July 3, 1934. F. W. STORCK 1,964,933

APPARATUS FOR DUPLICATING IMPRINTED MATTER

Filed July 21, 1930 6 Sheets-Sheet 1

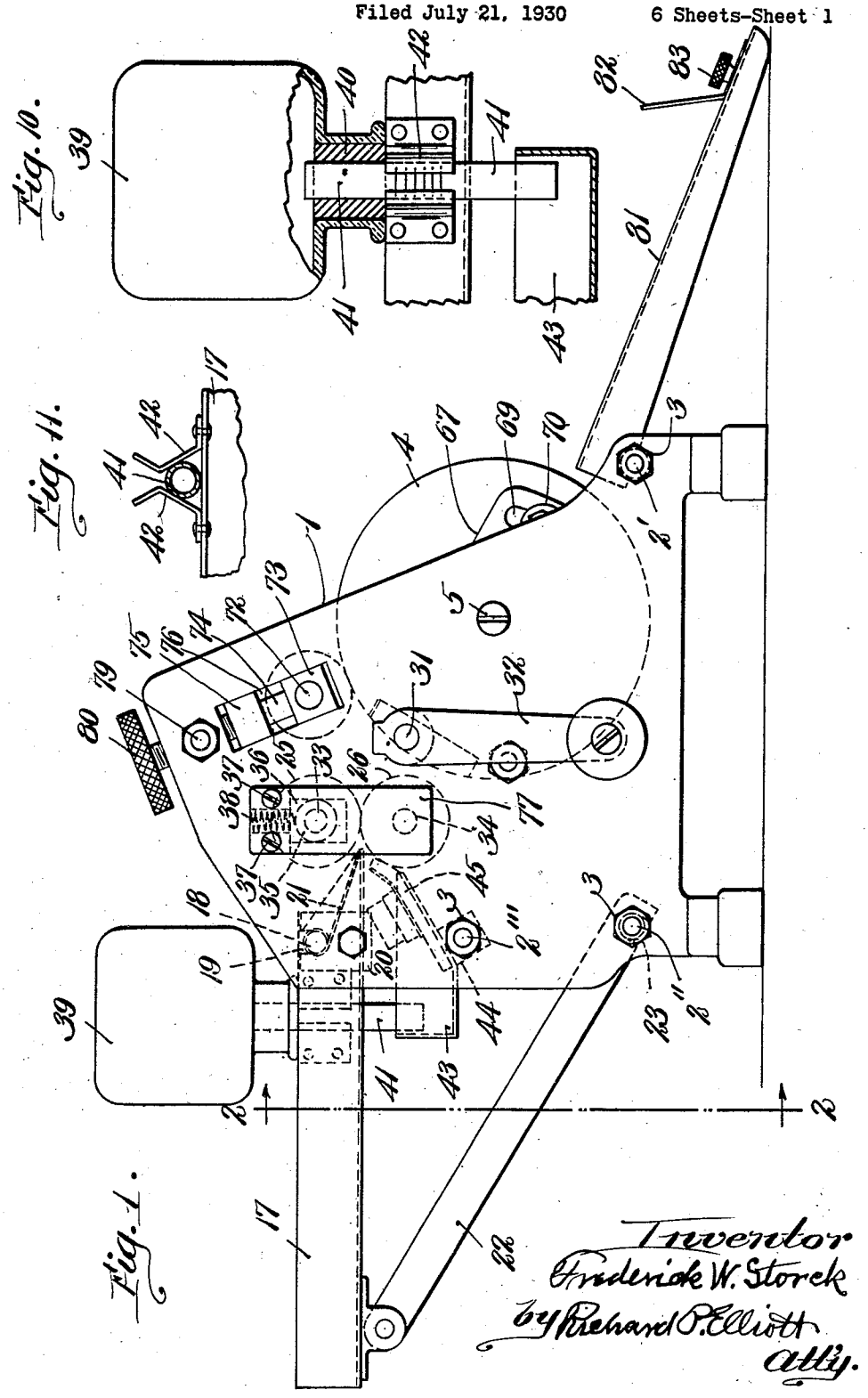


Fig. 10.

Fig. 11.

Fig. 1.

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APPARATUS FOR DUPLICATING IMPRINTED MATTER

Filed July 21, 1930 6 Sheets-Sheet 2

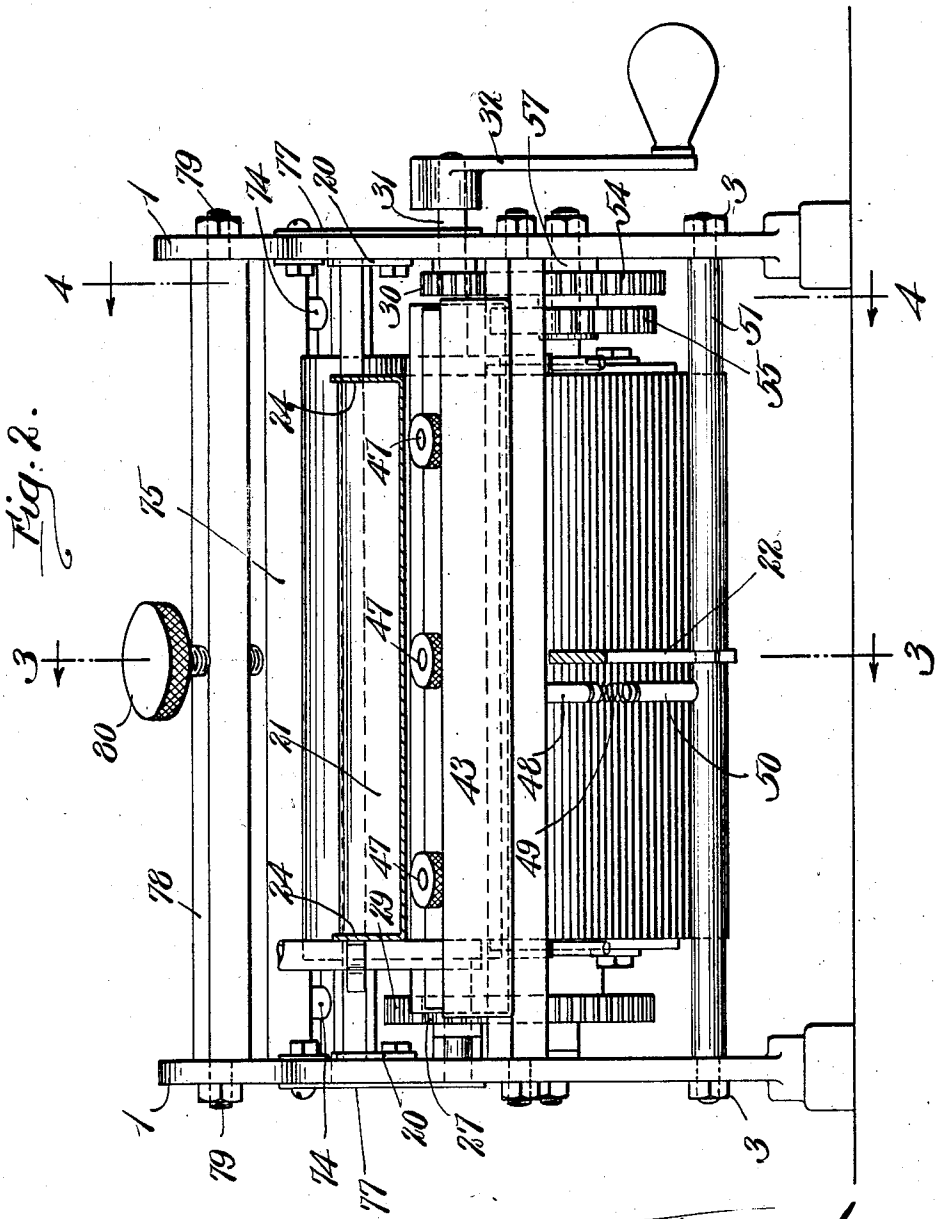


Fig. 2.

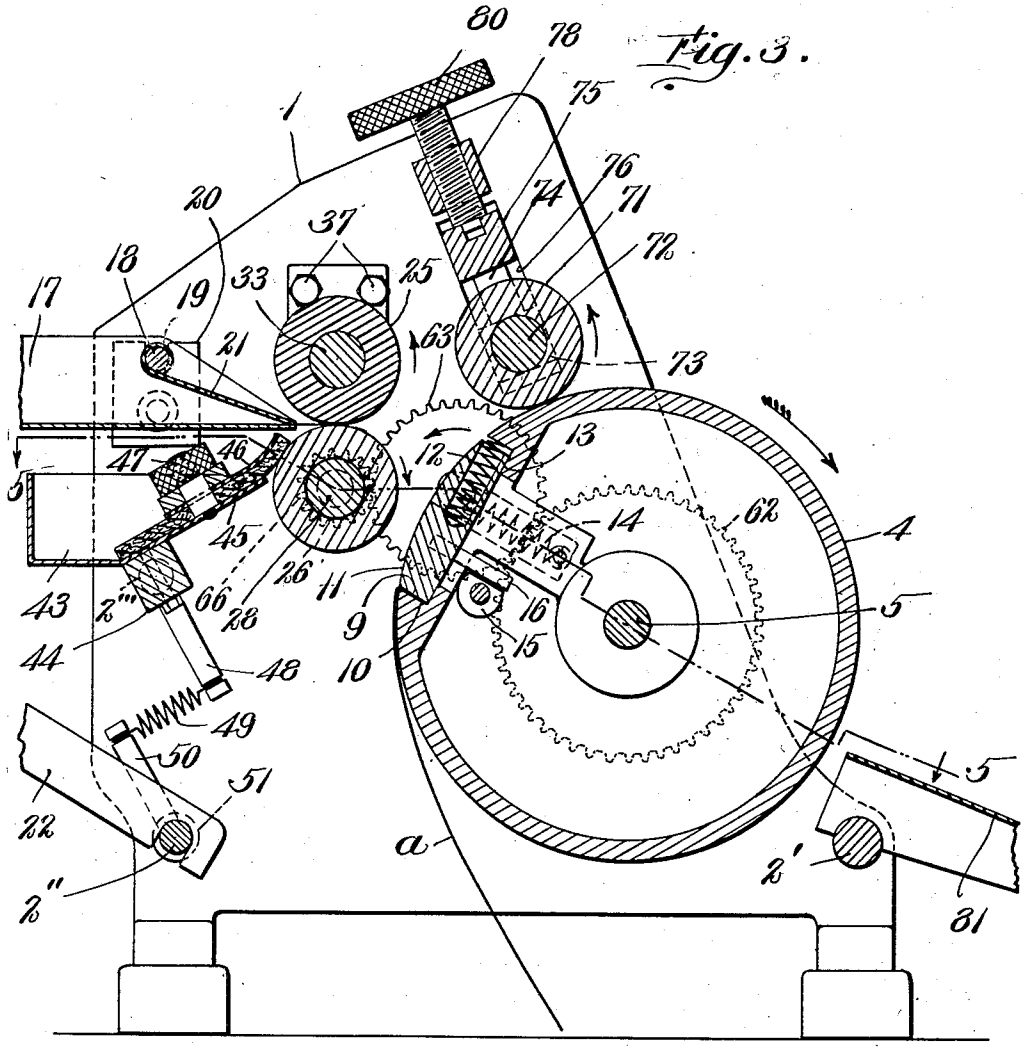
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APPARATUS FOR DUPLICATING IMPRINTED MATTER

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Fig. 3.



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APPARATUS FOR DUPLICATING IMPRINTED MATTER

Filed July 21, 1930 6 Sheets-Sheet 4

Fig. 7.

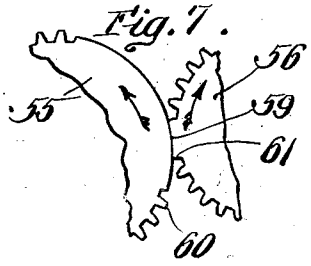


Fig. 6.

Fig. 4.

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APPARATUS FOR DUPLICATING IMPRINTED MATTER

Filed July 21, 1930 6 Sheets-Sheet 5

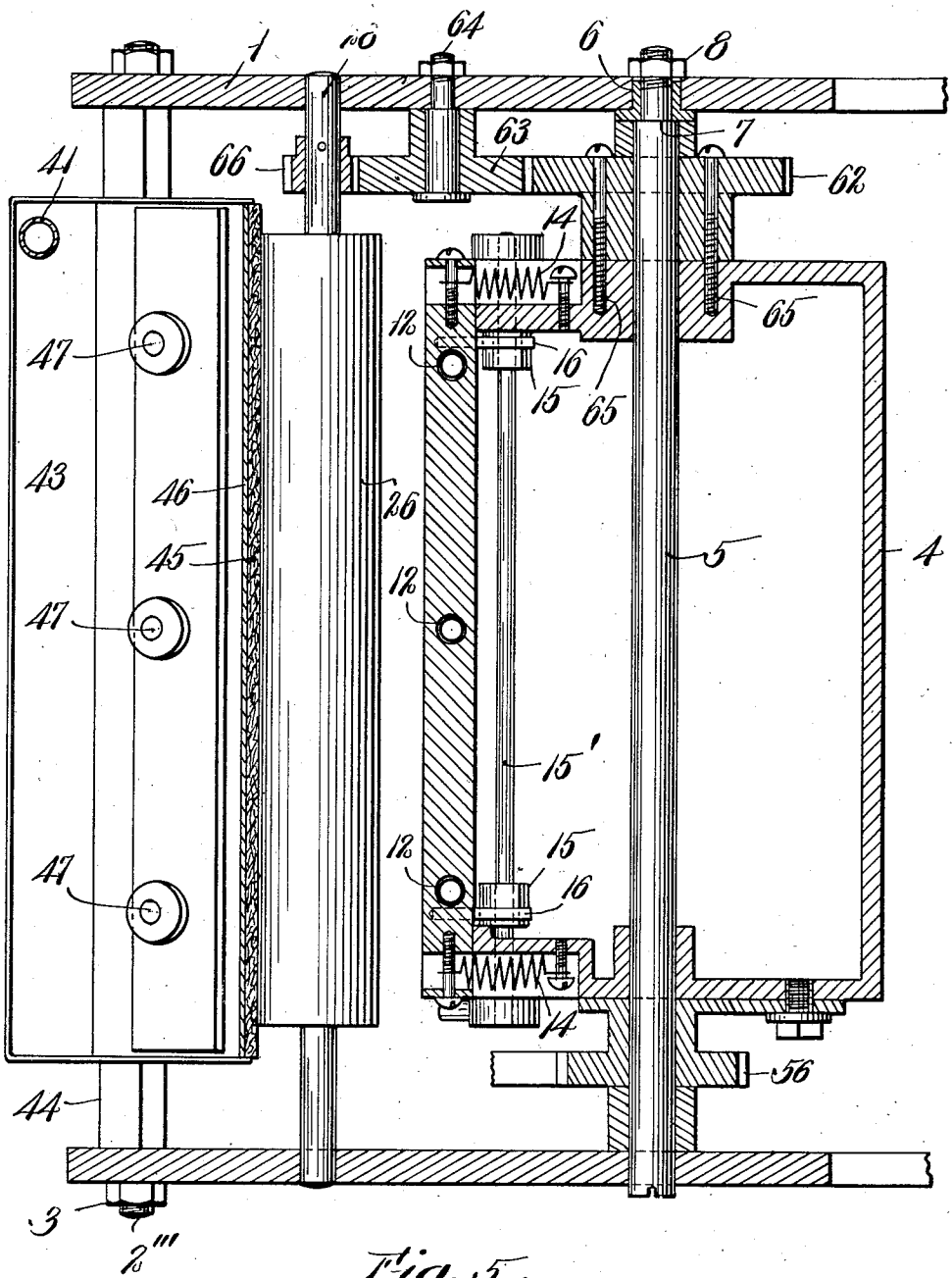


Fig. 5.

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APPARATUS FOR DUPLICATING IMPRINTED MATTER

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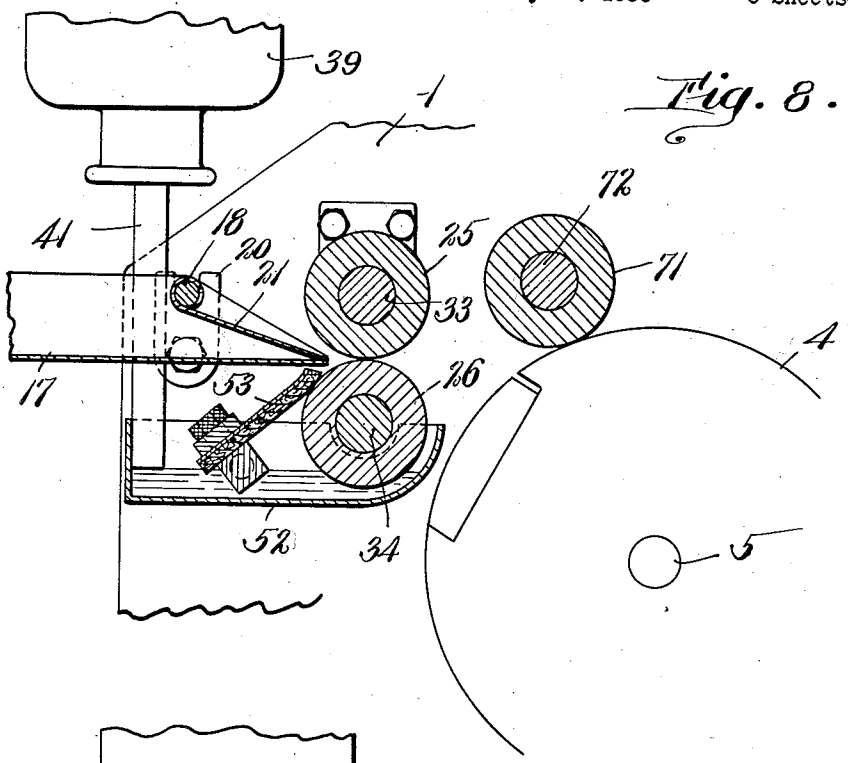


Fig. 8.

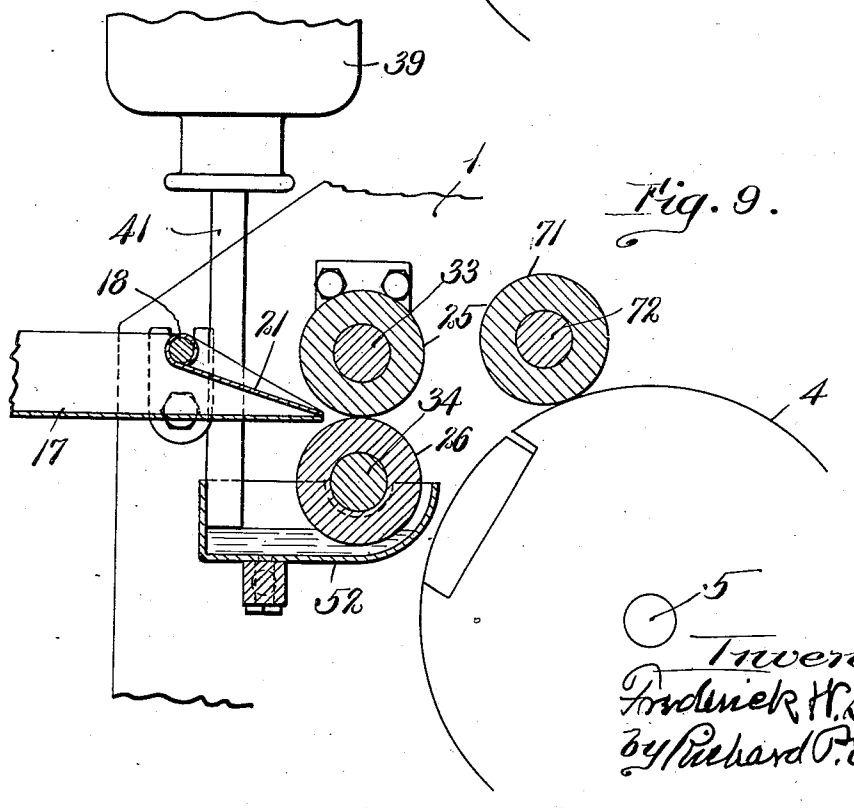


Fig. 9.

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UNITED STATES PATENT OFFICE

1,964,933

APPARATUS FOR DUPLICATING IMPRINTED MATTER

Frederick William Storck, Arlington, Mass.

REISSUED

Application July 21, 1930, Serial No. 469,501

24 Claims. (Cl. 101—132)

This invention relates to improvements in duplicating machines and the process of duplicating and multiplying records, more particularly in the method by which the record is made on a sheet of paper or the like, in reverse, with suitable copying ink and reproduced therefrom as positive copies on duplicate sheets of paper or the like.

In duplicating machines of the character described herein, it is the practice to moisten the clear sheet of paper or the like on which the duplicate copy is imprinted, by either passing said clear sheet through a tank of liquid or by letting the liquid flow to the top of the clear sheet by the action of gravity, neither of these methods permits of an effective control over the quantity of liquid deposited on the clear sheet. To produce a duplicate copy uniform in appearance, the quantity of moisture supplied to the clear sheet should be uniform and it should be evenly distributed over the surface of same, otherwise the copy will be heavy in some places and light in others.

By my method of moistening the clear sheets, clear legible copies may be made on very thin sheets of material, such as tissue paper and the like, as it permits the use of a volatile quickly diffusing moistening fluid, in such small quantities that it dampens the clear sheet to so slight a degree as to be hardly noticeable, yet sufficient to produce a strong clear copy.

The objects of my invention are as follows:

To provide devices for a duplicating machine to automatically control the quantity of moistening fluid deposited on a clear sheet by barometric and capillary action, to thereby produce a larger number of clear, legible and well defined copies of the original.

Another object of my invention is to provide means for adjusting the tension of the pressure roll against the cylindrical platen, thus to increase or decrease the pressure by which the clear sheet is pressed against the master sheet, to thereby produce a heavy or light impression on the clear sheet as desired.

A further object of my invention is to so construct a duplicating machine, that a large number of clear, well defined light or heavy copies of the original may be made at will on any kind of paper now in use, whether it be thick or thin, and irrespective of the kind of material used in its manufacture.

Another object is to so construct and arrange the feeding devices, cylindrical platen and pressure roll, that the printing is done at the top of the platen. By such arrangement, the master copy is secured to the platen by one end, permitting the free end to hang down and be kept straight and flat as it passes up into contact with the clear sheet and under the pressure roll. This arrangement takes care of the expansion of the master copy due to the moisture it takes up from the clear sheets.

Another object of my invention, is to provide means for intermittently rotating the cylindrical platen and feeding rolls in unison, and to interrupt their movement at a definite point in their rotation to allow time to feed clear sheets to said feed rolls so they will pass to and be accurately positioned upon the master copy.

A further object of my invention is to provide means, whereby a duplicate copy of matter imprinted on a master sheet may be produced on a clear sheet without distorting or puckering either of said sheets.

A further object of my invention is to provide a duplicating or multiplying machine that will make a greater number of copies than could be made heretofore in a given length of time, and will print such copies either light or heavy as desired.

Other objects of my invention will appear from the description and drawings which accompany the same, and which illustrate the preferred form in which I embody my invention. The statement of the objects of my invention are intended to generally explain the same and not to limit it in any manner.

In the drawings accompanying this specification and forming a part thereof:

Fig. 1 is an end elevation of my improved duplicating and multiplying machine, and shows the general arrangement of the various parts.

Fig. 2 is a side front elevation taken from the left of Fig. 1, on line 2, 2.

Fig. 3 is a sectional elevation taken on line 3, 3, Fig. 2.

Fig. 4 is a sectional elevation taken on line 4, 4, Fig. 2.

Fig. 5 is a sectional top view taken on line 5, 5, Fig. 3.

Fig. 6 is a section of one end of the printing roll, and shows the end of the segment for clamping the sheet having the printed reverse copy of record to be reproduced. It shows one of the spring members which hold the segment in its recess and the cam member for moving said segment sidewise to clamp and unclamp the reverse master copy.

Fig. 7 is a side sectional elevation of the inter-

mittent gears which operate to intermittently rotate the printing platen.

Fig. 8 is a diagrammatic sectional elevation of a modified form of moistening device, showing a section of the printing platen, the pressure roll for printing, the feeding and moistening rolls, liquid tank, gravity feed reservoir and fibrous material for conveying and controlling the moisture imparted to a duplicate sheet of paper.

Fig. 9 is a diagrammatic sectional end view of another modified form of moistening device.

Fig. 10 is a side elevation partly in section of the gravity feed reservoir for supplying the moistening fluid to the feeding tank.

Fig. 11 is a plan view of the spring clamps for holding the gravity feed reservoir in its vertically adjusted position.

In the drawings 1, 1, are the end members of the stationary frame in which are mounted the operating elements of the duplicator. The frames 1, 1, are held in position by the rods 2', 2'', 2''', and the nuts 3, 3, 3, threaded upon them.

The printing platen 4 is rotatably mounted upon the shaft 5, which in turn is secured against rotation in the frames 1, 1, the shaft 5, being held against rotation by the bushing 6, shoulder 7, and nut 8, which is threaded on the end of said shaft 5.

The printing platen 4 is provided with a clamping device for holding the reverse master copy of the record, its upper end 9, being clamped between the radial wall 10, and the edge of the segment 11. The segment 11 is held against the wall 10 and paper, by the tension of the springs 12, 12, 12, and is held in the recess 13 by the tension of the springs 14, 14.

The cams 15, 15, bear upon the pins 16, 16, secured in the segment 11, rotation of the shaft 15 causes the high part of the cams 15, 15, to contact with the pins 16, 16, and move the edge of the segment away from the radial wall 10, and free end 9, of the reverse sheet.

I provide a support 17 for the duplicate sheets of paper; it is supported by a rod 18, which passes through holes in its inner end, the rod 18 is supported at each end in upwardly projecting slots 19, 19, in the members 20, 20, which are secured to the side frames 1. A member 21 is rotatively hinged at one edge to the rod 18, so that its outer free edge will lie upon the bottom of the support 17. The duplicate sheet of paper is passed under the free edge of the member 21 as it is fed to the feeding rolls, the friction of the edge of the member 21 on the sheet of paper serves to smooth it and hold it flat and present its edge evenly to the feeding rolls. A brace 22 is pivoted to the outer end of the support 17, at one of its ends, its other being provided with a slot 23, to removably engage the rod 2''.

It will be understood that the sheet of material on which the reverse master copy is made may be of any desired size, the margins at the edges of the sheet may be varied at will and the record in writing, printing or drawing may occupy as much or little of the surface of said sheet as desired, also the record may be made on the master reverse copy in any desired position and impressed on a duplicate sheet of material in a corresponding position.

Means are provided for feeding the clear sheet of material to the printing platen 4, and accurately position it to make the desired contact with the master reverse copy of the record to be duplicated, comprise the guiding edges 24, 24, of the support 17, contact with which maintains the forward edge of the clear sheet parallel with the axis of the feeding roll 25, and the combined feeding and moistening roll 26. The roll 26, is non-porous and rotated in the directions indicated by the arrows, by and in unison with the printing roll 4, as will be more fully described.

The feed roll 25, is provided with the shaft 33, which extends beyond each end to form journals designed to rotate in the bearings 35, 35; said bearings 35, 35 are slidably mounted in the rectangular bearing blocks 36, 36. The bearing blocks 36, 36 are secured to the inside of the side frame 1, 1, by screws 37, 37; springs 38, 38, acting on the bearing blocks 36, 36, serve to maintain the feed roll 25 in contact with the roll 26, with a predetermined pressure.

When feeding the duplicate sheet of paper to the duplicator, it is moved forward in contact with one side 24, of the support 17, until its forward edge evenly contacts with the feeding rolls 25 and 26, at the point where they are held in contact, as will be fully explained hereinafter, the feeding of the duplicate sheet into contact with the feed rolls 25 and 26 takes place while they are not rotating.

A suitable moistening fluid is applied preferably to the under side of the duplicate sheet by the roll 26, as it is fed through the feeding rolls 25 and 26. The moistening fluid must be such as will dissolve the ink on the reverse master sheet. I preferably use a fluid dissolvent that will dry rapidly and diffuse quickly and evenly over the surface of the clear sheet. My reason for using a rapidly drying moistening fluid, is that I have discovered such fluid will not distort the material of the duplicate sheet of paper, or the like, and cause it to wrinkle and curl.

I have found that more and better duplicate copies can be made from the master reverse copy in a given length of time from a rapidly diffusing and drying fluid, and by controlling the amount of fluid deposited on each duplicate sheet.

The means for feeding the moistening fluid consists of an inverted reservoir 39, to hold the desired quantity of the moistening fluid having a stopper 40, and a tube 41, inserted in an opening in the stopper. Spring clamps 42, 42, are secured to the side of the support 17. Said clamps 42, 42, are adapted to receive the tube 41, and frictionally hold it so that it may be adjustable up and down vertically. The end of the tube 41 is arranged to extend downwardly into an open tank 43, and adjusted up and down to raise or lower the level of the fluid in said tank 43.

The reservoir 39, being inverted, the fluid therein will be held from flowing out by the action of vacuum while the end of the tube is covered by fluid in the tank 43. When the level of the fluid in the tank 43 is lowered by use, and the end of the tube 41, uncovered, additional fluid will flow down to replenish what is used.

The tank 43 is secured to the hollow tube 44, which in turn is mounted on one of the stay rods 2'''. Liquid is fed from the tank 43 to the moistening roll 26, by means of capillary action of the fibrous material 45, which is secured to the forward slanting edge of the tank 43, by the flexible plate 46, and screws 47. The lower edge of the fibrous material 45 is immersed in the fluid, the outer side near its upper edge contacting with the roll 26, so that fluid conveyed upwardly by the fibrous material will be deposited on the roll 26, and thereby spread upon the duplicate sheet of

paper as it is fed to the printing platen 4, by rotation of the rolls 25, and 26.

The hollow tube 44 is free to rotate on the stay rod 2''', for the purpose of holding the fibrous material 45, against the roll 26, with a predetermined pressure. The pressure is obtained by means of the stud 48, spring 49, stud 50, and hollow tube 51, mounted on the stay rod 2''. As shown in Fig. 2, the hollow tube 51 extends between the side frames 1, 1, and is held by friction against rotation by tightening the nut 3. To increase the tension of the spring 49, the nut 3 is loosened and the hollow tube 51 rotated outwardly thereby lengthening the spring 49, and increasing its tension, and the pressure of the fibrous material against the moistening roll, a reverse movement, of the tube 51, decreases the tension.

In practice I have found it is preferable to employ capillary action to convey the moistening liquid to the roll 26, because it enables me to control the amount of moisture deposited on the clear sheet, the amount of ink dissolved from the reverse master copy, and impressed on the clear sheet during each cycle of operation. By these means I am able to make a clearer, sharper reproduction, a greater number of copies and a heavy or light impression as desired.

In Figs. 8 and 9 are shown two modified methods of supplying moistening fluid to the clear sheet. In Fig. 8 a portion of the roll 26 is immersed in the fluid contained in the tank 52, the liquid being distributed and the surplus removed by the fibrous material 53.

Fig. 9 is the same in construction as Fig. 8, except that the fibrous material is omitted.

The mechanism for intermittently rotating the printing platen 4, consists of the pinion 30, mounted on the stud 31, and the crank 32, for rotating it continuously or otherwise as desired: the intermediate gear 54, to which the intermittent gear 55 is secured, the gear 55 enmeshes with the other intermittent gear 56. The gears 54 and 55 are rotatably mounted on a stud 57, which is secured to one of the frames 1. The intermittent gears 55 and 56 are of the usual construction, wherein a predetermined portion of the periphery of each is free from teeth and continued rotation of the driving gear will not rotate the driven until the blank space in the driving gear has passed the blank space in the driven gear and the teeth in both enmesh. Fig. 7 illustrates the construction of the gears 55 and 56.

In operation the gears 55 and 56 rotate in the direction of the arrow, when in their rotation the blank space 58 reaches the space 59, the space 58 will slide on the concave blank space 59 without imparting any rotative movement to the gear 56, until the gear tooth 60 contacts with the wall 61, of the blank space 59, thereupon the teeth of both gears enmesh and the gear 56 and printing platen 4 will be rotated.

The feed rolls 25 and 26 are intermittently rotated from the printing platen 4 by means of the gear 62, which is rotatably mounted on the fixed shaft 5, and secured to the end of the printing platen 4, by screws 65, 65. The gear 62 enmeshes with and drives the intermediate gear 63, which is rotatably mounted on the stud 64. The intermediate gear 63 enmeshes with and drives the pinion 66, which is secured by pins, or otherwise to the shaft 28, of the moistening and feeding roll 26. The pitch diameter of the gears 62 and 63, and the pinion 66, are so proportioned that the peripheral surfaces of the printing platen 4, and the feeding roll 26, rotate at the same speed, and their rotative movements synchronize in stopping and starting.

It will be noted that the gear 56 is rotatively mounted on the shaft 5, and is adjustably secured to the end of the printing platen 4, by means of the extension 67, formed upon it and the bolt 68, which passes through the circular slot 69. The bolt 68 is threaded into the end wall of the printing roll 4 and is provided with the washer 70. The purpose of this method of attaching the gear 56 to the roll 4 is to provide means for adjusting the position of the clamping wall 10, with relation to the point of contact of the pressure roll 71, with the printing platen 4.

To locate the impression of the reverse master copy of the record on the duplicate sheet in the desired position, clamp the reverse master copy of the record to the printing platen 4, and adjust the intermittent gear 56 until the duplicate sheet contacts with the reverse master copy of the record at the desired location.

The pressure roll 71 is preferably made of yieldable material such as rubber. It is formed upon the shaft 72, which is journalled at its ends in the bearings 73, 73. The bearings 73, 73, are secured to studs 74, 74, which in turn are secured to the cross bar 75. Elongated slots 76, 76, are formed in the two side frames 1, 1, of a size to receive the bearings 73, 73, and the ends of the cross bar 75, and permit them to slide freely therein. A cross-bar 78 is secured at its ends to the frames 1, 1, by nuts on the threaded portions 79. The cross-bar 78 is located above and in line with the cross-bar 75; its purpose is to receive the threaded adjusting screw 80. The lower end of the adjusting screw 80 contacts with the cross-bar 75 by adjusting the screw up or down in the threaded hole in the cross-bar 78, the pressure of the pressure roll 71, on the printing platen 4, is varied as desired.

A shelf 81 is provided, one end of which is removably positioned on the rods 2', its free end being supported on the shelf or table which supports the duplicator when being operated, the shelf 81 may be provided with a stop 82 secured to it by the screw 83. The shelf 81, is positioned so that the duplicate sheets will fall upon it as they pass from the pressure roll 71.

The operation of my improved duplicating and multiplying machine is as follows:

Assuming the required number of clear sheets for producing the duplicate copies desired have been placed upon the support 17, and the record to be duplicated made in reverse on a master sheet in the desired position. The first step is to secure one edge of the master sheet between the clamping members 9 and 12.

In the operation of printing, the duplicate sheet is moved under the forward edge of the member 21, until it evenly contacts with the feed rolls 25, and 26, rotation of said rolls and the printing platen 4 will moisten the duplicate sheet and feed it between the pressure roll 71, and the printing platen 4, at the same time the reverse master copy of the record meets the clear moistened sheet and passes with it under the pressure roll 71, thus bringing them into contact to produce a printed duplicate of the record. The duplicate printed sheet as it passes from under the pressure roll 71, falls upon the shelf 81.

It will be seen that through the action of the intermittent gears, the rotation of the printing platen 4 will be stopped when the wall 10 of the

clamping means has reached a predetermined distance from the point of contact of the pressure roll 71. This characteristic of the operating mechanism enables the operator to feed and position the duplicate sheet so that the record on the master reverse copy may be accurately located on such duplicate sheet, or so that it may be made to register accurately with any matter previously impressed on said duplicate sheet.

In the drawings and description accompanying the same I have shown and described the best form that now occurs to me in which to embody my invention. I do not however, wish to be limited to the form shown, as it is apparent that modifications may be made in the form and arrangement of the parts without departing from the spirit of my invention.

Having described my invention, what I claim is:

1. In a machine for duplicating on a clear sheet matter imprinted in reverse with copying ink on a master sheet, a tank containing a solvent liquid, means for conveying a constant quantity of said liquid to the under face of the clear sheet by capillary actions, means for positioning and feeding successive clear sheets to contact and register with the imprinted face on the master sheet and means to press the clear sheet against the master sheet to print thereon a duplicate of the matter imprinted on the master sheet.

2. In a machine, means for duplicating on a clear sheet, matter imprinted in reverse with dissolvable copying ink on a master sheet, means for moistening the under face of said clear sheet comprising a tank, a solvent liquid in said tank, a strip of fibrous material having one edge immersed in said liquid solvent, its other edge resting upon the periphery of a moistening roll, said moistening roll, means for feeding and positioning the moistened face of the clear sheet against the imprinted face of the master sheet to print a duplicate of the matter on the master sheet upon the clear sheet and means for holding said master sheet.

3. In a machine for duplicating on a clear sheet, matter imprinted in reverse with copying ink on a master sheet, a frame, a revolvable platen, means for securing the master copy to said platen, a pressure roll in contact with said platen, combined feeding and moistening rolls, means for conveying a moistening fluid to one of said rolls, means for intermittently rotating said platen and feeding rolls in unison and to interrupt their movement while a clear sheet is positioned between the feeding rolls to be fed to and register with the master copy, to print a duplicate of the matter on the master copy at a predetermined position on the clear sheet.

4. In a machine for printing on a clear sheet a duplicate of the matter imprinted in reverse in copying ink on a master sheet, means for moistening the under face of a clear sheet comprising a tank having a quick diffusing and rapid drying fluid solvent therein, combined feeding and moistening rolls and means for conveying by capillary action the fluid solvent from the tank to one of said combined feeding and moistening rolls and means for rotating said feeding rolls to distribute the fluid solvent on the under face of the clear sheet as it passes through said rolls.

5. In a machine for printing on a clear sheet a duplicate of the matter imprinted in reverse with copying ink on a master sheet, means for moistening a clear sheet, comprising an inverted reservoir closed at the top for containing a moistening fluid, means to convey the liquid from the bottom of said reservoir into a tank, and maintain it at a predetermined level therein, said tank, a pair of revolvable feeding rolls, means for conveying the fluid in the tank to one of said feeding rolls by capillary action and means for revolving said feeding rolls to feed and moisten the clear sheet as it passes through the feeding rolls.

6. In a machine for producing on a clear sheet duplicate copies of matter imprinted in reverse on a master sheet with copying ink, means for moistening and feeding the clear sheet comprising a reservoir, a tank, combined feeding and moistening rolls, means for revolving said rolls and means whereby a liquid solvent is conveyed from the reservoir to one of said feeding rolls by barometric and capillary action and deposited on the under face of a sheet of copy paper as it passes through the rolls.

7. In a machine for producing duplicate copies of matter imprinted in reverse on a master sheet with copying ink, a stationary frame, a printing platen rotatably mounted in said stationary frame, an intermittent gear adjustably secured to said printing platen to intermittently rotate it, combined feeding and moistening rolls mounted in said stationary frame, means to convey moistening fluid to one of said rolls, means for rotating said feeding and moistening rolls in unison with said printing platen to feed a clear sheet to contact with a master sheet secured to said printing platen and means to press said clear sheet against the master sheet.

8. In a machine for producing duplicate copies of matter printed in reverse on a master sheet, a frame, a printing platen revolvably mounted in said frame, means for securing said master sheet to said printing platen, means for intermittently rotating said printing platen, a pair of feed rolls for feeding a clear sheet of paper, means for conveying a volatile moistening fluid to one of said feed rolls to be deposited on a clear sheet of paper as it passes between said pair of feed rolls, means for revolving said feed rolls in unison with the rotative movement of the printing platen and a pressure roll for pressing the clear sheet against the master copy.

9. In a machine for producing duplicate copies of matter imprinted in reverse on a master sheet with copying ink, a stationary frame, a shaft mounted in said frame, an intermittent gear mounted on said shaft, a printing platen mounted on said shaft and adjustably secured to said intermittent gear, means for securing the master copy to said printing platen, means for feeding and moistening a clear sheet, means for rotating said feeding and moistening means in unison with the printing platen, means for conveying moistening fluid to said moistening and feeding means, and means for pressing the clear sheet against the imprinted face of the master sheet.

10. In a machine for duplicating on a copy sheet matter imprinted in reverse on a master copy with copying ink, a device for moistening a copy sheet, comprising a tank, a fibrous material mounted in said tank, means to convey moistening fluid from said tank to the under face of a copy sheet by capilliary action and means to automatically maintain a predetermined quantity of moistening fluid in said tank.

11. In machine for duplicating on a copy sheet matter imprinted in reverse on a master sheet with copying ink, means for supporting a copy sheet and guiding same in a flat condition to feed-

ing rolls, said feeding rolls, a device for moistening a copy sheet comprising a fibrous material, means to supply said fibrous material with a moistening fluid by capillary action from a tank, said tank and means to convey said moistening fluid from the fibrous material to the under face of a copy sheet.

12. In a machine for duplicating on a clear sheet, matter imprinted in reverse on a master sheet in copying ink, a stationary frame, a printing platen revolvably mounted in said stationary frame, means to secure a master sheet to said printing platen, combined feeding and moistening rolls, means for conveying moisture to the underside of the clear sheet of paper only when the said combined feeding and moistening rolls are rotated.

13. In the art of printing duplicate copies of matter imprinted on master sheets with dissolvable ink by steps which consist of moistening the underside of a clear sheet by capillary action with a quickly diffusing and drying liquid ink dissolvent and of feeding the damp clear sheets into contact with the master imprinted sheet under pressure.

14. The method of multiplying copies comprising forming a master copy sheet with ink characters in reverse, providing moisture by capillary attraction uniformly subjecting one face of a sheet to such limited moisture, disposing the moistened face of said sheet and master copy in position for contact with each other and subjecting such sheets to pressure.

15. The method of multiplying copies comprising forming a master copy sheet with ink characters in reverse, uniformly subjecting the under face of a sheet to be printed to limited moisture, disposing said sheets in engaging relation and subjecting such sheets to pressure.

16. The method of multiplying copies comprising forming a master copy sheet with ink characters in reverse, uniformly subjecting the under face of a sheet to be printed to moisture by capillary attraction in the presence of pressure, disposing said moistened sheet over said copy and subjecting both to pressure.

17. That step in the method of multiplying copies from a reverse-character master copy which consists in elevating moisture by capillary attraction for application to a sheet, producing a uniform film from such moisture and transferring moisture from such film to the lower face of a sheet to be printed.

18. That step in the method of multiplying copies from a reverse-character master copy which consists in elevating moisture by capillary attraction for application to a sheet and producing a uniform film from such moisture upon a non-yielding roller, transferring moisture from such film to the face of a sheet to be printed and simultaneously subjecting said sheet to pressure.

19. In a copy-multiplying device, in combination, a master copy drum, a compression roller and a damping roller and wick means for moistening said damping roller.

20. In a copy-multiplying device having a master copy drum, in combination with opposed feed rollers for advancing a sheet to be printed, one of said rollers being journalled under tension, moisture supplying means including a wick, one of said rollers engaging said wick.

21. In a copy-multiplying device, means for moistening the sheets to be printed comprising a roller having a substantially non-absorbent surface, a moisture reservoir spaced therefrom and a wick for transferring moisture from said reservoir to said roller surface.

22. In a machine of the hectographic type, means adapted to guide the copy paper, a supply tank, means adapted to maintain a body of liquid in said tank at a constant level, a roller having a non-porous periphery and adapted to contact with the copy paper, a wick adapted to supply liquid from said tank to the periphery of said roller in the form of a thin surface film, and means adapted to apply the master letter or the like to the copy paper after it has been moistened.

23. In the art of hectographic duplicating, those steps which consist in supplying a thin film of liquid from a pool of said liquid to a solid and non-porous applicator by capillary action, and then transferring the film of liquid from said applicator to the copy paper, and causing the moistened copy paper to contact under pressure with the master document.

24. In a method of making duplicate copies of matter imprinted in reverse with copying ink on a master sheet, which includes the use of a non-inflammable rapidly drying liquid solvent and means to moisten one side of a copy sheet by capilliary action with a predetermined quantity of said liquid, bringing the master sheet and moistened sheet into contact under pressure and of adjusting the pressure to make either a light or heavy duplicate copy at will.

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