Aug. 24, 1948. J. A. RIGGS ET AL 2,447,872

PRINTING UNIT AND DRIVE MECHANISM THEREFOR

Filed Jan. 12, 1945 5 Sheets-Sheet 1

Fig. 1

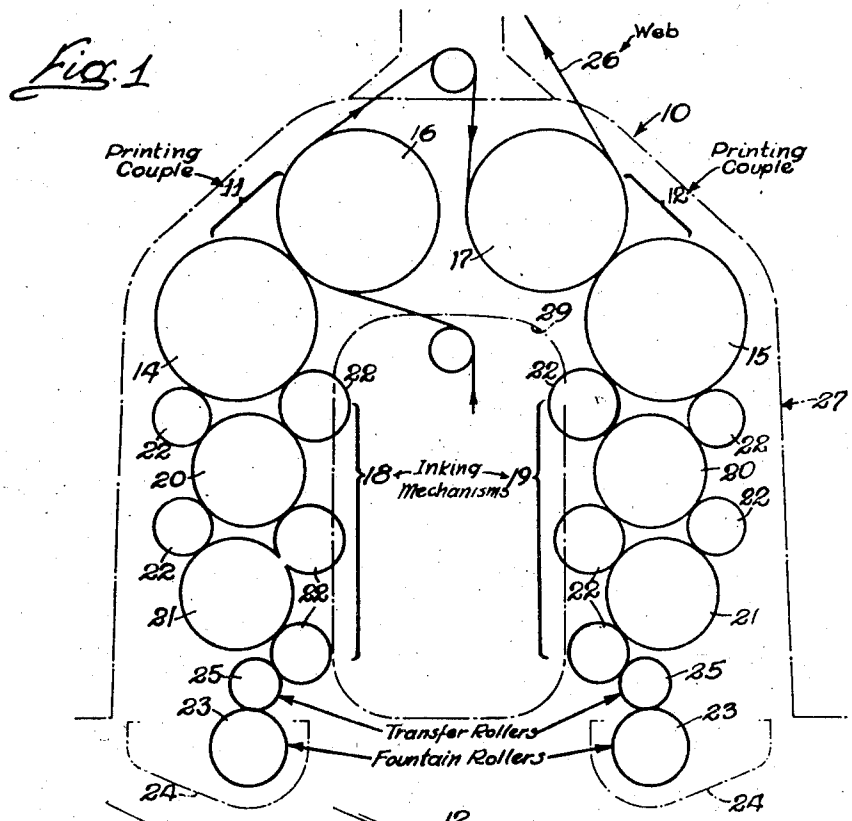
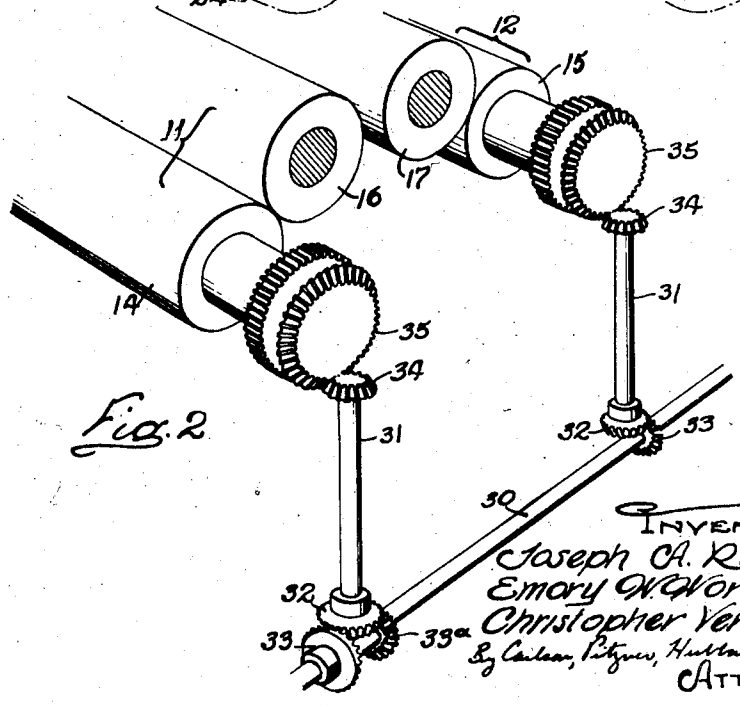


Fig. 2



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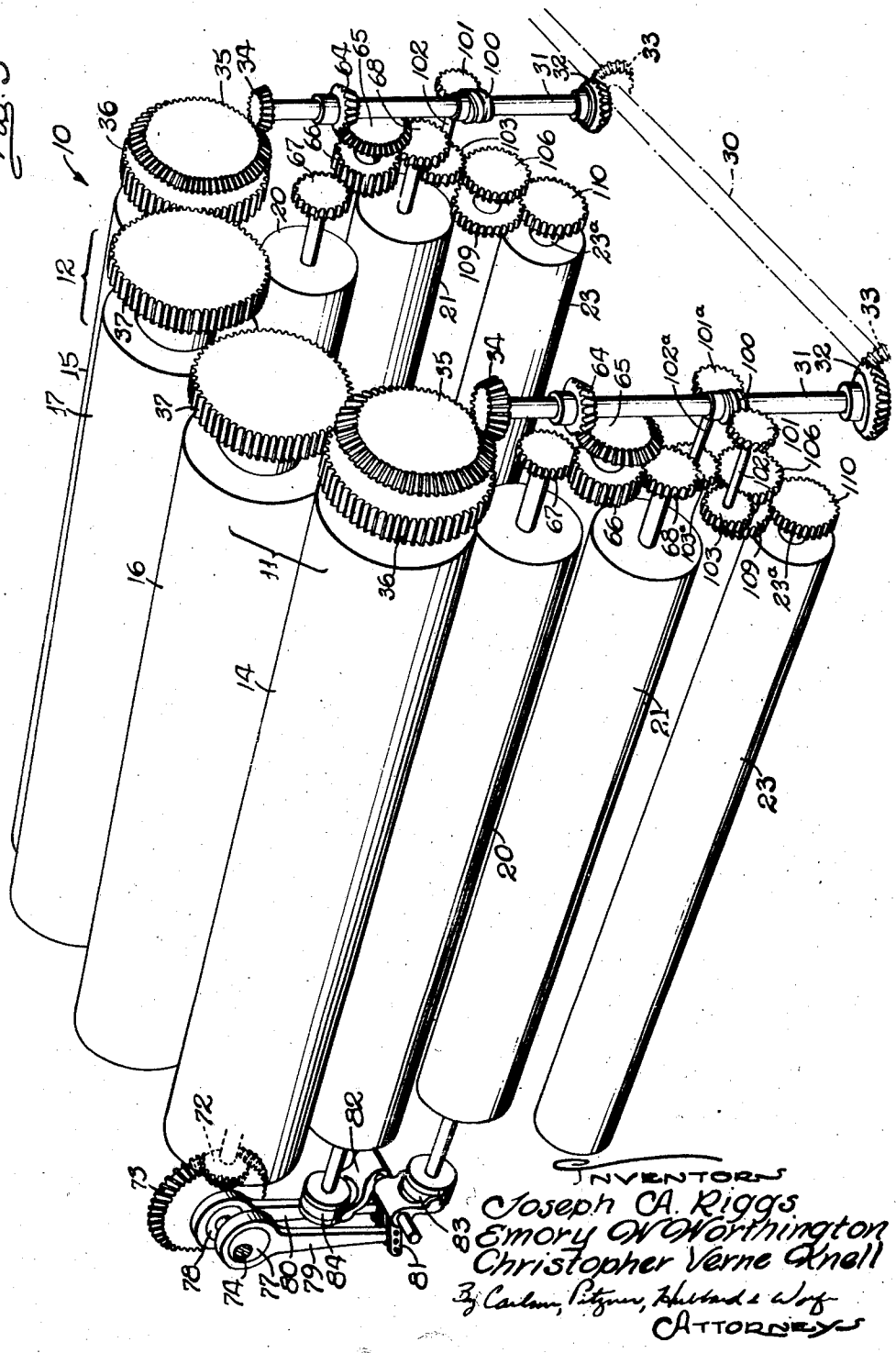
PRINTING UNIT AND DRIVE MECHANISM THEREFOR

Filed Jan. 12, 1945 5 Sheets-Sheet 2

Fig. 3



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PRINTING UNIT AND DRIVE MECHANISM THEREFOR

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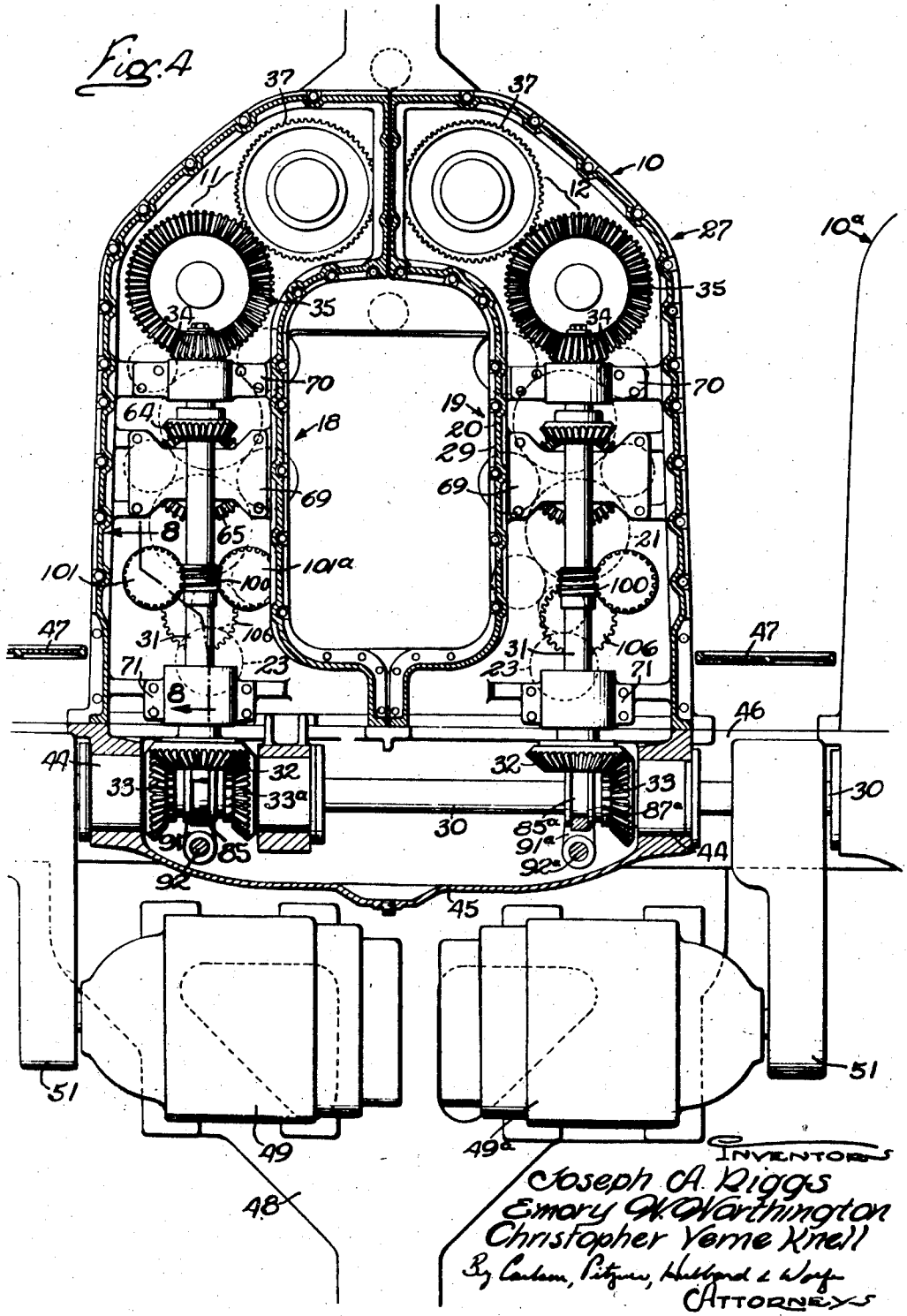
Fig. 4



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PRINTING UNIT AND DRIVE MECHANISM THEREFOR

Filed Jan. 12, 1945 5 Sheets-Sheet 4

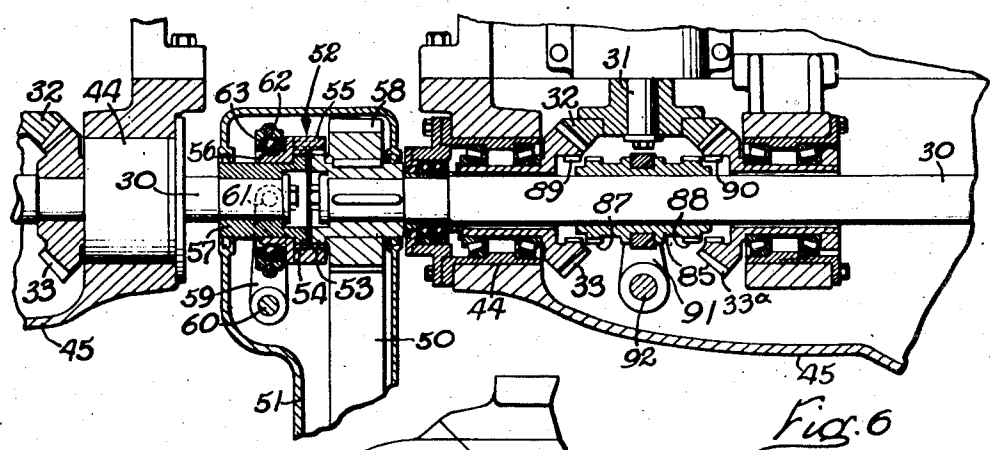
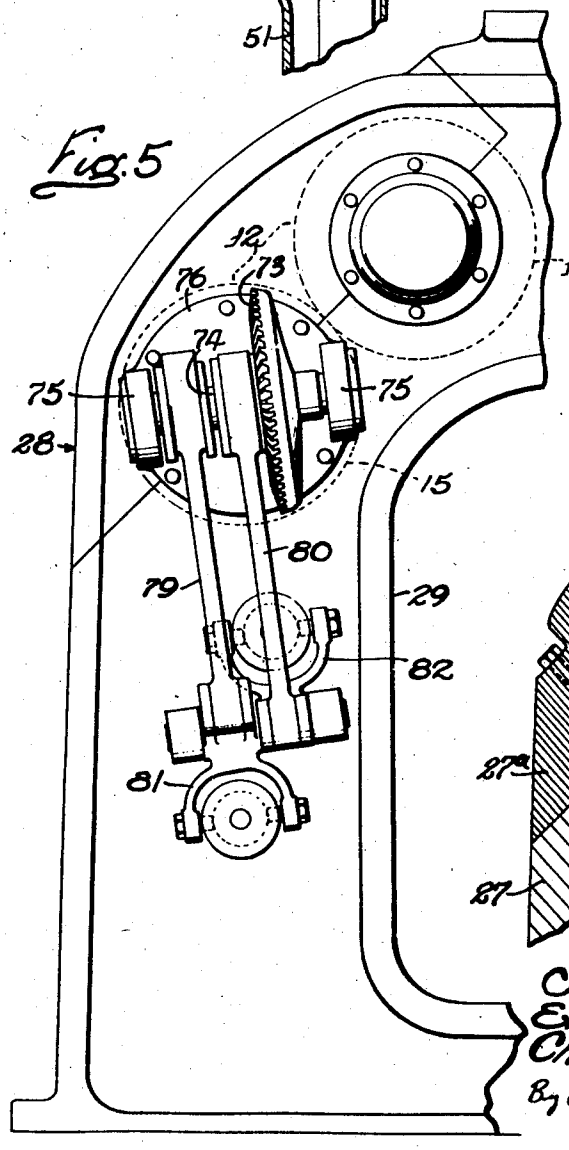


Fig. 6

Fig. 5



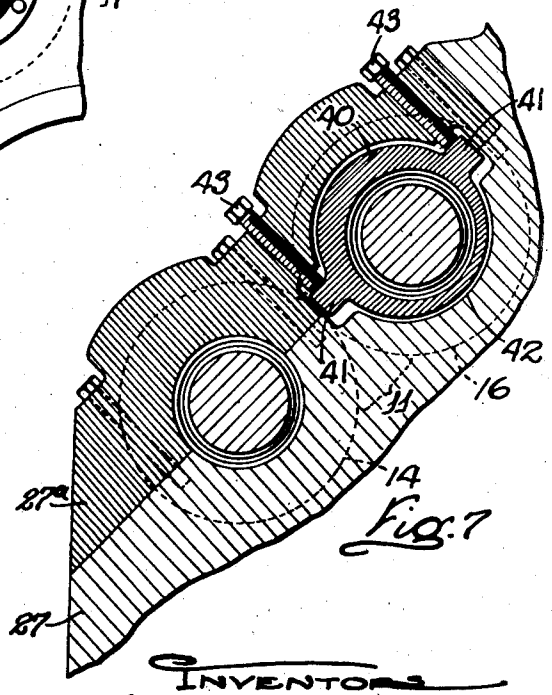


Fig. 7

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PRINTING UNIT AND DRIVE MECHANISM THEREFOR

Filed Jan. 12, 1945 5 Sheets-Sheet 5

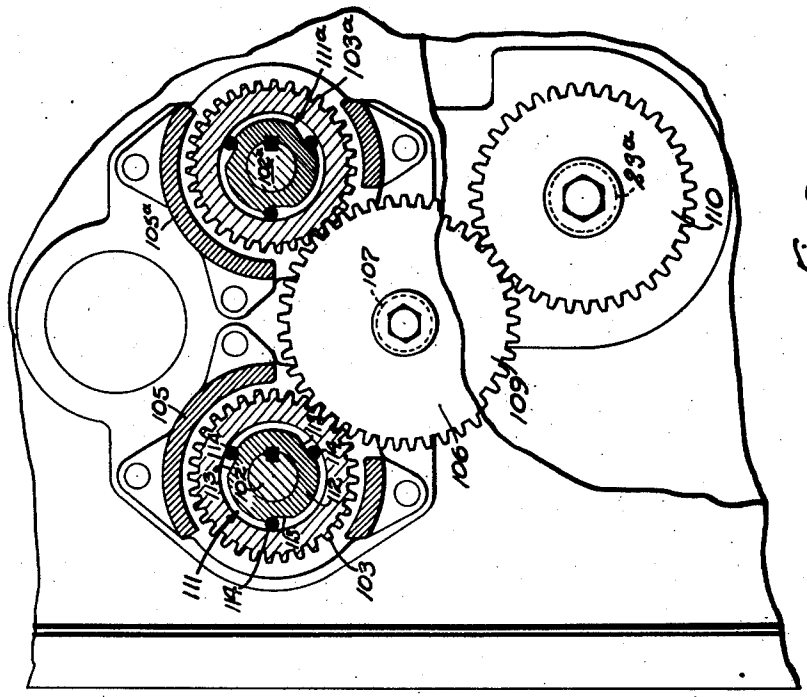

Fig. 9

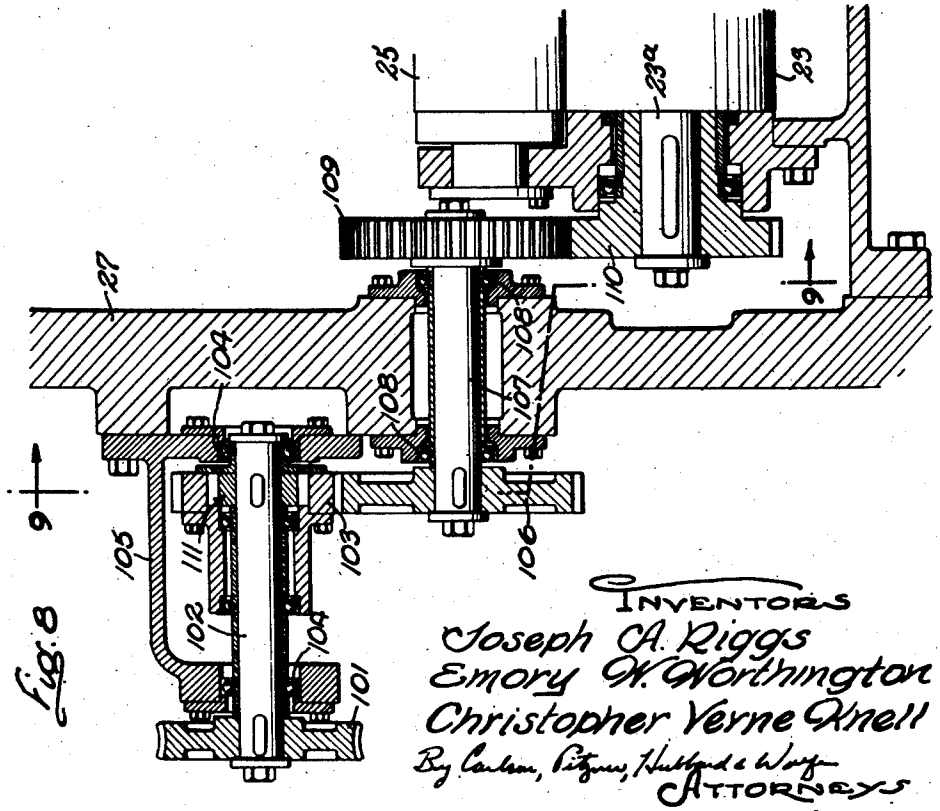

Fig. 8

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Patented Aug. 24, 1948

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UNITED STATES PATENT OFFICE

2,447,872

PRINTING UNIT AND DRIVE MECHANISM THEREFOR

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Application January 12, 1945, Serial No. 572,568

13 Claims. (Cl. 101—216)

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The present invention pertains to rotary type printing press units such as are employed in newspaper printing and like fields and more particularly to drive mechanisms therefor.

Units of the type noted commonly embody two printing couples with an inking mechanism beneath each and arranged symmetrically on opposite sides of a central vertical median plane, the rotary elements of the couples and inking mechanisms being in parallelism and journaled at their opposite ends in spaced side frames for the unit. Such side frames ordinarily have central openings or entrances in order that an operator may enter the space between the two side-by-side inking mechanisms for access to the same. In the units heretofore employed, however, it has been common to lead a vertical drive shaft upward along the center line of one side of the unit, this being the so-called "drive side," with the result that the opening into the unit at that side is almost completely blocked, making the interior accessible from only the opposite side.

One general object of the present invention is to obviate the difficulty noted above by providing a unit with a drive mechanism such that it occasions no central obstruction at either side of the unit.

More particularly it is an object of the invention to provide a printing press in which the inking mechanism, fountain, etc., for each one or more of the printing cylinders employed are located in substantial vertical alinement beneath the same and a drive established to each such printing cylinder through a corresponding vertical shaft rising to the same at one end of the cylinder from a depressed horizontal main drive shaft and with drives tapped off from the vertical shaft at appropriate points for the inking mechanism, etc. In consequence of such individualized connections for each printing cylinder and its associated mechanisms, with the driven elements disposed as noted, there is no obstruction laterally of the cylinder occasioned by the drive mechanism.

A further object is to achieve maximum simplicity of construction and precision of operation by providing a drive mechanism in which the drive connections for the printing cylinder inking mechanism, and desirably also the fountain, all stem directly from a single drive shaft.

Another object is to provide a two-couple printing unit having a drive mechanism such that clearance between the impression and printing cylinders of both couples may be adjusted without shifting or changing the mesh of any parts

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of the drive connections to the printing cylinders so that no change in registry for the printing cylinders will occur as an incident to such adjustment.

Another object is to provide a unit having a constant registry drive for the printing cylinder of the character indicated above, but in which provision is made for selective reversibility for one or more of the couples of the unit.

Another and important object of the invention is to provide a unit having a drive mechanism such as to utilize interchangeable parts in the major portion of such mechansim for presses constructed to accommodate printing cylinders of different standard diameters, such for example as 14½ and 15 inches.

Still another object is to provide a rotary printing press having a novel correlation of reversing mechanism for the printing cylinder and associated fountain so that even though the fountain drive connection stems from a portion of the cylinder drive, which is reversed as an incident to reversal of the latter, the drive for the fountain will remain unidirectional.

Further objects and advantages of the invention will become apparent as the following description proceeds taken in connection with the acompanying drawings, in which:

Figure 1 shows diagrammatically the layout of cylinders and rollers in a rotary printing press unit in which the present invention may be applied.

Fig. 2 is a schematic perspective view of the basic elements of the printing cylinder drive connections utilized in carrying out the present invention.

Fig. 3 is a view similar to Fig. 2 but showing more completely the drive connections not only to the printing cylinders but also to the inking mechanisms and fountain rollers for a unit like that diagrammed in Fig. 1.

Fig. 4 is a side elevation, taken from the drive side, of a press unit embodying the present invention, the housings or covers for the various drive elements being shown in section in order to expose the interiorly located parts.

Fig. 5 is a fragmentary side elevation of the unit showing the side opposite that appearing in Fig. 4.

Fig. 6 is a fragmentary enlarged detail sectional view showing the inter-unit coupling as well as the reversible connection between the horizontal drive shaft for the unit and one of the vertical shafts leading to the printing cylinder.

Fig. 7 is an enlarged fragmentary detail vertical sectional view through the mountings for the cylinders and the left-hand one of the couples of the unit of Fig. 4.

Fig. 8 is an enlarged fragmentary detail sectional view taken substantially along the line 8—8 in Fig. 4.

Fig. 9 is a fragmentary detail sectional view taken substantially along the line 9—9 in Fig. 8.

While the invention is susceptible of various modifications and alternative constructions, we have shown in the drawings and will herein describe in detail the preferred embodiment, but it is to be understood that we do not thereby intend to limit the invention to the specific form disclosed, but intend to cover all modifications and alternative constructions falling within the spirit and scope of the invention as expressed in the appended claims.

General organization of printing unit

The particular unit 10, chosen for illustration herein as an exemplary embodiment of the invention, is one designed for high speed newspaper work. The general layout of cylinders and rollers in the unit will be evident from Fig. 1. As there indicated, two printing couples 11, 12 are incorporated in the unit consisting of respective printing or plate cylinders 14, 15 and companion impression cylinders 16, 17. Beneath each printing cylinder 14, 15 is its associated inking mechanism 18, 19. The inking mechanisms may take a variety of forms and in the present instance each comprises a pair of vibrating rotary drums 20, 21 and coacting rollers 22, 25 driven by frictional contact with the drums.

Ink is supplied from fountain rollers 23 running partially submerged in baths of ink (not shown) in fountains indicated at 24. Ink is carried by these fountain rollers to pick-up rollers 25 which are in frictional contact with adjacent ones of the rollers 22 and driven thereby. The ink passes upward on the surfaces of successive ones of the elements of the inking mechanism, being distributed by axial vibration of the drums 20, 21 relative to the rollers 22 and is finally applied to the printing or plate cylinders 14, 15. Any suitable means may be provided for regulating the supply of ink from the fountain rollers 23 such for example as a regulating blade arrangement (not shown) like that disclosed in E. W. Worthington Patent No. 2,253,158 issued August 19, 1941.

A web 26 of paper may be threaded through the couples 11, 12 in various ways, as for example as shown in Fig. 1 where it is illustrated as arranged to accommodate printing of its opposite sides by respective ones of the two couples.

The printing and impression cylinders constituting the couples 11, 12, as well as the rotary elements of the inking mechanisms 18, 19, are journaled at their opposite ends in side frames 27, 28 (shown respectively in Figs. 4 and 5). The frame construction, as such, forms no part of the present invention, the particular frame illustrated being described and claimed in the copending application of Emory W. Worthington, Serial No. 572,567, filed January 12, 1945. For the present suffice it to say that the frames have been shown as being of an arch form in which the printing couples are arranged side-by-side with the upper cylinder in each couple, in this instance the impression cylinder 16, 17, offset laterally toward each other so that the centers of the cylinders in each couple lie on

lines inclined at an angle of about 45°. Particularly to be observed is the fact that in each of said frames is a central entrance opening 29 so dimensioned that an operator can enter through them and have access to the inner sides of the elements of the inking mechanisms 18, 19. The drive mechanisms hereinafter described are so arranged that these openings 29 are left completely unobstructed for entry therethrough at either side of the unit.

Printing cylinder drive connections

A basic feature of the novel drive mechanism for the unit shown is, as indicated in Fig. 2, the provision of direct, vertically extending drive connections to each of the printing cylinders 14, 15. For that purpose, a horizontally extending main drive shaft 30 is arranged to extend alongside the unit at a depressed or low level substantially below the same and from this horizontal shaft rise individual vertical drive shafts 31 directly to respective ones of the printing cylinders. The lower ends of the shafts 31 are connected to the horizontal shaft 30 through pairs of bevel gears 32, 33 while the upper ends of the shafts 31 are connected to the associated printing cylinders by bevel gears 34, 35. The gears 32 and 34 are rigid with the lower and upper ends respectively of the shafts 31 while the gears 35 are rigid with the cylinders 14, 15. The bevel gears 33, on the other hand, although coaxial with the shaft 30 are not rigid with it but, instead, provision is made by coupling them to the shaft at will for purposes which will later appear.

To complete the drives for the couples 11, 12 the impression cylinders 16, 17 are driven from their corresponding printing cylinders 14, 15 (Fig. 3). Spur gears 36, compounded with the bevel gears 35 on the printing cylinders, mesh with spur gears 37 on the impression cylinders.

Several important advantages accrue from the use of individual drive connections direct to each of the printing or plate cylinders as described above. Among these are elimination of any obstruction to the side frame entrance openings 29, elimination of possibility of faulty registry as the consequence of adjustment of pressure between printing and impression cylinders and adaptation of the press to installation in the same of cylinders of a variety of diameters.

With reference to maintenance of the frame entrance openings 29 unobstructed, it will be observed (Fig. 4) that the drive connections rise directly to the printing cylinders 14, 15. Since the printing cylinders themselves are disposed on opposite sides of the openings, the drive connections extending directly to them do not obstruct the openings in any way. Such an arrangement is to be contrasted with those heretofore common where two-couple units have been employed in which a central drive shaft has been carried up along the center line of one side frame and then connections branched out laterally to the two couples. See for example Fig. 2 of C. S. Crafts Patent No. 2,085,185 issued June 29, 1937.

With reference to elimination of the possibility of faulty registry as the consequence of adjustment of pressure between printing and impression cylinders, it is to be noted that in any printing couple provision should be made for adjusting the pressure between the printing and impression cylinders. In the present instance that adjustment is accomplished by shifting the impression cylinders while the axes of the printing cylinders always remain fixed. The adjust-

ment mechanism itself may be of the form illustrated in Fig. 7. As there shown, the end shaft of the impression cylinder is received in an eccentrically located bearing in a cylindrical sleeve 40. This sleeve has laterally projecting ears 41 extending into clearance recesses in the frame and the sleeve is received in a bore 42 formed in the side frame 27 and its coacting removable cap 27a. By threading the adjusting screws 43 in and out, the sleeve 40 may be rocked about its axis to shift the impression cylinder minutely transaxially with reference to the printing cylinder. It will be understood that an identical adjusting mechanism (not shown) is provided at the opposite side of the unit. For further detail of an adjusting mechanism suitable for the purpose, reference may be made to C. S. Crafts Patent No. 2,079,001, issued May 4, 1937, and particularly Figs. 1 and 3 thereof.

In any printing couple in which the impression and printing cylinders are connected by spur gears, alteration in the displacement between the axes of the cylinders inherently alters the backlash in the gear connection. With the drive mechanism disclosed herein, such alteration in backlash is of no consequence however in so far as maintenance of registry of the printing cylinders is concerned, since the point of altered back-lash does not lie between the source of power and the printing cylinders but is instead interposed between the latter and the impression cylinders. Alteration in impression cylinder registry is of relatively no moment. This factor of maintaining accurate and precise registry or angular position for the printing cylinders is of special importance in color work and consequently the herein disclosed drive mechanism is especially suited for such use.

As to adaptation of the present press unit for cylinders of different diameters, it will be perceived that substantially the same drive elements may be used throughout in constructing a press having cylinders of any one of a variety of diameters, the principal change necessary being simply to make appropriate alteration in the size of the spur gears 36, 37 which connect the components of the couples. Such standardization of a major portion of the parts of the press is of considerable practical importance in view of the fact that previous newspaper press designs have usually entailed substantially completely different sets of drive parts for presses having so little difference in cylinder size as 14½ and 15 inch diameters.

Turning now to somewhat more of the detail of the particular drive connections shown, it will be observed upon reference to Fig. 4 that the shaft 30 is journaled in antifriction bearings 44 at opposite ends of an elongated housing 45 fixed to the lower edge of the side frame 27 and to wall brackets 46 which support the latter, this casing being located below the level of the floor 47. The wall brackets or sills 46 may be supported by the usual Y-columns 48.

Ordinarily a plurality of units like 10 are arranged in a series with their drive shafts 30 alined end-to-end as indicated in Fig. 4, an additional unit 10a being there shown fragmentarily. Such units may be driven by a suitable electric motor or motors arranged either for unit drive, multi-drive, or group drive. In the present instance, an electric drive motor 49 has been shown in Fig. 4 for the unit 10 and a similar motor 49a for the unit 10a, these motors being connected to the drive shafts 30 of their respective units by

endless chains 50 (Fig. 6) in housing 51. Suitable couplings, designated generally as 52 (Fig. 6) may be provided for connecting together the drive shafts 30 of adjacent units when it is desired to operate them in unison.

The couplings 52 comprise, in this instance, matching spur gears 53, 54 fixed to the adjacent ends of shafts 30 together with an internally toothed ring gear 55 meshing with such spur gears and fixed to a collar 56 axially slidable on a bushing 57 fixed to one of the shaft ends and rigid with the spur gear 54. The other spur gear 53 is rigid with a sprocket 58 over which the chain 50 is trained. When the ring gear 55 is in mesh with both of the spur gears 53, 54, the shafts are thus coupled together whereas when the ring gear is slid axially to the left (as viewed in Fig. 6), out of mesh with the spur gear 53, the shafts are disconnected. Axial shifting of the collar 56 and ring gear 55 rigid with it is accomplished by a fork 59 pivoted on a rocket shaft 60 and swung by a suitable operating lever (not shown). This fork is connected by trunnions 61 with a ring 62 which is in turn connected by an antifriction thrust bearing 63 with the collar 56. By virtue of such couplings 52 between successive units, they may be coupled to operate in unison or individual ones of them silenced at will.

Inking mechanism drive connections

The drums 20, 21 of the inking mechanisms 18, 19 are driven directly from intermediate portions of the corresponding vertical drive shafts 31 which rise adjacent their ends. For that purpose, bevel gears 64 (Fig. 3) are fixed to the intermediate portions of these shafts 31 and meshed with companion bevel gears 65. The latter bevel gears are compounded with spur gears 66 which in turn mesh with spur gears 67 and 68 on the drums 20 and 21 respectively. The gears 66 are sufficiently wide with respect to the gears 67, 68 that the latter will remain continuously in mesh with the gears 66 during the axial vibration of the drums 20, 21. Upon reference to Fig. 4, it will be seen that brackets 69 are bolted to the face of the side frame 27 and these brackets serve to support the outboard bearings (not shown) for the compounded gears 65, 66.

The vertical drive shafts 31 are journaled in upper and lower antifriction bearings carried by respective brackets 70, 71 (Fig. 4) bolted to the outer face of the side frame 27. It will be perceived that upon unbolting these brackets, the shafts 31, together with the gears fixed thereto, may be removed as a unit. This not only simplifies maintenance and repair, but also makes possible initial "bench assembly" of such shaft and gear units thereby minimizing the erection time for the press.

Axial vibration of the inking drums 20, 21 is accomplished by mechanism located on the side of the press opposite the drive side, or in other words, at the so-called "operating side" (Figs. 3 and 5). Such mechanism is driven from the printing or plate cylinders 14, 15, identical mechanism being provided for each of the pairs of inking drums 20, 21 of the two ends of the press unit. Thus, each of these mechanisms includes a bevel gear 72 fixed to the associated one of the printing cylinders and meshing with a bevel gear 73. The latter gears are fixed on shafts 74 journaled in bearings carried by brackets 75 on removable mounting plates 76, each shaft 74 having rigid therewith a pair of eccentrics 77, 78. The eccentrics are connected by eccentric rods 79, 80

with bell cranks 81, 82. One arm of each bell crank is bifurcated and embraces a corresponding collar 83, 84 to which it is pivotally connected. Such collars are journaled on the ends of the shafts for respective ones of the drums 21, 20, being restrained against endwise movement thereon. Consequently, as the gear 73 is rotated, the eccentric rods 79, 80 alternately rise and fall rocking the bell cranks 81, 82 to vibrate the drums axially.

Reversing mechanism

Provision has been made in the disclosed printing press unit for reversing one of its couples with reference to the other by simple clutch actuation as distinguished from a much more complicated procedure of slipping gears, etc., frequently employed in prior units. Such reversal is frequently required in rewebbing the press for different purposes, as for example when it is to be used for multi-color work.

In the particular construction shown (see Figs. 2, 4 and 6), provision has been made for reversing the couple 11. For that purpose, a bevel gear 33ª, companion to the bevel gear 33 heretofore noted and meshing with the bevel gear 32, is utilized. By coupling alternate ones of the bevel gears 33, 33ª to the shaft 30 and permitting the other to turn idly, the vertical shaft 31 can be driven in respective opposite directions. To effect such coupling, a sleeve 85 (Fig. 6) is splined to the shaft 30 and has spur gears 87, 88 rigid with its opposite ends and adapted to mesh with corresponding internal ring gears 89, 90 integral with the bevel gears 33, 33ª. When the sleeve 85 is in the central or neutral position shown in Fig. 6, the couple 11 is silenced entirely. Shift of the sleeve 85 to the left couples the bevel gear 33 to the shaft 34, effecting rotation of the couple 11 in one direction, while shift of the sleeve in the opposite direction couples the alternate bevel gear 33ª to the shaft 34 for rotation of the couple in the opposite direction. The sleeve 85 may be moved by a shifter fork 91 (Fig. 4) pivoted on a rock shaft 92, the latter being provided with any suitable form of manual operating lever (not shown).

In the case of the right hand bevel gear 33 provision has been made for clutching this gear to the shaft 30 at will to make possible silencing of the couple 12 when desired. For that purpose a clutch may be utilized generally like that for paired gears 33, 33ª except that it is single ended. Thus it includes a sleeve 85ª splined on the shaft 3°, operated by a fork 91ª on a rock shaft 92ª, and having a spur gear 87ª rigid with one end and adapted to be moved by the sleeve into or out of mesh with an internal gear (not shown but like 90) in the hub of the associated gear 33.

In connection with reversibility of the unit, it is to be observed that for either direction of rotation the backlash in the drives to both printing cylinders of the unit is the same. Moreover, it is the same for all printing cylinders of all units in a series of the same. Accordingly the webbing of the unit or units may be changed and individual couples reversed without altering registry by change in backlash.

Fountain drive connections

Provision is desirably made for driving the fountain rollers 23 (Figs. 1 and 3) directly from the adjacent vertical drive shafts 31 in order to simplify and minimize the length of the drive connections to such rollers. For that purpose worms 100 (Fig. 3) are fixed to each of the shafts 31 and

meshed with a worm wheel 101 carried by a jack shaft 102 also carrying thereon a spur gear 103 (see also Fig. 8). The shafts 102 are mounted in antifriction bearings 104 in a bracket 105 fixed to the face of the side frame 27. The gears 103 in turn each mesh with a corresponding spur gear 106 carried by shafts 107 journaled in antifriction bearings 108 in the frame 27. The latter shafts 107 also have fixed thereto gears 109 meshing with gears 110 on the end of shafts 23ª carrying the fountain rollers 23.

In the case of the fountain roller for the right-hand couple 12, the foregoing completes the drive connections, the gear 103 being in that instance fast on the shaft 102. For the other fountain roller, however, provision must be made for automatically reversing it upon reversal of the shaft 31 from which it is driven. That is necessary since the fountain rollers must revolve undirectionally. Otherwise they cannot function in coaction with their regulating blades heretofore noted. It is to be observed, incidentally, that the direction of rotation for the pick-up rollers 25 relative to the fountain rollers is of no moment.

To afford a unidirectional drive for the left fountain roller 23 (Fig. 3) from the associated shaft 31, which latter is reversed to reverse the couple 11, the gear 103 in the train to this roller is connected to its associated shaft 102 by a one-way clutch 111 (Figs. 8 and 9). Such clutch consists of a generally disk shaped cage 112 fixed to the shaft 102 and peripherally notched as at 113 to present pockets tapering in a direction circumferentially of the cage to abrupt ends or shoulders. In these pockets are rollers 114 confined by the surrounding gear 103. Upon rotation clockwise the rollers 114 tend to roll upward along the inclined bottoms of the pockets 113, wedging tightly between the cage and gear so that the latter revolves with the cage. Upon rotation counterclockwise the rollers 114 roll down to the enlarged lower ends of the pockets, permitting the shaft 102 to turn freely relative to the gear 103 so that the latter does not turn.

To complete the unidirectional drive for the left fountain roller 23 a second gear train is led off from the associated one of the shafts 31 (Fig. 3) and which is generally like that described except that it is arranged to operate only when the shaft 31 is revolving in a direction opposite to that required for driving of the fountain roller through the train already described. Thus the second train includes a worm wheel 101ª meshing with the worm 100 and fixed on a shaft 102ª carrying a gear 103ª. The latter meshes with the gear 106 just as does the corresponding gear 103. In this instance the gear 103ª is connected to its shaft 102ª by a one-way clutch 111ª (Fig. 9) precisely like the clutch 111 heretofore described.

When the lefthand shaft 31 (Fig. 3) is rotating clockwise (as viewed from its upper end) the shaft 102 turns clockwise (as viewed from its outer end) and the shaft 102 turns counterclockwise. Accordingly, the gear 103 is coupled to the shaft 102 by the clutch 111 and drives the fountain roller 23 through 106, 107, 109, 110. Upon reversal of the shaft 31, the clutch 111 disengages and the other clutch 111ª engages, so that the fountain roller continues to turn in the same direction.

We claim as our invention:

1. In a rotary type printing unit, the combination of a pair of spaced side frames of arch form, each side frame comprising a pair of up-

right columnar portions joined at their upper ends by an arch portion, a pair of printing couples having their opposite ends journaled in said side frames, each couple including a printing cylinder and a coacting impression cylinder disposed with the ends of the printing cylinders journaled in the upper ends of the columnar portions of said side frames and with the ends of the impression cylinders journaled in the arch portions of said side frames, a drive mechanism including a horizontal drive shaft extending substantially along the lower end of one of said side frames, means including a pair of vertical shafts extending upward along the columnar portions of said one of said side frames for drivingly connecting said horizontal shaft to respective ones of said printing cylinders, means for drivingly connecting each of said printing cylinders to its companion impression cylinder, means for rotatably supporting said vertical shafts on said columnar portions of said side frames, a set of ink transferring rollers arranged below each of said printing cylinders and in transferring relation therewith, ink supplying mechanisms for feeding ink to respective sets of said ink transferring rollers, said ink transferring rollers having shafts journaled in said columnar portions generally along said vertical shafts and having driving connection with the latter.

2. In a rotary type printing unit, the combination of a pair of spaced side frames of arch form, each side frame comprising a pair of upright columnar portions joined at their upper ends by an arch portion, a pair of printing couples having their opposite ends journaled in said side frames, each couple including a printing cylinder and a coacting impression cylinder disposed with the ends of the printing cylinders journaled in the upper ends of the columnar portions of said side frames and with the ends of the impression cylinders journaled in the arch portions of said side frames, a drive mechanism including a horizontal drive shaft extending substantially along the lower end of one of said side frames, means including a pair of vertical shafts extending upward along the columnar portions of said one of said side frames for drivingly connecting said horizontal shaft to respective ones of said printing cylinders, means for rotatably supporting said vertical shafts on said columnar portions of said side frames, means for drivingly connecting each of said printing cylinders to its companion impression cylinder, a pair of inking mechanisms disposed beneath respective ones of said couples and each including a plurality of rotatable elements journaled in said columnar portions of said side frames, a pair of fountain rollers disposed beneath respective ones of said inking mechanisms, and means for connecting said vertical shafts drivingly to the adjacent ends of said rotatable elements and fountain rollers.

3. In a rotary type printing unit, the combination of a pair of spaced side frames of arch form, a pair of printing couples having their opposite ends journaled in said side frames, each couple including a printing cylinder and a coacting impression cylinder disposed with the impression cylinders somewhat above their companion printing cylinders and laterally offset toward each other, said impression cylinders being journaled in the upper arch portions of said frames, means for drivingly connecting each of said printing cylinders to its companion impression cylinder, means including a set of ink rollers vertically distributed under each of said printing rollers for supplying ink thereto in a generally upward path, a drive mechanism including a horizontal drive shaft extending substantially along the lower end of one of said side frames, and means including a pair of vertical shafts laterally spaced with respect to each other and extending upwardly along an outward face of one of said side frames for not only drivingly connecting said horizontal shaft to respective ones of said printing cylinders, but also connecting said horizontal shaft to said ink roller means.

4. In a rotary type printing unit, the combination of a frame structure having generally centrally located entrance openings in opposite sides thereof, a pair of printing couples extending between said sides adjacent the tops of said openings, each of said couples including a printing cylinder and a coacting impression cylinder, inking mechanisms for each of said couples located beneath its corresponding couple, said inking mechanisms each including a plurality of rotatable elements extending between said side frames at opposite sides of said openings and accessible through the latter, a horizontal drive shaft extending along one side of said frame structure beneath the opening in the latter, means including a pair of vertical drive shafts extending upward at opposite sides of the last-mentioned opening for connecting said horizontal shaft drivingly to each of said printing cylinders without obstruction of said last-mentioned opening, and means for driving said rotatable elements of said inking mechanisms from the intermediate portions of said vertical shafts which are respectively adjacent the same.

5. In a rotary type printing unit, the combination of a frame structure having generally centrally located entrance openings in opposite sides thereof, a pair of printing couples extending between said sides adjacent the tops of said openings, each of said couples including a printing cylinder and a coacting impression cylinder, inking mechanisms for each of said couples located beneath its corresponding couple, said inking mechanisms each including a plurality of rotatable elements extending between said side frames at opposite sides of said openings and accessible through the latter, ink fountain rollers disposed beneath each of said inking mechanisms, a horizontal drive shaft extending along one side of said frame structure beneath the opening in the latter, means including a pair of vertical drive shafts extending upward at opposite sides of the last-mentioned opening for connecting said horizontal shaft drivingly to each of said printing cylinders without obstruction of said last-mentioned opening, and means for driving said rotatable elements of said inking mechanisms as well as said fountain rollers from the intermediate portions of said vertical shafts which are respectively adjacent the same.

6. In a rotary type printing unit having a pair of side-by-side couples each including a printing cylinder and a coacting impression cylinder, a drive mechanism including a horizontal drive shaft below said couples and transverse to the same, a set of ink transferring rollers located generally below each of said printing cylinders, ink fountains for conveying ink to said roller sets respectively, means including a pair of vertical shafts laterally spaced with respect to each other for not only directly connecting said horizontal shaft to respective ones of said printing cylinders but also for conveying driving power to

said impression cylinder, said ink transferring rollers, and said ink fountain.

7. In a rotary type printing unit having a pair of side-by-side couples each including a printing cylinder and a coacting impression cylinder, a drive mechanism including spur gears rigid with the respective ones of said printing cylinders, additional spur gears rigid with corresponding ones of said impression cylinders and meshing with the spur gears rigid with the associated printing cylinders, means for adjustably shifting said impression cylinders transaxially to vary the clearance between the same and their associated printing cylinders, a horizontal drive shaft below said couples and transverse to the same, and means including a pair of vertical shafts laterally spaced with respect to each other for drivingly connecting said horizontal shaft to respective ones of said printing cylinders, whereby any change in backlash between meshing ones of said spur gears incident to adjustment of cylinder clearance does not alter the angular positions of said printing cylinders since their drive connections from said horizontal shaft remain unaffected by such adjustment.

8. In a rotary type printing unit having pair of side frames of arch form and having a pair of side-by-side couples each including a stationarily journaled printing cylinder and a coacting impression cylinder, said impression cylinder disposed somewhat above their companion printing cylinders and laterally offset toward each other, a drive mechanism including a horizontal drive shaft below said couples and transverse to the same, means including a pair of vertical shafts laterally spaced with respect to each other drivingly connecting said horizontal shaft to respective ones of said printing cylinders, means for journaling said impression cylinder in said frame and enabling bodily lateral positioning of the same with respect to the associated printing cylinder, and means including respective pairs of gears for connecting each of said printing cylinders to its companion impression cylinder, so that the drive connections to said printing cylinders and the degree of backlash therein remains undisturbed in spite of changing said gears to accommodate the drive to cylinders of different diameters and in spite of changing the degree of mesh of said gears incident to bodily positioning of said impression cylinders.

9. In a rotary type printing press having a pair of side frames between which extend the printing and impression cylinders of a printing couple as well as the rotary elements of an inking mechanism located below said couple, a drive mechanism comprising a horizontal drive shaft journaled adjacent the lower portion of one of said side frames and extending transverse to the axes of said cylinders, a vertical drive shaft having first and second bevel gears rigid with its lower and upper ends respectively as well as a third gear rigid with its intermediate portion, means including a bevel gear carried by said horizontal shaft for drivingly connecting the latter to said first gear for rotating said vertical shaft, means including gears meshing with said second and third gears for connecting the latter drivingly respectively to said printing cylinder and said inking mechanism, and means including brackets removably secured to the outer face of said one side frame for rotatably supporting said vertical shaft in position for outward bodily removal of the same together with the gears rigid therewith, whereby said vertical shaft and gears rigid therewith together with said brackets may be fashioned as a separate bench assembled unit for application to the press.

10. In a rotary type printing press having a pair of side frames between which extend the printing and impression cylinders of a printing couple as well as the rotary elements of an inking mechanism located below said couple and the fountain roller of an ink fountain disposed beneath said inking mechanism, a drive mechanism comprising a horizontal drive shaft journaled adjacent the lower portion of one of said frames and extending transverse to the axes of said cylinders, a vertical drive shaft having first and second toothed elements rigid with its lower and upper ends respectively as well as a third and fourth toothed element rigid with its intermediate portion, means including a toothed element carried by said horizontal shaft for drivingly connecting the latter to said first toothed element for rotating said vertical shaft, means including toothed elements meshing with respective individual ones of said second and third and fourth gears for connecting the latter drivingly respectively to said printing cylinder and said inking mechanism and said fountain roller, and means removably secured to the outer face of said one side frame for rotatably supporting said vertical shaft in position for outward bodily removal of the same together with the four toothed elements rigid therewith, whereby said vertical shaft and toothed elements rigid therewith together with said supporting means may be fashioned as a separate bench assembled unit for application to the press.

11. In a rotary printing press, the combination of a printing couple including a printing cylinder, an inking mechanism having revoluble rollers and drums, and a fountain roller, all arranged one above another in the order named, a drive shaft extending vertically along one end of such series of elements, means for directly connecting said shaft drivingly to said couple and fountain roller and to said drums at adjacent points along the length of said shaft, and means located at the end of said series of elements opposite said shaft and driven from said printing cylinder for effecting relative axial movement between said rollers and drums of said inking mechanism in timed relation with the rotation thereof.

12. In a rotary type printing press, the combination of a printing couple, means including a reversely rotatable vertical drive shaft at one end of such couple for reversely rotating said couple, a fountain including a rotatable fountain roller arranged with the latter in parallelism with said couple and with one end of said fountain roller adjacent said shaft, a first gear drivingly connected to said fountain roller, second and third gears each meshed with said first gear and carried by respective shafts which lie on opposite sides of said vertical shaft and substantially equidistant therefrom, means including a common worm gear on said vertical shaft for jointly rotating the last-mentioned shafts in unison but in respective opposite directions, and means including one-way clutches for connecting said last-mentioned shafts drivingly to respective ones of said second and third gears, one of said clutches being engageable only during rotation of said vertical shaft in one direction and the other only during rotation of said vertical shaft in the opposite direction, whereby rotation of said fountain roller is maintained unidirectional despite any

reversal of said vertical shaft and the couple driven thereby.

13. In a rotary type printing unit, the combination of a pair of spaced side frames of arch form, each side frame comprising a pair of upright columnar portions joined at their upper ends by an arch portion, a pair of printing couples having their opposite ends journaled in said side frames, each couple including a printing cylinder and a coacting impression cylinder disposed with the ends of the printing cylinders journaled in the upper ends of the columnar portions of said side frames and with the ends of the impression cylinders journaled in the arch portions of said side frames, a drive mechanism including a horizontal drive shaft extending substantially along the lower end of one of said side frames, means including a pair of vertical shafts extending upward along the columnar portions of said one of said side frames for drivingly connecting said horizontal shaft to respective ones of said printing cylinders, means for rotatably supporting said vertical shafts on said columnar portions of said side frames, means for drivingly connecting each of said printing cylinders to its companion impression cylinder, a pair of inking mechanisms disposed beneath respective ones of said couples and each including a plurality of rotatable elements journaled in said columnar portions of said side frames, means for supplying ink to said inking mechanisms respectively, and means for connecting said vertical shafts drivingly to the adjacent ends of said rotatable elements.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
800,088	Edgar	Sept. 19, 1905
1,138,782	Pancoast	May 11, 1915
1,451,721	Terry	Apr. 17, 1923
1,569,065	Bechman	Jan. 12, 1926
1,641,100	Scott	Aug. 30, 1927
1,680,018	Granger	Aug. 7, 1928
1,900,263	Wood	Mar. 7, 1933
1,922,439	Jackson	Aug. 15, 1933
2,039,867	Zuckerman	May 5, 1936
2,079,001	Crafts	May 4, 1937
2,150,672	Davie	Mar. 14, 1939
2,227,616	Wolf	Jan. 7, 1941
2,350,580	Blackley et al	June 6, 1944