sleeve and shaft, said hub being connected to said sleeve, manually operable means carried by the hub for arcuately adjusting the sleeve and drum relative to the shaft, said drum having indicia at one margin thereof, and an indicator member secured to the shaft and coacting with the indicia on the drum for indicating the range of adjustment of the drum relative to the shaft in either direction from a given position.

3. A duplicator comprising spaced apart side frame members, a transverse shaft rotatably supported thereby, an arcuately adjustable sleeve on the shaft, a drum axially mounted on the shaft and sleeve and secured to the sleeve for arcuate adjustment with the sleeve relative to the shaft, an operable crank for the shaft at one end thereof and having a hub provided with a worm therein, said hub being connected to said sleeve, a manually operable adjusting wheel secured to each end of the worm, said adjusting wheels being on opposite sides of and equidistant from a plane containing the shaft axis, and projecting axially through the crank for access by the hand, and a worm wheel secured to the shaft within the hub and meshing with said worm whereby the crank effects rotation of the shaft and drum in unison whereas rotation of said adjusting wheel effects relative angular adjustment in a correlative direction of the drum relative to the shaft.

4. A duplicator comprising spaced apart side frame members, a transverse shaft rotatably supported supported

thereby, an arcuately adjustable sleeve on the shaft, a drum axially mounted on the shaft and sleeve and secured to the sleeve for arcuate adjustment with the sleeve relative to the shaft, an operable crank for the shaft at one end thereof and having a central generally hollow casing portion, a support detachably mounted in said casing portion against rotation therein and secured to said sleeve, a worm wheel secured to said shaft beyond said sleeve, a worm rotatably mounted in said support, and a manually operable adjusting wheel secured to each end of the worm and projecting axially through the casing portion for access by the hand, the crank being operative for rotating the shaft and drum in unison, and rotation of either adjusting wheel effecting relative angular adjustment in a correlative direction of the drum relative to the shaft.

5. A duplicator comprising spaced apart side frame members, a transverse shaft rotatably supported thereby, an arcuately adjustable sleeve on the shaft, a drum axially mounted on the shaft and sleeve and secured to the sleeve for arcuate adjustment with the sleeve relative to the shaft, a crank mounted on the shaft and sleeve at one end and secured to the sleeve for rotating the sleeve and thereby the drum, and means mounted in the crank reacting between the shaft and sleeve for angularly relatively adjusting the shaft and sleeve.

6. A duplicator comprising a frame, a rotatable shaft having an extension to the exterior of the frame, a drum mounted on the shaft for rotation therewith, means for feeding sheets through the duplicator in effective engagement with the drum, said sheet feeding means being driven by said shaft, a driving element mounted on said extension of said shaft and including a casing portion, and means in said casing portion interconnecting the drum and shaft for making relative arcuate adjustments therebetween.

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