Dec. 22, 1942. W. W. DAVIDSON 2,306,044

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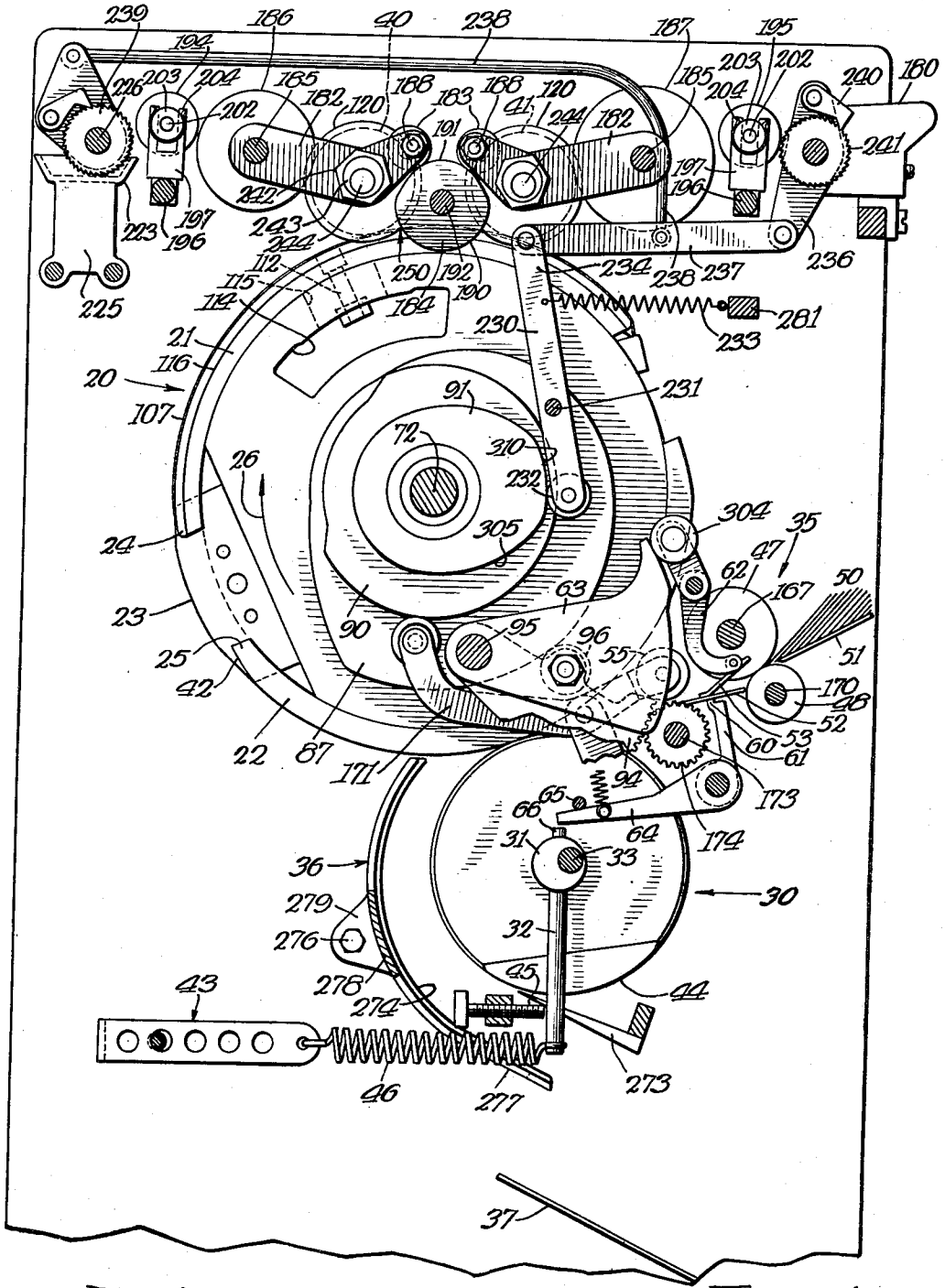


Fig. 1

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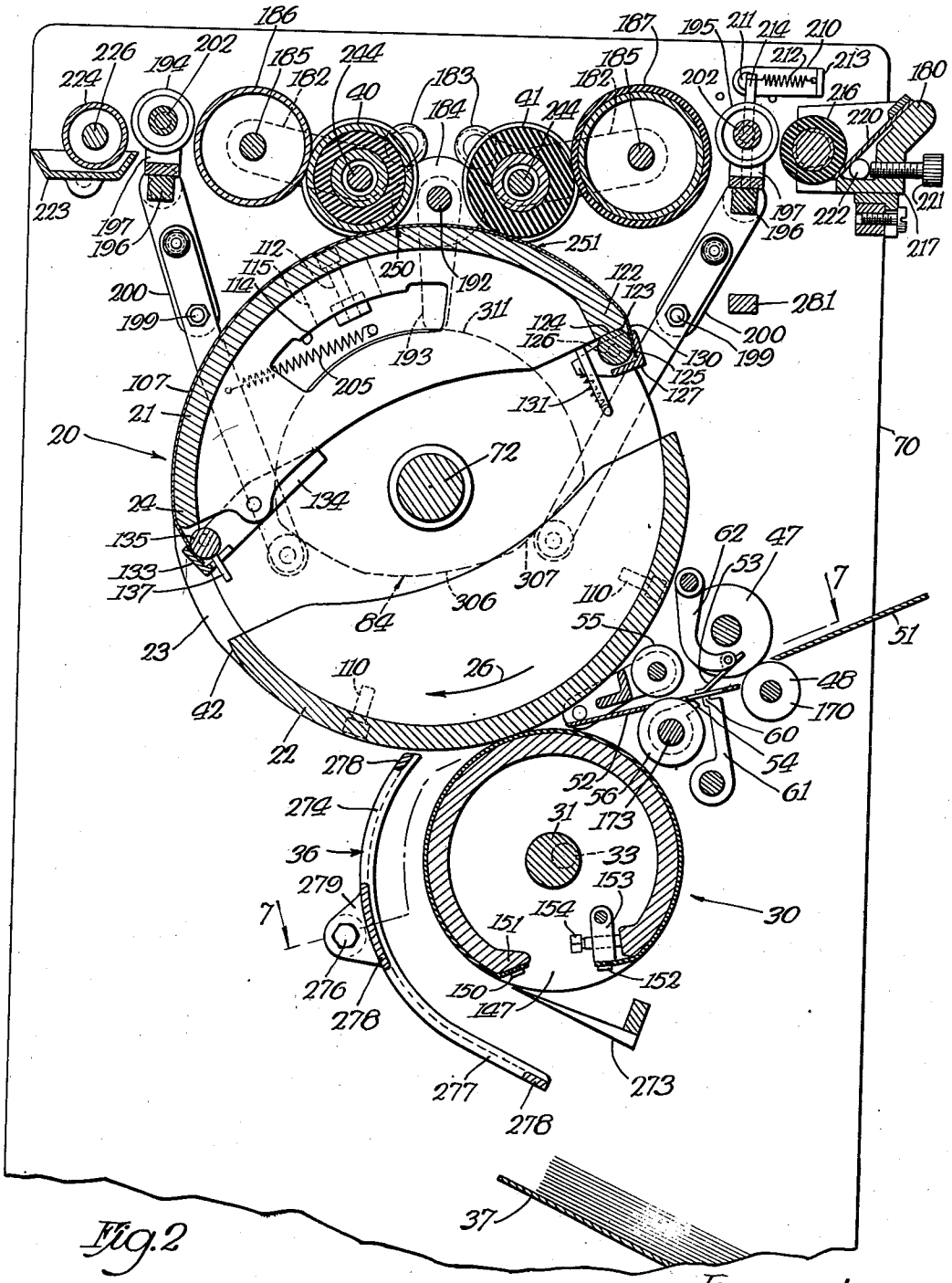


Fig. 2

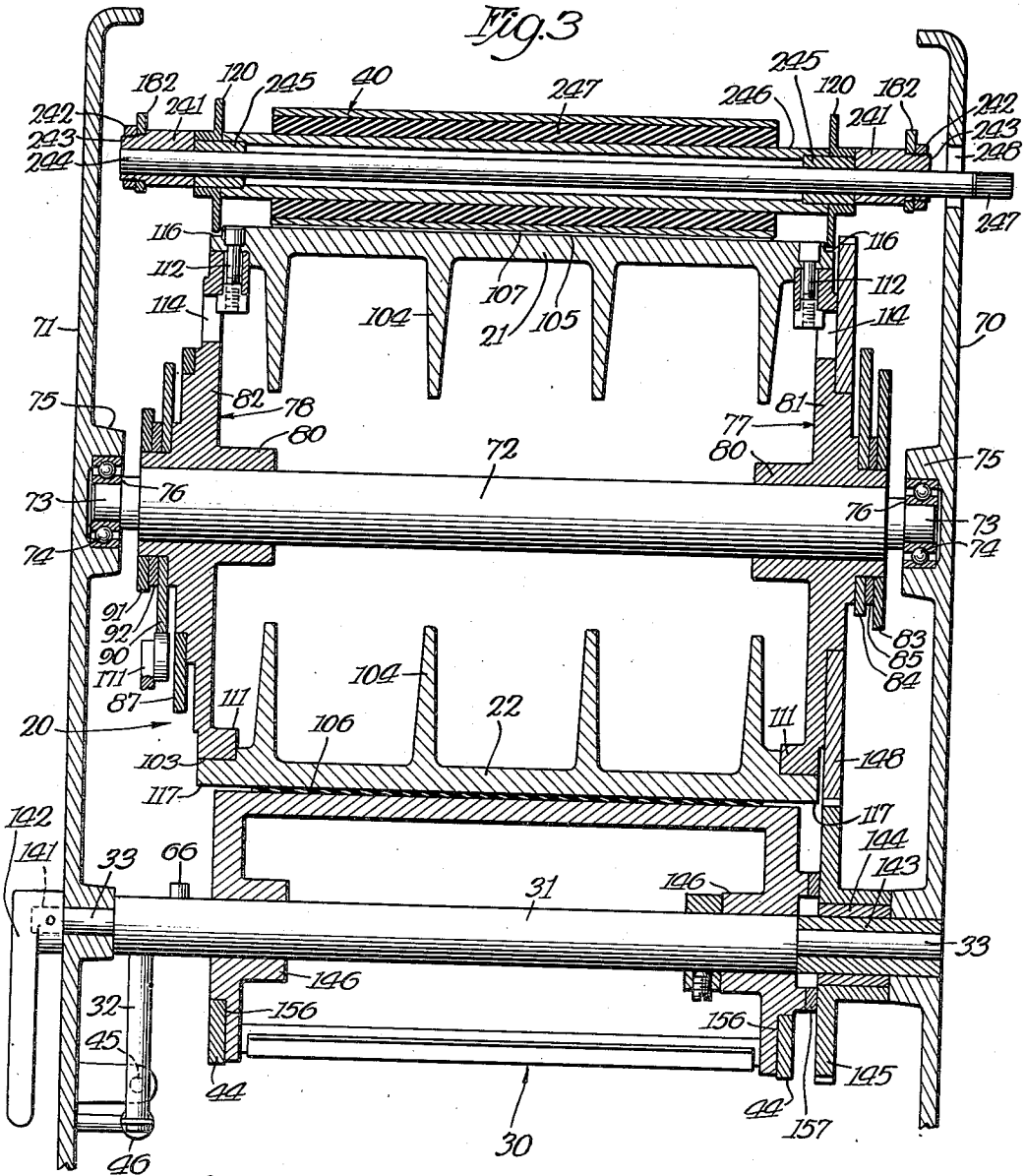
Inventor:
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Dec. 22, 1942. W. W. DAVIDSON 2,306,044

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Fig. 3



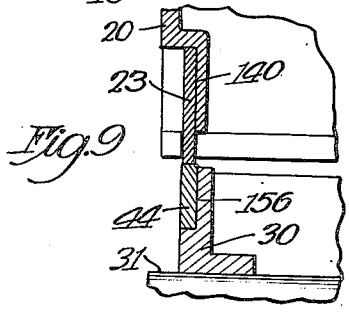


Fig. 9

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Fig. 4

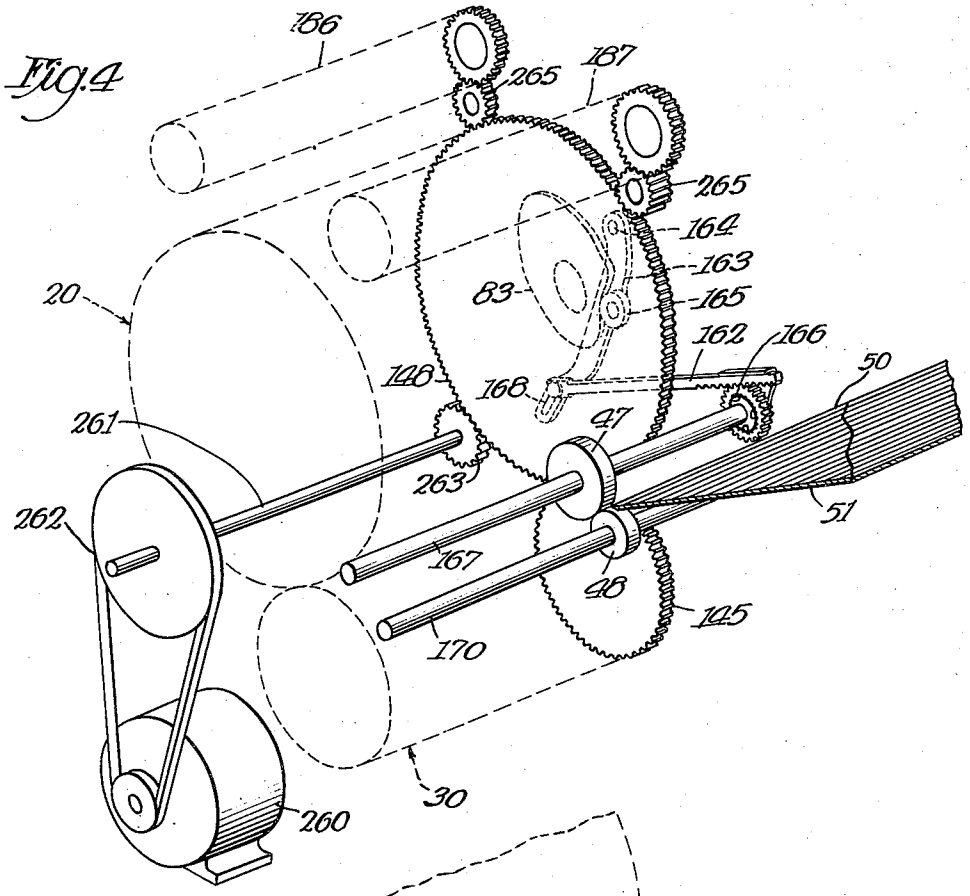
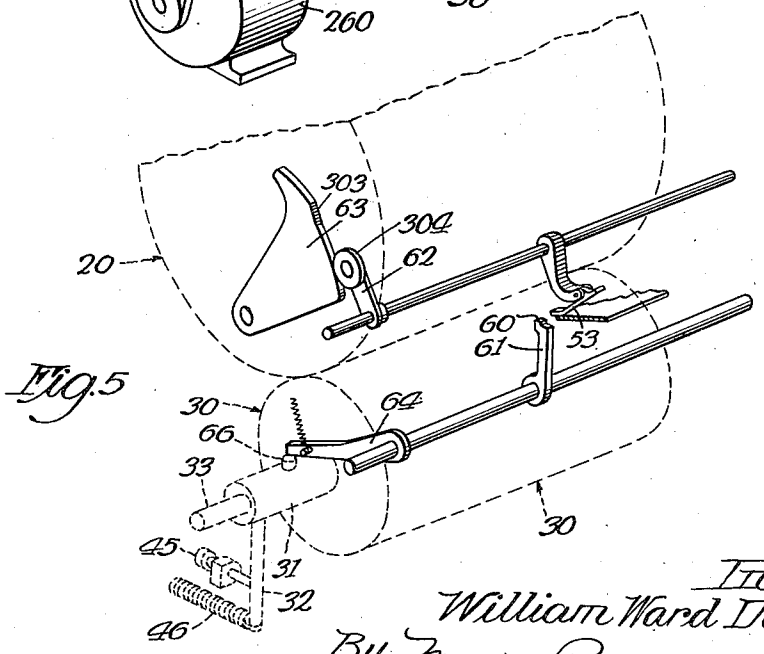


Fig. 5



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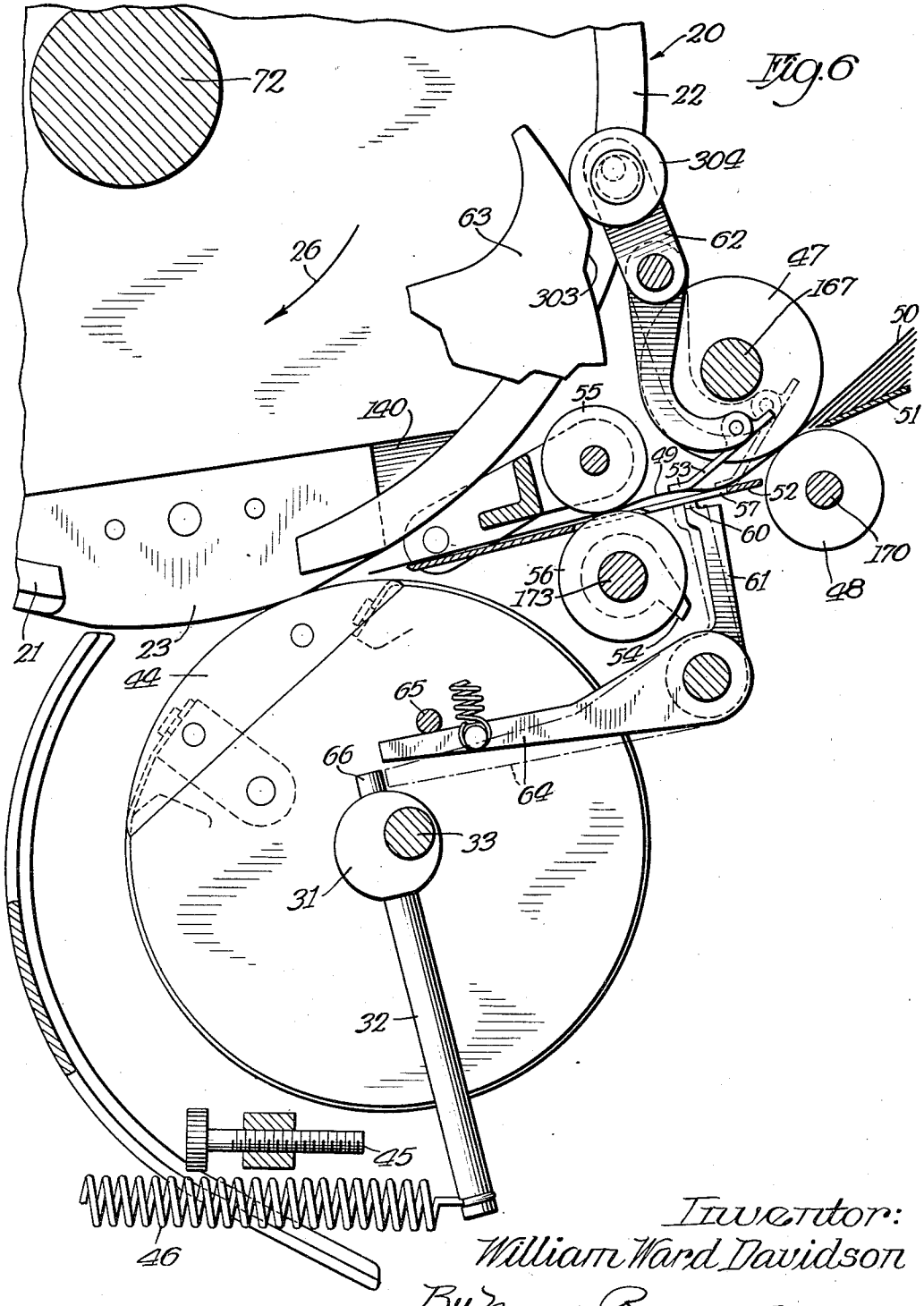


Fig. 6

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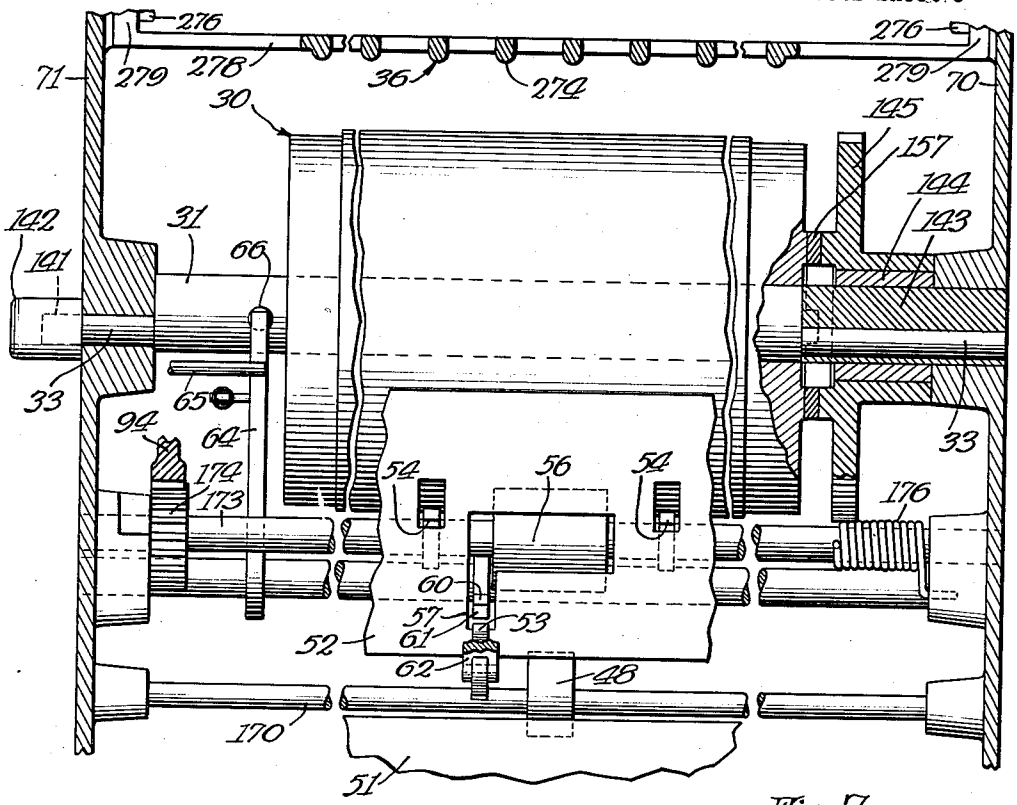


Fig. 7

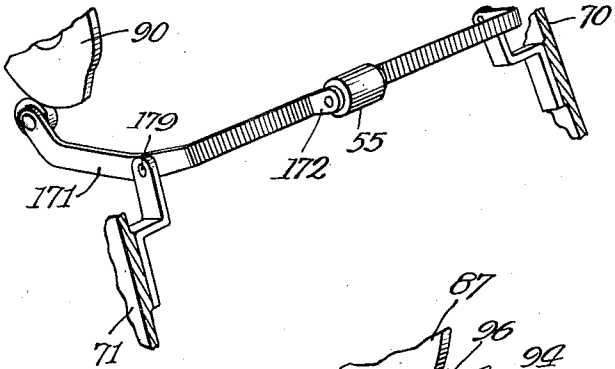
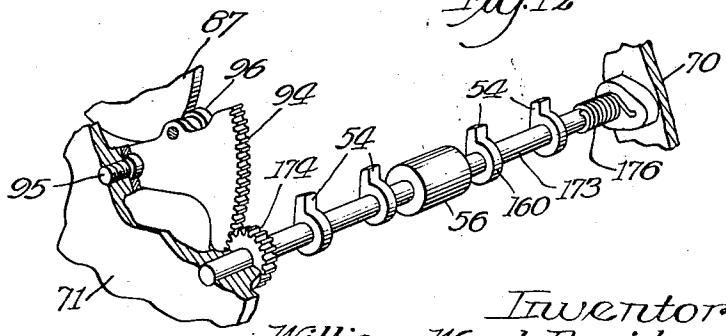


Fig. 11

Fig. 12



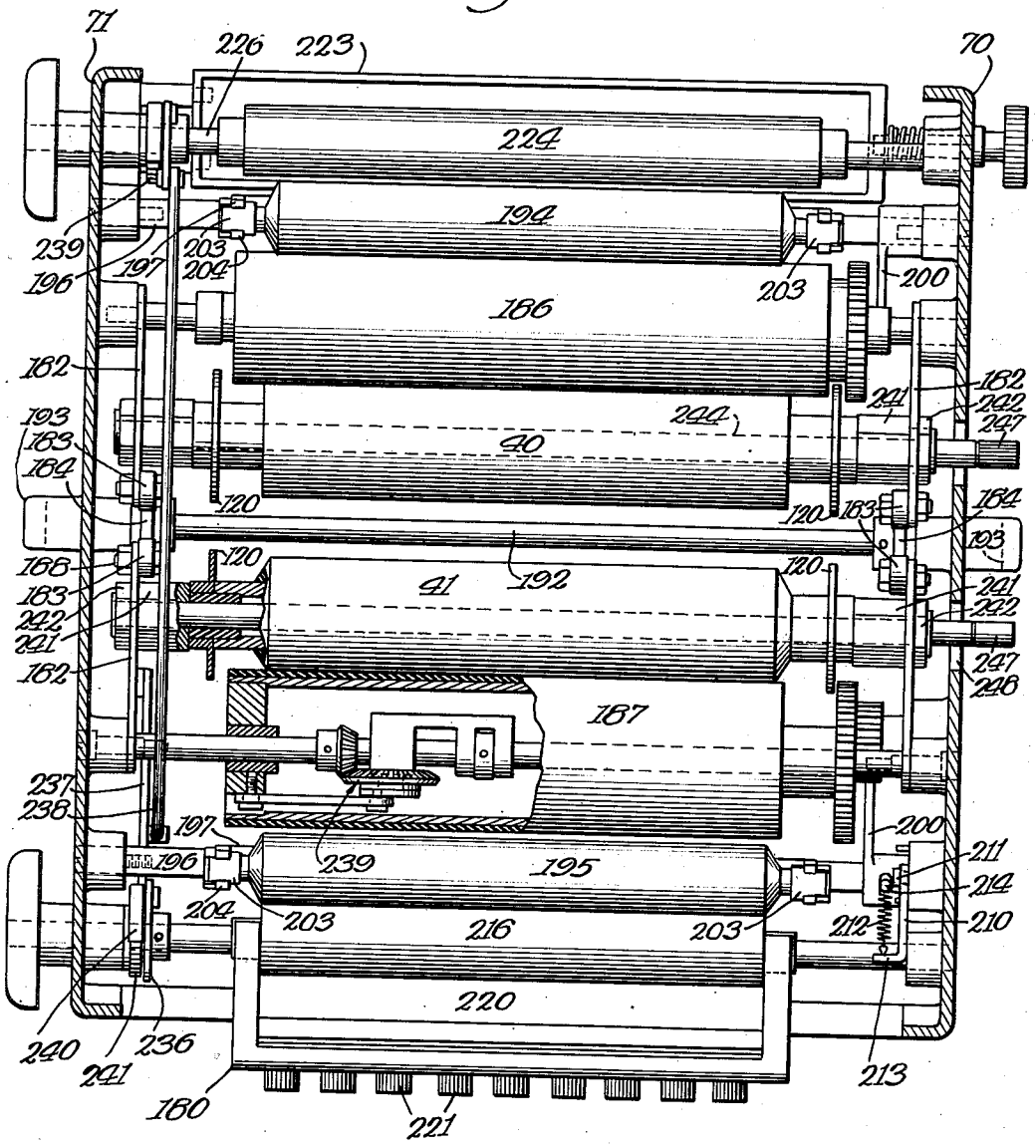
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Fig. 8



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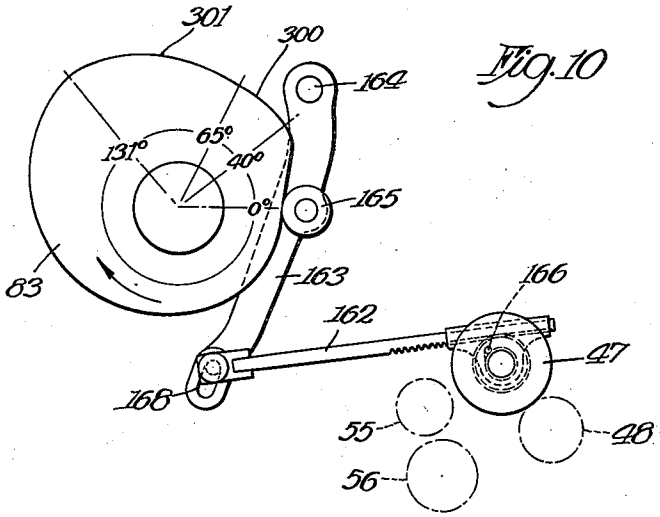


Fig. 10

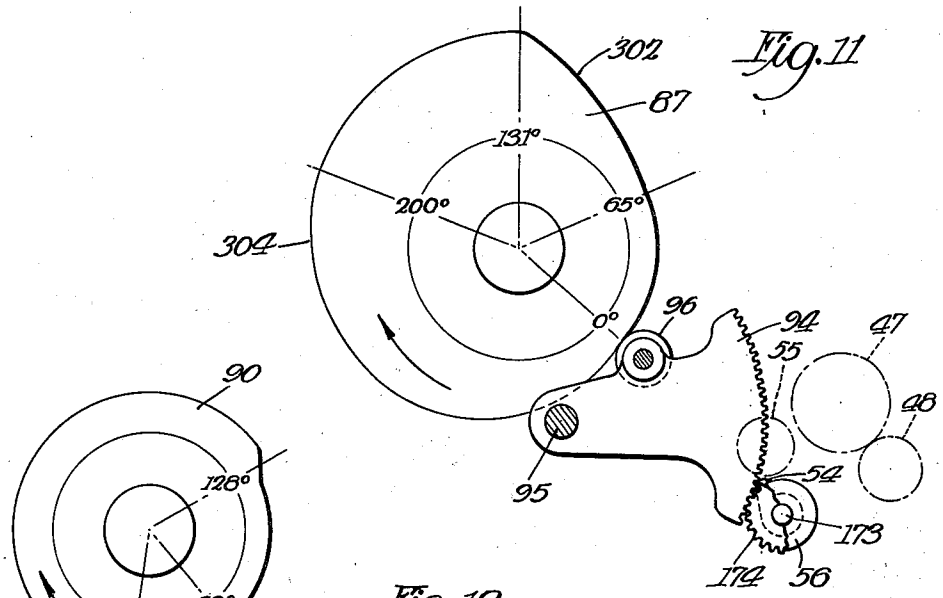
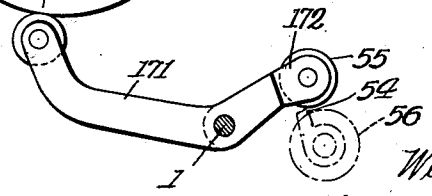


Fig. 11

Fig. 13



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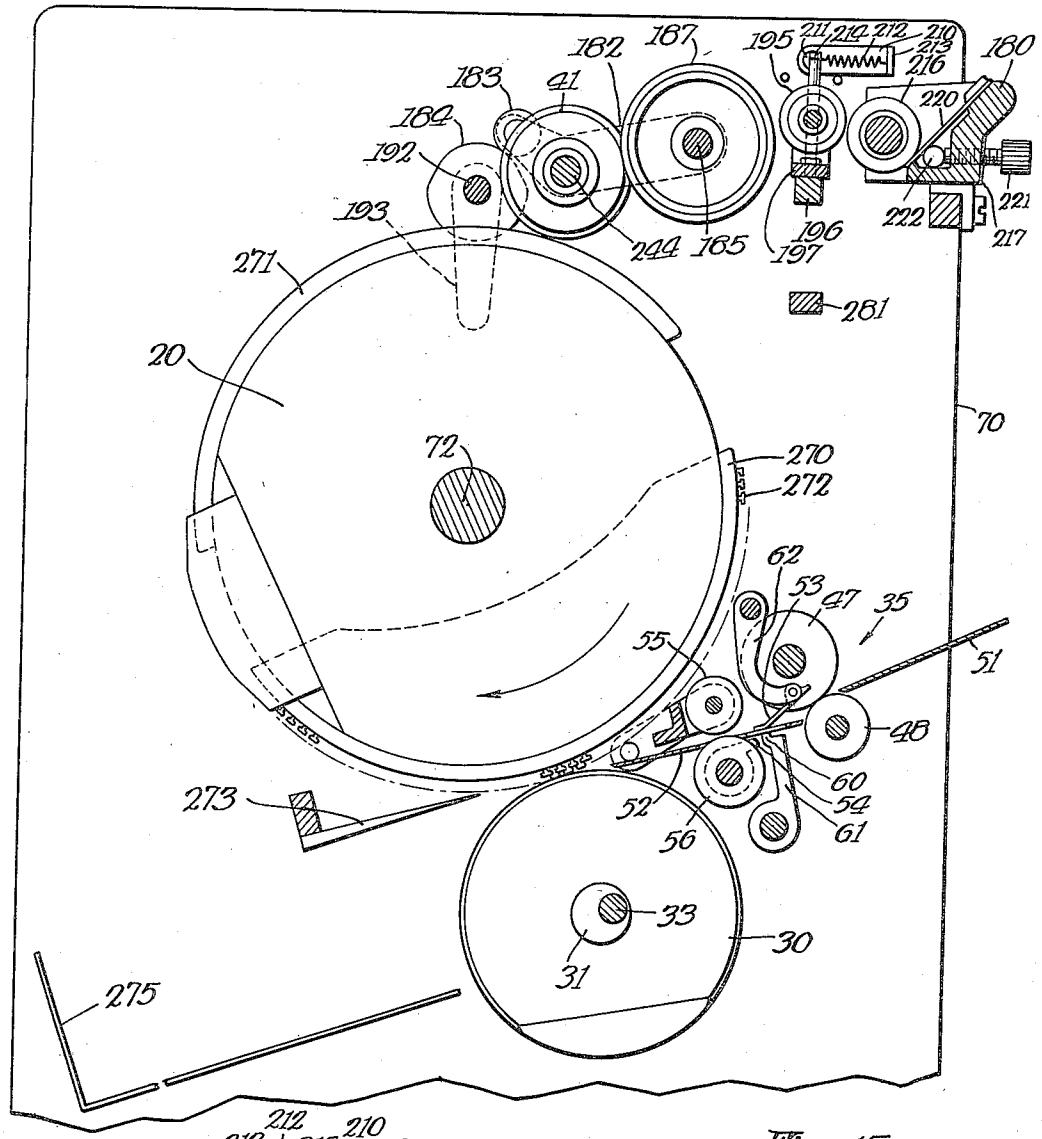


Fig. 15

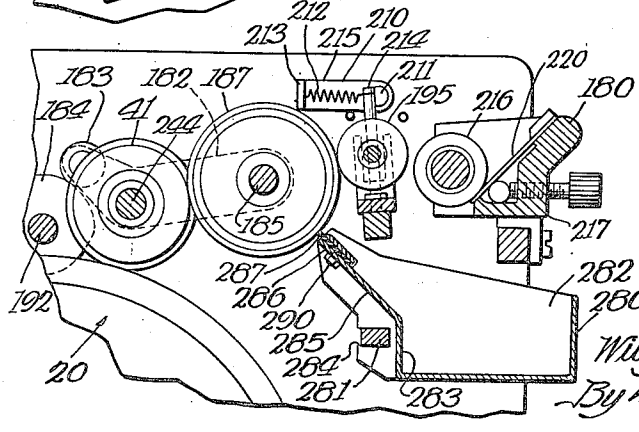


Fig. 16

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Patented Dec. 22, 1942

2,306,044

UNITED STATES PATENT OFFICE

2,306,044

PRINTING PRESS

William Ward Davidson, Evanston, Ill.

Application May 5, 1939, Serial No. 272,053

19 Claims. (Cl. 101—144)

The present invention relates to new and useful features in the construction and general assembly of rotary printing presses and to certain new and useful improvements which have a broader application to presses generally.

It is one of the objects of the invention to provide a printing press which can be used in general business offices whose employees are not skilled in the art of printing, yet satisfies the requirements of printers generally and can be used in printing plants for light and fast work.

In providing such a press, the question of price range is of prime importance. Many of the improvements developed in recent years amount to nothing more than accessories added to otherwise old presses and the cost of a particular installation was indexed by how many additional accessories were required by a purchaser. No substantial reorganization of the press assemblies has been had to eliminate parts and elements conventionally believed necessary. In fact, many manufacturers of presses prefer to have one basic unit to which accessory units can be added. This reduces the manufacturer's inventory overhead and shoulders upon the purchaser the cost-burden of the aggregately assembled units that are necessary to provide the results the purchaser asks for.

It is one of the purposes of the present invention to provide a reorganized press construction which accomplishes the results of the larger and more complicated conventional presses and which can be furnished at a single price within that which general business offices would be willing to pay to have an installation made to take care of their light work.

In providing a press that can be operated successfully by employees in general business offices it is important that the press be fool-proof for unskilled labor. Simplicity and ruggedness make it possible to accomplish this, and in the present invention these features have been emphasized. On the other hand these features make the present press desirable for use in printing shops and although the press of the present invention is already a high speed press within the meaning of these words in the art, its low cost enables work speeds to be multiplied in relation to equipment overhead since two or more of the present presses may be installed within a budget normally allocated for a single conventional press. This enables a multiplication of work to be turned out on the same overhead.

Not only this, but the press of the present invention performs work acceptacle to printers and the discriminating public alike, within the standards and criterion that have come to be expected of a printing process. In the present invention the process is preferably lithographic although the press illustrated is designed, with little change, to operate as a direct or type printing press, within the purposes and objects of the invention.

In addition to these features, I provide an improved rotary press having only two cylinders in the printing couple, and to the end that the operator may manage the press with a minimum amount of movement around the press, all the controls are readily reached from the feed station; the dampening and inking assemblies are located on top where their condition and the functioning of the fountains and rollers can be seen at a glance. This construction provides adequate room at the back of the press to replace the lithographic plate without changing the settings or position of associated parts when it is necessary to give to the cylinder the attention needed in setting up and adjusting it to run off a printing job.

The present invention also provides an improved regulator for determining the pressure between the blanket cylinder and the plate segment and between the blanket cylinder and the platen segment in relation to the thickness of the paper stock being printed. Functioning in combination with this is an improved control for preventing the transfer of ink from the blanket cylinder to the platen segment when a sheet is skipped by the feeder.

Moreover, I recognize and capitalize upon the fact that with the main cylinder making more than half a revolution between inking contacts with the form rollers, I can eliminate many distributor and form rollers heretofore believed necessary. The off-contact time makes it possible with the size and form of the rollers employed in the present invention to pick up and adequately distribute the ink before repeated inking contacts with the plate.

These being among the objects of the present invention, other and further objects will become apparent from the drawings herein, the description relating thereto and the appended claims.

Referring now to the drawings:

Fig. 1 is a side elevation of a preferred form taken inside the frame member on the left hand side from the feed station and looking toward the right hand frame member with those parts shown in section that engage the left hand frame member;

Fig. 2 is a section throughout the middle of

the press on a plane normal to the cylinder and rollers;

Fig. 3 is a section taken on the line 3—3 in Fig. 2;

Fig. 4 is a perspective view of the isolated drive mechanism for the several parts that are positively driven in the invention;

Fig. 5 is a perspective view of the isolated cam drive for the sheet skip control;

Fig. 6 is a close up of the feeder mechanism shown in Fig. 2;

Fig. 7 is a section taken upon the line 7—7 in Fig. 2;

Fig. 8 is a top plan of the inking and dampening mechanism with certain parts in partial section;

Fig. 9 is a restricted section taken longitudinally through the cylinders when they are in separated position;

Fig. 10 is a scaled view of the cam and follower mechanism for the separator roller;

Fig. 11 is a scaled view of the cam and follower mechanism for the lower feed roller;

Fig. 12 is a perspective of the mechanism shown in Fig. 11;

Fig. 13 is a scaled view of the cam and follower mechanism for the upper feed roller;

Fig. 14 is a perspective view of the mechanism shown in Fig. 13;

Fig. 15 is a view similar to Fig. 1 showing an adaptation of the preferred form for direct or type printing;

Fig. 16 shows the clean-up attachment, partly in section, for the ink assembly.

Before referring to the drawings in further detail, a better understanding of the drawings and the description to follow will be had if, at this time, the cycle of operation of the embodiment illustrated is briefly outlined as it would appear to one standing beside the physical machine observing it in operation.

GENERAL ORGANIZATION

The main cylinder **20** is mounted to rotate in the direction indicated by the arrow **26** away from the feed side of the press which in the view shown in Fig. 1 is the right side. A plate segment **21** and a platen segment **22** are mounted on the cylinder with a cam segment **23** located between the trailing edge **24** of the plate and the leading edge **25** of the platen segment.

The blanket cylinder **30** is mounted below the main cylinder upon a shaft **31** that is eccentrically rotated by the arm **32** about its ends **33**. The ends **33** are disposed toward the feed side of the machine from the axis **72** of the main cylinder on a line connecting them that is inclined from the vertical approximately twenty-five degrees, with the enlarged portion of the shaft **31** on the side of the ends **33** away from the feed side.

The feed mechanism is indicated by the numeral **35**. The inking and dampening units are located on top of the cylinder and a curvilinear deflector located upon the delivery side is shown at **36** to catch the printed sheets and deliver them to the delivery table **37** right side up.

GENERAL OPERATION

The press is constructed so that the main cylinder is driven in normal operation between 4,000 and 6,000 revolutions per hour. As it rotates the damp form roller **40** and the ink form roller **41** engage the plate on the segment **21** and are raised by the cam **42** from contact when the platen segment **22** passes below them.

With each rotation of the main cylinder the cam **23** engages the follower segment **44** mounted on the blanket cylinder **30**. The cam **23** forces the blanket cylinder downwardly by displacing the eccentric shaft **31** about the shaft **33** and moving the arm **32** counterclockwise from the stop **45**. The arm **32** moves against the tension of the spring **46** whose tension can be varied by means of a catch and spaced openings assembly **43**.

Just before the cam **23** relinquishes contact with the follower segment **44** the feeding mechanism **35** moves a sheet into the clearance that is established by the cam **23** between the cylinders. The speed with which the sheet is moved is an accelerating one which reaches the peripheral speed of the main cylinder just as the two cylinders are moved towards each other again by the spring **46** acting upon the arm **32**. At this time the blanket **34** prints the sheet, and the leading edge of the sheet strikes the deflector **36** and slides out upon the delivery table **37** at the end of the operation.

During the time the sheet is between the cylinders the arm **32** does not contact the stop **45**. The spring **46** establishes the printing pressure independently of the stop **45** since the sheet of paper itself separates the cylinders a distance enough to prevent the full return of the arm **32** against the stop **45** when the cam **23** releases the cylinder **30**.

However, when the paper is expelled from between the cylinders that clearance is taken up by the spring **46** drawing the arm **32** against the stop **45** which then comes into operation to determine the degree of pressure contact that is to be exerted between the plate and the blanket.

In feeding the sheets to the bite between the cylinders, a separating roller **47** is intermittently driven to feed the sheet **50** from the feeding tray **51** to the feeding table **52** under a feeler lever **53** resting upon the table **52**. Each sheet **50** is driven by the separator **47** a distance greater than necessary for the leading edge thereto to reach the stops **54** and in this way provides a slight buckle **49** in the sheet as seen in Fig. 6. After the sheet reaches the stops **54** the pressure roller **55** is lowered against the feed roller **56** whereupon the separator roller **47**, the pressure roller **55**, and the feed roller **56** are positively driven at an accelerating speed which is only stopped after the sheet has been engaged and subjected to the bite and pull-out action developed by the cylinders.

Whenever a sheet is skipped, the feeler **53** is no longer supported by the sheet above the slot **57** and therefore the feeler drops therethrough into contact with the lug **60** upon the rocker arm **61** when the arm **62** which carries the feeler **53** is actuated by the cam surface **63**. The movement of feeler **53** rotates the rocker arm **61** until the free end **64** is moved from against its stop **65** to a position in the path of the lug **66** controlling the operation of the arm **32**. The action of the feeler **53** is timed to take place when the cam **23** is in a position forcing separation of the cylinders, at which time end **64** is free to move into the path of the lug **66**. Then when the cam **23** leaves the follower segment **44**, the pressure contact which is normally resumed between the cylinders is prevented until the cam **23** again causes movement of the shaft **31** on the next revolution. By that time the feeler **53** has

been returned ready to respond again to hold the rocker lever 64 down once more if a sheet is still not in feed position on the feed table.

Having thus described enough of the details of the general structural characteristics of the invention to understand the general organization and operation, reference may be had to the drawings in greater detail for a more complete description of the structural characteristics preferably employed in the printing press disclosed to accomplish the operation just outlined and the objects of the invention generally.

PRINTING COUPLE

The construction of the main cylinder 20 and the blanket cylinder 30 as well as the damp form roller 40 is illustrated in Fig. 3, as viewed from the feed station. The right hand frame member 70 is located upon the right hand side of the drawing and the left hand frame member 71 upon the left hand side of the drawing.

a. Main cylinder

The main cylinder 20 is supported upon the shaft 72 which in turn has reduced end portions 73 journalled in bearing rings 74 that are mounted in cylindrically machined bosses 75 integral with the frame members 70 and 71. Shoulders 76, provided by the reduction of the end portion 73, rotate against the inner faces of the bearing rings 74, and confine axial movement of the shaft 72 to close limits, the bearings and shoulders being suitably lubricated by means not shown to prevent wear.

The cylinder 20, as constructed, comprises right and left hand disks 77 and 78, respectively, which have annular flanges 80 that fit upon the shaft 72 to which they are secured in rigid relationship. The flanges 80 are of sufficient strength and length to support the radial portions 81 and 82 against all working stresses encountered in the operation of the press.

Upon their outer faces the disks 77 and 78 are provided with graduated cylindrical shoulders to receive in supported relationship various gears and cams to be hereinafter described in greater detail, it being sufficient at the present time to identify the cams with regard to their respective locations upon the several shoulders.

At the right end of the cylinder 20, upon the disk 77, cams 83 and 84 are mounted with a spacing washer 85 between them. The outer cam 83 operates the separator roller 47 and the inner cam 84 operates the ductor rollers which will be identified later.

At the left end of the cylinder, the disk 78 carries three cams; cam 87 which operates the lower feed roller 56, cam 90 which actuates the upper feed roller 55 and cam 91 which actuates the ratchets upon the foundation rollers identified later. The spacer 92 is disposed between the cams 90 and 91 to hold them in correct position and both cam assemblies are secured to their respective disks by cap screws engaging them in circular slots (not shown).

The rims of the radial portions 81 and 82 are machined cylindrically as at 103 to support thereon the plate segment 21 and the platen segment 22. These segments comprise semi-cylindrical shells structurally rigidified by radial ribs 104 upon the inside thereof and machined to a cylindrical contour upon their outer surfaces as at 105 and 106, respectively. The cylindrical contour 105 is of a radius slightly less than the radius of the cylindrical contour 106 of the platen segment by an amount equal substantially to the thickness of the plate 107. The purpose of this construction is to have the cylindrical contour of the cylinder of substantially the same diameter throughout when the plate 107 is mounted upon the plate segment 21.

The platen segment is rigidly secured to the radial portion 81 by countersunk radial bolts 110 (seen in dotted lines in Fig. 2) which are threaded into annular supporting flanges 111 that form a part of the rim of the radial portions 81 and 82. On the other other hand, the plate segment is apertured and countersunk to receive bolt and nut assemblies 112 which extend through the annular flanges 111 with portions cut away from the radial portions 81 and 82, as at 114, to provide access to the nut and bolt assemblies 112.

In the preferred embodiment, two pairs of peripherally spaced bolts are employed to hold the platen segment in place, while two transversely spaced nut and bolt assemblies 112 are employed to hold the plate segment adjustably in place. The peripheral adjustment of the plate segment is accommodated by radial slots 115, as shown in Fig. 2, permitting the bolt and plate segment to slide circumferentially on the rims 103 when the nut and bolt assemblies are loosened.

In this way a simple construction is employed to expedite locating the plate segment relative to the platen and the blanket cylinder 30 for registering and adjustment purposes.

As will be hereinafter described, the cylindrical edges of the segments 21 and 22 are machined as at 116 and 117, respectively, to provide paths cooperating with wheels 120 mounted upon the form rollers 40 and 41. The paths 116 and 117 form arcs of circles and have different radii. Along the end edges of the platen segment 22, the whole segment is cut away or relieved at both ends in identical manner to provide inclined surfaces engaging the wheels 120, the inclined surface at the leading end comprising the cam 42 lifting the wheels.

The radial dimension of the respective paths is such that the wheels 120 will run in the paths 117 and lift the form rollers 40 and 41 from possible contact with the platen when the plate segment 21 is disposed next to the form rollers. The relieved paths 116 permit the form rollers to contact the plate 107.

As shown in Fig. 2 the plate segment 21 is provided with clamping elements at the leading and trailing edges. The leading edge of the plate segment is indicated at 122. At this edge the segment is rounded slightly as at 123 to provide a flat radial surface 124 against which a semicylindrical clamp fixture 125 is rigidly fastened. Shafts 126 are eccentrically mounted in the ends of the fixture, and L-shaped clamping elements 127 are mounted upon the shaft so as to move in clockwise direction, as viewed in Fig. 2, to clamp and release the leading edge 130 of the plate 107 in a relationship which is tightened by the pull of the plate upon the clamping elements, the spring 131 assisting the clamping elements in establishing this clamping relationship.

At the trailing edge 24 the plate segment is likewise rounded slightly but in this instance the clamping cylinder 135 is eccentrically mounted upon the rocking arm 134 along with the L-shaped clamping member 133 which supports the assembly upon the plate segment. The lever 137 is employed to rotate the eccentrically mounted

cylinder 135 relative to the L-shaped clamping member 133 in a counter-clockwise direction to release or receive the trailing dege of the plate. In pressing the arm 137 inwardly to do this, the arm is also pressed clockwise with regard to the plate segment to bring the sleeve closer to the rounded edge, at which position the trailing edge of the plate may be inserted between the clamping faces. Thereafter the arm 137 is released and a spring, not shown, actuating the rocking arm 134 draws the plate taut and automatically removes therefrom any slack developed in the plate under running conditions.

The cam segment 23 heretofore described, is mounted upon the disk 82 where the latter is cut away as at 140 (Figs. 6 and 9). In view of the fact that the cam 23 is longer circumferentially than the space between the segments 21 and 22, the segments 21 and 22 are cut away to receive cam 23 axially within their borders free of wheels 120 where it will engage the cam segment 44. Two segments 23 are provided so that one may be mounted at one end of the main cylinder and the other at the other end.

b. Blanket cylinder

The blanket cylinder is made of a single casting whose outer surface is ground to a cylindrical surface. The casting includes annular flanges 146, which rotatably support the cylinder upon the shaft 31, and is provided with a gap 147 (Fig. 2) wherein the mountings for the blanket are provided. This mounting means comprises headed pegs 150 upon the relieved leading edge 151 of the cylinder which engage keyhole slots in the leading edge of the blanket. The trailing edge is slotted in the same way as the leading edge but the headed pegs 152 there are supported upon a movable member 153 which is subjected to the control of the hex headed bolt 154 employed to place the proper tension upon the blanket.

Spanning the gap, as more particularly shown in Figs. 6 and 9, the follower segments 44 for the cams 23 are mounted in recesses 156 upon the ends of the blanket cylinder. The outer contour of these follower segments extends slightly beyond the cylindrical surface of the cylinder 30 yet not quite to the outer surface of the blanket. In this way the segments 44 do not project far enough to engage any portion of the main cylinder other than the cam 23. This is to be noted since the blanket cylinder rotates twice in the illustrated form while the main cylinder is being rotated once.

c. Printing pressure regulation

The blanket cylinder 30 is rotatably mounted upon an eccentric shaft 31 which permits contact pressure regulation between the cylinder 30 and the main cylinder 20, as already described generally. In providing this mounting, the shaft 31 rotatably carries the cylinder 30 on the outside surface thereof and in turn is rotatably mounted upon eccentric reduced end portions 33 provided concentric with each other at both ends of the shaft. On the left hand side, the shaft is journalled in and extends beyond the frame 71, as at 141, where it receives the manual control handle 142. At its other end, the end portions 33 are rotatably journalled in a bearing sleeve 143 which is turn is received in the frame member 70 and carries upon its outer side a second sleeve bearing supporting a free running gear 145 meshed with a gear 148 upon the main cylinder 20.

Rotation of the blanket cylinder is accomplished from the main cylinder through a universal joint 157 known in the art as an Oldham coupling which interconnects the end of the cylinder 30 and the gear 145.

Rotation of the handle 142 eccentrically rotates the shaft 31 about the ends 33, the shaft being so disposed that its greatest diameter yields in a direction of the pressure induced upon it when the main cylinder rotates and the cam 23 engages the follower 44.

At no time is the separation of the cylinders great, the distance being merely enough to clear possible contacts and provide a space into which the sheet 50 may be inserted and gripped by the cylinders when they return to contact after the cam 23 and the follower 44 separate. Even at the extra high speeds under which the cylinders have been run in tests there is little if any vibration. The throw of the cam 23 moves the blanket cylinder such a small distance that it is hardly detectable by the eye. In fact, as shown in Fig. 6, it will be noted that even the movement of the arm 32, which is magnified greatly because of the leverage induced by displacement of the eccentric shaft, is not very great. This magnification of the movement of the arm 32, however, is purposely done so that the adjustment of the stop 45 can be brought to a fine point without undue care being necessary.

With regard to the adjustment of the stop 45, it will be remembered that the cylindrical surface presented by the main cylinder, while the plate is in position, is of substantially uniform diameter throughout.

The stop 45 is adjusted so that it, in cooperation with the arm 32, determines precisely the distance between the axes of the main cylinder and the blanket. This distance determines the pressure which will exist between the plate upon the main cylinder 20 and the blanket upon the blanket cylinder 30. This pressure is uniform and positive within limits that do not cause the arm 32 to leave the contact 45 against the action of the spring 46.

However, when the blanket is ready to transfer the ink to the sheet 50, the printing pressure should be and is greater than that of the transfer pressure due to the fact that the diameter of the platen segment is the same as that of the plate segment and the thickness of the sheet 50, when in position between the blanket and the platen segment, causes the printing pressure to be subjected to the tension of the spring 46 by wedging the cylinders further apart and forcing the arm 32 to leave the contact 45. The tension can be varied by adjusting the tensioning device 43. This is the relationship of the printing and transfer pressures as controlled by the eccentric shaft, the stop 45 and the spring 46.

It has already been pointed out that little if any vibration exists between the cylinders, even when they are driven at high speeds. In addition to this, the arm 32 does not move from its position, as shown in Fig. 6, into direct contact with the stop 45 to jar against the stop or cause a slapping action, since, when the cylinders are relieved of contact between the cam 23 and the follower 44 they come together upon the sheet 50 whose thickness supports the arm 32 away from the stop 45. Thus when the cam 23 and the follower 44 separate, the arm 32 comes quickly to a point spaced from the stop 45 and only reaches the stop 45 after the sheet 50 has been delivered. This action of the arm 32 prevents

noise and wear upon the stop 45 and the arm 32.

This separating action of the cylinders upon each revolution by the arm 32, the cam 23 and the follower 44 has a further advantage. The parts involved in making adjustments are not permitted to seat themselves in strained positions which would render delicate adjustments impossible as is the case in conventional constructions, and in addition to advantages derived in providing a perfectly registered bite for the sheet 50, the pressure adjusting separator movement of the blanket cylinder makes it possible to have an improved control for keeping the cylinders separated in event a sheet is skipped by the feeder.

From the description thus far it will be readily apparent that the elements employed in the printing couple, their structural characteristics, assembly and operation are quite simple. The number of adjustments are minimized and those that are provided can be made easily by persons who happen to be unskilled in the printing field. The means for positioning the plate and blanket are quite simple and once the plate is located by the nut and bolt assemblies 112 only one adjustment need be attended to thereafter, namely, the adjustment of the stop 45.

FEEDER

It has been mentioned that a line connecting the axes of the cylinders is inclined to the vertical approximately twenty-five degrees. This position places the plane of tangency between the cylinders in a position inclined to the horizontal, sloping downwardly away from the feed position. The degree of inclination is preferably within a range having a mean of 25° or 30° and the magazine table 51 carrying the sheets 50 is disposed in a plane approximately parallel, though slightly below said plane of tangency. Thus the sheets of paper 50 are permitted to gravitate to the lower edge of the magazine 51 without manual attention, yet do not bear against the separator roller 47 heavily enough to buckle under their own weight.

The magazine 51 is mounted detachably upon the frame members 70 and 71 on the feed side of the cylinders 20 and 30 with the lower edge very close to the cylinders. At the lower edge and almost substantially within the combined contour of the two cylinders the improved and compact feeding mechanism is mounted. As has already been mentioned, the main elements comprise an intermittently driven separator roller 47, a retard roller 48 and two positively driven sheet moving rollers 55 and 56, the last of which has associated with it a sheet registering device generally designated 160 and more particularly shown in Fig. 12.

a. Registry

The sheet registering device 160 operates in synchronism with the cylinders 20 and 30 and functions by having stop fingers 54, associated with the lower feed roller 56, moved to an upright position for a given portion of the cycle of the press' operation to receive and register a sheet delivered to them from the separator roller 47.

The separator roller 47 is intermittently driven by the pitman 162 shown in Figs. 4 and 10 which in turn is propelled by the rock lever 163 pivotally mounted at 164 and driven by a follower 165 engaging the cam 83. An overrunning clutch 166 is interposed in the drive of the separator roller so that the sheet 50 when pulled off the stack by the bite of the cylinders will be fed without hindrance from the separator roller even though the intermittent drive through the pitman has ceased. This intermittent drive includes the shaft 167 which is rotatably mounted in the side frames of the presses and an adjustable bolt and slot assembly 168 to vary the throw of the pitman 162.

The retard roller 48 is mounted on a shaft 170 provided with eccentric trunnion bearings (not shown) journalled in the side frames of the press. The bearings are so located with respect to the shaft 167 carrying the separator roller that the retard roller 48 is in substantially tangential contact with the separator roller. The axis of the trunnions is so positioned that bodily movement of the retard roller 48 in a direction imposed by the sheet advancing causes the retard roller to move forward slightly and away from the separator roller 47.

However, the shaft 170 is constantly urged in the opposite direction by suitable means and is limited by a suitable stop (both of which are not shown) which gages the distance between the retard roller 48 and the separator roller 47 to permit only one sheet to pass therebetween when the pitman 162 actuates the separator roller 47.

The sheet 50 as drawn from the stack by the separating roller is propelled forwardly upon the feed guide plate 52 a distance greater than necessary for it to reach the register stops 54 after which the sheet is brought to a stop with enough expanse of sheet between the separator roller 47 and stop 54 to provide the substantial buckle 49 in the sheet. This assures registry at all times. In moving over the feed guide plate 52, the sheet passes under the feeler 53 and prevents the feeler from dropping through the slot 57. The feeler 53 is thereby kept from contact with the lug 60 upon the arm 61 which would cause the latch 64 to engage the lug 66 upon the eccentric 31 and prevent return of the arm 32 after the cam 23 and follower 44 relinquish contact. The eccentric shaft 31 is thereby left free to move the blanket cylinder into contact with the main cylinder when the sheet 50 is therebetween.

After the buckle 49 in the sheet 50 is established, and in timed relationship with the rotation of the main cylinder, the upper feed roller 55 is lowered by the cam 90 which actuates the follower arm 171, and thereby the roller support bail 172 through the pivot pins 179 (Fig. 14). When lowered, the upper roller 55 contacts the lower roller 56, with the front edge of the sheet between them. After this contact has been established the lower roller 56 is automatically rotated to accelerate and deliver the sheet into the space between the cylinders at a speed whose ultimate velocity is identical with the surface velocity of the main cylinder 20. This drive is accomplished from the cam 87 and a gear segment 94 pivoted at 95 with the follower between at 96.

As the lower roller 56 is driven, the separator roller 47 is also driven further forward simultaneously to maintain the buckle 49 in the sheet between the feeder rollers and the separator roller so as to prevent any undue strain being placed upon the sheet on the feed rollers.

Once the cylinders 20 and 30 come together upon the sheet 50 the drive of the separator roller is stopped. The over-running clutch comes into operation and the upper roller 55 is raised to per-

mit the bite between the cylinders 20 and 30 to complete the operation of the withdrawing of the sheet from the stack.

Not only does the maintenance of the buckle in the sheet prevent undue strain, it also prevents feed slippage arising between the feed rollers 55 and 56. Their operation is comparatively free of any substantial draw and it is not the intention of the invention that these rollers be used to pull the sheet from the stack. The main portion of this operaion is done by the cylinders themselves as assisted by the separator rollers during the time the latter operate. The feeder rollers are merely burdened with accelerating the free edge of the sheet to a registering position between the cylinders. In this way accurate feeding of the sheet in perfect registry is assured and the longevity and effectiveness of the feed rollers is greatly enhanced since they are in operation during only a small portion of the feed movement of the sheet.

Movement of Registry Stops

The action of the end registering fingers will now be described. The stops 54 are carried upon segments mounted upon the shaft 173 which supports the lower roller 56 (Fig. 12). These rollers are driven, as already described, through a gear 174 in mesh with a gear segment 94 that in turn is actuated by the cam 87 mounted upon the main cylinder 20. The setting of the driving train is such that when the sheet 50 contacts stops 54 they are normally vertical, being held in this position by a return spring 176 which through the gear train maintains the follower 96 firmly against the cam 87.

Immediately after the separator roller 47 feeds a sheet against the stops 54 with the buckling action, and after the pressure roller 55 is lowered, as already described, to grip the leading edge of the sheet firmly, the cam 87 operates the gear segment 94 to rotate the feed roller 56, and, at the same time, to rotate the stops 54 away from the leading edge of the sheet as it is advanced by the roller 56. The feeding of the sheet follows as has been already described. When released by the cam 87, the cycle of the stops is completed by the return of the feed roller 56 and the stops 54 to their initial position under the influence of the return spring 176, which incidentally eliminates all slack from the drive of the feed roller 56 so that the feeding of the next sheet and all successive sheets is absolutely uniform.

Inking and Dampening

The inking and dampening rollers are located above the main cylinder. The ink fountain 180 is disposed between the frame members upon the feed side of the press and the water fountain 181 is disposed between the frame members upon the opposite side of the press. Between these two fountains the rollers are all mounted with their axes lying preferably substantially in one plane.

The form rollers 40 and 41, already described, are proximate each other and supported for vertical movement intermediate the ends of the rocker arms 182 which at their adjacent ends carry cam followers 183 that ride upon a common cam 184. The followers 183 are adjustable by means of eccentric bolts 188 to regulate the pressure between the form rollers and the plate.

The pivotal axes of the arms 182 are the shafts 185 supporting the respective distributing rollers, namely, the water distributing roller 186 and the ink distributing roller 187. In this manner of supporting the arms 182 the form rollers are never out of contact with their respective distributing rollers.

As best shown in Fig. 1, the followers 183 engage the cam 184 at points spaced about 90° where the reduced dwell 191 is of sufficient length to receive them both at the same time. The larger dwell 190 of the cam 184 though about 180°, may be less than 180° provided the inclines themselves never exceed the angularity between the followers.

The cams 184, there being one on each side of the press, are mounted on the shaft 192 which carries on the end thereof a handle 193 where the shaft extends beyond the side frame 71. Both form rollers are lowered when the handle extends straight down. When the handle is turned to a horizontal position extending toward the feed side, the ink form roller is raised. When the handle is turned away from the feed side of the press the dampening form roller is raised, and when the handle 193 is turned to point straight up both form rollers are raised. This construction provides a very effective form roller throwout mechanism which is simple in construction and easily understood. An unskilled operator would learn quickly to detect whether the form rollers individually or together are in their "off" or "on" position by the direction of the handle. Suitable detents (not shown) are provided for locating the handle in the four positions described.

As part of the ink and water distributing system I provide an improved mechanism for actuating the ductor rollers, roller 194 being the water ductor and roller 195 being the ink ductor. These mechanisms comprise identical parts mounted in reverse for the water and ink ductor rollers respectively. As shown in Fig. 2 each mechanism comprises a shaft 196 journalled in the side frames and provided with upwardly extending spaced yokes 197 and downwardly and inwardly extending follower arms 200 that engage, in common, the cam 84 and are adjustable arcuately about the bolt 199. The contour of the cam 84 is shown in Fig. 2 in proper relation to the segments 21 and 22 so as to move the ductor rollers in timed relationship with the rotation of the main cylinder 20.

The ductor rollers are rotatably mounted upon the shafts 202 journalled in boxes 203 that are slidably mounted between the yoke arms 204 of the yoke member 197. Thus the ductor rollers are free to rotate in relation to any roller with which either come in contact. Springs 205 are employed to retain the followers against the cam 84.

INK DUCTOR THROW-OUT

With regard to ink ductor 195 particularly, a new and novel device is incorporated to locate it in either one of two positions. In one position the ductor roller is in and out of contact with the ink fountain roller 216 under the control of the cam 84, and in the other position the ink ductor roller is located continuously against the ink distributor roller 187.

The device which accomplishes this, comprises an over-center snap-arm 210 pivoted to the frame member 70 as at 211 with a spring 212 interconnecting the free end 213 of the arm with an upwardly extending arm 214 secured to the yoke 197. In this particular construction the yoke 197 is permitted enough relative movement counter-clockwise about the shaft 196 when the

arm 210 and spring 212 are disposed in their alternate positions, as indicated by the numeral 215 in Fig. 16.

INK FOUNTAIN

The ink fountain 180 comprises an ink roller 216 rotatably mounted in the mouth of a horizontally opening casing 217 which is fitted with a flexible steel blade 220 regulated by means of fine threaded thumb screws 221 set close together with short rollers 222 placed end to end between the blade and the adjusting screws 221. The rollers provide an improved fountain construction wherein pressure upon the blade is never localized at a point but is spread uniformly for each screw 221 throughout the length of the roller which allows the flow of ink to be regulated to a nicety at any section and throughout the full length of the blade. In this way a very effective and simple control of the ink feed clearance between the blade and the roller is provided which supplies a substantially uniform film of ink upon the surface of the ink rollers 216 throughout their length.

Water Fountain

The water fountain includes a water tray 223 with the water fountain roller 224 running partly submerged therein, the tray being mounted upon side frames by a bracket 225 and the water roller being mounted for rotation upon a shaft 226 journalled in bosses preferably integral with the side frames.

Fountain Roller Actuation

The ink roller and the water roller are operated by an improved pawl and ratchet arrangement of wide adjustment that is driven in timed relationship with the rotation of the main cylinder 20. Each of the pawl and ratchet arrangements for the ink and water rollers are designed from parts that are simple in their construction. These parts comprise a rocker arm 230 which is pivotally mounted intermediate its ends on a spur bearing 231. At its end 232 the arm has a follower which engages the cam 91 whose contour and location regarding the main cylinder is as shown. The upper end 234 of the rocker arm 230 is connected with the lower end 235 of a second rocker arm 236 by means of a thrust link 237. The second rocker arm 236 is pivotally mounted intermediate its ends to rotate about the axis of the roller 216, and carries at its upper end a pawl 240 engaging a ratchet 241 rigidly secured to the shaft of the roller 216. A spanning link 238, running to the ratchet 239 upon the shaft 226 of the water roller 224, is driven from the link 237.

The ratchets 239 and 241 are disposed identically on the shafts of the fountain rollers 216 and 224. The rollers 216 and 224 rotate in the same direction. The linkage is such that the ink ratchet 241 operates on the thrust of the cam 91 so that the heavy pull of the ink roller is borne on the cam thrust stroke, and the water ratchet 239, which has a much lighter load, is operated by the spring 233 upon the return movement of the follower—the spring 233 thus serving a dual purpose as a cam follower return and as fountain roller actuator. The direction of turning the ratchets is, of course, that in which the ink roller 216 rotates in correct relationship to the blade 220. In this way not only are surplus parts eliminated, but the remaining parts are standardized to be identical for inventory purposes and are made very simply.

Roller Mountings

Referring to Fig. 3, the arms 182, supporting the form rollers 40 and 41, are shown as apertured to receive eccentric bushings 243 on the arms 182, which may be adjusted by loosening the clamp nuts 242 upon the threaded reduced end 243 of the bushing 243, where it extends through and beyond the arm 182. These bushings receive a cylindrical shaft 244 therethrough, which, intermediate the inner ends of the bushing 243, rotatably carries bearing sleeves 245 which support the wheels 120 and the cylindrical iron stock 246 upon which the rubber covering 247 is cast.

With this construction the roller can readily be removed from the press without disturbing its adjustment by withdrawing the shaft longitudinally through the side frame 70, a knurled end portion 247 of the shaft being provided to assist in this and the side frame 70 being cut away, as at 248, in the form of a vertical slot which accommodates the end of the shaft 244 as the roller moves up and down during its working cycle.

If any axis of the rollers or cylinders is not exactly parallel with the axes of the others, both ends of that roller can be adjusted independently by the means provided until all axes are perfectly parallel. In this way a simple and easily adjusted mounting for each bearing is provided, with all parts standardized to reduce inventory overhead for both the manufacturer and the dealer, like numbers referring to like parts in the several views.

Ink Distribution

Referring now to the timing of the ductor rollers and the feeders, and to the kinematics of the inking and dampening assemblies, it is to be noted that perfect distribution of dampening fluid and ink upon the plate is accomplished by two assemblies of only three rollers each, one of which in each group is the respective ductor. The relative diameters of the three rollers in both the dampening assembly and the inking assembly is significant. In the preferred embodiment, as shown in the accompanying drawings, the ink distributing roller 187 and the water distributing roller 186 of the respective inking and dampening assemblies are larger than the other rollers in their respective assemblies.

The following explanation will be restricted for the sake of simplicity to the inking assembly although what is said applies to the dampening assembly also.

The size of the ink distributor roller 187 is such that it revolves about 2½ times in the period of time that the form roller 41 is not in contact with the plate 107, and in the particular embodiment this amounts to about four revolutions while the main cylinder 20 is making one complete revolution.

The form roller 41 is of a size such that it revolves about three times during the time that the distributing roller revolves the above mentioned 2½ times. The ductor roller 195 is constructed of a diameter so as to revolve approximately five times while the distributor roller is revolving 2½ times. With these ratios disclosed by way of giving a suitable example of the relative dimensions it will be seen that any two contacting points between the rollers do not come together again within the period of time existing between the breaking and making of contact between the form roller and the cylinder. With

the ratios provided in the preferred form, with each revolution of the distributor roller, the form roller turns 1⅜ times and the ductor roller turns 1⅘ times, and, the ductor roller revolves 1⅞ times for each revolution of the form roller. With these ratios it is possible to introduce an even layer of fresh ink upon the ductor roller over a substantial segment of its outer surface when it is in contact with the inking roller without that segment of fresh ink overlapping itself within the 2½ revolutions of the distributor roller. Thus in the interval between the time the form roller breaks contact with the plate 107 and again makes contact with the plate there is adequate time for substantial distribution of ink to take place. However, in the construction of the present invention the size of the rollers and the timing of the ductor roller provides more time than this within which ink may be distributed for transfer to the plate.

I employ a means for inking the distributor roller at a time synchronized with the rotation of the cylinder when the path the fresh ink has to follow before it would otherwise come into contact with the plate surface for the first time is appreciably longer than the path yet to be followed by the circumference of the cylinder remaining to be contacted by the form roller at the time the ink is transferred to the distributing roller.

In the relationship of the relative diameters, as shown, it will be seen that there is enough time provided for another revolution of the distributor roller from the time the ink is transferred thereto to the time that the form roller picks up the fresh ink and contacts the plate with it. This means that when the main cylinder is rotated, as shown in Fig. 2, to a point where the form roller contacts the plate at 250, the ductor roller may transfer fresh ink to the distributor roller without any of the fresh ink reaching the plate until the next contact between the ductor roller and the plate, namely, until the leading edge 122 of the plate segment brings the plate again into contact with the form roller. This arrangement provides a sufficient margin of safety to turn the ductor roller as much as a ½ a turn to take the ink from the ink roller since the ductor roller has to rotate more than ½ of a revolution before fresh ink thereon is in a position to come into contact with the distributing roller after being moved by the cam arm 200 into contact with the distributing roller.

The discussion so far has been related to the fresh inking of clean rollers. A great deal of the distributing action induced between the ink assembly rollers continues after the leading edge 122 of the plate segment is again in contact with the form roller since the form roller 41 provides approximately ⅓ of a revolution after contact with the plate before the ink distributing roller 187 has to replace the ink taken from the form roller by the plate. This in point of time would be approximately where the form roller would reach contact with the plate at 251. This provides approximately 330° of revolution of the main cylinder within which the inking assembly is devoted entirely to ink distribution. It is only for the remaining 30° of revolution of the main cylinder that the inking assembly is burdened with supplying ink to the plate by drawing ink twice from the same part of distributing roller 187 without intermediate replenishment, this being the arc between point 251 and the point 250.

Thus it will be seen that the structural characteristics disclosed and described and the operation thereof provide an improved inking system for plate cylinders. It remains only to point out in this connection, that with the more accurate and efficient blade control provided it is possible to supply films of ink to the ink rollers which are thinned down a great deal without endangering the uniformity of distribution. With the ink thinned down it is possible to rotate the ink roller through a wider arc by a long throw upon the pawl 240. The ductor roller when it contacts with the distributor roller thus has the ink it received from the ink roller already distributed upon its surface more than heretofore provided upon conventional ductor rollers so that when the replenishing ink is picked up by the distributor roller it is already distributed well over the face thereof, the relative size of the rollers in the ink assembly, as already pointed out, being such that a wide sector of fresh ink upon the ductor roller will not overlap itself within two or three revolutions of the distributor roller.

Power Transmission

The transmission of power throughout the press is best shown in Fig. 4. The prime mover for the press is a motor 260 that is connected to a shaft 261 by a pulley and belt assembly 262. The shaft 261 is suitably journalled to the side frames and carries a pinion gear 263 which meshes with the ring gear 148 secured to the disk 77. The separator roller 47 is powered through the pitman 162 by means of the cam 83 also mounted upon the disk 77 and the distributing rollers 186 and 187 powered through counter-shaft gearing 265 for positive rotation. The blanket cylinder 30 is shown with a ring gear 145 in mesh with the ring gear 148 for synchronous and positive rotation therewith as already described.

Cam Timing

It would now appear to be in point to discuss the timing of the cams, having alluded to certain characteristics thereof and having described all the elements and assemblies involved. The following figures and dimensions are used by way of example and are not to be interpreted as limitations.

About 90° before the cam 23 upon the cylinder 20 engages the cam 44 upon the blanket cylinder 30, namely, at about the time the point 250 upon the cylinder 20 engages the cylinder 30, the cams 83, 87 and 90 are located in their zero positions as shown in Figs. 10, 11 and 13. Within the 90° turn of the cylinder 20 that follows, the cam 83 uses the first 40° to actuate the separator roller 47 and thereby move the front edge of the sheet 50 against the stops 54 with sufficient slack in the sheet to provide the buckle 49. Within the next 9° the upper feed roller 55 is lowered to grip the leading edge of the sheet.

The respective parts are maintained in their respective positions thereafter until the cylinder has rotated 65° from its original position whereupon the follower 165 leaves the dwell 300 on the cam 83 and is driven farther out by the incline 301 simultaneously with the drive of the follower 96 by the incline 302 upon the cam 87. This simultaneous drive starts the accelerated, registered feed movement of the sheet towards the bite with the contour of the inclines 301 and 302 cooperatively assuring the retention of the buckle 49 in the sheet.

Shortly after the feed movement has begun the cams 23 and 44 engage and the cylinders 20 and 30 are separated. By that time the cam 63, which is carried by the arm 94, has moved to a position where the incline 303 actuates the follower 304 upon the arm 62 to operate the feeler mechanism (Fig. 5).

With the sheet 50 holding up the feeler 53 the arm 32, under the tension of the spring 46, is permitted to establish the printing pressure between the cylinders when the cams 23 and 44 relinquish contact.

By the time the cylinders 20 and 30 come together again the sheet is moved approximately ¼ of an inch beyond the center line where and at the time the bite takes place.

Immediately after the bite is established the upper feed roller 55 is raised and the follower 96 enters upon the decline 304*a* of the cam 87 to return the stops 54 and lower the feed roller 56 gradually to their initial position, the pitman 162 being returned at the same time.

In the meantime the plate has been in contact with the form rollers 40 and 41. Within the 132° of cylinder rotation before the point 250 on the cylinder 20 reaches the ink form roller 41, the ink roller ratchet 241 has been actuated for the first 95° thereof by the cam incline 305 (Fig. 1) during which the ink ductor follower 200 (Fig. 2) has been free of contact with the dwell 306 upon the cam 84.

During the remaining 37° of the 132° the ductor roller 195 is moved from the ink roller 216 to the distributor roller 187 by the incline 307 upon the cam 84, by which time the water ductor arm 200 reaches the dwell 308.

Also within said 37° the ratchet follower 232 has come to the end of the high dwell 310 upon the cam 91 and for the following 95° of revolution, the ratchet arm 238 is moved by the spring 233 to rotate the water fountain roller 224 in synchronism with the time the ductor roller 194 is against the water fountain roller 224. Thus within this last 95° of revolution the damp is picked up by the ductor 194 and thereafter the incline 307 of 35° upon the cam 84 moves the water ductor roller 194 back against the water distributor roller 186.

The high dwell 311 upon the cam 84 keeps the ductor rollers in contact with their respective distributor rollers for the remaining 188° turn of the cylinder 20 throughout which they will function as distributor riding rollers.

Type and Direct Printing

The invention, as shown in Fig. 15, is adapted for direct printing. Although it is preferable to employ the blanket covered cylinder 30 as a platen a hard surface cylinder (not shown) could be substituted for the blanket covered cylinder 30, if desired, to cooperate with the type supporting segment 270 mounted in place of the platen 22. A counter-weight segment 271 is, in this instance, substituted for the plate segment 21. In event the type segment 270 is one which is long enough to cover a larger portion or practically all of the circumference of the cylinder 20, the hard surfaced platen cylinder (not shown) will be one with a continuous outer surface. In this construction the dampening assembly can either be removed completely from the press, as shown, or be held out of engagement by rotating the handle 193 away from the feed side of the press, an expedient not shown in the drawing.

In the adaptation shown, the form roller 41 contacts the type supported in the type channels 272 of the type segment 270 and in this instance a stationary stripper 273 is employed to break contact between the paper fed between the cylinder and the blanket roller 30 which now serves as a platen instead of an impression transferring medium. The delivery table 37 is indicated at 275 below the stripper 273. All the functionings of the modification shown in Fig. 15 correspond with the description of parts contained herein covering the preferred form of the invention, except that ink form roller 41 is held off of segment 271, as clearly seen in Fig. 15.

In this way the press disclosed and described herein is readily adaptable to print directly or indirectly upon the sheets of paper 50 fed to it by the feeding mechanism 35.

Sheet Delivery

The delivery mechanism for both constructions will be described and compared at this time, having in mind certain objects already alluded to and other advantages and new results provided by the construction as shown. Referring to Fig. 2, the deflector 36 is a single casting comprising spaced curved ribs 274 that follow the contour of the impression cylinder 30 over a portion of its length, ending in straight portions 277 that carry the sheet 50 far enough to assure it reaching the delivery table 37. The curved ribs are joined at their ends by three integral cross sections 278 with the intermediate sections thereof terminating at both sides of the deflector in lugs 279 which receive bolts 276 that detachably support the deflector between the side frames 70 and 71. The sheet contacting edges of the ribs are polished preferably round to facilitate sheet movement.

Referring to Figs. 1 and 2 where the printing ink is applied to the bottom of the sheet 50 by the blanket roller 30, the deflector 36 is mounted to catch the sheets 50 as they come from between the two cylinders and to right them for delivery onto the delivery table 37 with the printed side up. The stripper 273 in this instance is mounted below the blanket cylinder 30.

In the direct printing adaptation shown in Fig. 15, the main cylinder 20 places the ink on top of the paper and a delivery mechanism is provided which also delivers the printed side of the sheet up.

In the construction shown in Figs. 1 and 2 the printed sheet is seldom touched by the stripper. The arrangement of parts is such that the peripheral speed and centrifugal throw of the blanket cylinder flings the sheet free practically every time without the stripper being needed to assist. The deflector engages the back side, i. e., dry side of the sheet without ever touching the printed ink arrangement. This is of particular interest in that when the direction of the sheet is changed and the sheet is forced to follow a path not normal to the direction it would follow if it were free to move after being discharged from between the printing cylinders, a great deal of frictional contact and pressure is exerted between the handling member and the surface of the sheet where the imposed path of the sheet is curvilinear.

In the present invention this friction is capitalized upon to prevent a sheet driven at high speed from striking the registering stops of the delivery table hard enough to nick the leading edges of the sheet, yet the sheet is delivered positively without any danger of smearing the fresh ink upon the printed surface thereof.

INK CLEAN-UP

In Fig. 16 I show an improved clean-up attachment for the ink rollers. This attachment comprises a metal tray 280 adapted to slide into position upon a cross sectionally rectangular strut member 281 connecting the side frame members. The length of the cleaning attachment is approximately one-half the length of the rollers and its end members 282 extend forwardly beyond the front wall 283 a sufficient distance to provide for slots 284 which slip over the strut 281 and assist in locating tray 280 in place. Along its upper edge the front wall 283 is inclined forwardly as at 285 toward the center of the distributor roller 187 as the tray 280 is located in place. The front edge 286 of the inclined portion 285 has secured thereto a flexible blade 287 made preferably of synthetic rubber, such as "Duprene," which is adjustably held in place by nut and bolt assemblies 290 to contact the circumference of the distributor roller when the tray is in its resting position.

During the cleaning operation the tray 280 is placed first on one side and manually forced lightly against the surface of the circumference of the distributor roller 187 to clean therefrom ink present there. The strut 281 and slots 284 operate as stops to prevent crowding the metal tray against roller 187, and a solvent, such as gasoline, is used to loosen the ink, the solvent being applied to only that half of the roller. After one end of the roller is cleaned, the tray is slid gradually along the strut 281 to clean progressively through to the other end of the rollers.

The length of the tray 280, although providing a saving in material, primarily is designed to teach inexperienced operators that only one-half of the roller's length is to be solvenized at a time. Although in the present invention this factor is not so important, it is important where there are many frictionally driven riders and other rollers. By solvenizing only half the length of the roller, ink tackiness on the remainder of the rollers drives the riders until the cleaned portion dries to provide a dry friction that assists in cleaning the remaining portion of the rollers. Slippage between the rollers is thereby avoided which would be engendered if solvent were applied throughout, the solvent and ink solution being quite slippery.

In this cleaning operation the snap-over arm 210 is located in the position 215 and the ductor roller 195 is continuously held against the distributor roller 187. The cleaning operation is done with the press running and the handle 193 up so that none of the gasoline reaches the plate.

In this process the gasoline is transferred back and forth between all the rollers to loosen the ink and carry it down into the tray 280. The rollers dry right away without inking, the press being thereby prepared for the next run quickly and in a very simple manner with no saturated rags or waste to be disposed of to prevent spontaneous combustion, and no soiling of the hands or clothes.

Having thus set forth and described the advantages of the invention and the structural characteristics of a preferred embodiment thereof, it will be appreciated that the various constants and dimensions set forth are used for purposes of illustration only and can be varied if compensatory changes are made in other parts of the device. Consequently, although certain embodiments of the present invention have been shown and described in detail herein it will be apparent to those skilled in the art that various modifications and changes may be made therein without departing from the spirit and substance of the invention, the scope of which is commensurate with the appended claims.

Certain features disclosed herein are not intended to be covered broadly by the present claims, being claimed in other copending applications. Without attempting to list all of such features, examples are the adjustability of a segment, particularly a plate carrying segment, on the discs, the delivery of the sheet optionally either face up, especially when the press prints either face, and the deflector for turning over the sheet.

I claim as my invention:

1. In a printing press, the combination of a main cylinder adapted to carry a lithographic plate upon one segment and to support a blank sheet of paper on another segment thereof, a movable blanket cylinder rotatable with the main cylinder and mounted to be moved toward and away from the main cylinder, resilient means for advancing the cylinders toward each other, means rigidly limiting the distance between them during the offset operation, but rendered ineffective so as to leave the resilient means resiliently urging them into pressure contact during the printing operation, means for feeding a sheet between said cylinders immediately prior to the printing operation, and means removing said cylinder-advancing means from operation when a sheet is not fed between the cylinders.

2. In a printing press, the combination of a main cylinder having plate and platen portions, a movable blanket cylinder rotatable with the main cylinder and mounted to be moved toward and away from the main cylinder, cam segment means forcing separation of the cylinders each revolution, resilient means for advancing the cylinders toward each other, means rigidly limiting the distance between them during the offset operation, but rendered ineffective so as to leave the resilient means resiliently urging them into pressure contact during the printing operation, means for feeding a sheet between said cylinders immediately prior to printing operation, and means removing said cylinder-advancing means from operation when a sheet is not fed between the cylinders.

3. A printing couple comprising a main cylinder having plate and platen portions, a movable blanket cylinder rotatable with the main cylinder and mounted to be moved toward and away from the main cylinder, means forcing separation of the cylinders prior to the feed of a blank sheet between the cylinders, resilient means for advancing them toward each other, means rigidly limiting the distance between them during the offset operation, but rendered ineffective so as to leave the resilient means resiliently urging them into pressure contact during the printing operation, means for feeding a sheet between said cylinders immediately prior to printing operation, and means removing said advancing means from operation when a sheet is not present between the cylinders.

4. In a printing press, a first cylinder including a plate and a platen, a second cylinder including a blanket member rotatably mounted for movement toward and away from the first cylinder, means separating the cylinders immediately preceding printing contact therebetween, means for feeding a sheet between the cylinders during said

separation, and means preventing contact between the cylinders when a sheet is absent.

5. In a printing press, a main cylinder, a secondary cylinder, means supporting said cylinders for movement toward and away from each other, and a contact pressure regulating device comprising pendulating means for bringing together said cylinders, a stop means limiting said movement toward each other, and tension means operative when the stop means is ineffective.

6. In a printing press, a segmented main cylinder, a secondary cylinder, said main cylinder having a substantially uniform diameter with the printing medium in place upon one of the segments, tension means normally holding said cylinders in contact under printing pressure, and stop means holding said cylinders in predetermined limited relationship for providing a transfer pressure.

7. In a printing press, a main cylinder, a secondary cylinder, means supporting said cylinders for movement toward and away from each other, means separating the cylinders in timed relation with their degree of rotation, means normally operative for maintaining a predetermined circumferential position between the cylinders, means for rendering said normally operative means inoperative when a sheet is missing, and means for superseding said normally operative means when a sheet is present.

8. In a printing press, a main cylinder, a secondary cylinder, an eccentric shaft supporting one of said cylinders with the greater diameter of eccentricity disposed on the side of the axis of said cylinder towards which the engaging surfaces of the cylinders rotate, pendulating means for forcing rotation of the eccentric shaft in the direction of rotation of the cylinder it supports, tension means opposing said rotation of the shaft, and stop means limiting rotation of the shaft in a reverse direction.

9. In a printing press, a main cylinder carrying a platen and a plate, a secondary cylinder carrying a blanket, means supporting said cylinders for relative movement toward and away from each other, pendulating means for separating the cylinders after relative contact is rotationally relinquished between the plate and blanket, means imposing a resilient pressure opposing said separation and providing a printing pressure when the platen and blanket contact, means limiting said resilient pressure means when the plate and said blanket are together.

10. In a printing press, a printing couple performing repeated cycles of operation, means supporting the members of the couple for movement into and out of cooperative relation, means for driving the members in synchronized relationship, resilient means urging one of the members into cooperation with the other member, means for counteracting said resilient means for separating the members, means for locking said resilient means to remove it from operation after a separation of the members and during one of said cycles, detector means operatively engaging said locking means to actuate same whenever a sheet is missing, and means moving said detector means in synchronized relationship with the drive of the printing couple by which the detector means completes its check after said counteracting means operates to separate the members.

11. A printing press having a printing couple, means for feeding sheets to the couple, means for moving the couple into and out of printing engagement, an element controlling the last means for at times disposing the couple in operative position, a sheet detector engaging said element when a sheet is missing, means for reciprocating said sheet detector, said reciprocation actuating said element when the detector engages said element.

12. A printing press having a printing couple, means for feeding and registering sheets for the printing couple, means for moving said printing couple out of operative position, a trip controlling the printing couple moving means, a feeler device responsive to the presence and absence of a sheet for engaging said trip when a sheet is missing from register position, and means for reciprocating said feeler for actuating said trip when the trip is engaged by the feeler.

13. A printing press comprising a printing couple one member of which is movable into and out of printing engagement with another member, means for feeding a sheet to said couple in timed relation with respect to the operation thereof including a feed table, a latch means disposed below the table and operable to dispose the one member out of said printing engagement, oscillating means driven in relationship to the couple including a pivotally mounted feeler member, said feeler member dropping through an opening in said table when a sheet is absent to engage and actuate said latch means.

14. A two-cylinder lithographic printing press in which one cylinder is the transfer cylinder and the other is twice as large in diameter and bears a plate and platen separated by a gap, and having automatic throwout and return means for causing the cylinders to be separated when a sheet is skipped and returning them to the printing position, characterized by the timing of the throwout movement and subsequent return so that each occurs when the same gap is adjacent the transfer cylinder, whereby the inking of the transfer cylinder remains constant when a sheet is skipped.

15. In a printing press, a first cylinder having a plate and platen portions, a second cylinder having a transfer surface and rotatably mounted to coact first with the plate portion and then with the platen portion of the first cylinder, resilient means urging the cylinders toward one another, and means adjustably limiting their movement to adjustably determine the pressure of the second cylinder on one portion of the first cylinder, the other portion of the first cylinder being of such radius as to force the cylinders slightly apart against the resilient means whereby the pressure of the second cylinder on said other portion is determined by the resilient means, and means for adjusting the resilient means whereby the pressures of the two portions are independently adjustable.

16. A two-purpose printing press including only two cylinders, one of the cylinders being twice the diameter of the other and at times including a plate-carrying segment and a platen segment having an outer platen surface of proper radius for engaging the smaller cylinder for offset printing, and at times constructed and arranged for receiving raised-image printing means at the platen position within substantially the same radius for letterpress printing, dampening, inking, sheet-feeting, and sheet-ejecting means therefor, a cam associated with the platen segment during offset printing for preventing contact of the dampening and inking means with the platen surface while letting them contact the plate on the plate-carrying segment, and means effective

during letterpress printing for rendering the damping unit inoperative and for rendering the inking unit inoperative as to the plate-carrying segment; the sheet-feeding means feeding sheets to the platen position for either type of printing.

17. A two-purpose printing press including only two cylinders, one of the cylinders being twice the diameter of the other and at times including a plate-carrying segment and a platen segment having an outer platen surface of proper radius for engaging the smaller cylinder for offset printing, and at times constructed and arranged for receiving raised-image printing means at the platen position within substantially the same radius for letterpress printing, dampening, inking, sheet-feeding, and sheet-ejecting means therefor, means effective during offset printing for preventing contact of the dampening and inking means with the platen surface while letting them contact the plate on the plate-carrying segment, and means effective during letterpress printing for rendering the dampening unit inoperative and for rendering the inking unit inoperative as to the plate-carrying segment; the sheet-feeding means feeding sheets to the platen position for either type of printing.

18. A two-purpose printing press including only two cylinders, one of the cylinders being twice the diameter of the other and at times including a plate-carrying segment and a platen segment having an outer platen surface of proper radius for engaging the smaller cylinder for offset printing, and at times constructed and arranged for receiving raised-image printing means within substantially the same radius for letterpress printing, dampening, inking, sheet-feeding, and sheet-ejecting means therefor, means effective during offset printing for preventing contact of the dampening and inking means with the platen surface while letting them contact the plate on the plate-carrying segment, and means effective during letterpress printing for rendering the dampening unit inoperative and for rendering the inking unit operative as to the raised-image means only; the sheet-feeding means feeding sheets to the platen position for offset printing and to the raised-image means for letterpress printing.

19. A two-purpose printing press including a transfer member, a shaft geared to the transfer member, discs rigid on the shaft, and a pair of segments carried by the discs for cooperation with the transfer member, rigid enough to withstand printing pressures, and one of which is adapted to carry a lithographic plate and the other of which is provided with a platen surface, one of said rigid segments being readily removable and interchangeable with a segment adapted to carry a raised-image printing element.

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