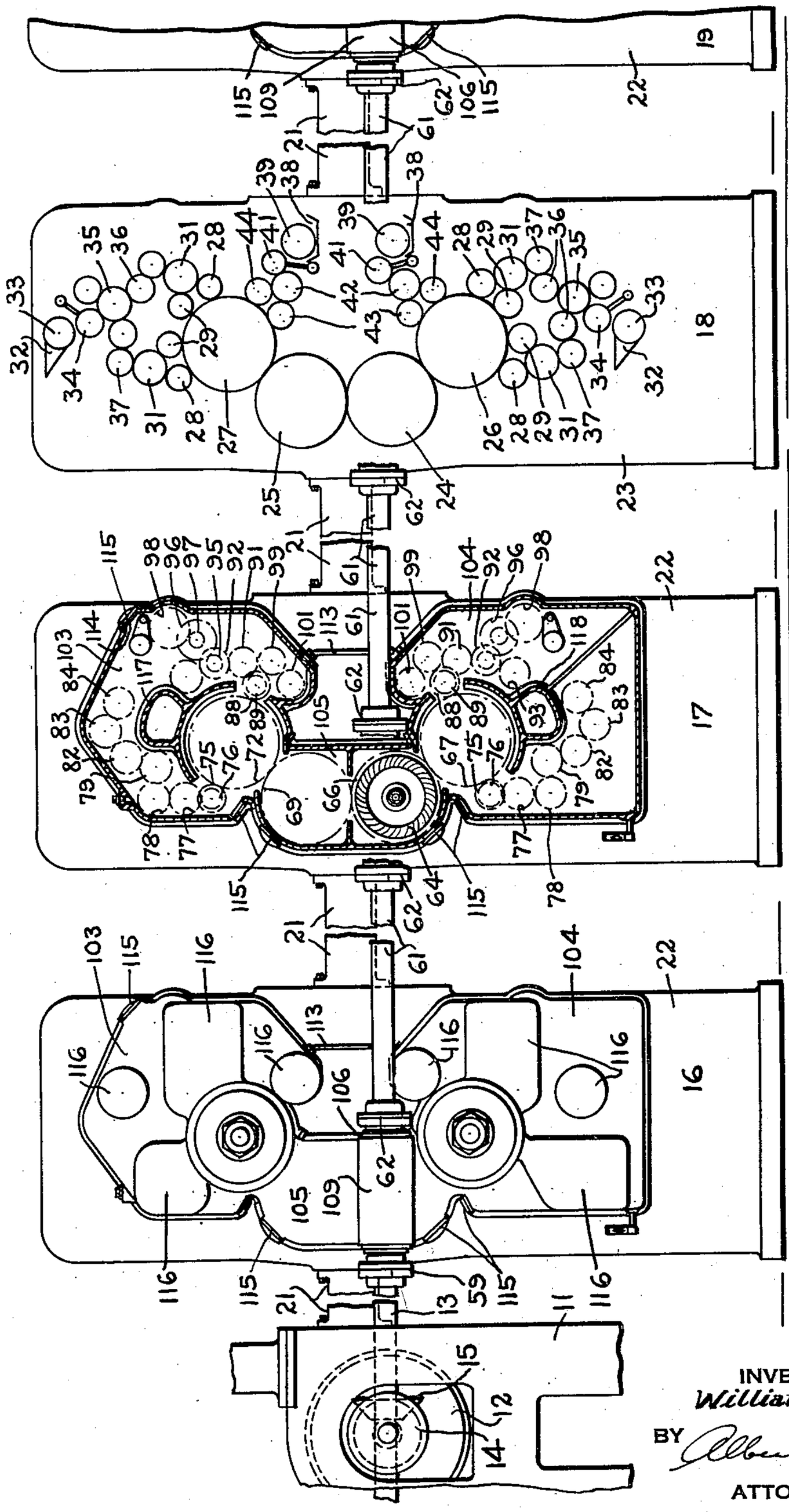
Dec. 23, 1941. W. F. HUCK 2,267,100

PRINTING MACHINE

Filed July 30, 1940 4 Sheets-Sheet 1

Fig. 1.



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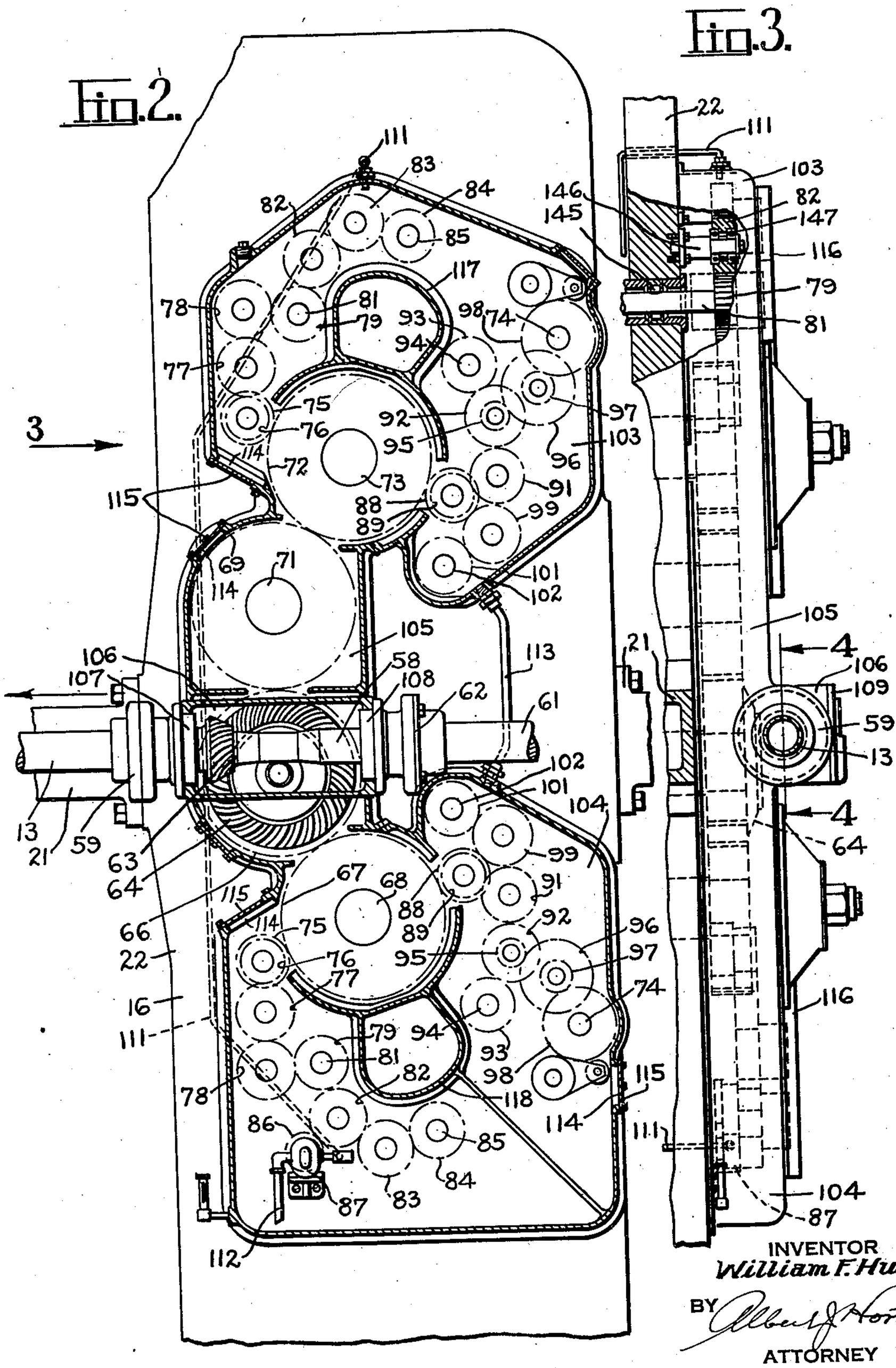
PRINTING MACHINE

Filed July 30, 1940 4 Sheets-Sheet 2

Fig. 3.

Fig. 2.



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PRINTING MACHINE

Filed July 30, 1940 4 Sheets-Sheet 3

Fig. 4.

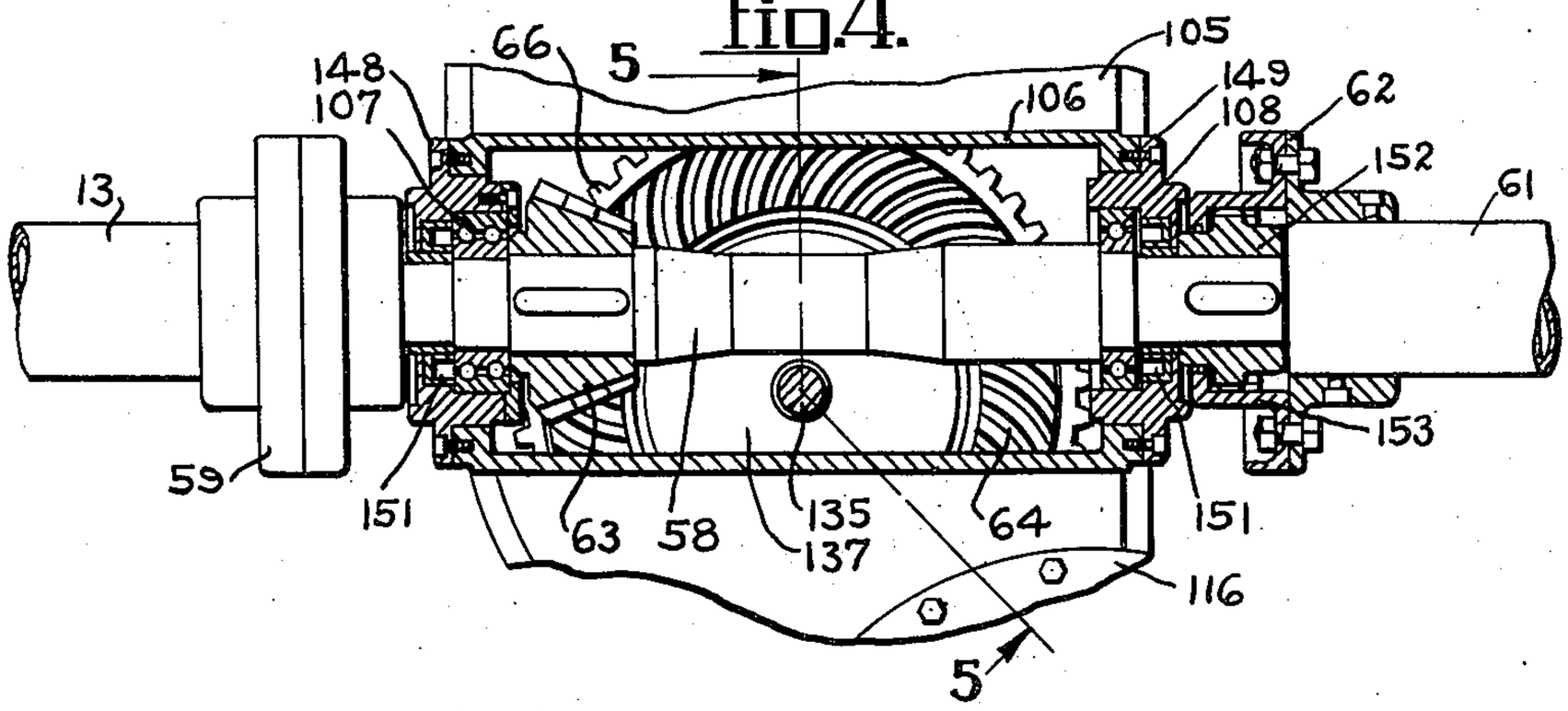


Fig. 5.

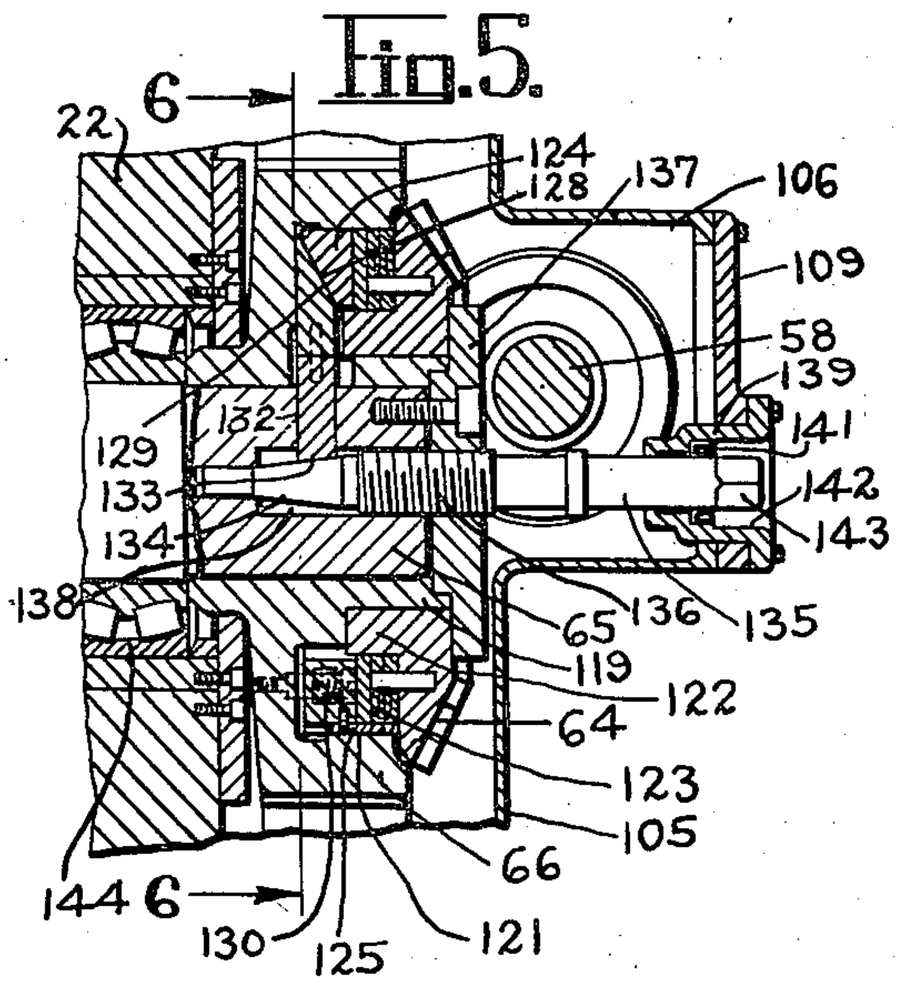
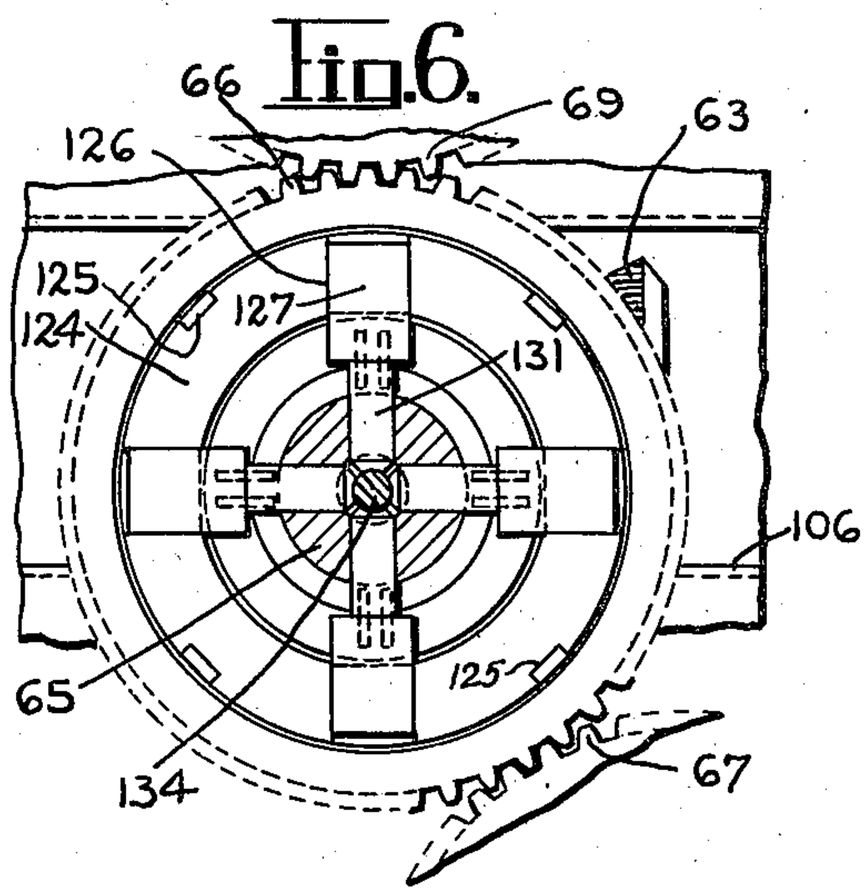


Fig. 6.



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PRINTING MACHINE

Filed July 30, 1940 4 Sheets-Sheet 4

Fig. 7.

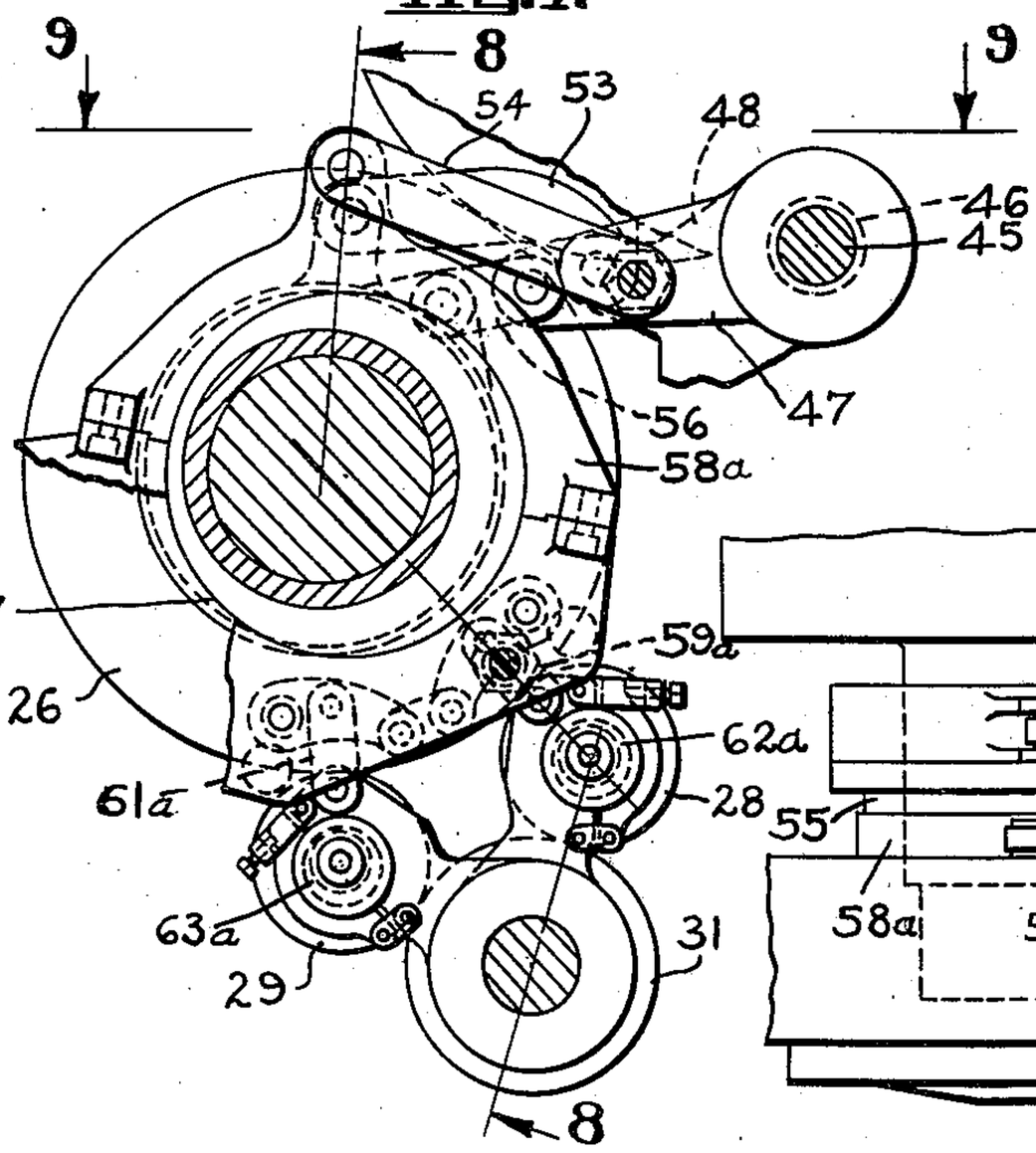


Fig. 9.

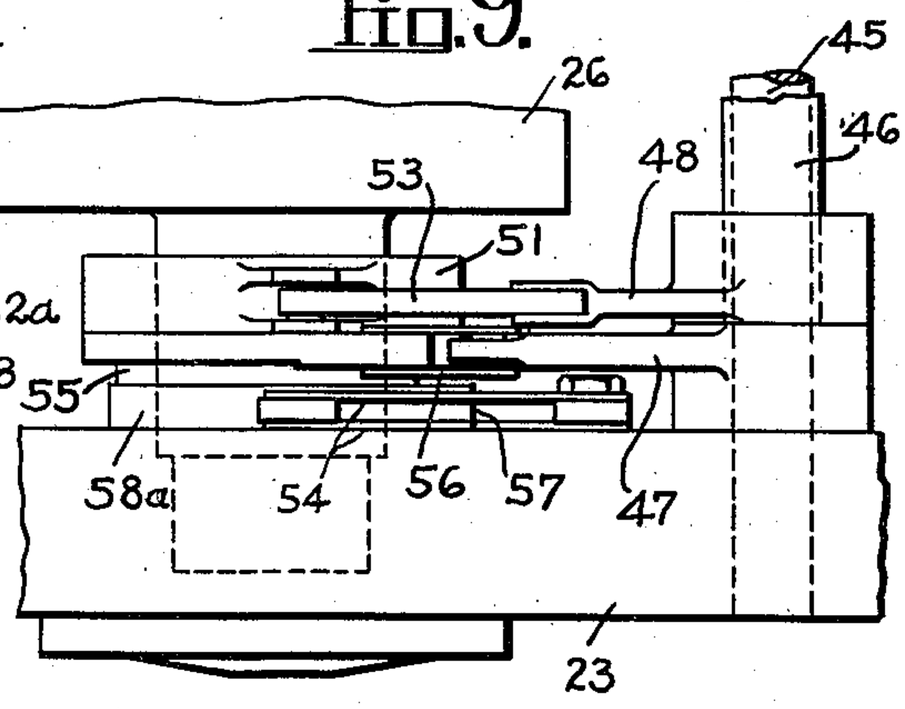
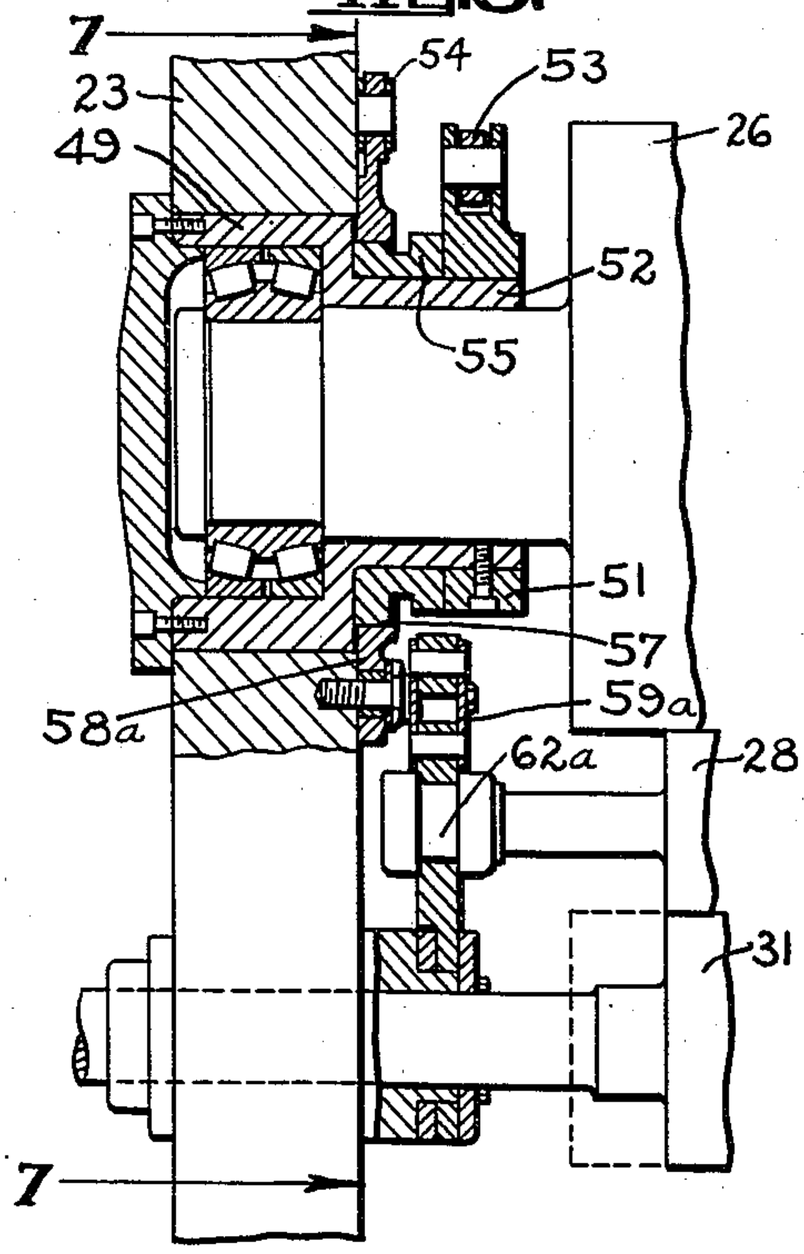


Fig. 8.



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Patented Dec. 23, 1941 2,267,100

UNITED STATES PATENT OFFICE

2,267,100

PRINTING MACHINE

William F. Huck, Richmond Hill, N. Y., assignor to R. Hoe & Co., Inc., New York, N. Y., a corporation of New York

Application July 30, 1940, Serial No. 348,356

19 Claims. (Cl. 101—1)

This invention relates to improvements in rotary printing machines and more particularly to a printing machine wherein one of the printing cylinders and certain of the ink cylinders are arranged to rotate on fixed axes while another printing cylinder and certain of the ink rollers are mounted in movable bearings so as to be readily tripped, or separated from coacting cylinders.

It has been found to be desirable in order to increase the efficiency of such printing machines and to reduce the attention required to operate them, to provide an oil-tight casing about the driving gears, which interconnect the various driven cylinders and rollers, which casing will also enclose the outer and open end of the bearings of such cylinders and rollers as well as other operative parts of the machine, such as actuating cams, cam rollers, and an oil pump for causing a circulation of oil through the casing.

In offset lithographic and other printing machines that are arranged to trip the printing cylinders and at times the inking mechanism, into and out of operating position, difficulty has been experienced in fully enclosing the gearing that drives the cylinders that are tripped. This difficulty is not so pronounced with respect to the main printing cylinders because such of these as are tripped, are usually supported by eccentric bearing bushings which are rotated to trip the cylinders. However, it has been found impractical to use such means for tripping the ink cylinders, of which there are generally several that must be moved simultaneously and in varying degree. In consequence, the ink cylinders have usually been carried in bearings, all of which are secured to a separate frame that is moved as necessary to trip the inking mechanism. Such an arrangement can not readily be provided with an oil tight enclosure because there would be many sliding joints through which the oil would leak. With the arrangement herein disclosed, the ink cylinders rotate on fixed axes and their bearings are mounted directly in the main frame of the machine. This arrangement in combination with other mechanism herein shown provides a printing machine in which all the gearing is fully enclosed in an oil tight casing and lubricated by a circulating oil system.

One object of this invention is to provide an improved form of printing machine having a novel combination of elements, including a printing cylinder rotatable in bearings that may be either fixed or movable, a reciprocable ink cylinder mounted to rotate on a fixed axis, ink rollers having movable bearings, whereby they may be tripped, interconnecting gears for driving the driven members, an oil-tight casing enclosing the gears, and means to circulate oil through the casing.

Another object is to provide in a printing machine of the above or analogous type, means to drive each of a plurality of printing units from a common source of power and to enclose this driving means in a housing, which is associated with the aforesaid gear casing as a part thereof.

Still another object is to provide improved clutch means to connect and disconnect any one of a plurality of units from the aforesaid common source of power, and which is operable from outside of the oil-tight gear casing and does not interfere with the actuation of the other units.

A further object is to provide in a printing machine of the above nature, a casing enclosing all of the gears and which rigidly supports a section of a main drive shaft adapted to be connected to those of adjacent units by universal couplings.

A still further object of this invention is to provide a rotary printing machine of generally improved construction, whereby the same will be relatively simple, durable and inexpensive in construction, as well as convenient, practical, serviceable, and efficient in use.

With the foregoing and other objects in view, which will appear as the description proceeds, the invention resides in the combination and arrangement of parts, and in the details of construction hereinafter described and claimed.

A preferred embodiment of the invention is illustrated in the accompanying drawings, reference being made to an application Serial No. 261,480, filed March 13, 1939, by the present applicant, for the disclosure of structure and details as hereinafter referred to.

In the drawings:

Figure 1 is a somewhat diagrammatical illustration showing portions of a multicolor lithographic web printing machine, having a plurality of printing units each embodying the features and principles of this invention;

Figure 2 is an enlarged side view of one of the printing units with the gear casing and the drive shaft housing sectioned and showing the positions of the interconnected driving gears, which are indicated by dot and dash pitch circles;

Figure 3 is a side view, partly in section, of the gear casing looking in the direction of arrow 3 in Figure 2;

Figure 4 is a sectional view through the drive

shaft housing and universal joints taken on the line 4—4 of Figure 3;

Figure 5 is a sectional view taken on the line 5—5 of Figure 4;

Figure 6 is a sectional view taken on the line 6—6 of Figure 5;

Figure 7 is a sectional view of part of a cylinder and ink roller tripping mechanism adapted for use in the printing machine and taken on the line 7—7 of Figure 8;

Figure 8 is a sectional view taken on the line 8—8 of Figure 7; and

Figure 9 is a top view of the mechanism shown in Figures 7 and 8 looking in the direction of the arrows 9—9 of Figure 7.

Referring now to the drawings wherein like reference numerals designate like parts throughout the several views, and more particularly to Figure 1, the reference numeral 11 denotes a frame which supports a motor 12 geared to a main drive shaft 13 by bevel gears 14 and 15. The main drive shaft 13 extends from the frame 11 to the first printing unit of a plurality of such units 16, 17, 18 and 19, spaced apart and connected together by space bars 21.

The printing units 16, 17, 18 and 19 are substantially identical in structure and include side frames 22 and 23, between which coacting printing cylinders in this instance known as blanket cylinders 24 and 25 extend, which respectively coact with plate or form cylinders 26 and 27. Coacting, and in contact with each of the form cylinders 26 and 27, are two pairs of ink rollers 28 and 29 which receive ink from axially reciprocable ink cylinders 31. In Figure 8, the extent of their axial movement is indicated by dotted lines. Each upper and each lower pair of ink cylinders 31 is supplied with ink from an ink fountain 32, through a fountain roller 33, a ductor roller 34, a reciprocable roller 35, and rollers 36 and 37. A moisture fountain 38 is provided for each form cylinder 26 and 27, from which moisture is supplied to the respective cylinder through a fountain roller 39, a ductor roller 41, a reciprocable moisture cylinder 42, and rollers 43 and 44.

Conditions occasionally arise requiring that the printing, or blanket, cylinder 25 be tripped, or separated from the coacting cylinder 24, that the form cylinders 26 and 27 be tripped, or separated from the respective coacting printing cylinders 24 and 25, and the ink rollers 28 and 29 be tripped, or separated from the form cylinder contacted thereby. A mechanism for so tripping the cylinders 25, 26 and 27 and the rollers 28 and 29 is fully shown and described as is also the means to reciprocate the ink and moisture cylinders 31, 35 and 42 in the application referred to above.

Figures 7, 8 and 9 disclose the above mentioned tripping mechanism and show the same as applied to the form cylinder 26, the ink rollers 28 and 29, and the ink cylinder 31. By reference to the above referred to application, it will be understood that the tripping actuation is accomplished by manipulation of tripping shafts 45 and 46, shaft 46 being tubular and surrounding the shaft 45. Lever arms 47 and 48 are secured to the shafts 45 and 46, respectively, and may be secured together by disconnecting means not herein shown, but fully disclosed in the application previously mentioned, whereby they may be caused to act in unison, or individually, as desired.

The cylinder 26 is journaled in eccentric bearing bushings 49, rotatably supported in the frames 22 and 23. Each of the bushings 49 has a ring 51 secured upon the end of its hub 52, which ring 51 is pivotally connected by a link 53 to the lever arm 48 in such a manner that when the shaft 46 is rocked, the bushings 49 will be rotated to separate the form cylinder from its coacting printing cylinder 24. Another ring 55 is rotatably mounted on the hub 52 and is pivotally connected by links 56 to the lever arm 47, whereby it will be rotated when the shaft 45 is rocked. Rotation of the ring 55 through an eccentric surface 57 formed thereon, will cause a plate 58*a*, which rides on the surface 57 to be moved transversely to its axis, and through links 59*a* and 61*a*, to rotate bearings 62*a* and 63*a* for the ink rollers 28 and 29, about the axis of the ink cylinder 31. Rotation of the plate 52*a* about the ring 55 is prevented by links 54 pivotally connected to the plate and to the frame of the machine. When the lever arms 47 and 48 act simultaneously due to being joined, the cylinder 26 is tripped, and the ink rollers 28 and 29 are moved about the axes of the ink cylinders 31 and out of contact with the plate cylinder 26.

Each printing unit 16, 17, 18 and 19 is provided with a main drive shaft section 58 (see Figures 2, 4 and 5), the section 58 of the unit 16 being connected to the main drive shaft portion 13 from the motor 12 by a universal joint 59, and to a main drive shaft portion 61 extending between the units 16 and 17 by a universal joint 62. Similar drive connecting means is provided for the main drive shaft sections of the units 17, 18 and 19, whereby a common drive is provided for all of them. At each unit, a bevel pinion 63 is keyed to the shaft section 58 and preferably has the well known "Hypoid" form of spiral teeth, which mesh with similarly formed teeth on a bevel gear 64, adapted to be drivingly connected to a shaft end 65 of the lower printing cylinder 24 by an improved form of clutch mechanism to be hereinafter described.

A gear 66 (see Figures 2 and 5), adapted to be connected to the bevel gear 64 by the above mentioned clutch mechanism, rotates with the cylinder shaft end 65 and meshes with a gear 67, secured on a shaft end 68 of the form cylinder 26, and with a gear 69 on a shaft end 71 of the other printing cylinder 25. The gear 69 is in mesh with a gear 72 on a shaft end 73 of the form cylinder 27. The reciprocating ink and moisture cylinders 31, 35 and 42 respectively, for each form cylinder 26 and 27, are driven from the gears 67 and 72 respectively, through two series of gearing, one gear series being disposed on each side of each of the gears 67 and 72. In addition to driving the reciprocating cylinders, one of each gear series, associated with gears 67 and 72, also drives a cam shaft 74, whereby the ink ductor roller 34 is oscillated.

The gear series at one side of each of the gears 67 and 72 includes a gear 75 in mesh with the gear 67 or 72, and having a gear 76 rotatable therewith, the latter gear 76 being in mesh with a gear 77, which in turn is in mesh with a gear 78. The gear 78 is in mesh with a gear 79 on the shaft 81 of one of the ink cylinders 31. The gear 79 is in mesh with a gear 82 which is in mesh with a gear 83. The gear 83 is in mesh with a gear 84 on the shaft 85 of the ink cylinder 35. In the series of gears associated with the gear 67, the gear 82 also meshes with a gear 86 on the drive shaft of an oil pump 87.

The other gear series associated with each of

the gears 67 and 72 includes, a gear 88 in mesh with the gear 67 or 72, and having a gear 89 rotatable therewith, the latter gear 89 being in mesh with a gear 91. The gear 91 is in mesh with a gear 92, which is in mesh with a gear 93 on the shaft 94 of the other ink cylinder 31. A pinion 95 rotatable with the gear 92 is in mesh with a gear 96 having a pinion 97 rotatable therewith, which is in mesh with a gear 98 on the cam shaft 74. The gear 91 also meshes with a gear 99, which is in mesh with a gear 101 secured on the shaft 102 of the reciprocating moisture cylinder 42.

An oil-tight casing for convenience in manufacture made up of an upper section 103, a lower section 104, and an intermediate section 105, the sections being sealed and bolted together, is provided to enclose all of the above mentioned gears and pinions. A housing 106 extends axially over and about the main drive shaft section 58 at each unit. The housing 106 has end bearings 107 and 108 in which the shaft section 58 is rigidly journaled, and is in this instance, made integral with the intermediate section 105 of the gear enclosing casing. The housing 106 is provided with a cover 109. The casing sections 103, 104 and 105 are arranged to be securely sealed and bolted to the side frame 22 of the printing machine under consideration, and an outlet pipe 111 leads from the oil pulp 87, through the frame 22, and then upwardly, passing through the frame 22 above the gear casing section 103, and into the same to discharge oil into the casing upon the gears and pinions therein. An inlet pipe 112 is also provided, by which the oil pump 87 receives oil from the bottom of the lower casing section 104.

The upper casing section 103 flares outwardly to embrace the various pinions and the cam gear 98, and extends downwardly to cover the lower gear 101 of the series of gears associated with the gear 72. A drain pipe 113 leads from the lower portion of the upper casing section 103, surrounding the aforesaid gear 101 to the upper portion of the lower casing section 104, surrounding the corresponding gear 101. The pipe 113 could be omitted by slightly changing the form of the upper casing section 103 to avoid the pocket formed about the aforesaid gear 101 of the gear series associated with the gear 72. The intermediate casing section 105 is relatively narrow, and extends between the upper and lower sections 103 and 104 respectively, to embrace the gears 66 and 69. Suitable openings 114 are located about the casing sections in their sides to permit access. The openings 114 are provided with sealed covers 115. Suitable access openings are also provided in the face of the casing sections and these as shown in Figures 1 and 3, are provided with covers 116. A wall 117 is arranged in the upper casing section 103, whereby the oil is deflected toward each of the gear series therein, and a like wall 118 is arranged in the lower casing section 104 for a similar purpose.

The clutch mechanism for connecting the "Hypoid" gear 64 with the shaft end 65 of the printing cylinder 24, and to the gear 66 (see Figures 4, 5 and 6), includes a hub portion 119 formed in the gear 66 by counterboring the same, as at 121, and upon which the bevel gear 64 is adapted to freely rotate. The bevel gear 64 has a hub portion 122, upon which is mounted a plurality of friction clutch discs 123. A ring 124 is secured to the gear 66 by keys 125, and is seated in the counterbore 121 to abut the discs 123. The ring 124 is provided with radial cut-outs 126, in which bars 127 are adapted to slide. Where the bars 127 pass through the cut-outs 126 in the ring 124, they are inclined, as at 128, to correspond with inclined surfaces 129, formed on the ring 124 in the cut-outs 126. The corresponding inclined surfaces 128 and 129 are so arranged that a radially outward movement of the bars 127 will force the ring 124 against the discs 123 to bind them together and against the bevel gear 64. Suitable springs 130 acting on the ring 124 tend to maintain it in disc releasing position.

An extension 131 is provided for, and is secured to, each of the bars 127, and these extensions pass through radial openings 132 provided in the shaft end 65. The inner ends of the bar extensions 131 are inclined, as at 133, to correspond with a taper 134 formed adjacent the inner end of a spindle 135, the inner end of which is journaled in the shaft end 65. The inclined surface 133 and the taper 134 are so arranged that movement of the spindle inwardly and axially of the shaft end 65 will force the bar extensions 131 and thus the bars 127 radially outward. The spindle 135 is provided with a screw threaded portion 136, which is screw threaded through a plate 137 secured to the end of the shaft end 65, and which overlies the bevel gear 64 to hold it axially in place on the hub portion 119 of the gear 66. The spindle 135 is free to rotate in an axially disposed bore 138 provided in the shaft end 65 for this purpose. The spindle 135 extends outwardly through the housing 106, and is journaled in a bushing 139, provided with a stuffing box 141, mounted and secured in the housing cover 109. The bushing 139 is preferably counterbored, as at 142, to permit access of a wrench to the squared outer end 143 of the spindle 135, whereby it may be rotated from outside of the casing to actuate the bars 127 to connect the bevel gear 64 to the shaft end 65 and to the gear 66.

The use of "Hypoid"-shaped gear teeth on the bevel gears 63 and 64, permits the centers of the shafts 58 and 65 to be offset in respect to each other, whereby the spindle 135 may be disposed in axial alignment with the shaft 65 and the driven gear 64. In the improved form of clutch disclosed, the pitch lines of the bevel gears 63 and 64 mesh when the clutch discs 123 are tight together, and they separate slightly when the clutch is loosened, whereby the bevel gear 64 will rotate more freely when the unit is silenced.

The provision in a rotary printing machine having driven coacting printing cylinders and driven reciprocating ink cylinders on fixed axes, of driving means such as the interconnecting gears and pinions above described, enclosed in an oil-tight casing, insures constant and sufficient lubrication of these gears and pinions without requiring the time consuming attention of a machine operator. To further insure efficient lubrication of rotating machine parts, the printing cylinder bearings 144 mounted in the machine frame 22 (see Figure 5 as an example), open into the oil casing, whereby they are constantly and sufficiently lubricated, also without any attention of the machine operator. Likewise, the bearings 145 (see Figure 3) for the reciprocating ink cylinders 31, mounted in the machine frame 22, also open into the oil-tight casing, and thus are automatically lubricated. The intermediate gears, such as 77, 78, and 82, 83 are rotatably mounted on studs 146, secured to the machine frame 22 (see Figure 3), and by the use of ball, or like bearings 147, which are open for

the reception of the lubricant in the oil casing, are also automatically lubricated.

The bearings 107 and 108 (see Figure 4) for the shaft section 58 also open into the housing 106 to be automatically lubricated. These bearings 107 and 108 are mounted in end plates 148 and 149 respectively, which are sealed and secured to the ends of the housing 106, and are provided with stuffing boxes 151. The arrangement is such that the shaft section 58 with the bevel pinion 63 may be disconnected from the universal joint 62 and drawn through and out of the housing 106, for instance to the left in Figure 4. The universal joints 59 and 62 as shown, are preferably of the well known gear type couplings having a member 152 with external teeth meshing with the internal teeth of a part 153.

It will be understood that the invention herein disclosed may be embodied in other specific forms without departing from the spirit or essential attributes thereof, and it is therefore desired that the present embodiments be considered in all respects as illustrative and not restrictive, and it will be further understood that each and every novel feature and combination present in or possessed by the mechanism, herein shown and described, forms a part of the invention included in this specification.

What I claim is:

1. In a printing machine having a form cylinder and a coacting printing cylinder, an ink cylinder, and an ink roller arranged to transfer ink from the ink cylinder to a form on the form cylinder, bearings for the said ink cylinder supporting it to rotate on a fixed axis in the machine frame, intermeshing gears on one side of the machine for driving the said form, printing and ink cylinders in timed relation, an oil-tight casing enclosing the gears, and an oil circulating system having an outlet arranged to feed oil to the upper portion of the casing for lubricating the gears as oil flows downwardly through the casing by gravity, movable bearings for the form cylinder whereby it may be moved away from the printing cylinder, and bearings for the ink roller associated with movable supports, whereby the ink roller is maintained in contact with the ink cylinder and the form while permitting movement of the form cylinder.

2. In a printing machine, a printing unit having a form cylinder and a coacting printing cylinder, a bearing for rotatably supporting the printing cylinder, a movable bearing for the form cylinder, whereby it may be moved away from the printing cylinder, an ink cylinder, bearings for the ink cylinder arranged to support the cylinder to rotate on a fixed axis and to reciprocate axially, an ink roller to transfer ink from the ink cylinder to a form on the form cylinder, movable bearings for the ink roller, intermeshing gears on one side of the machine for driving the cylinders in timed relation, and an oil-tight casing enclosing the gears, and an oil circulating system having an outlet arranged to feed oil to the upper portion of the casing associated therewith, the bearings for the form, printing and ink cylinders being open into the casing to be lubricated by the oil as it flows downwardly due to gravity through the casing over the gears.

3. In a printing machine having a form cylinder and a coacting printing cylinder, an ink cylinder, bearings for the coacting printing cylinder, an ink roller arranged to transfer ink from the ink cylinder to a form on the form cylinder, bearings for the said ink cylinder supporting it to rotate on a fixed axis in the machine frame, intermeshing gears on one side of the machine for driving the said form, printing and ink cylinders in timed relation, an oil-tight casing enclosing the gears, and an oil circulating system having an outlet arranged to feed oil to the upper portion of the casing for lubricating the gears as oil flows downwardly through the casing by gravity, movable bearings for the form cylinder whereby it may be moved away from the printing cylinder, and bearings for the ink roller associated with movable supports, whereby the ink roller is maintained in contact with the ink cylinder and the form while permitting movement of the form cylinder, all of said form, printing and ink cylinder bearings being open to the said casing to be automatically lubricated by the oil circulating downwardly through the housing.

4. In a printing machine, a printing unit having a form cylinder and a coacting printing cylinder, a bearing for the printing cylinder, a movable bearing for the form cylinder, whereby it may be moved away from the printing cylinder, an ink cylinder, bearings for the ink cylinder arranged to support the cylinder to rotate on a fixed axis and to axially reciprocate, an ink roller to transfer ink from the ink cylinder to a form on the form cylinder, movable bearings for the ink roller whereby it may move with and away from the form cylinder, intermeshing gears on one side of the machine for driving the said form, printing and ink cylinders in timed relation, an oil-tight casing enclosing the gears, and an oil circulating system having an outlet arranged to feed oil to the upper portion of the casing associated therewith, a main drive shaft section extending through the casing, and bearings for the main drive shaft rigidly supported by the casing to support the said drive shaft section for rotation on a fixed axis, the casing being open its entire length from its upper portion to below the bearings for the main drive shaft section whereby oil flowing downwardly due to gravity through the casing will lubricate the gears and the bearings for the form, printing and ink cylinders and the main drive shaft section.

5. In a printing machine, a printing unit having a form cylinder and a coacting printing cylinder, a bearing for the printing cylinder, a movable bearing for the form cylinder, whereby it may be moved away from the printing cylinder, an ink cylinder, bearings for the ink cylinder arranged to support the cylinder to rotate on a fixed axis and to reciprocate axially, an ink roller to transfer ink from the ink cylinder to a form on the form cylinder, movable bearings for the ink roller whereby it may move with and away from the form cylinder, intermeshing gears on one side of the machine for driving the said form, printing and ink cylinders in timed relation, an oil-tight casing enclosing the gears, and an oil circulating system having an outlet arranged to feed oil to the upper portion of the casing associated therewith, a main drive shaft section extending through the casing, and bearings for the main drive shaft rigidly supported by the casing to support said shaft section for rotation on a fixed axis, all of said bearings for the form, printing and ink cylinders and for the shaft section being open into said casing to be lubricated by the oil as it flows downwardly due to gravity through the casing over the gears.

6. In a printing machine, a printing unit hav-

ing a form cylinder and a coacting printing cylinder, a bearing for the printing cylinder whereby it will rotate on a fixed axis, a movable bearing for the form cylinder, whereby it may be moved away from the printing cylinder, an ink cylinder, bearings for the ink cylinder arranged to support the cylinder to rotate on a fixed axis and to reciprocate axially, an ink roller to transfer ink from the ink cylinder to a form on the form cylinder, movable bearings for the ink roller whereby it may move with and away from the form cylinder, intermeshing gears on one side of the machine for driving the said form, printing and ink cylinders in timed relation, an oil-tight casing enclosing the gears, and an oil circulating system having an outlet arranged to feed oil to the upper portion of the casing associated therewith, a main drive shaft section extending through the casing, bearings for the main drive shaft rigidly supported by the casing to support the shaft section for rotation on a fixed axis, a bevel pinion within the casing and secured on the said shaft section, a bevel gear within the casing and mounted for free rotation about the axis of the printing cylinder and in mesh with said bevel pinion, and means within the casing to drivingly connect and disconnect the bevel gear with the printing cylinder and the intermeshing gears in the casing, the said means being operable from the outside of the casing.

7. In a printing machine, a printing unit having a form cylinder and a coacting printing cylinder, a bearing for the printing cylinder whereby it will rotate on a fixed axis, a movable bearing for the form cylinder, whereby it may be moved away from the printing cylinder, an ink cylinder, bearings for the ink cylinder arranged to support the cylinder to rotate on a fixed axis and to axially reciprocate, an ink roller to transfer ink from the ink cylinder to a form on the form cylinder, movable bearings for the ink roller whereby it may move with and away from the form cylinder, intermeshing gears on one side of the machine for driving the form, printing and ink cylinders in timed relation, an oil-tight casing enclosing the gears, and an oil circulating system having an outlet arranged to feed oil to the upper portion of the casing associated therewith, a main drive shaft section extending through the casing, bearings for the main drive shaft rigidly supported by the casing to support the shaft section for rotation on a fixed axis, a bevel pinion in the casing secured on the shaft section, a bevel gear in the casing and mounted for free rotation about the axis of the printing cylinder and in mesh with the bevel pinion, and means operable from outside the casing to drivingly connect and disconnect the bevel gear with the printing cylinder and the intermeshing gears in the casing, all of the said bearings for the form, printing and ink cylinders, and the bevel gear and cylinder connecting means being open into the casing to be lubricated by the oil as it flows downwardly due to gravity through the casing over the intermeshing gears, the bevel pinion and the bevel gear.

8. In a printing machine, a printing unit having a form cylinder and a coacting printing cylinder, a bearing for the printing cylinder whereby it will rotate on a fixed axis, a movable bearing for the form cylinder, whereby it may be moved away from the printing cylinder, an ink cylinder, bearings for the ink cylinder arranged to support the cylinder to rotate on a fixed axis and to reciprocate axially, an ink roller to transfer ink from the ink cylinder to a form on the form cylinder, movable bearings for the ink roller whereby it may move with and away from the form cylinder, means to move the movable bearings for the form cylinder and for the ink roller both simultaneously and separately, intermeshing gears on one side of the machine for driving all the said form, printing and ink cylinders in timed relation, an oil-tight casing enclosing the gears, and an oil circulating system having an outlet arranged to feed oil to the upper portion of the casing associated therewith, a main drive shaft section extending through the casing, bearings for the main drive shaft rigidly supported by the casing to support the shaft section for rotation on a fixed axis, the casing being interiorly formed to provide a path for and to guide oil entering at the upper portion thereof over the gears and to below the bearings of the drive shaft section.

9. In a printing machine, a printing unit having a form cylinder and a coacting printing cylinder, a bearing for the printing cylinder whereby it will rotate on a fixed axis, a movable bearing for the form cylinder, whereby it may be moved away from the printing cylinder, an ink cylinder, bearings for the ink cylinder arranged to support the cylinder to rotate on a fixed axis and to axially reciprocate, an ink roller to transfer ink from the ink cylinder to a form on the form cylinder, movable bearings for the ink roller whereby it may move with and away from the form cylinder, means to move the movable bearings for the form cylinder and for the ink roller both simultaneously and separately, intermeshing gears on one side of the machine for driving the several cylinders in timed relation, an oil-tight casing enclosing the gears, and an oil circulating system having an outlet arranged to feed oil to the upper portion of the casing associated therewith, a main drive shaft section extending transversely through the casing, and bearings for the main drive shaft rigidly supported by the casing to support the shaft section for rotation on a fixed axis, the casing being interiorly formed to provide a path for and to guide oil entering at the upper portion thereof over the gears and to below the bearings of the drive shaft section, all of the form, printing and ink cylinders and shaft bearings being open into the casing to be lubricated by the oil as it flows downwardly due to gravity through the casing over the gears therein.

10. In a printing machine, a printing unit having a form cylinder and a coacting printing cylinder, a bearing for the printing cylinder whereby it will rotate on a fixed axis, a movable bearing for the form cylinder, whereby it may be moved away from the printing cylinder, an ink cylinder, bearings for the ink cylinder arranged to support the cylinder to rotate on a fixed axis and to reciprocate axially, an ink roller to transfer ink from the ink cylinder to a form on the form cylinder, movable bearings for the ink roller whereby it may move with and away from the form cylinder, means to move the movable bearings for the form cylinder and for the ink roller both simultaneously and separately, intermeshing gears for driving the form, printing and ink cylinders in timed relation, an oil-tight casing enclosing the gears, and an oil circulating system having an outlet arranged to feed oil to the upper portion of the casing and an inlet in communication with the bottom of the casing associated therewith, a main drive shaft section

extending transversely through the casing, bearings for the main drive shaft rigidly supported by the casing to support the shaft section for rotation on a fixed axis, a bevel gear in the casing secured on the shaft section, a bevel gear in the casing and mounted for free rotation about the axis of the printing cylinder and in mesh with the bevel pinion on the shaft section, the casing being interiorly formed to provide a path for and to guide oil entering the upper portion thereof over the intermeshing and bevel gears and to below the bearings of the drive shaft section, and means operable from the outside of the casing, to drivingly connect and disconnect the bevel gear with the cylinder and the intermeshing gears in the casing.

11. In a printing machine, a printing unit having a form cylinder and a coacting printing cylinder, a bearing for the printing cylinder whereby it will rotate on a fixed axis, a movable bearing for the form cylinder, whereby it may be moved away from the printing cylinder, an ink cylinder, bearings for the ink cylinder arranged to support the cylinder to rotate on a fixed axis and to reciprocate axially, an ink roller to transfer ink from the ink cylinder to a form on a form cylinder, movable bearings for the ink roller whereby it may move with, and away from the form cylinder, means to move the movable bearings for the form cylinder and for the ink roller both simultaneously and separately, intermeshing gears for driving the cylinders in timed relation, and an oil-tight casing enclosing the gears, and an oil circulating system having an outlet arranged to feed oil to the upper portion of the casing and an inlet in communication with the bottom of the casing associated therewith, a main drive shaft section extending transversely through the casing, bearings for the main drive shaft rigidly supported by the casing to support the shaft section for rotation on a fixed axis, a bevel pinion in the casing secured on the shaft section, a bevel gear in the casing and mounted for free rotation about the axis of the printing cylinder and in mesh with the bevel pinion on the shaft section, and means to drivingly connect and disconnect the bevel gear with the cylinder and the intermeshing gears in the casing, the means being operable from the outside of the casing, the casing being interiorly formed to provide a path for and to guide oil entering the upper portion thereof over the intermeshing gears, the pinion and the gear, all of the form, printing and ink cylinders and shaft bearings and the bevel gear and cylinder connecting means being open into the casing to be lubricated by the oil guided downwardly by the casing over the gears therein.

12. In a printing machine, a printing unit having a form cylinder and a coacting printing cylinder, a bearing for the printing cylinder whereby it will rotate on a fixed axis, a movable bearing for the form cylinder, whereby it may be moved away from the printing cylinder, an ink cylinder, bearings for the ink cylinder arranged to support the cylinder to rotate on a fixed axis and to reciprocate axially, an ink roller to transfer ink from the ink cylinder to a form on the form cylinder, movable bearings for the ink roller whereby it may move with and away from the form cylinder, intermeshing gears for driving the several cylinders in timed relation, an oil-tight casing enclosing the gears, and an oil circulating system having an outlet arranged to feed oil to the upper portion of the casing and an inlet in communication with the bottom of the casing associated therewith, a main drive shaft section extending through the casing, bearings for the main drive shaft rigidly supported by the casing to support the shaft section for rotation on a fixed axis, a bevel pinion in the casing secured on the shaft section, a bevel gear in the casing and mounted for free rotation about the axis of the printing cylinder and in mesh with the bevel pinion on the shaft section, the casing being interiorly formed to provide a path for and to guide oil entering the upper portion thereof over the intermeshing gears, the pinion and the gear, and means to drivingly connect and disconnect the bevel gear with the cylinder and the intermeshing gears in the casing, the said means including a means operating spindle in axial alignment with the printing cylinder and extending outwardly through the casing to be actuated from outside thereof.

13. In a printing machine, a plurality of coacting printing cylinders, intermeshing gears for driving the cylinders and secured thereto, an oil-tight casing enclosing the gears, a drive shaft section extending through and being rotatably supported by the casing, to rotate on a fixed axis, a first bevel gear in the casing and secured on the shaft section, a second bevel gear in the casing and mounted to freely rotate about the axis of the said one of the cylinders and being in mesh with the first bevel gear, and means to clutch the second bevel gear to a gear secured to one of the cylinders, the said means having an operating part extending outwardly through the casing.

14. In a printing machine, a plurality of coacting printing cylinders, intermeshing gears for driving the cylinders and secured thereto, an oil-tight casing enclosing the gears, a drive shaft section extending through and being rotatably supported by the casing, to rotate on a fixed axis, a first bevel gear in the casing and secured on the shaft section, a second bevel gear in the casing and mounted to freely rotate about the axis of the said one of the cylinders and being in mesh with the first bevel gear, and means to clutch the second bevel gear to a gear secured to one of the cylinders, the said means having an operating part extending outwardly through the casing, and the said shaft section with the first bevel gear thereon being removable axially from the casing.

15. In a printing machine, a plurality of coacting printing cylinders, intermeshing gears for driving the cylinders and secured thereto, an oil-tight casing enclosing the gears, a drive shaft section extending through and being rotatably supported by the said casing, to rotate on a fixed axis, a first bevel gear in the casing and secured on the shaft section, a second bevel gear in the casing and mounted to freely rotate about the axis of one of the cylinders and being in mesh with the first bevel gear, and means to clutch the second bevel gear to a spur gear secured to one of the cylinders, the said means including clutch surfaces between the second bevel gear and the spur gear, a clutch operating ring in the spur gear and having an inclined surface, a radially movable bar having an inclined surface corresponding to that on the ring and positioned radially to the axis of the spur gear, and an operating spindle extending axially of the ring and adapted to move the bar radially, to engage the clutch and connect the second bevel gear with the spur gear, the said spindle extending through the casing for manipulation from the outside thereof.

16. In a multi-unit printing machine, a plurality of printing units, a main drive shaft adapted to drive all of the units, a plurality of main bevel gears on the main drive shaft, each of said printing units having a unit shaft rotatable to drive it and a unit bevel gear on said unit shaft and being in mesh with a main bevel gear, and a clutch member arranged to couple one of the gears to its shaft, and to simultaneously press a unit gear and a main gear into pitch line engagement.

17. In a multi-unit printing machine, a plurality of units each having a unit shaft rotatable to drive it, a main shaft adapted to drive all of the units, a plurality of main bevel gears secured to the main shaft, a unit bevel gear rotatable on each unit shaft and being in mesh with a main bevel gear, and a clutch member movable axially of each unit shaft to couple its unit gear to its unit shaft; each of the said clutch members being arranged to press its unit gear into pitch line engagement with its main bevel gear when the clutch is engaged, and to relieve the pressure between the gears when it is disengaged.

18. In a printing machine having a form cylinder and a coacting printing cylinder, ink cylinders beside the form cylinder, an inking roller to transfer ink from each ink cylinder to the form cylinder, a gear connected to the form cylinder in mesh with a gear connected to the printing cylinder, a series of intermeshing gears drivingly connected to the form cylinder gear for driving each of the ink cylinders, an oil-tight casing enclosing all of the gears, an oil circulating system arranged to carry oil to the upper portion of the casing whereby gravity will cause the oil to flow downwardly through the casing, the casing being interiorly formed to provide a path for the oil entering its upper portion to direct the oil toward and onto the gears of each series and to the form cylinder gear.

19. In a printing machine having a form cylinder and a coacting printing cylinder, ink cylinders beside the form cylinder, an inking roller to transfer ink from each ink cylinder to the form cylinder, a gear connected to the form cylinder in mesh with a gear connected to the printing cylinder, a series of intermeshing gears drivingly connected to the form cylinder gear for driving each of the ink cylinders, a main drive shaft section, a bevel pinion on the shaft section, a bevel gear in mesh with the pinion and adapted to be drivingly connected to the printing cylinder gear, an oil-tight casing enclosing all of the gears, including the bevel pinion, and through which the shaft section extends and in which it is journaled, an oil circulating system adapted to feed oil into the casing at its upper portion whereby gravity will cause the oil to flow downwardly through the casing, the casing being interiorly formed to provide a path for the oil entering at its top to direct it toward and onto the gears of each series, including the form cylinder gear and the bevel pinion and gear.

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