Feb. 11, 1941. R. I. BREUER ET AL 2,231,109

POLYGRAPHING MACHINE

Filed Jan. 6, 1940 3 Sheets-Sheet 1

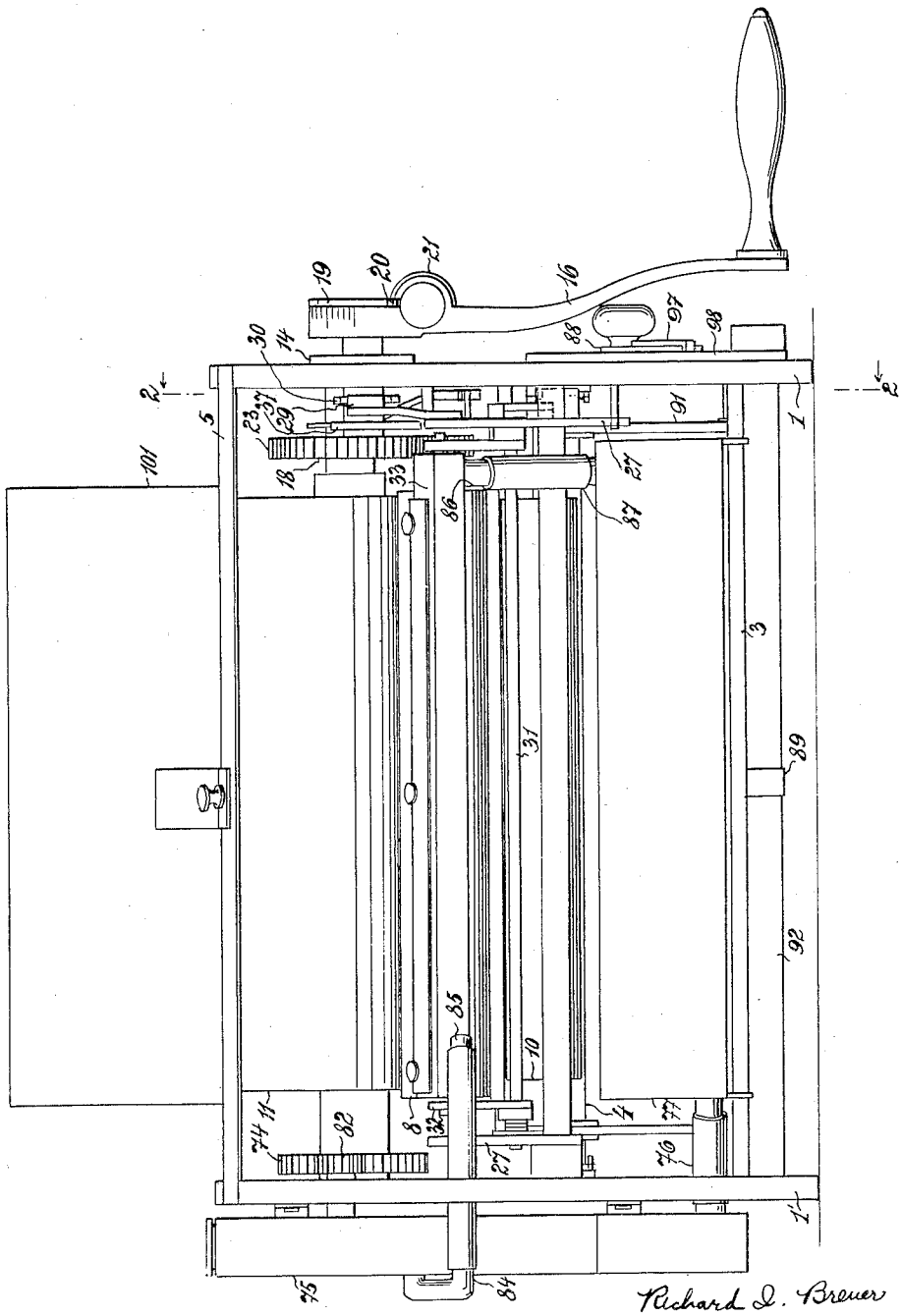


Fig. 1

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POLYGRAPHING MACHINE

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Fig. 2

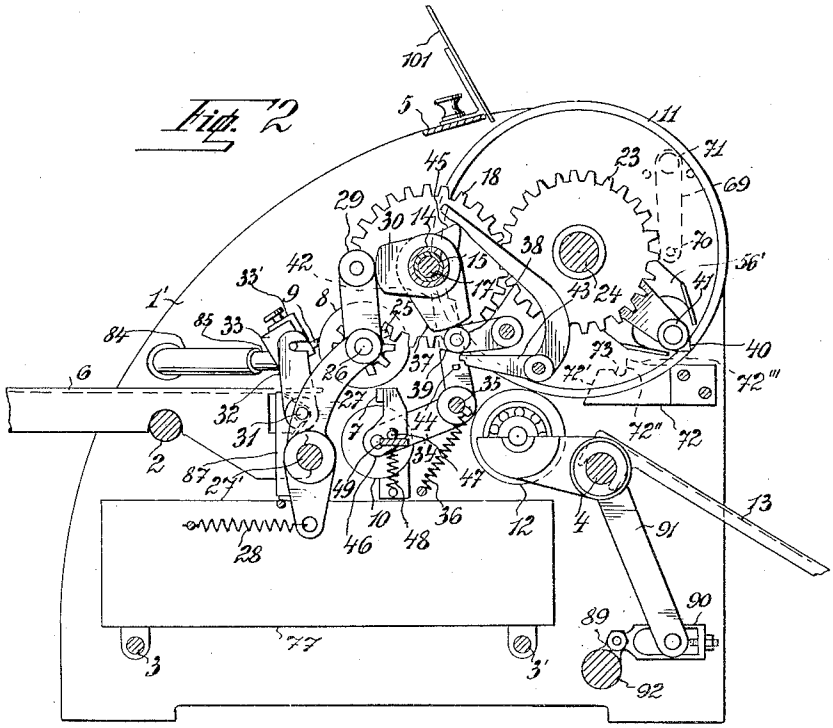
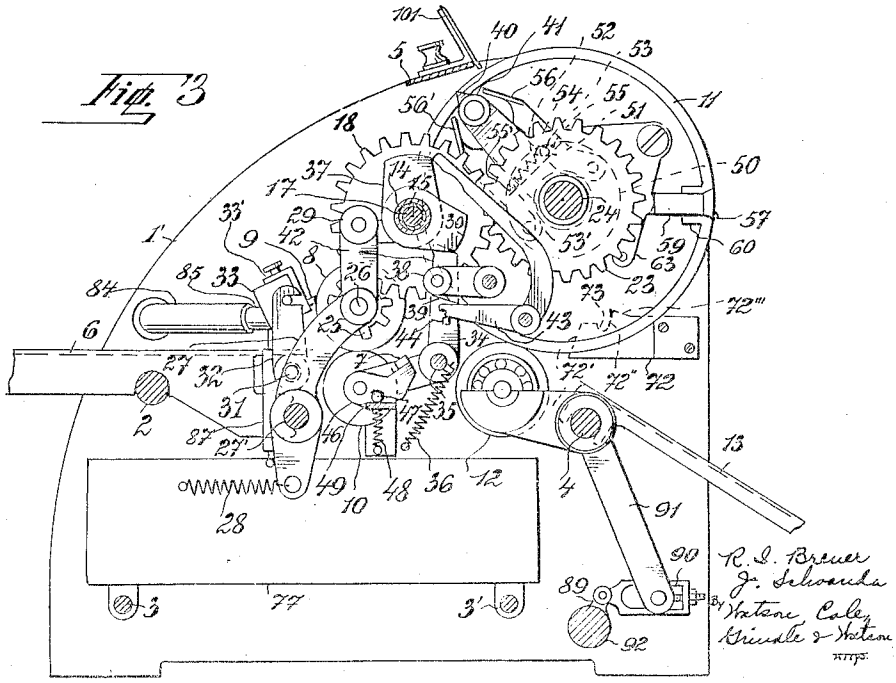


Fig. 3



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Fig. 5

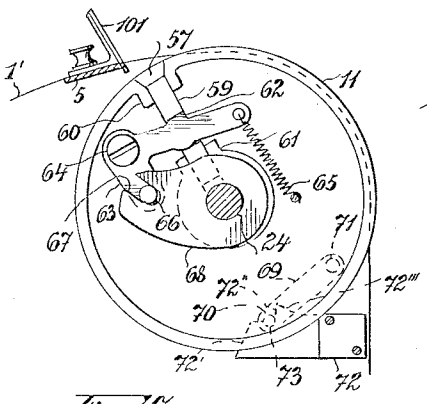


Fig. 6

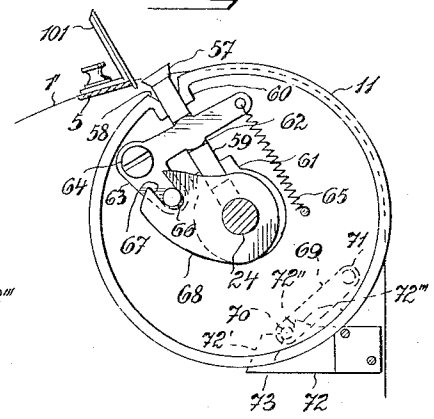


Fig. 7

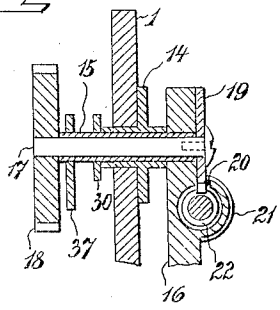


Fig. 8

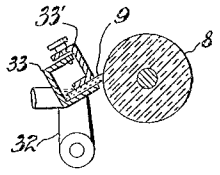
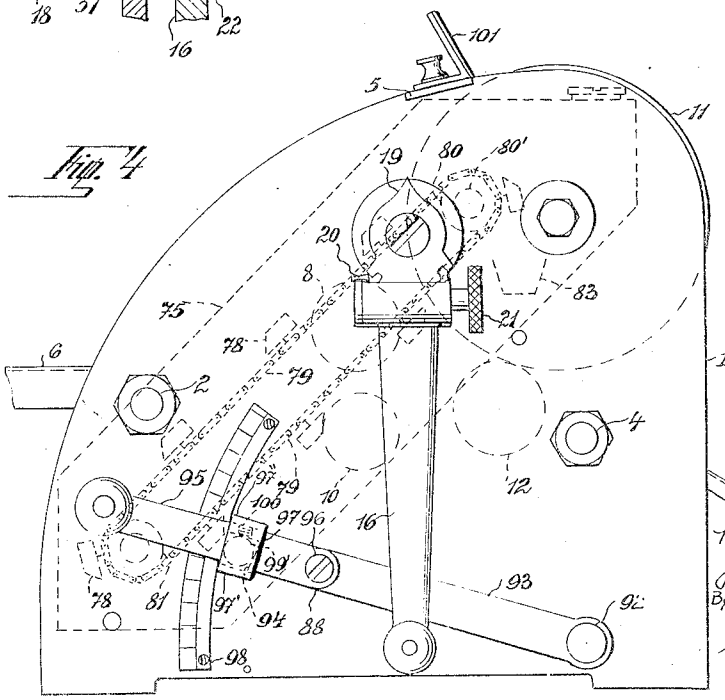


Fig. 4



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Patented Feb. 11, 1941 2,231,109

UNITED STATES PATENT OFFICE

2,231,109

POLYGRAPHING MACHINE

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Application January 6, 1940, Serial No. 312,734
In Germany January 17, 1939

7 Claims. (Cl. 101—132.5)

This invention relates to machines for copying by means of soluble ink from originals on which the script or drawing appears as mirror picture. The invention relates especially to machines, in which the sheets to be printed are moistened with a solvent by means of a moistening device and then passed through between a drum on which the original is mounted and a counterpressure roll, a portion of the ink being dissolved and the script or drawing of the original printed on the moistened sheet being copied in correct position.

In order to obtain the required number of sharp, well readable copies, the moistening of the sheets must be very uniform and economical. In some machines of known type a throttling valve is mounted in the conduit between the reservoir for the solvent and the moistening device, said throttle valve being destined for regulating the degree of moistening, but even in this manner of regulating the admission of solvent uniform moistening of the sheets is obtained only, when the machine is continually driven at corresponding speed. The inconvenience exists further, that it requires some time to bring the machine into the state ready for operation as the saturation of the moistening bar takes place only slowly. It may further happen, that the solvent for the ink drops into the machine, if the valve has by accident not been closed at the termination of the copying operation.

In another group of known machines the valve, inserted in the conduit between the reservoir and the moistening device, is constructed as shutting off valve and controlled from a circulating part of the machine. Also in these machines the degree of moistening of the sheets is dependent on the speed of operation. Further, a continuous regulation of the valve stroke is necessary to account for the sinking of the liquid level in the reservoir.

In a third group of machines of known type a bar of absorbent material is used for moistening the sheets, said bar dipping into a container, the liquid level in which is always maintained at the same height. Also this moistening device is not free from objections. The inconvenience exists, that the reservoir must be emptied after the copying work has been done and filled again before the work begins again. The solvent is further conveyed also in the intervals of service when the paper sheet is inserted, whereby disturbances of service may be caused.

The invention has for its object, to provide a valveless moistening device for polygraphing machines for copying originals with copiable script, this device beginning to act as soon as the machine rotates and is stopped when the machine is stopped, so that the moistening device reaches the state necessary for regular operation already after one or a few revolutions of the machine and conveys always the same quantity of solvent at every rotation of the printing drum, independently of the working speed and of the duration of the intervals at the insertion of a fresh sheet.

The moistening device must be applicable on machines with a roll moistening the sheets, and especially in machines with a roll moistening the upper side of the sheets. Moistening of the pressure roll cooperating wtih the moistening roll must be avoided. It must further be possible, to provide a reservoir of large volume for the ink solvent and to arrange this reservoir at a point where it does not disturb the sight upon the operating parts of the machine.

Another object of the invention is, to construct the device for holding the original on the printing drum so that it is opened when the driving crank is rotated in the direction opposite to the operative direction and closed again by subsequent turning of the driving crank in the operative direction, the drum remaining at standstill.

Another object of the invention is, to provide means for interrupting the feeding of the sheets to be printed during the rotation of the printing drum and to construct these means so that the moment at which the feeding is interrupted can be changed.

Other objects of the invention will be explained in describing the embodiment of the invention illustrated in the accompanying drawings, in which:

Fig. 1 shows the polygraphing machine in front elevation without table for the sheets to be printed,

Fig. 2 is a section on line 2—2 of Fig. 1,

Fig. 3 is a view similar to Fig. 2 some parts being shown in different position,

Fig. 4 shows an end view of the machine,

Fig. 5 shows an end view of the printing drum with the device for securely holding the original,

Fig. 6 is a similar view as Fig. 5, the drum with the device being in a different position,

Fig. 7 shows a longitudinal section through the shaft of the driving crank and

Fig. 8 is a cross section through the container for the moistening bar.

1, 1' designate the two uprights of the machine which are connected the one with the other by rods 2, 3 and 3', an axle 4 and a bar 5. The table

for the sheets to be printed is designated by 6, the sheets being placed so that their front edge bears against an abutment bar 7. A roll 8 is moistened by a bar 9 of absorbing material. The moistening roll 8, which may be made from porcelain or other non-porous material, cooperates at the given moment with a roll 10 and conveys the moistened sheet to the clamping point between a drum 11, on which the original is fixed, and a counter pressure roll 12. The printed sheet is delivered from the machine by means of a guide plate 13.

In the upright 1 a bush 14 (Fig. 7) is inserted which serves as bearing for a hollow shaft 15, on which a hand crank 16 is fixed. Through the hollow shaft 15 extends a shaft 17 of solid cross section, on the inner end of which a spur wheel 18 is keyed. On the outer end of shaft 15 a hand 19 is fixed adapted to be adjusted on a scale on the circumference of the crank hub. The arm of the hand opposite the point forms a toothed segment 20 with the teeth of which a worm 22 meshes which is mounted on the hand crank 16 and adapted to be turned by means of a knob 21. The gear 20, 22 is automatically braking and therefore forms at any position of hand 19 a clutch between crank 16 and shaft 17.

The spur wheel 18 meshes on the one hand with a spur wheel 23 on a drum shaft 24 and on the other hand with a spur wheel 25 on a shaft 26 of the moistening roll 8. The shaft 26 is mounted at both ends in oscillatable levers 27, which are fixed on a shaft 27' and controlled by a spring 23. One of the levers 27 has an extension, in which a roll 29 is mounted on which acts at the given moment a cam 30 on crank shaft 15. An axle 31 is mounted in the levers 27 and on this axle arms 32 of a container 33, 33', destined to hold the moistening bar 9, are fixed.

The bearings for the lower roll 10 for conveying the sheets are in bell crank levers 34 fixed on an axle 35 controlled by a spring 36. The axle 35 is controlled by a cam 37 on the hollow shaft 15, said cam acting upon the end 39 of one of the bell crank levers 34 through the intermediary of a roller 38 mounted on an oscillatable arm. The axle 35 is further controlled by a hand 40 on the spur wheel 23, which hand carries a roller 41 which, at the given moment, acts upon a lever 42 fixed on the axle 35. When the lever 42 has been oscillated by the hand 40, an angular pawl 43 comes into engagement with a pin 44 on the bell crank lever 34 and securely holds this lever in its position. The releasing of pawl 43 is effected by a cam 45 on shaft 15.

Levers 46 are hingedly mounted on the hollow shaft of conveying roll 10, the free ends of these levers being connected by the abutment bar 7. Springs 48 engage on pins 47 on the levers 46. The pins 47 are held by the pull of the springs in engagement with flanges 49 fixed on the uprights of the machine.

The hand 40, the point of which slightly projects from the wall of drum 11 is fixed on a ring-shaped insertion piece 50 of the spur wheel 23 (Fig. 3). This insertion piece has a straight edge 51 on its outer circumference. In the space between the straight edge 51 and a circular recess 52 of the spur wheel two rollers 53, 53' are located which are pressed the one away from the other by a spring 54. Pins 55, 55' inserted in levers 56, 56' are at the side of the rollers, the pivot pins of these levers being fixed in the insertion piece 50. The two rollers 53, 53' act in the manner of wedges and prevent turning of the hand in both directions. If, however, the two levers 56, 56' are moved the one towards the other, the rollers are forced into the widening middle portion of the hollow space accommodating them and the hand can then be adjusted.

A bar 57 of trapezoidal cross section serves for clamping the original on drum 11 loosely rotatable about shaft 24 and this bar is mounted in a longitudinal slit 58 in the wall of the drum (Figs. 5 and 6). At the ends of bar 57 two rods 59 are fixed which are shiftable in radially arranged guides 60, 61. A rounded thickened portion of bell crank levers 63, oscillatable about pins 64, engage in a recess 62 of the rods 59. A spring 65 is attached to one end of each of the bell crank levers 63. A pin 66 on the other end of each bell crank lever 63 is guided in a notch 67 of a cam 68 keyed on the drum shaft 24.

On one of the end walls of drum 11 a pawl 69, rotatable about a pin 71, is arranged, on which a bolt 70 is fixed. The pawl 69 cooperates with a stationary stop 72 which has guide edges 72', 72'' and 72''' and a semicircular recess 73.

A spur wheel 74 (Fig. 1) is keyed on the drum shaft 24 and operates a scooping mechanism which is accommodated in a casing 75 fixed on the outer surface of the upright 1'. This casing 75 is connected by a pipe 76 with a large tank 77 for the medium for dissolving the ink and contains a chain 79 on which buckets 78 are attached (Fig. 4), said chain being wound around rollers 80, 81. On shaft 80' of roller 80, this shaft extending through the casing 75, a spur wheel 82 is keyed which meshes with the spur wheel 74. By the buckets the solvent for the ink is poured into a gutter 83 which, by a conduit 84 (Fig. 1) is connected with an inlet socket 85 of the container 33, 33' in which the moistening bar is located. On the end of the container remote from the inlet socket a discharge socket 86 is arranged to which a hose 87 is connected which ends in the top plate of tank 77.

The roll 12 cooperating with the drum 11 is adjustable in vertical direction in order to vary the pressure at which the moistened sheet is pressed against the original. The adjusting is effected by turning a hand lever 88 which actuates a system of levers 89, 90, 91. The lever 88 consists of an arm 93 fixed on shaft 92 and having at its end an acute-angled incision 94 and an extension 95 which is hingedly connected with the arm 93. A C-shaped fish plate 97 is connected with the extension 95. One arm 97' of the fish plate 97 forms together with the incision 94 and the side wall of a curved bar 98 a hollow space in which a roller 99 is located. The other arm 97'' of fish plate 97 supports a spring 100 which loads the roller 99.

When the machine for copying an original has to be operated, the crank 16 is turned from the inoperative position shown in Fig. 4 in anticlockwise direction. The turning movement of the crank is transmitted by the spur-wheel 18 to the spur-wheel 23 and to shaft 24 of said spur-wheel on which the arms 68 are fixed. These arms act upon the bell crank levers 63 (Fig. 5) fixed on the drum 11, but effect at first no oscillation of these levers because the resistance caused by the drum is less great than the force of the springs 65 which hold these levers 64 in their position. After a part rotation of drum 11 bolt 70 of pawl 69 slides along edge 72''' of stop 72 and drops into the notch 73, whereby further rotation of the drum is prevented. This opera-

tion takes place, however, only at a small revolving speed. If the speed of rotation is great, as is the case for instance if unintentionally the crank is pushed when the same is in the inoperative position, the drum is not braked. In this instance the pawl 69, when running up edge 72''', is not thrown inwards and can therefore not engage into the notch 73.

If crank 16 after the drum has been locked is still turned in anticlockwise direction, the bell crank levers 63 are oscillated from the position shown in Fig. 5 into the position shown in Fig. 6. The clamping bar 57 is then lifted so that the front edge of an original placed on a table 101 can drop between bar 57 and the seat 58 of the same. If crank 16, which is locked against turning in anticlockwise direction, is then turned in clockwise direction, the elements return into the position shown in Fig. 5. From a continuous turning of the crank in clockwise direction results that bolt 73 of pawl 69, running up on the edge 72'', is lifted out of notch 73.

The drum 11 can be coupled with its shaft 24 by the clamping bar 57 and the lever system 59, 63, 68 serving for the actuation of the clamping bar, so that the clamping bar is closed by the turning of the drum shaft in the operative direction and opened by the turning of said drum shaft in the opposite direction. This construction presents two advantages: The clamping bar 57 is strongly pressed onto its seat when the machine is in operation and the spring 65, which holds the clamping bar in closing position, can therefore be comparatively weak. The second advantage is, that the closing of the clamping bar 57 takes place when the drum is at standstill. Thus it is possible to employ a fixed table for supporting the original.

After the original has been fixed on the drum, the crank 16 is turned in clockwise direction and the scooping mechanism 78, 79 pours the dissolving medium for the ink into the gutter 83. Through the pipe 84 this dissolving medium flows to the inlet socket 85 of the container 33, 33', through this container and finally through discharge socket 86 and hose 87 back to the tank 77 communicating with the casing 75 of the scooping mechanism.

The scooping mechanism 78, 79 is of such dimension that the quantity of liquid flowing through the container of the moistening bar at each revolution of the crank is considerably greater than the consumption for moistening a sheet, this consumption being very little and amounting to only fractions of a cubic-centimeter. By this ample supply of solvent is attained that the moistening bar 9, which at the beginning of the operation is dry, the cross-section of which can be very small, is rapidly saturated with solvent. Generally two or three turnings of the crank are already sufficient to bring the moistening bar 9 into the saturated state required for the orderly operation. If the saturated state has been attained, the mostening bar 9 absorbs only a very small portion of the liquid flowing through the container 33, 33' and gives up the same to the moistening roll 8 which in this manner is very economically moistened. The degree of moistening is independent on the speed at which the machine is operated because the scooping mechanism conveys always the same quantity of liquid at each operation independently on the revolving speed of the driving mechanism.

If the turning of the crank is stopped for the insertion of a fresh sheet, the container 33, 33' of the moistening bar is empty and the conveying of solvent onto the moistening roll 8 is interrupted. For this reason it is impossible that, even at long interruptions of operation, solvent can collect on the moistening roll. A further advantage is, that the quantity of solvent evaporating during the interruption of service is very small.

As soon as the moistening bar 9 has attained its saturated state the point of the hand 40 is adjusted so that it is situated just behind the end of the script on the original. The polygraphing work can then begin. With this object in view the front edge of the sheet supported by table 6 is placed against the bar 7 and the crank 16 is then turned once in clockwise direction from the initial position shown in Fig. 4.

After a part rotation of the crank the cam 30 on the crank shaft 15 is disengaged from roll 29 and under the action of spring 28 the lever 27 is oscillated in the direction in which the moistening roll 8 descends. At the same time cam 37 slides off the roller 38 and the bell crank levers 34 are oscillated, under the pull exerted by spring 36, in the direction in which the roll 10 is lifted. At the same time the arms 46 carrying the abutment bar 7 are oscillated from the position shown in Fig. 2 into the position shown in Fig. 3.

The moistening roll 8 engages then with the roll 10. When the rotation of the driving crank continues, the sheet is therefore moistened and conveyed to the clamping point between the printing drum 11 and the counter pressure roll 12.

As soon as the roller 41 on hand 40 strikes against the lever 42, the shaft 35 oscillates the lever 34 by a small angle and the roll 10 descends so that it is no longer in frictional engagement with roll 8. The pawl 43 engages at the same time over pin 44 and holds the oscillated bell crank levers 34 in their position. As the conveying rolls 8 and 10 are no longer in frictional engagement no moistening of the sheet takes place. From this moment the sheet is conveyed only by the printing drum 11 and the counter pressure roll 12.

The elements of the machine operative at this feeding movement of the lower sheet conveying roll 10 are dimensioned and arranged so that at the moment when roll 10 is lowered the distance of the hand 40 from the clamping point between printing drum 11 and roll 12 (measured along the drum casing) is equal to the distance of this clamping point from the clamping point of the conveying rolls 8 and 10. As the hand 40 is adjusted to the end of the script on the original, the sheet is consequently moistened only at the portion on which it is printed. In this manner ink solvent is saved and it is further prevented under any circumstances that the backing roll 10 comes directly into contact with the moistening roll 8 and is thus moistened. This means a great advantage because the moistening of the counter pressure roll cooperating with the moistening roll, especially when a large number of copies has to be produced, influences the uniformity of the moistening.

Directly before the crank 16 assumes again the original position, the cam 30 engages again with the roller 29, and the cam 37 with the roller 38, and the conveying rolls 8 and 10 assume again the position shown in Fig. 2. At the same time pawl 43 is oscillated by the cam 45 so that it can come again into engagement with the pin 44 at the next following operation.

If the script has not been printed on the desired portion of the sheet, the hand 19 is correspondingly adjusted by actuating knob 21 on crank 16. As the spur wheel 18 keyed on shaft 17 of the hand meshes with the spur-wheel 23, the drum shaft 24 and the printing drum 11 coupled with this shaft by the lever system 59, 63, 68 is turned at this adjustment, whereas the control mechanism for the conveying rolls 8 and 10 remains in its adjusted position. Herefrom results that the distance of the bar 57, which holds the original, from the clamping point between drum 11 and counter pressure roll 12, at the moment when the conveying of the sheet by the rolls 8, 10 begins, is increased or reduced.

If the appearance of the copies shows, that the moistening of the sheet is not sufficient, the adjusting of bar 33', which clamps the moistening bar (Fig. 8), is altered in order to increase or to reduce the suction force of the moistening bar. During the printing of a large number of copies the adjusting of the clamping bar need not be altered, because the solvent fed at each operation to the container 33, 33' is independent on the level of the liquid in the tank 77 or in the container 75 of the scooping mechanism. Regulation in the course of the copying work is necessary only in so far, as with the increasing of the number of sheets to be printed the printing pressure between drum 11 and the counter pressure roll 12 must be altered. This regulation is effected by means of the lever 88.

If the edition has been printed, the crank 16 is slowly turned in anticlockwise direction, in order to bring the clamping bar into the position shown in Fig. 6 and to thereby detach the original from the printing drum.

What we claim is:

1. Polygraphing machine for copying from an original text in soluble ink, comprising in combination a drum for holding the original, a roll for pressing on to the original the sheets to be printed, a moistening roll, a bar of absorbent material the upper end of which slides on said moistening roll and the lower end is inserted in a container having a discharge aperture, a driving mechanism for rotating said drum, a tank for solvent and a device inserted in said driving mechanism and adapted to feed the solvent from the tank into said container of said bar.

2. Polygraphing machine for copying from an original text in soluble ink, comprising in combination a drum for holding the original, a roll for pressing on to the original the sheets to be printed, a moistening roll, a bar of absorbent material the upper end of which slides on said moistening roll and the lower end is inserted in a container having a discharge aperture, a driving mechanism for rotating said drum, a tank for solvent, and a scooping mechanism inserted in said driving mechanism and adapted to lift the solvent from the tank into said container of said bar.

3. Polygraphing machine for copying from an original text in soluble ink, comprising in combination a drum for holding the original, a roll for pressing on to the original the sheets to be printed, a moistening roll, a bar of absorbent material the upper end of which slides on the moistening roll and the lower end is inserted in a container having a discharge aperture, a driving mechanism for rotating said drum, a tank for solvent, and a device inserted in said driving mechanism and adapted to feed to said container more solvent than is necessary for the moistening of the sheets.

4. Polygraphing machine for copying from an original text in soluble ink, comprising a drum for the original, a roll for pressing on to the original the sheets to be printed, a pair of conveying rolls, a device for moistening one of said rolls with a solvent for the ink, a system of levers in which the bearings for the conveying rolls are accommodated, and a hand adjustably mounted on the drum for controlling said system of levers.

5. Polygraphing machine for copying originals with text in soluble ink, comprising in combination a pair of rolls for moistening and conveying the sheet to be printed, a system of levers in which the bearings for the conveying rolls are accommodated, a drum for holding the original, a roll for pressing on to the original the sheet to be printed, a hollow cam shaft for controlling the system of levers and a shaft mounted in the hollow shaft for driving the drum and the conveying rolls, said shaft being adjustably connected with said hollow shaft.

6. Polygraphing machine for copying originals with text in soluble ink, comprising in combination a device for moistening the sheets, a drum freely rotatable on its shaft and adapted to hold the original, a pressing roll for pressing the sheets on to the drum, means for securely holding the original on the drum, and a system of levers mounted on said drum said system being connected at the one end with the means for securely holding the original and at the other end with the shaft of said drum.

7. Polygraphing machine for copying originals with text in soluble ink, comprising in combination a device for moistening the sheets, a drum freely rotatable on its shaft, a press roll for pressing the sheets on to the drum, means for securely holding the original on the drum, a system of levers mounted on said drum connected at the one end with the means for securely holding the original and at the other end with the shaft of said drum, a penduling suspended pawl on said drum, and a stop for said pawl on the machine frame and having guide edges adapted to prevent engagement of the pawl in the abutment when the machine is operated at great speed.

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