April 29, 1941. F. W. EGAN ET AL 2,240,112

PRINTING MACHINE

Filed Oct. 10, 1939 6 Sheets-Sheet 1

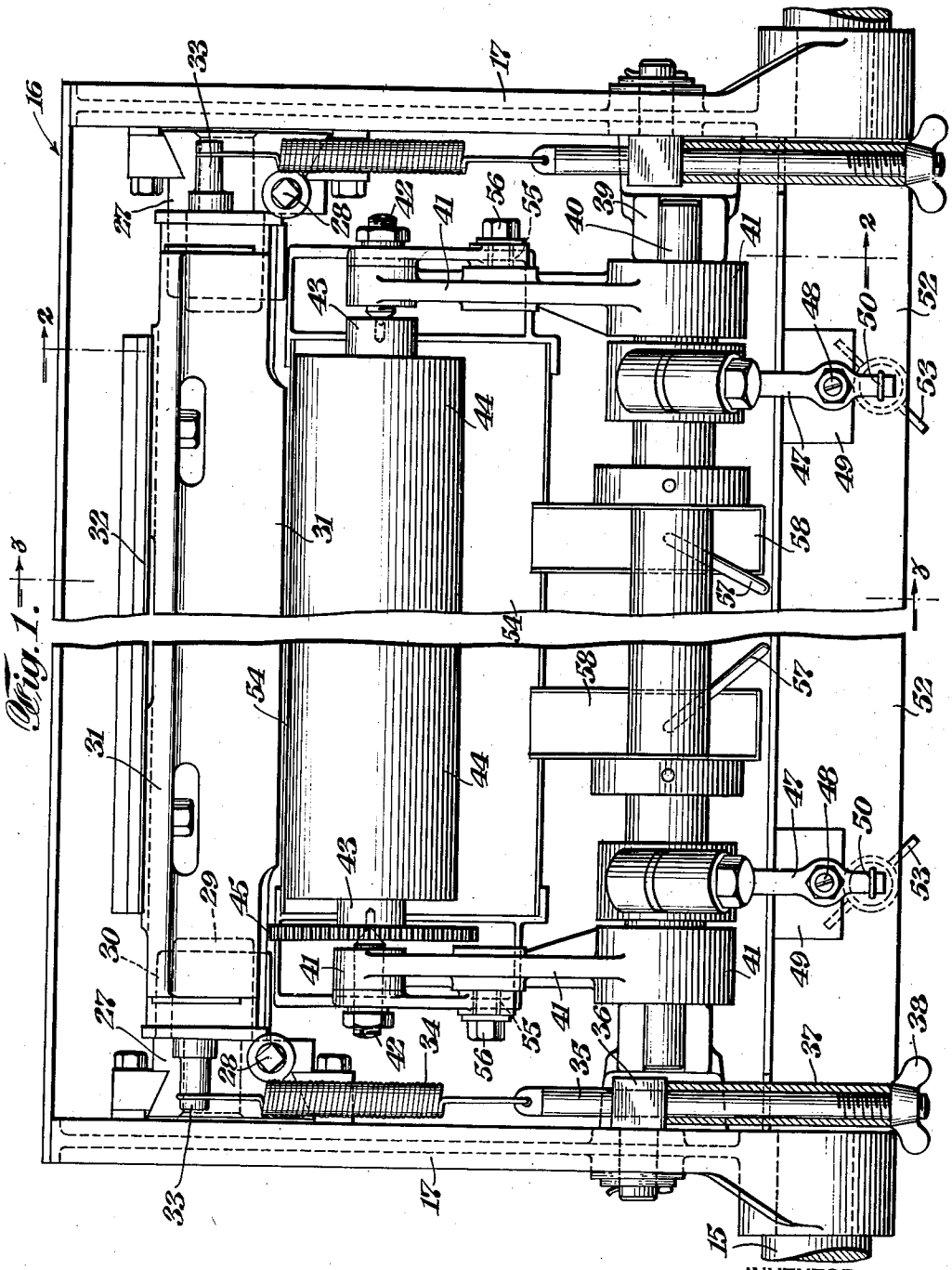


Fig. 1.

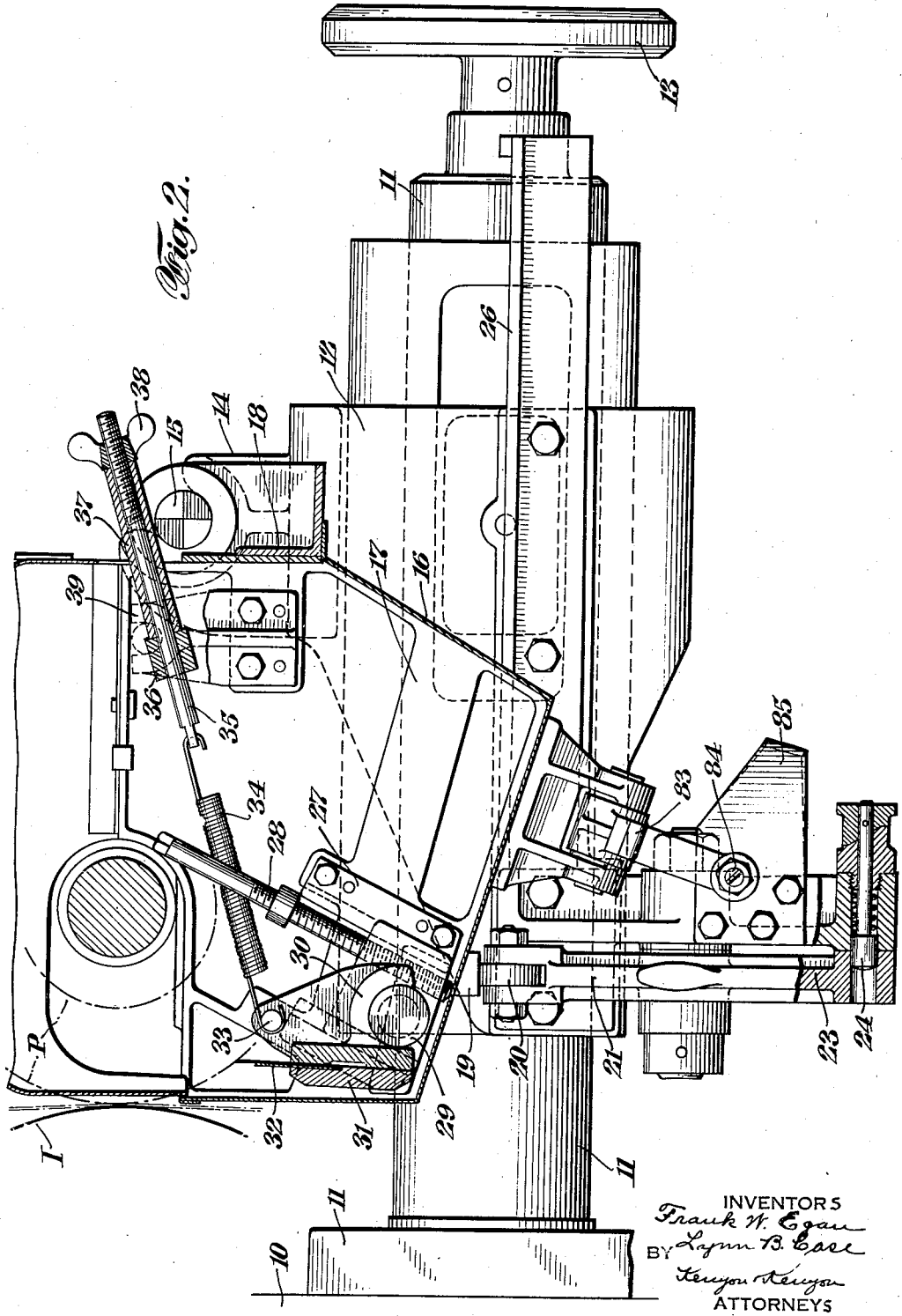
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PRINTING MACHINE

Filed Oct. 10, 1939 6 Sheets-Sheet 2

Fig. 2.




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April 29, 1941. F. W. EGAN ET AL 2,240,112

PRINTING MACHINE

Filed Oct. 10, 1939 6 Sheets-Sheet 3

Fig. 3.

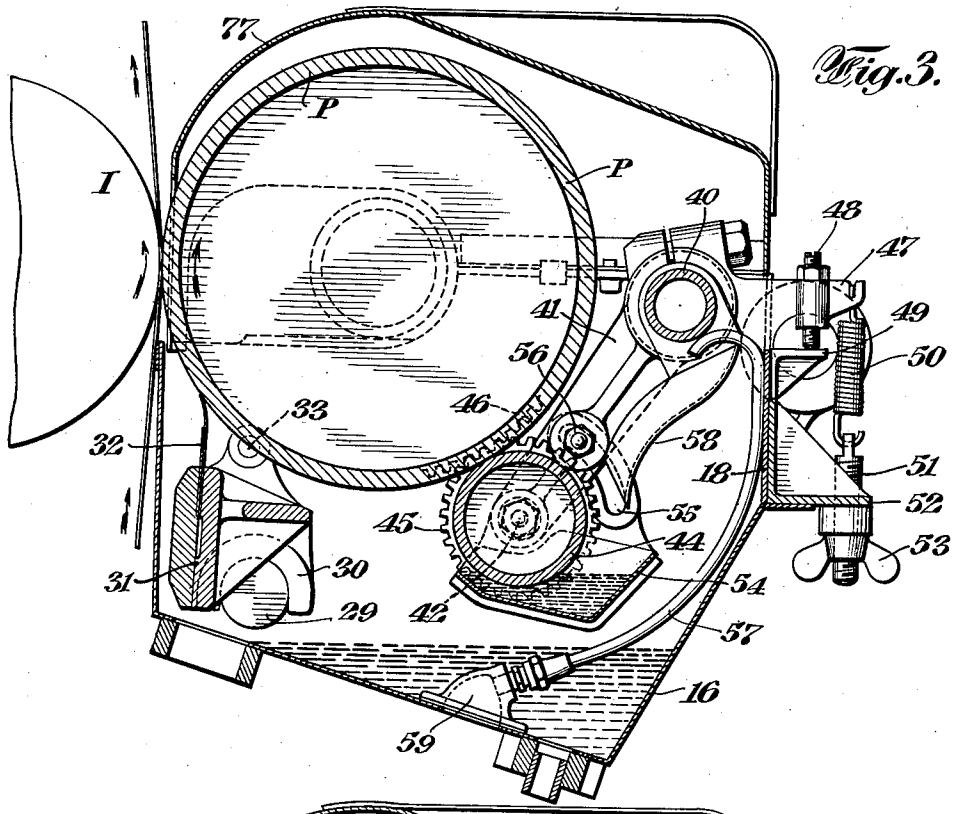
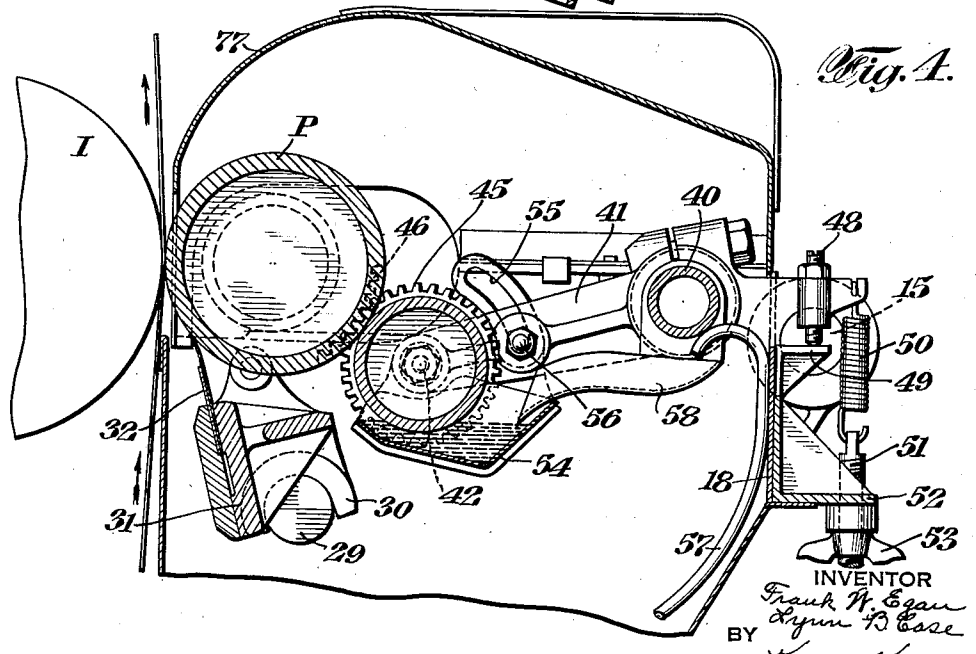



Fig. 4.




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PRINTING MACHINE

Filed Oct. 10, 1939 6 Sheets-Sheet 4

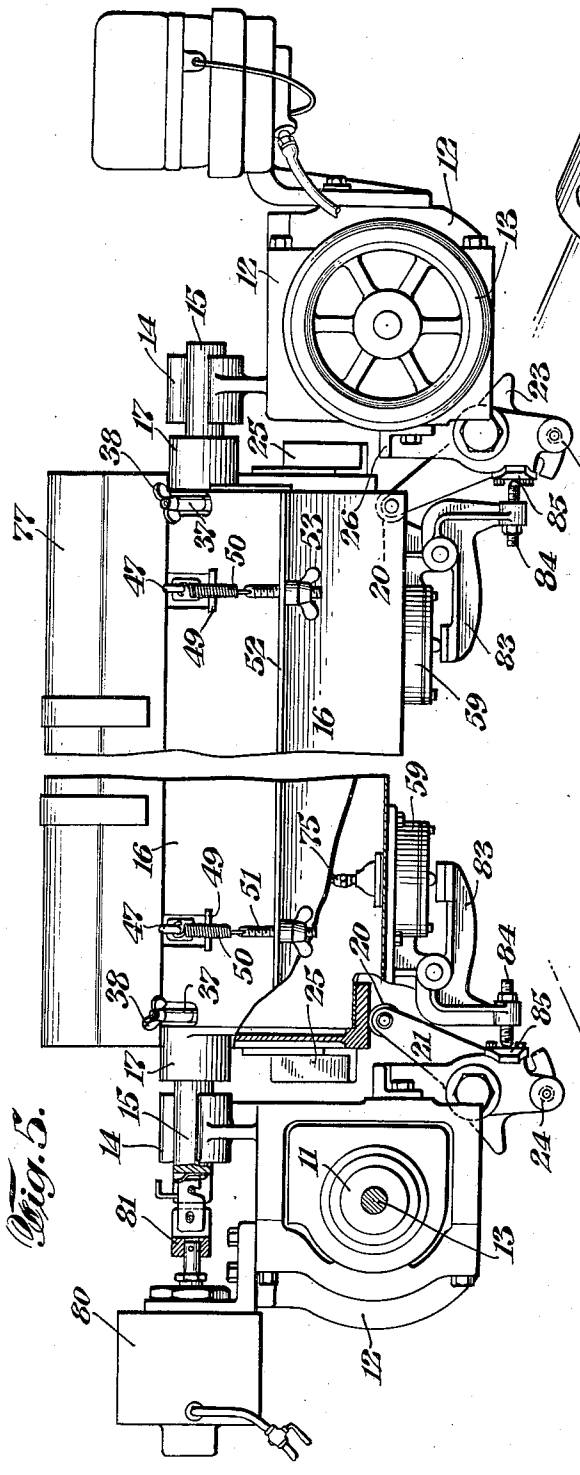


Fig. 5.

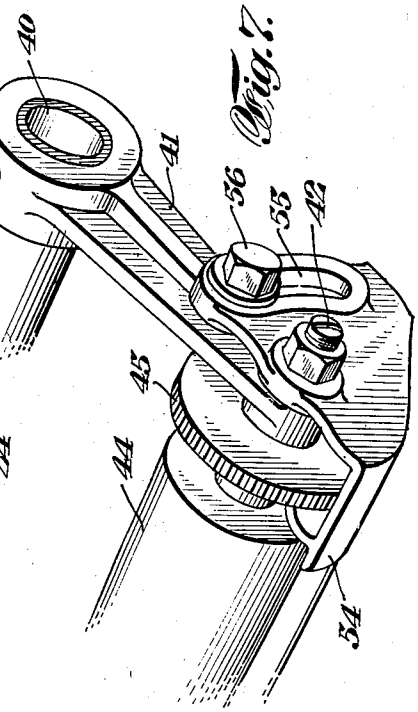


Fig. 7.

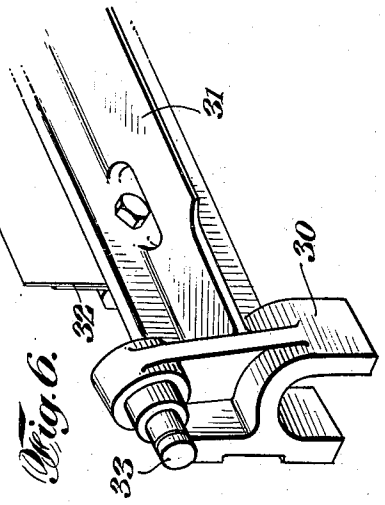


Fig. 6.

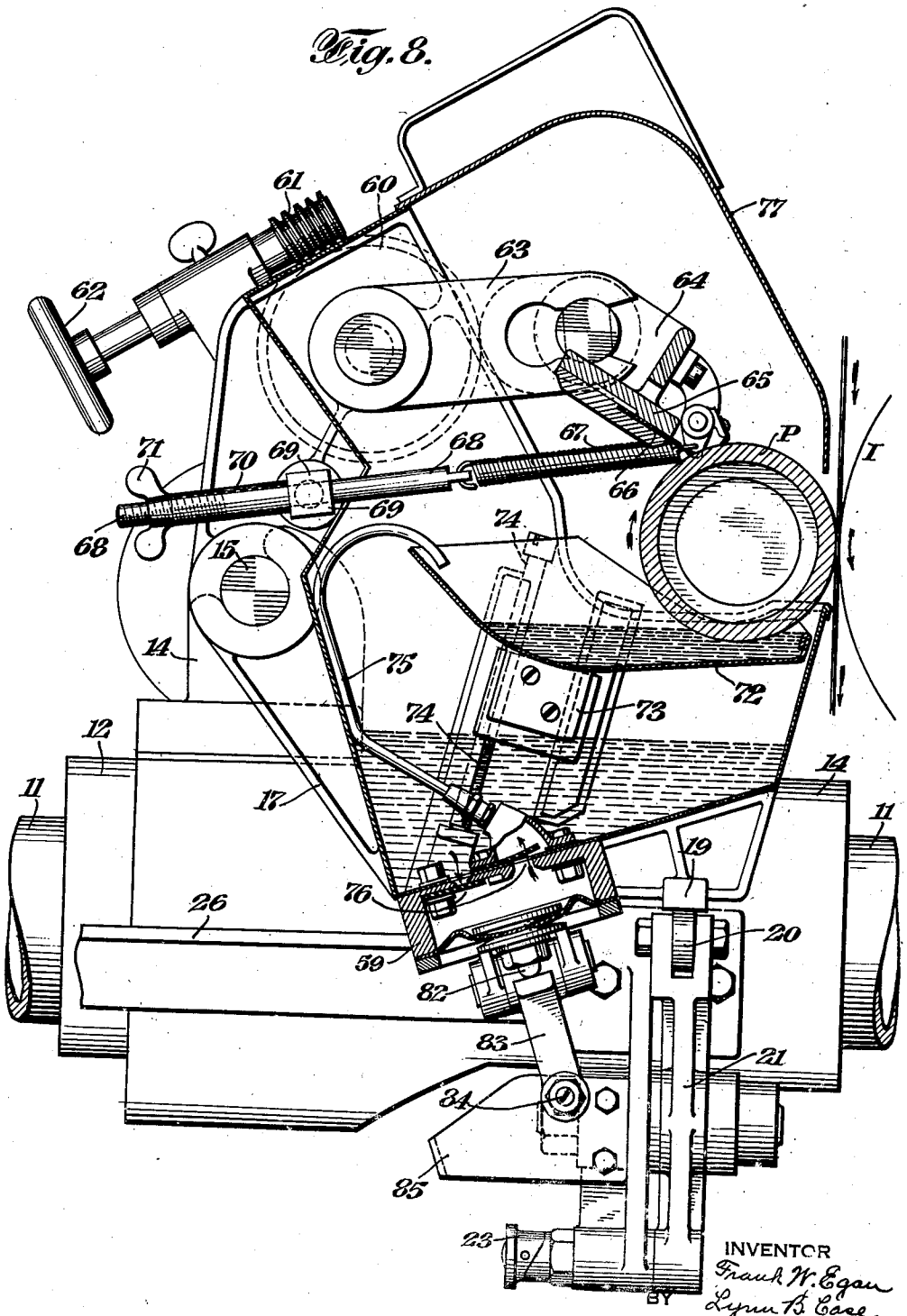
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PRINTING MACHINE

Filed Oct. 10, 1939 6 Sheets-Sheet 5

Fig. 8.



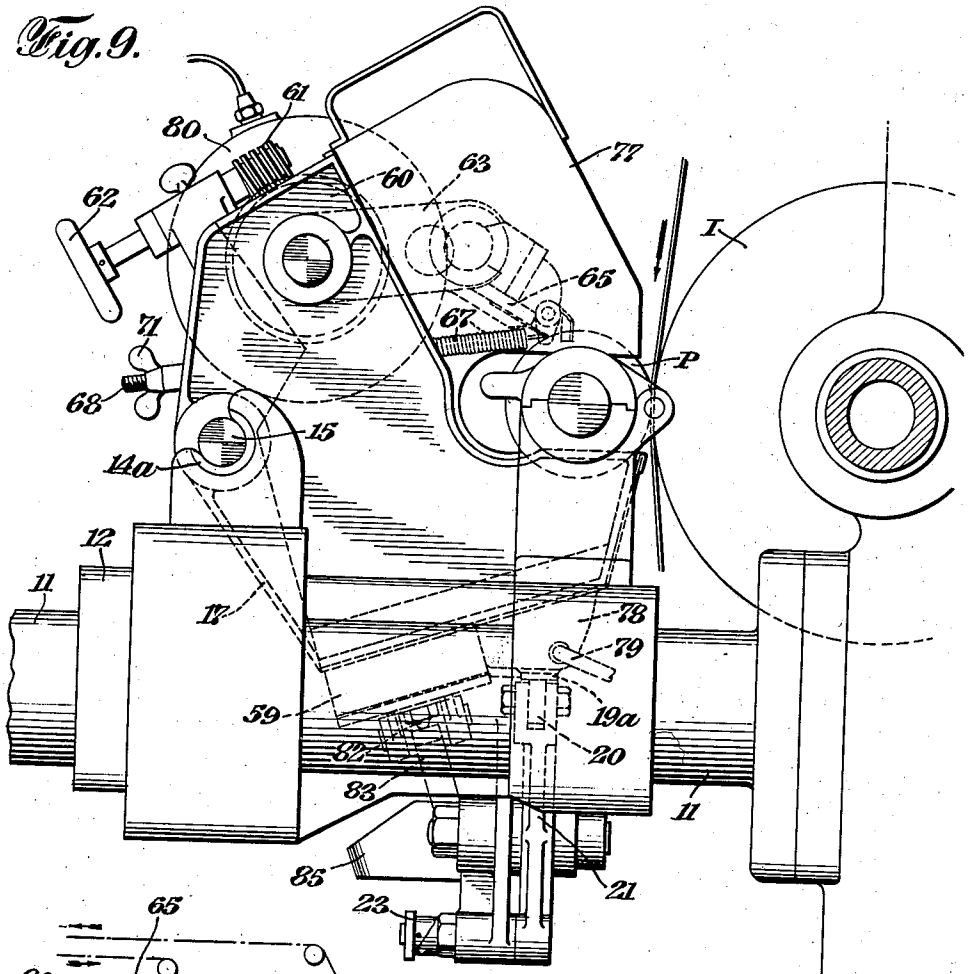

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PRINTING MACHINE

Filed Oct. 10, 1939 6 Sheets-Sheet 6

Fig. 9.



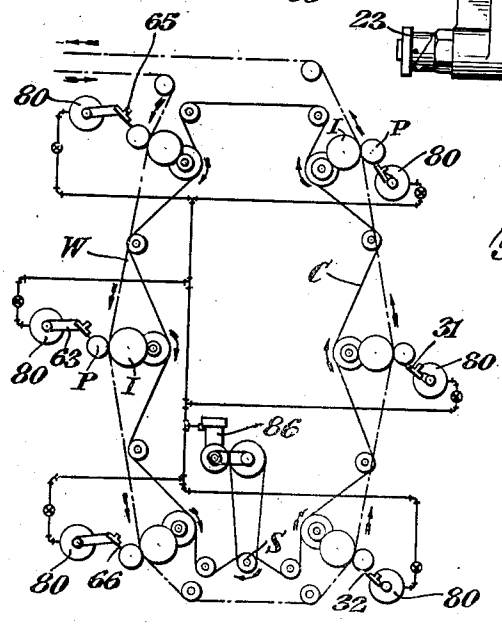




Fig. 10.

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Patented Apr. 29, 1941 2,240,112

# UNITED STATES PATENT OFFICE

2,240,112

## PRINTING MACHINE

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Application October 10, 1939, Serial No. 298,730

17 Claims. (Cl. 101—157)

This invention relates to printing machines of the general type illustrated in Scott et al. Patent No. 2,102,386. In such type machine, there are several sets of printing and impression cylinders so arranged that the web to be printed passes upwardly through some of the sets and downwardly through the remaining sets. Provision is made for using different size printing cylinders and for expeditiously replacing a printing cylinder with a different size printing cylinder. Means also are provided for supplying ink to the printing cylinders and in intaglio printing, a doctor blade co-operates with the printing cylinder to remove excess ink therefrom. In order for the optimum operation, the ink should be supplied uniformly to the printing cylinder.

An object of this invention is the provision of a doctor mounting which can easily and quickly be adjusted for co-operation with different size printing cylinders.

A further object of this invention is the provision of ink supply means which will insure delivery to the cylinder of an ink film of uniform thickness.

A still further object of this invention is the provision of means for agitating the ink supply to keep it of uniform composition.

Other objects, novel features and advantages of this invention will become apparent from the following specification and accompanying drawings, wherein:

Fig. 1 is a plan view of one embodiment of the invention;

Fig. 2 is a section substantially on the line 2—2 of Fig. 1 with some elements omitted;

Fig. 3 is a section substantially on the line 3—3 of Fig. 1;

Fig. 4 is a section similar to Fig. 3 but with a different size printing cylinder;

Fig. 5 is an end elevation of Fig. 1;

Figs. 6 and 7 are fragmentary perspective views of parts of the device;

Fig. 8 is a view similar to Fig. 2 of a second embodiment of the invention;

Fig. 9 is an end view of Fig. 8 illustrating a modification, and

Fig. 10 is a schematic view.

Figs. 1 to 7 illustrate a set of impression and printing cylinders between which the web is fed upwardly together with the mechanisms associated therewith. The frame 10 of the printing press carries a pair of posts 11 on each of which is slidably mounted a carriage 12 which is adjustable toward and away from the frame by the hand wheel 13. An impression cylinder I is journalled in the frame 10 and a printing cylinder P is journalled in bearings mounted on the carriages 12.

Each carriage is provided with an upwardly facing yoke member 14 in which is received a pintle 15 extending from one end of a pan 16 arranged to enclose the major portion of the printing cylinder P, each pintle being arranged near the top and rear of the pan. This pan comprises end frames 17 which carry the pintles 15 and a cross-bar 18 extending between said frames, together with a strip of sheet metal attached to the frames and cross-bar and constituting the front, back and bottom of the pan. On the bottom of the pan near the front thereof is provided a rail 19 which rests upon a pair of spaced rollers 20. The pan is supported by the rollers 20 and yoke members 14 in definite relation to the roller P and the frame 10, but may be easily and quickly moved out of such relation. The rollers 20 are journalled in the free ends of pivoted arms 21 equipped with operating handles 22. Each arm has an extension 23 having a recess to receive a spring-actuated bolt 24 to lock each arm 21 with its roller properly arranged to support the pan in its normal position. To drop the pan from its normal position, the locking bolts are pulled out, thereby permitting the pan to swing about the axes of the pintles 15. Flanges 25 provided on the ends of the pan engage horizontal rails 26 on the carriages 12 to limit swinging movement of the pan. By lifting the back of the pan to disengage the pins 15 from the yoke members 14, the pan is released for sliding movement on the rails 26 away from the frame 10.

To each frame 17 is connected a slide 27 which is provided with a feed screw 28 for effecting adjustment of the slide toward and away from the printing cylinder P. Each slide is provided with a cylindrical projection or stub 29 on which rests a hook 30 extending from a cross-bar 31. The hooks support the bar from the projections for swinging movement about the axis of the projections. A doctor blade 32 is carried by a cross-bar 31 for engagement with the surface of the printing roller P. At each end of the cross-bar 31 is provided a pin 33 to which is attached one end of a coil spring 34. The other end of such spring is connected to a rod 35 slidably mounted in a block 36 pivotally supported from the frame 17. A sleeve 37 having one end abutting the block 36 surrounds the end of the rod 35 projecting beyond the block 36, such end of the rod being threaded and extending slightly beyond

the end of the sleeve 37. On the threaded end of the rod 35 is provided a wing nut 38 by means of which the tension of the spring 34 may be regulated. The adjustability of the slide 27 makes it possible to use the same doctor blade for different size rollers P without any re-arrangement of the doctor blade relative to the cross-bar 31.

A yoke member 39 is supported by each frame member 17 and receives one end of a shaft 40. A pair of arms 41 are fixed to the shaft 40 and are provided with adjustable pins 42 having conical ends extending into sockets in the end of a shaft 43 on which is mounted an inking roller 44 for co-operation with the printing cylinder P. The shaft 43 is provided with a gear 45 in mesh with a gear 46 rotatable with the printing cylinder P, the gear ratio being such that there is a slight slippage between the surfaces of the printing roll and inking roll. Arms 47 are attached to the shaft 40 and extend through slots in the rear of the pan. In each arm 47 is provided a set screw 48, one end of which engages a platform 49 to limit clockwise swinging movement of the arm 41, thereby determining the spacing between the printing cylinder and inking roller. The free end of each arm 47 is connected to one end of a coil spring 50, the other end of which is attached to a threaded rod 51 passing through the angle iron 52 attached to the cross-bar 18. A wing nut 53 is provided on the rod 51 for adjusting the tension of the spring 50 which tends to swing the arm 47 clockwise. An ink trough 54 is supported by the pins 42 below the inking roller 44, the trough being free to rotate on such pins. Each end wall of the trough has an arcuate slot 55 into which projects a bolt 56 threaded to the arm 41, the bolt 56 serving to clamp the trough 54 in any desired position of adjustment.

The main body of ink is retained in the bottom of the pan 16 and is supplied to the trough 54 through the pipes 57 which discharge into chutes 58 supported by the shaft 40 and leading downwardly to the trough 54. Each pipe 57 leads from the outlet of a diaphragm pump 59 located at the bottom of the pan, the construction and operation of which will later be described. The pumps 59 supply ink to the trough at a higher rate than ink is taken out by the roller 44 so that ink continuously overflows the front edge of the trough and the position of the front edge of the trough relative to the axis of the roller determines the area of the roller in contact with the ink. Upon change of the printing roller P from one size to another, the arms 41 are adjusted to locate the inking roller 44 in proper relation to the printing roller. After such adjustment, the front edge of the trough 54 is properly fixed relative to the axis of roller 44 to obtain the desired area of contact. The proper positioning of the front edge of the trough relative to the roller axis is obtained by releasing the bolt 56 and properly rotating the trough after which the bolt 56 is tightened. Also, the doctor blade 32 is adjusted by moving the slide 27 by rotating the feed screw 28.

In the modification disclosed in Fig. 8, the web passes downwardly between the impression cylinder I and the printing cylinder P. The pan 16 is of the same general structure as previously described and is supported from the carriages 12 through the medium of yokes 14 and pintles 15 and is equipped with a cross-rail 19 resting upon rollers 20 carried by pivoted arms 21 as previously described. The pan 16 and carriages 12 are provided with flanges 25 and 26 by means of which the pan may be guided into and out of assembled relation to the frame as well as to the printing and impression cylinders. At each end of the pan is journalled a worm gear 60 having in mesh therewith a worm wheel 61 provided with a hand wheel 62. An arm 63 is attached to the worm gear 60 for rotation therewith and to the outer end of each arm 63 is hinged a second arm 64. A cross-bar 65 connects the arms 64 and carries a doctor blade 66. On the arm 64 is provided a pin to which is attached one end of a coil spring 67, the other end of which is attached to a rod 68 slidably supported in a block 69 pivotally carried by the frame 17. A sleeve 70 surrounds the portion of the rod 68 projecting beyond the block 69, and the rod 68 is threaded to receive a wing nut 71 adapted to bear against the end of the sleeve 70, the wing nut making it possible to adjust the tension of the spring 68. The doctor blade is adjustable toward and away from the printing cylinder by manipulation of the hand wheel 62.

The ink trough 72 is carried by a slide 73 supported by the frames 17 and a feed screw 74 is provided for effecting adjustment of the slide. The main body of ink is carried in the bottom of the pan 16 and is introduced into the tray 72 through pipes 75 leading from pumps 76 located at the bottom of the pan.

Upon change of the printing cylinder to one of a different size, the doctor is adjusted by operation of the hand wheel 62 and the ink trough 72 is adjusted by operation of the feed screw 74. The area of contact between the cylinder and ink is determined by the adjustment of the trough. Each of the pans 16 is equipped with a sheet metal cover 77 which overlies the printing roller, inking trough and doctor blade.

In Fig. 9 is illustrated a modification adapted for use in printing with so-called hot melt ink or ink which is solid at ordinary room temperature and is liquid at temperatures materially in excess of ordinary room temperature. The arrangement of the pan 16 and its supporting structure is the same as in Fig. 8, except that means are provided for heat insulating the pan, together with the pintles 15 from the frame. For this purpose, each yoke 14 is supplied with a liner 14*a* of heat insulating material which will withstand the wear effected by reciprocation of the pintles 15 and the rail 19 is likewise equipped with a strip 19*a* of similar heat-insulating material. On the bottom of the pan 16 is provided a steam jacket 78 to which steam is supplied through the pipe 79. The ink in the pan is heated by the steam supplied to the jacket 78 and loss of heat from the pan by conduction is minimized by the provision of the insulating members 14*a* and 19*a*. It is contemplated that when hot melt ink is used, the printing cylinder P will be heated by suitable means (not shown).

The pan 16 is supported for reciprocation axially of the printing cylinder P to effect reciprocation of the doctor over the surface of such cylinder. A vibrator 80 has its vibrating element connected through a suitable coupler 81 with one pintle 15 and operation of the vibrator results in reciprocation of the pan 16. Also, in the modification illustrated in Figs. 3 and 4, reciprocation of the pan effects reciprocation of the inking roller 44 relative to the printing roll. Such re-

ciprocation also is effective to operate the pumps **59** to pump ink from the pans into the troughs **54** and **72** and also to keep the ink well mixed. As shown in Fig. 8, each pump **59** comprises a housing attached to the bottom of the pan and having two openings, one of which communicates with the interior of the pan and the other of which communicates with the pipe **57** of Fig. 3 or the pipe **75** of Fig. 8. One wall of the housing comprises a flexible diaphragm to which is attached a stud **82**. This stud is adapted to be engaged by one end of a bell crank lever **83** pivotally supported by the bottom of the pan. The other end of the bell crank lever is provided with an adjustable pin **84** which is adapted to engage an abutment member **85** carried by the frame. As the pan vibrates, the bell crank levers are caused to rock, thus flexing the diaphragms and pumping ink from the bottom of the pan through the pipes into the trough.

As shown in Fig. 10, the vibrators **80** are connected through a set of pipes to a pneumatic pump **86** which is driven by a belt from the main drive shaft S of the machine. The vibrators, therefore, become inoperative simultaneously with the stopping of the machine, thereby preventing vibration of the doctors over the surface of the stationary cylinders. Also, as shown in this figure, the connection of the vibrators may be to the doctors only rather than to the pans **16**. With such connections, the pans remain stationary and also the doctors are vibrated when the machine is in operation.

Fig. 10 further shows the general outline of the machine and the arrangement of the different sets of printing and impression cylinders so that a plurality of different impressions may be applied to a web by a single passage of such web through the machine. Similarly, operation of the various sets of printing and impression cylinders is effected by means of a single chain C driven by the main drive shaft S. The web W passes downwardly through the sets of printing and impression cylinders at one side of the machine and upwardly through the sets of printing and impression cylinders at the opposite side of the machine.

We claim:

1. In a printing machine, a printing cylinder, a pan partially enclosing said cylinder, a doctor for said cylinder, a holder for said doctor, pivotal supporting means for said holder, a carrier in said pan for said pivotal supporting means movable to adjust said pivotal supporting means toward and away from the printing cylinder axis, means for effecting movement of said carrier, and resilient means supported by said pan and connected to said holder for maintaining the latter with the doctor in engagement with the surface of said cylinder.

2. In a printing machine, a printing cylinder, a pan partially enclosing said cylinder, a doctor for said cylinder, a holder for said doctor, pivotal supporting means for said holder, a slidable carrier in said pan for said pivotal supporting means movable toward and away from the printing cylinder axis, means to effect reciprocation of said carrier, and resilient means supported by said pan and connected to said holder for maintaining the latter with the doctor in engagement with the surface of said cylinder.

3. In a printing machine, a printing cylinder, a pan partially enclosing said cylinder, a doctor for said cylinder, a holder for said doctor, pivotal supporting means for said holder, a pivoted carrier in said pan for said pivotal supporting means oscillatable to adjust said pivotal supporting means toward and away from the printing cylinder axis, means to effect movement of said carrier, and resilient means supported by said pan and connected to said holder for maintaining the latter with the doctor in engagement with the surface of said printing cylinder.

4. In a printing machine, a printing cylinder, a pan partially enclosing said cylinder and supported for reciprocation axially of said cylinder, a trough supported in said pan, a pump supported by said pan and having a vibratory actuating member, means for effecting vibration of said member upon reciprocation of said pan, means for conducting fluid from said pan to said pump, and means for conducting liquid from said pump to said trough.

5. In a printing machine, a printing cylinder, a pan partially enclosing said cylinder and supported for reciprocation axially of said cylinder, a trough supported in said pan, a pump supported by said pan and having a vibratory actuating member, means for effecting vibration of said member upon reciprocation of said pan, means for conducting fluid from said pan to said pump, means for conducting liquid from said pump to said trough, and means for adjusting said trough relative to said printing cylinder.

6. In a printing machine, a printing cylinder, a pan extending lengthwise of and partially receiving said cylinder, an ink trough in said pan, a doctor co-operating with said cylinder and mounted in said pan, means for reciprocating said pan and pump means actuated by reciprocation of said pan for delivering ink from said pan to said trough.

7. In a printing machine, a printing cylinder, a pan extending lengthwise of and partially receiving said cylinder, an ink trough in said pan, a doctor co-operating with said cylinder and mounted in said pan, means including rollers engaging the bottom of said pan for reciprocably supporting said pan, means to effect reciprocation of said pan, pivoted arms supporting said rollers, and means for locking said arms in pan-supporting position.

8. In a printing machine, a printing cylinder, a pan extending lengthwise of and partially receiving said cylinder, an ink trough supported in said pan in operative relation to said cylinder, means including rollers supporting said pan for reciprocation, means to reciprocate said pan and pan-supported pump means actuated by reciprocation of the pan for delivering ink from said pan to said trough.

9. In a printing machine, a printing cylinder, a pan extending lengthwise of and partially receiving said cylinder, an ink trough supported in said pan, a pintle extending from each end of said pan, hooks receiving said pintle for reciprocatory movement of the pan, flanges on the ends of said pans, horizontal rollers adapted to be engaged by said flanges in one position of the pan, a pair of pivoted arms, rollers at the ends of said arms, means locking said rollers in position to support said pan with the flanges out of contact with the rollers and means for reciprocating said pan.

10. In a printing machine, a printing cylinder, a pan extending lengthwise of and partially receiving said cylinder, an ink trough supported in said pan, means including rollers supporting said pan for reciprocation, pivoted arms at the ends of which are mounted said rollers, flanges on the

edge of said pan, horizontal rails adapted to be engaged by flanges in one position of the pan, means locking said arms with said rollers supporting said pan with the flanges out of contact with the rollers, and means for reciprocating said pan.

11. In a printing machine, a printing cylinder, a pan extending lengthwise of and partially receiving said cylinder, an ink trough supported in said pan in operative relation to said cylinder, a pair of pivoted arms, rollers at the end of said arms adapted to engage said pan and support the same for reciprocation, means for locking said arms in pan-supporting position, additional means for supporting said pan upon movement of said rollers out of pan-supporting position, and means to reciprocate said pan.

12. In a printing machine, a printing cylinder, a transfer roll operatively related to said cylinder, pivoted means supporting said roll for arcuate adjustment about the axis of the supporting means, a trough suspended from said last-named means below said roll for adjustment about the axis thereof, and means for supplying ink to said trough.

13. In a printing machine, a printing cylinder, a pan partially enclosing said cylinder, a doctor for said cylinder, a holder for said doctor, pivotal supporting means for said holder, a carrier in said pan for said pivotal supporting means movable to adjust said pivotal supporting means toward and away from the printing cylinder axis, means to effect movement of said carrier, resilient means supported by said pan and connected to said holder for maintaining the latter with the doctor in engagement with the surface of said cylinder, an ink trough mounted in said pan, and means for adjusting the same relative to said printing cylinder.

14. In a printing machine, a printing cylinder, a pan extending lengthwise of and partially receiving said cylinder, an ink trough mounted in said pan, a doctor co-operating with said cylinder and mounted in said pan, means for effecting adjustment of said doctor and said ink trough relative to said cylinder, means for reciprocating said pan, and means actuated by reciprocation of said pan for delivering ink from said pan to said trough.

15. In a printing machine, a printing cylinder, a pan partially enclosing said cylinder and supported for reciprocation axially of said cylinder, a doctor for said cylinder, means in said pan pivotally supporting said doctor and movable to adjust the same relative to said printing cylinder, resilient means supported by said pan urging said doctor into engagement with the surface of said cylinder, and means for effecting reciprocation of said pan.

16. In a printing machine, a cylinder, a pan partially enclosing said cylinder, heat insulating members supporting said pan for reciprocation axially of said cylinder, means in said pan pivotally supporting said doctor and movable to adjust the same relative to said printing cylinder, resilient means supported by said pan urging said doctor into engagement with the surface of said cylinder, and means for effecting reciprocation of said pan.

17. In a printing machine, a cylinder, a pan partially enclosing said cylinder, heat insulating members supporting said pan, means in said pan pivotally supporting said doctor and movable to adjust the same relative to said printing cylinder, resilient means supported by said pan urging said doctor into engagement with the surface of said cylinder, and means for effecting reciprocation of said doctor axially of said cylinder.

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