June 25, 1940. G. GOEBEL ET AL 2,205,720

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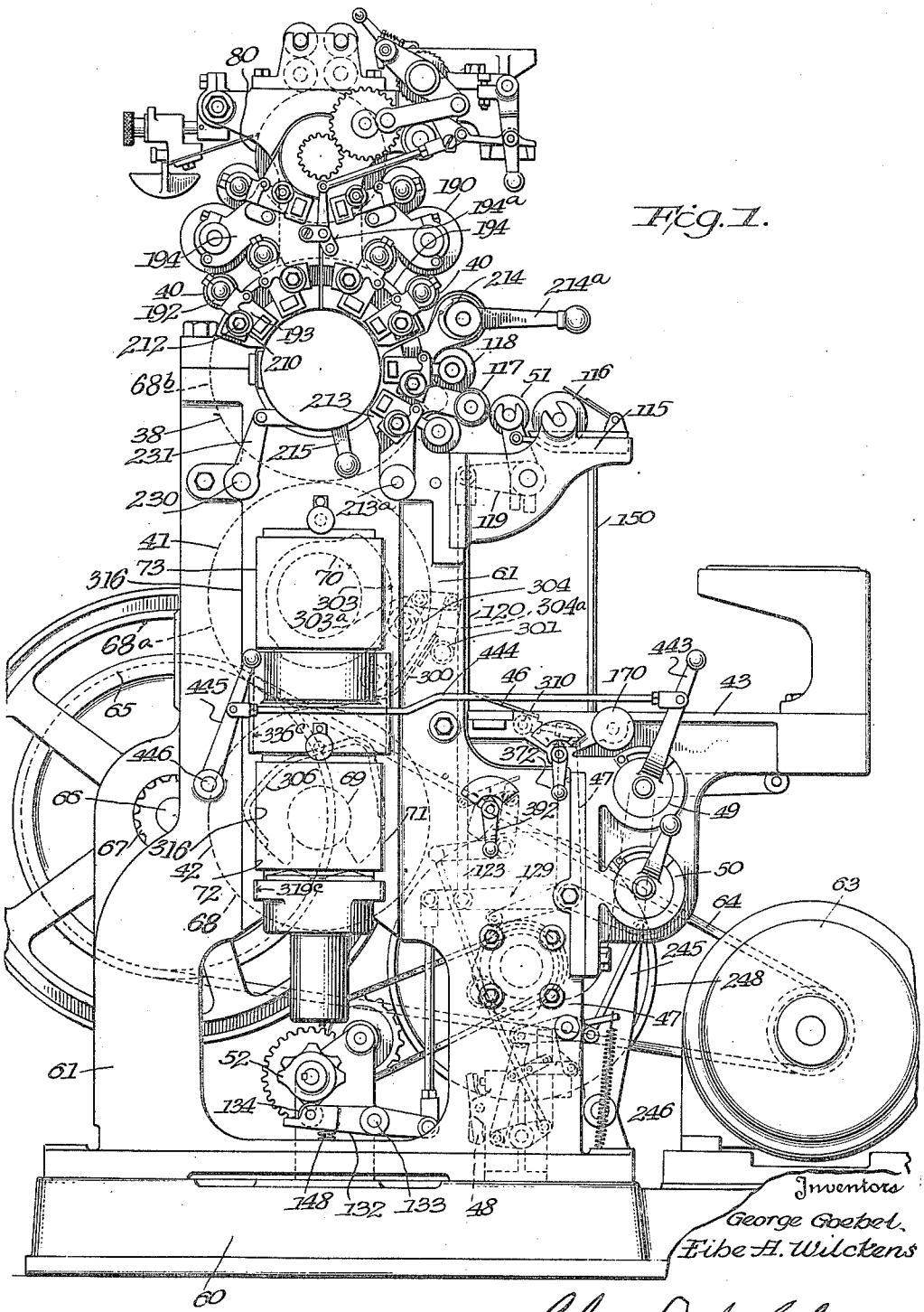


Fig. 1.

Inventors
George Goebel.
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By Cushman Darby & Cushman
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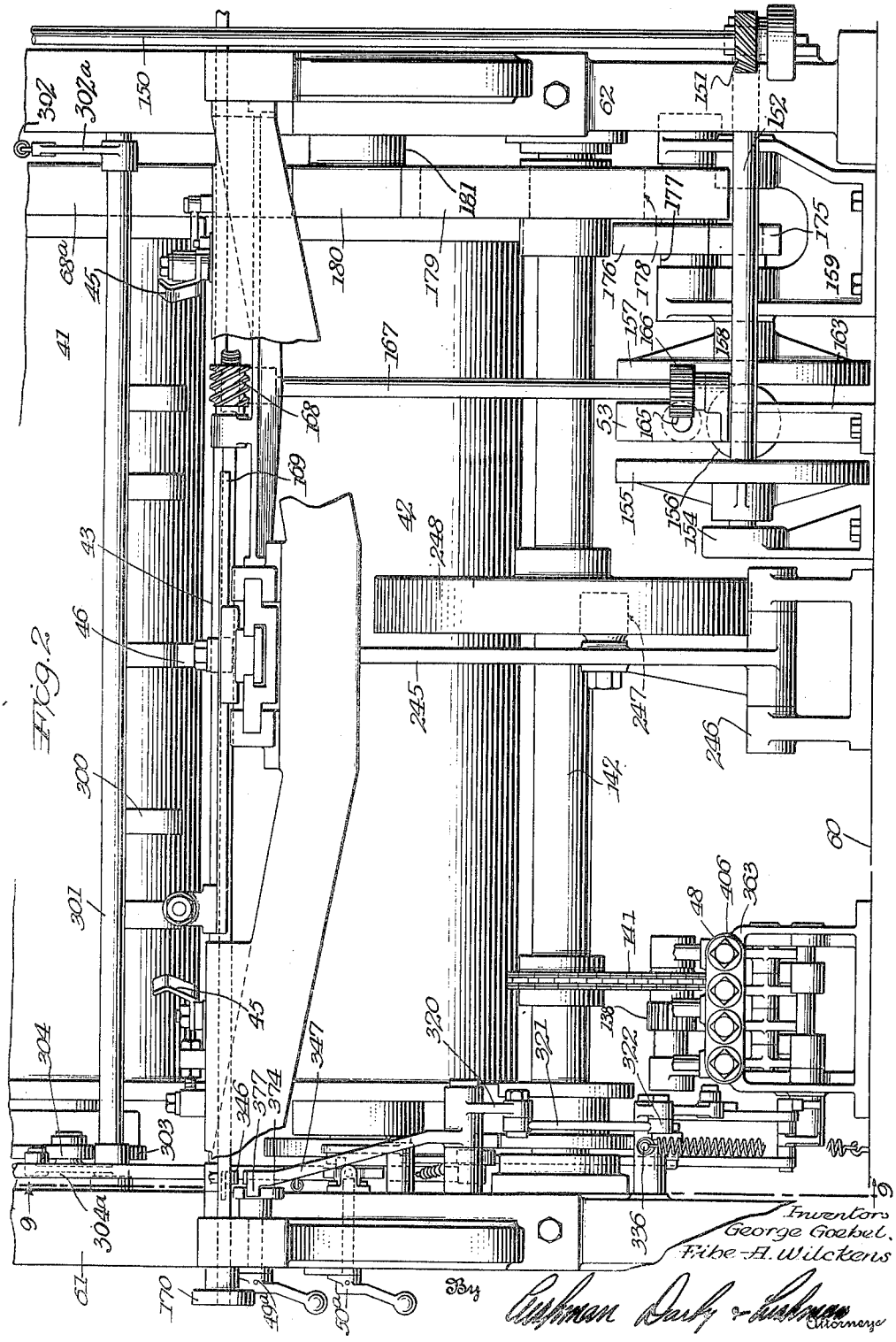


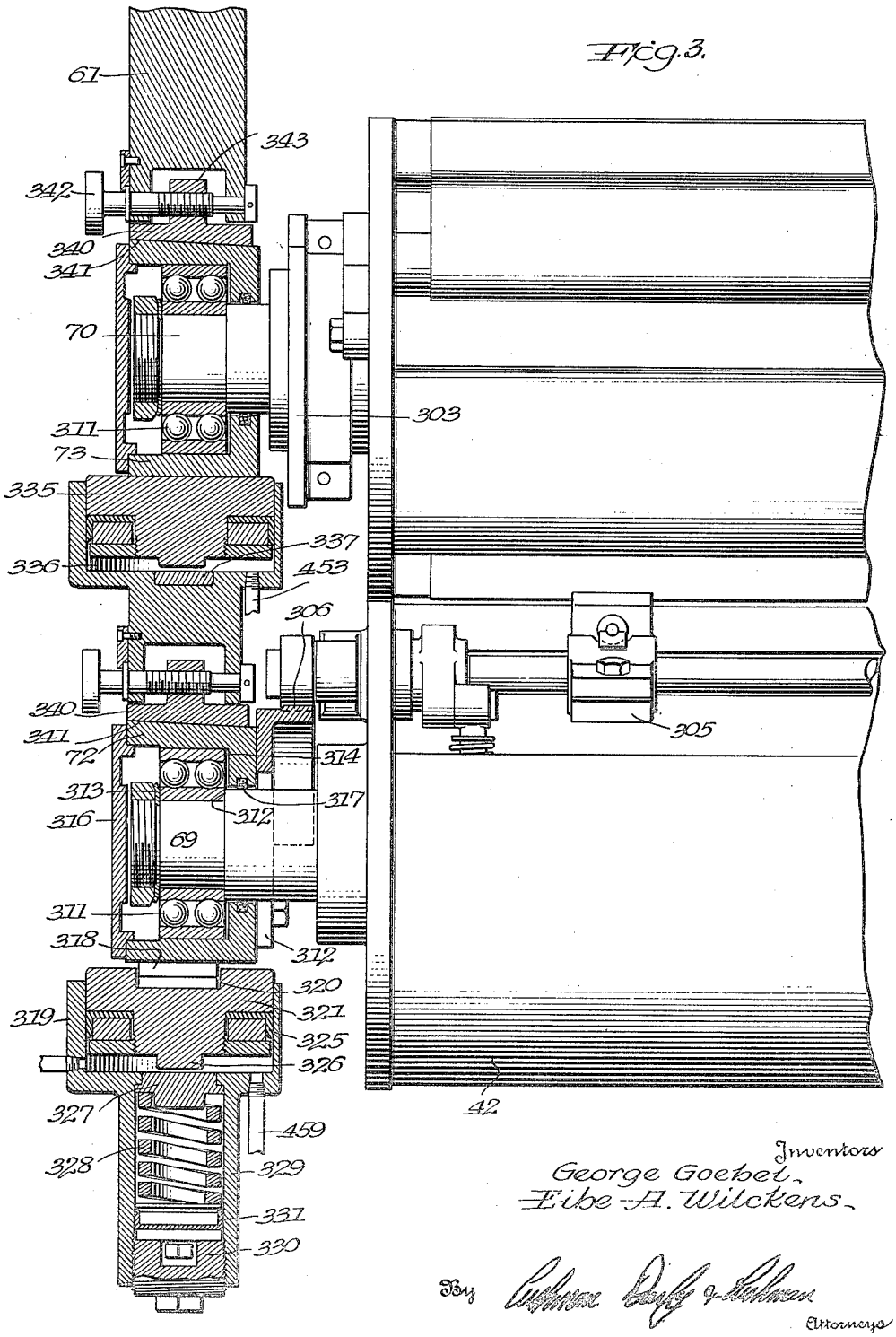
Fig. 2

June 25, 1940. G. GOEBEL ET AL 2,205,720

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Fig. 3.



Inventors
George Goebel.
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By Attorneys

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Fig. 4.

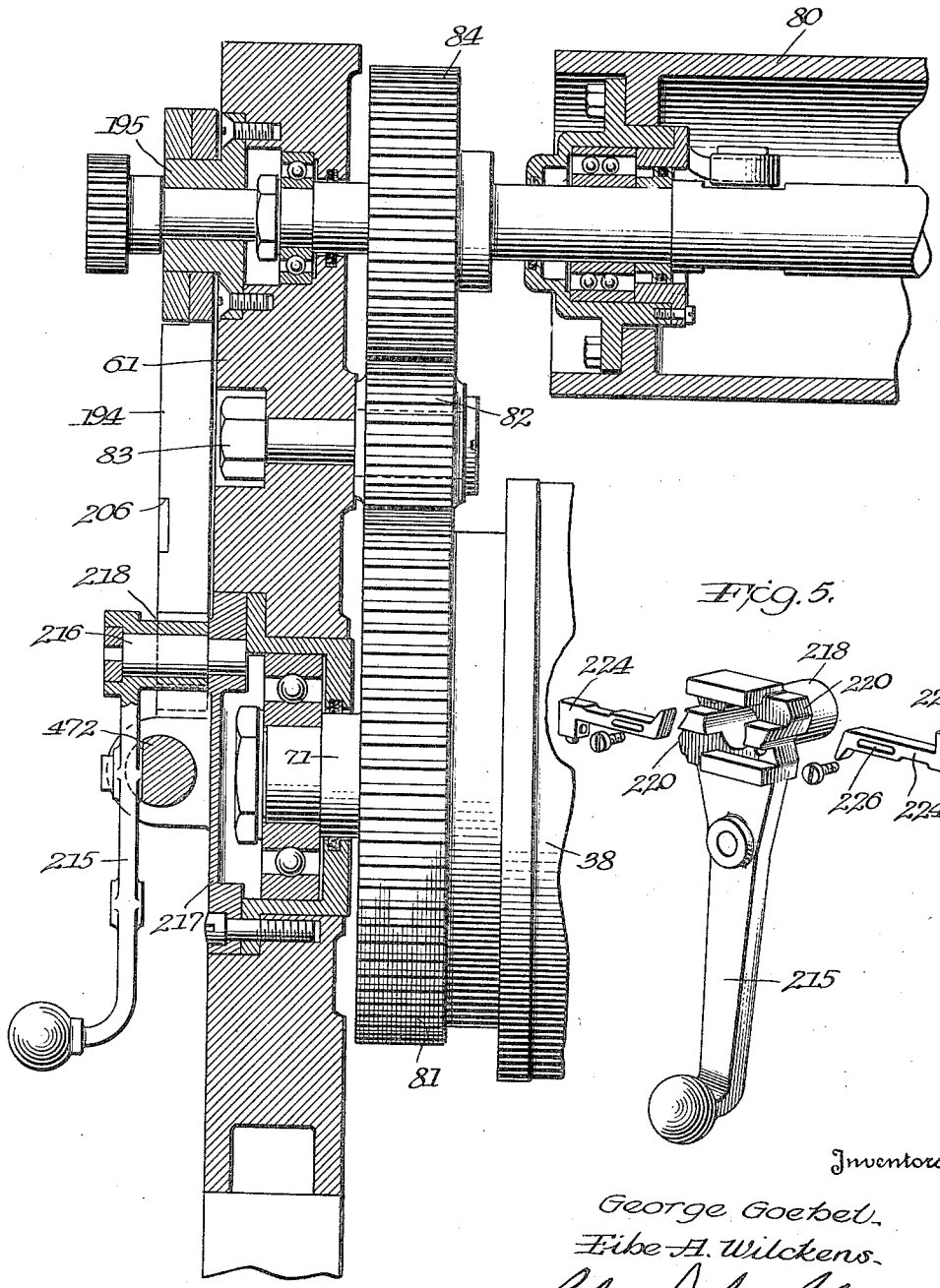


Fig. 5.

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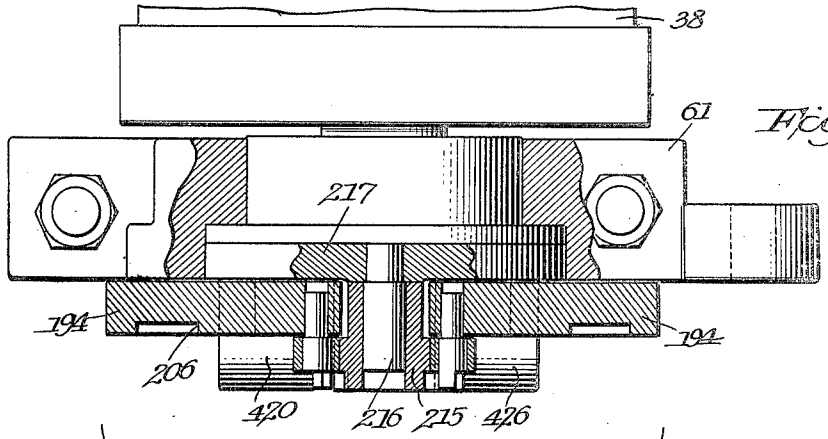


Fig. 6.

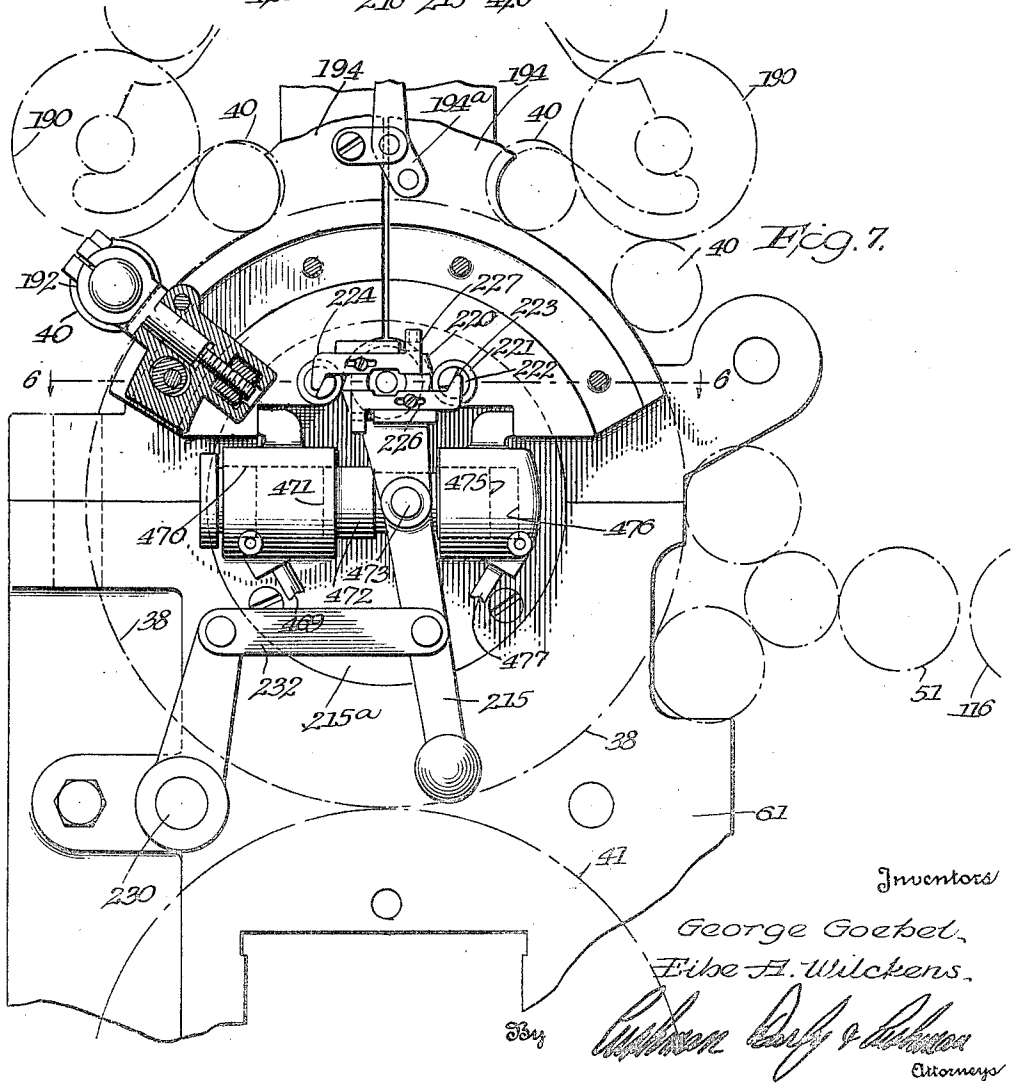


Fig. 7.

Inventors
George Goebel,
Fibe H. Wilckens.
By Watson Cole Grindle & Watson
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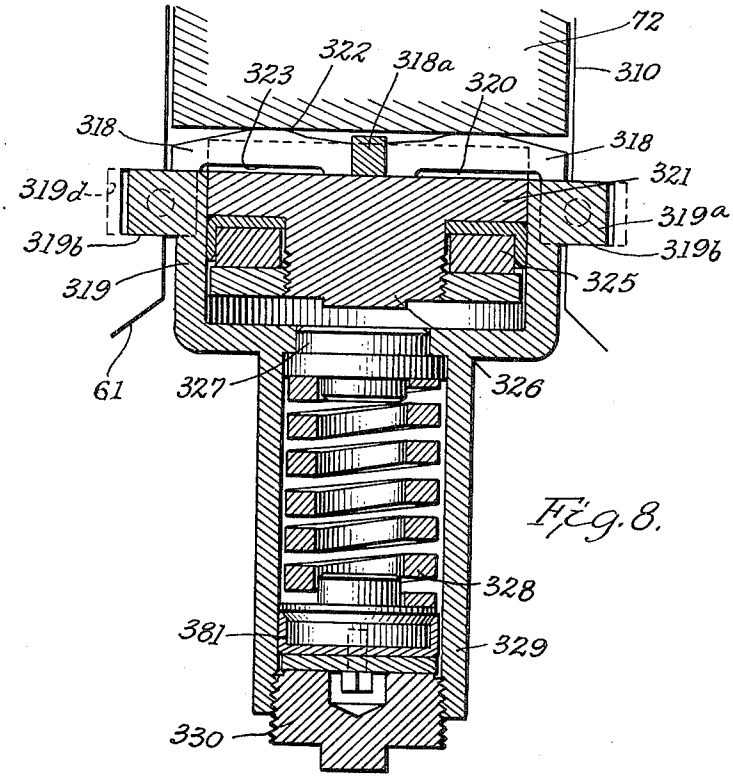


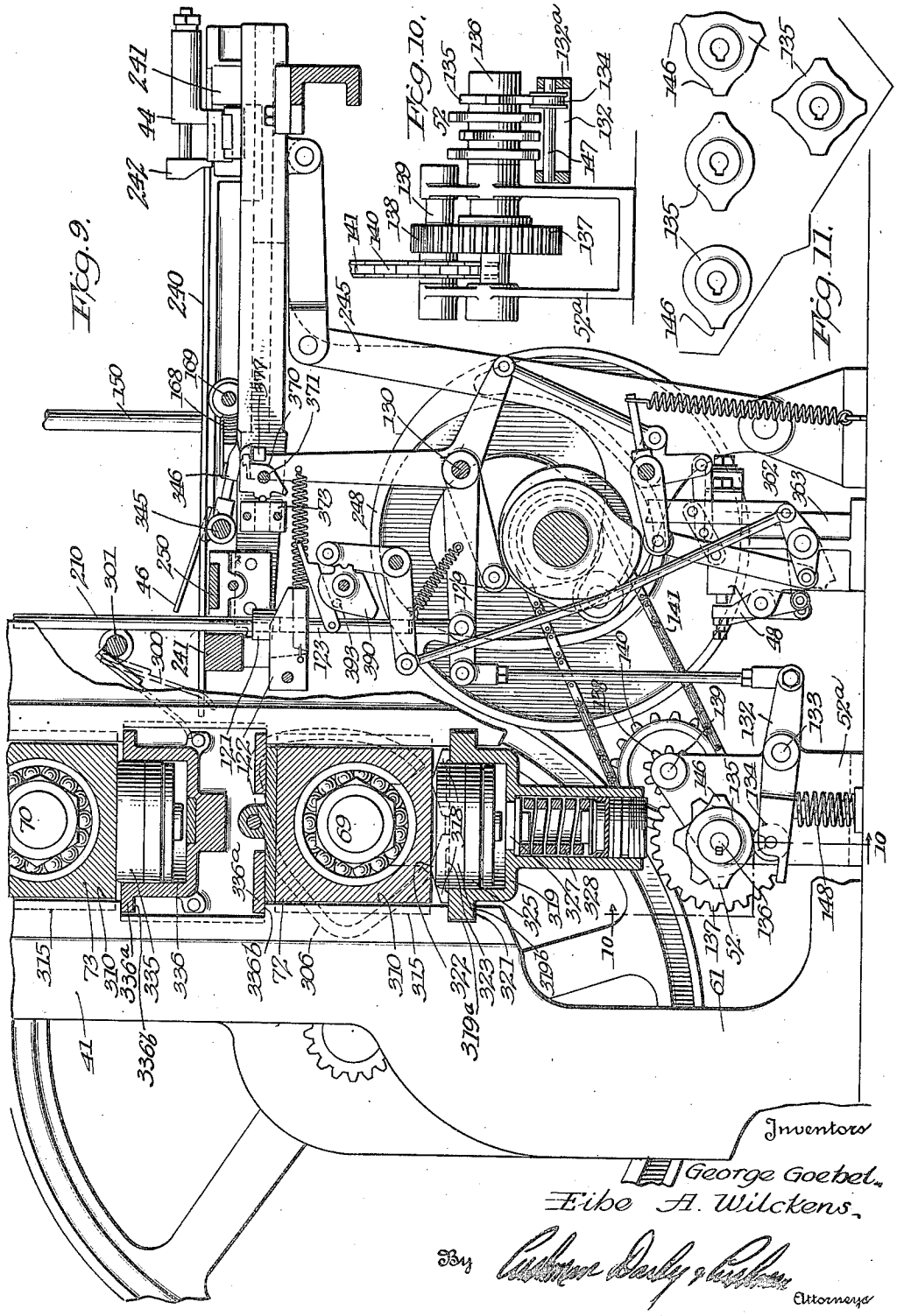
Fig. 8.

Inventors,
George Goebel
Eibe A. Wilckens,
By,
Cushman, Darby & Cushman
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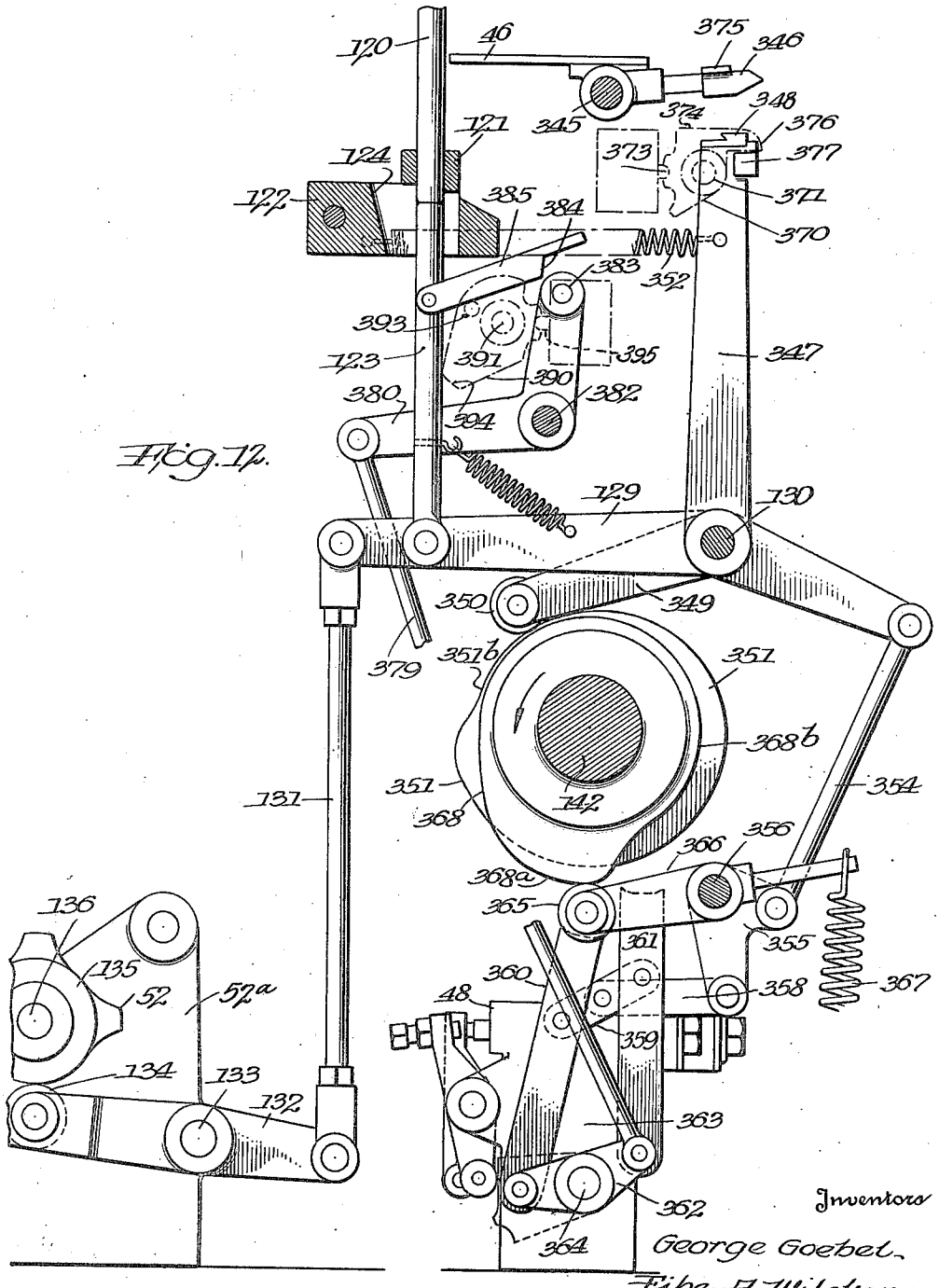


June 25, 1940. G. GOEBEL ET AL 2,205,720

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Fig. 12.



Inventors
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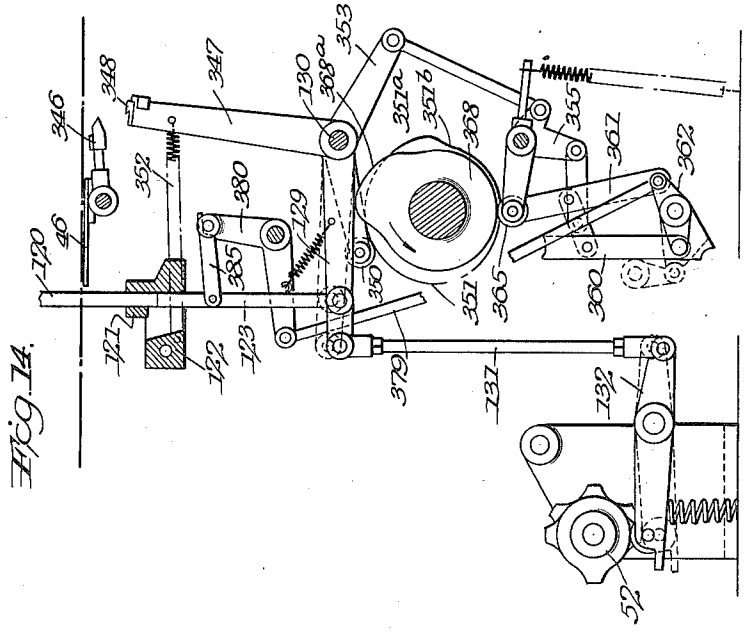


Fig. 14.

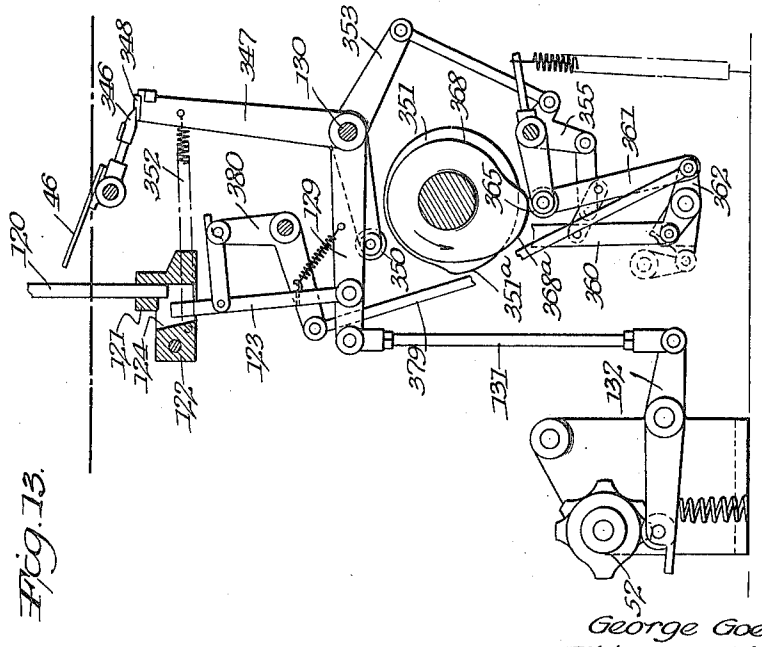


Fig. 13.

Inventors'
George Goebel.
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By Wilkinson Dorsey & Wilkinson

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Fig. 15.

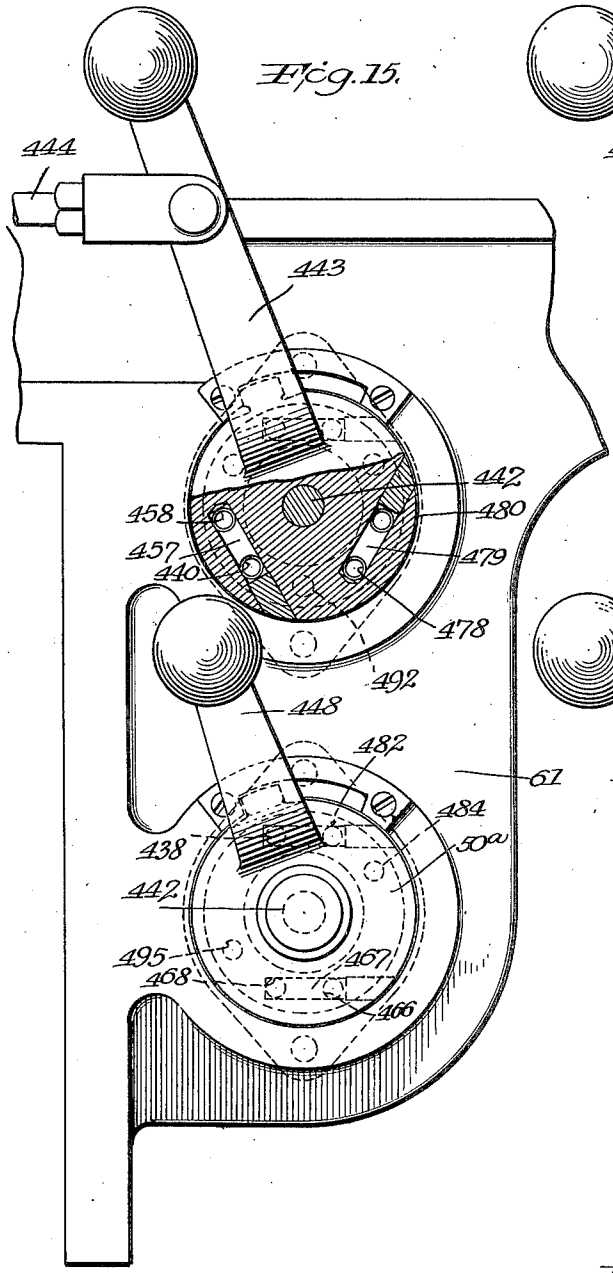
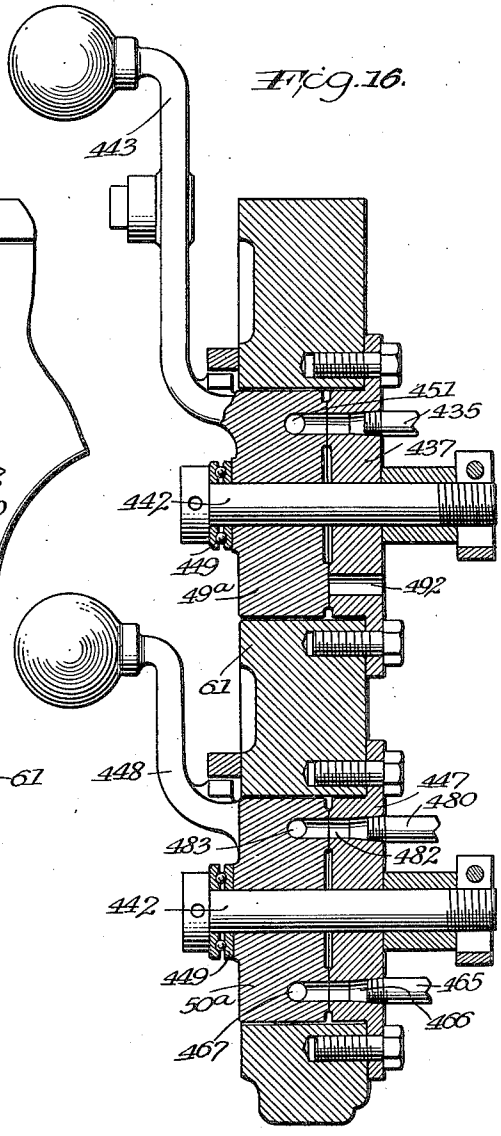


Fig. 16.



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June 25, 1940. G. GOEBEL ET AL 2,205,720

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Fig. 17.

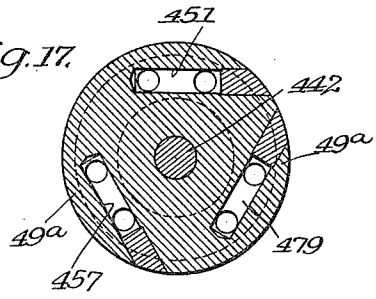


Fig. 18.

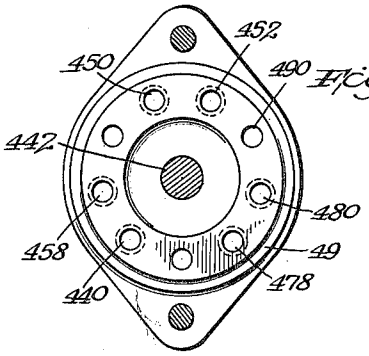


Fig. 19.

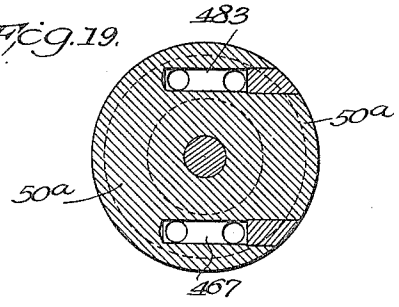


Fig. 20.

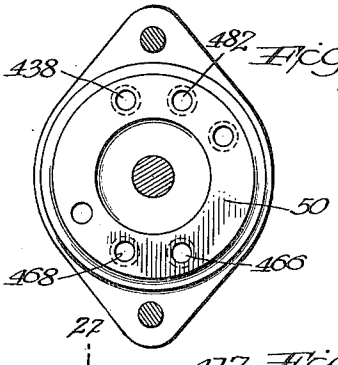


Fig. 22.

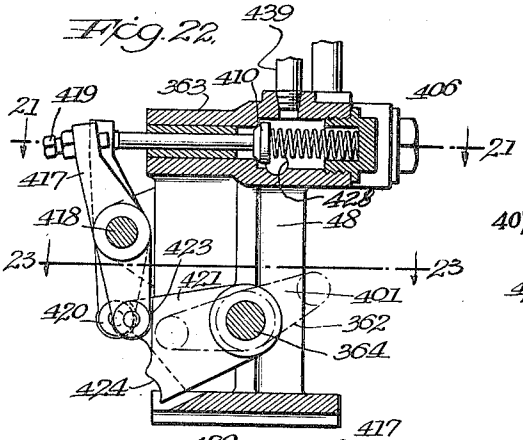


Fig. 21.

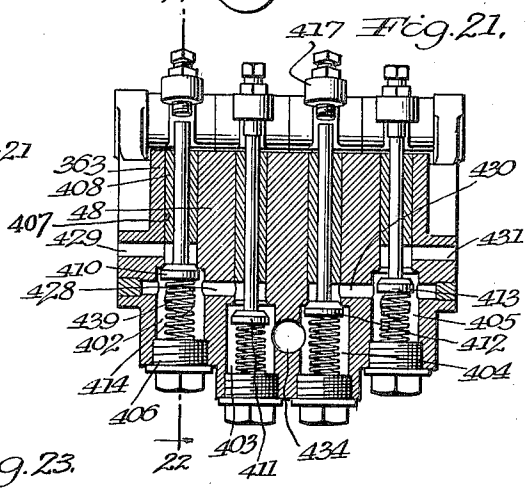
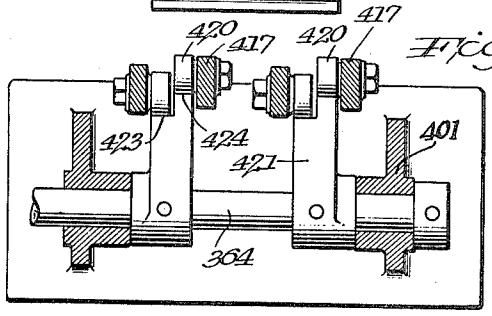


Fig. 23.



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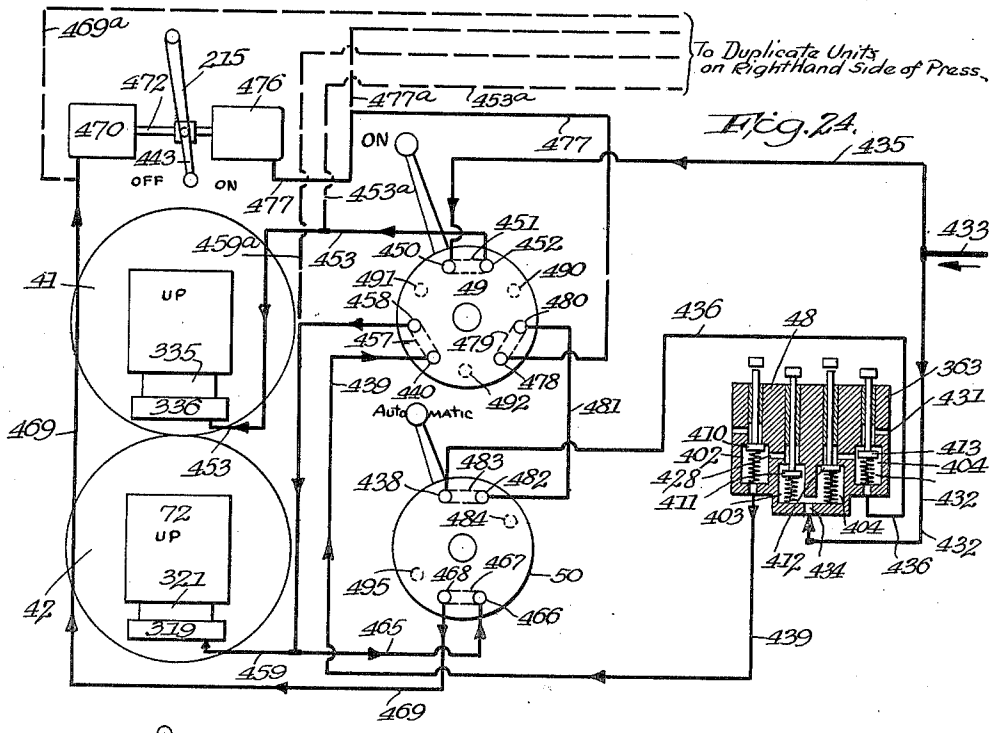


Fig. 24.

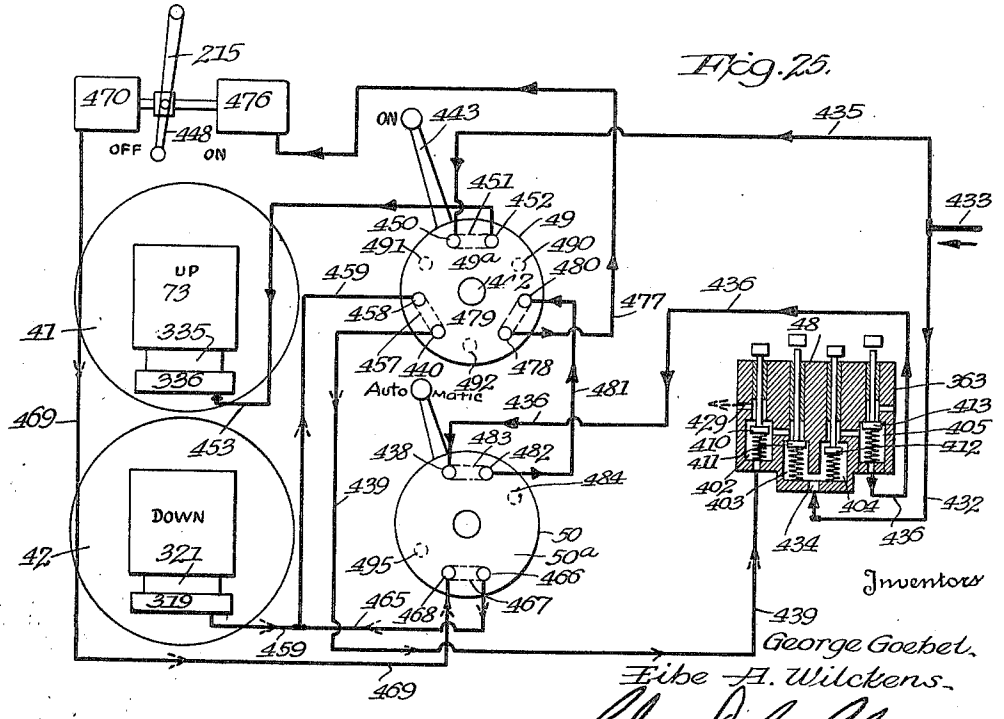


Fig. 25.

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June 25, 1940. G. GOEBEL ET AL 2,205,720

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Fig. 76.

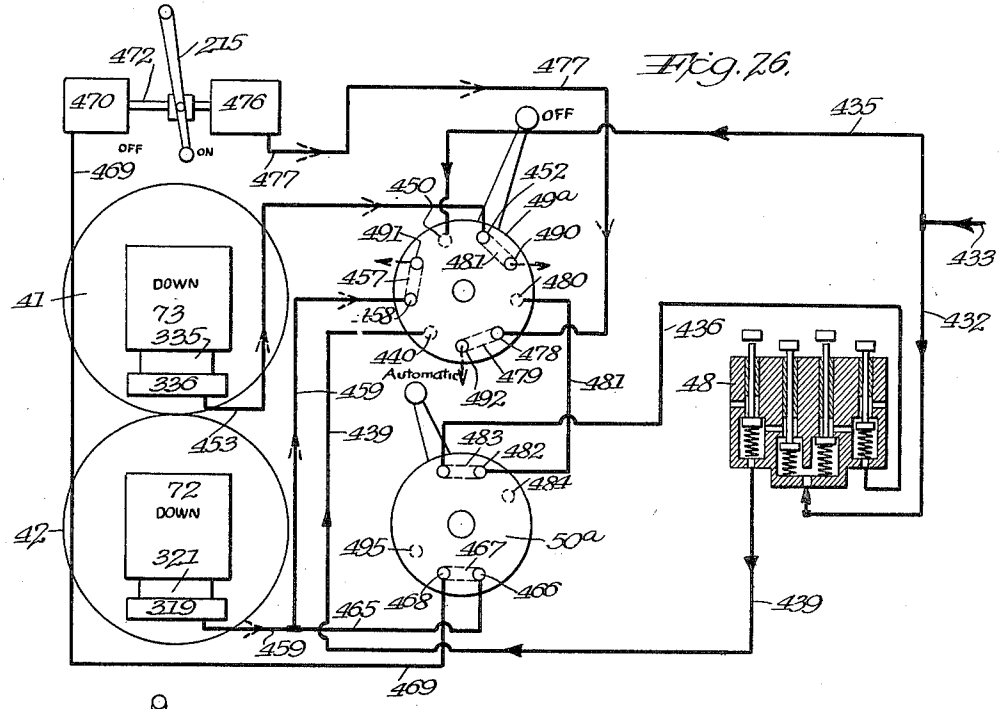
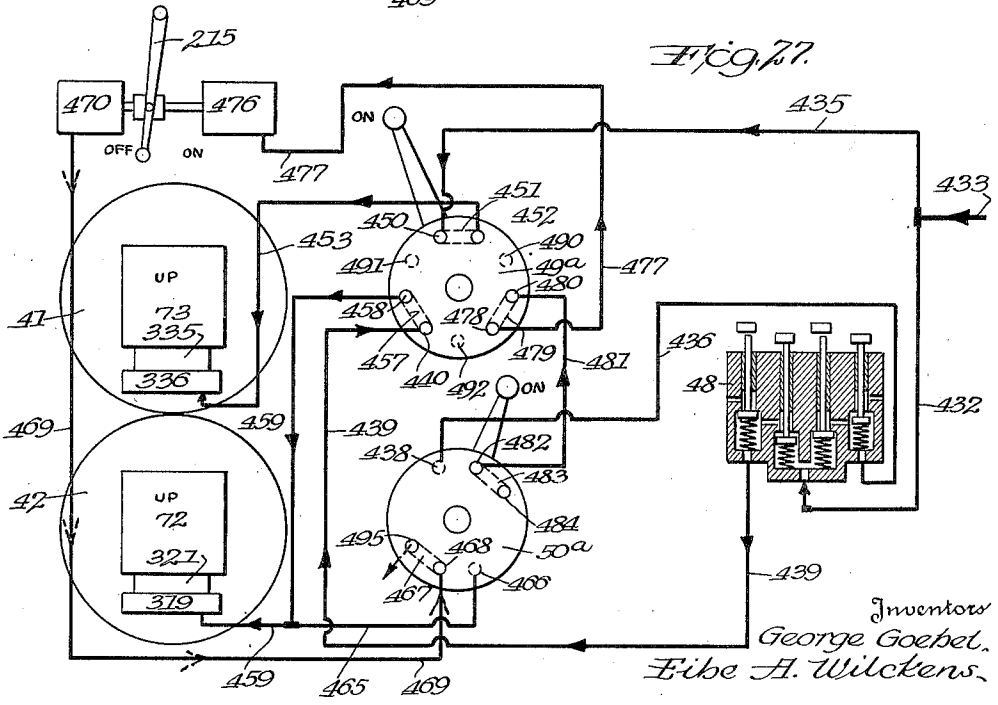


Fig. 77.



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Patented June 25, 1940

2,205,720

UNITED STATES PATENT OFFICE

2,205,720

PRINTING PRESS

George Goebel and Eibe A. Wilckens, Baltimore, Md., assignors to Crown Cork & Seal Company, Inc., Baltimore, Md., a corporation of New York

Application October 1, 1936, Serial No. 103,592

32 Claims. (Cl. 101—247)

The present invention relates to a press and, more particularly, to a lithographing press.

An important object of the invention is to provide a press which will be capable of high speed production of uniformly printed sheets, all of the mechanisms of the press being so designed that sheets to be printed or lithographed will be properly fed between the cylinders and the cylinders maintained in proper position for efficient printing action.

A further important object of the invention is to provide a press wherein the press cylinders are held in printing position by fluid pressure.

Printing or lithographing presses of the rotary cylinder type, that is, presses including a plate cylinder, transfer cylinder and impression cylinder, are ordinarily provided with means for supporting the transfer and impression cylinders which are of such arangement that these two cylinders may be separated from the plate cylinder and from each other for inking operations or other operations preliminary to running. The supporting means is also ordinarily designed to permit the impression cylinder to drop away from the transfer cylinder in the event no sheet is presented for printing at the proper moment. The latter arrangement prevents the transfer cylinder from printing upon the surface of the impression cylinder, as would be the case if the two cylinders were to remain in their ordinary relation when no sheet has been presented between them. It is also usual to have the same mechanism move the ink form rolls from the plate cylinder and interrupt the dampening mechanism when no sheet is presented for printing.

Heretofore, the means for supporting the transfer and impression cylinders and for permitting the impression cylinder to drop from the transfer cylinder when no sheet is presented for printing has comprised a trip mechanism formed entirely of mechanical elements. Such a mechanism must necessarily comprise extremely heavy elements since the cylinders of the press ordinarily weigh some hundreds of pounds and considerable leverage must be exerted to quickly raise the impression cylinder after it has once been dropped due to the absence of a sheet, and in time to have it in printing position on the next printing cycle should a sheet then be present for movement between the cylinders of the printing couple. A further disadvantage of the mechanical arrangement ordinarily used to support the cylinders results from the fact that they must be frequently adjusted during the course of a day's work. When a press is first started in the morning, all of the metal elements thereof are either cold or merely at room temperature. Assuming that the press is then adjusted so that the cylinders will be properly spaced with regard to each other, it will be necessary to again adjust the cylinders after the press has been operated for a short time, due to the heating and resultant expansion of the elements which takes place during operation. Obviously, each time that the press remains idle for a short time and the various metal parts become cold and contract, a re-adjustment must be made, requiring stopping of the press. Also, a number of poorly printed sheets are usually produced before the necessity of adjustment is noted, and test sheets are wasted during the making of the adjustment.

The present invention includes a mechanism for supporting the transfer and impression cylinders by fluid pressure, preferably a compressible gaseous fluid such as air, this arrangement obviating all of the difficulties discussed above. More particularly, the use of air pressure to hold the cylinders in printing position eliminates all of the heavy mechanical elements heretofore used to support and lift the cylinders. It has been found that the use of compressed air for this purpose, with the construction included in the present invention enables the impression cylinder to be quickly lifted for printing an entering sheet after it has been dropped because of the absence of a sheet. The use of compressed air also entirely eliminates the necessity of frequent adjustment of the cylinders to proper printing position because most of the heavy mechanical elements ordinarily subject to change in length by reason of temperature changes, are entirely eliminated. For that reason, the press of the present invention may be adjusted to place the printing cylinders in the desired position and they will remain in that position regardless of continuous or intermittent operation of the press. A further advantage resulting from the use of air is obtained by reason of the fact that the press cylinders may move apart by reason of the compressibility of the air should a foreign object or a number of superimposed sheets move between them, this separating movement obviating damage to the press from that source.

Another important object of the invention ancillary to the above, is the provision of a valve mechanism for controlling the flow of air to the pressure chambers which support the printing couple. Still another object of the invention is to provide a trip mechanism for controlling the

position of the flow control valves according to whether or not a sheet is present for movement through the printing couple at the proper moment.

Other objects and advantages of the invention will be apparent from the following specification and drawings wherein,

Figure 1 is a side elevation of the press;

Figure 2 is a rear view of the lower portion of the press;

Figure 3 is a central vertical sectional view through the journals of the transfer and impression cylinders;

Figure 4 is a vertical sectional view through the left hand journals of the plate cylinder and ink cylinder;

Figure 5 is a disembodied perspective view of the locking and operating means for the ink form roll hangers;

Figure 6 is a horizontal sectional view through the left hand side frame taken on the line 6—6 of Figure 7;

Figure 7 is an end elevation of the ink form roll throw-out mechanism;

Figure 8 is a vertical sectional view of the supporting mechanism for the impression cylinder journal;

Figure 9 is a longitudinal vertical sectional view taken on the line 9—9 of Figure 2;

Figure 10 is a detail sectional view on the line 10—10 of Figure 9 showing the dampening roll cam mechanism;

Figure 11 shows the cams of the dampening roll cam mechanism;

Figure 12 is a vertical sectional view on an enlarged scale showing the sheet trip means forming part of the mechanism for controlling the position of the press cylinders and ink form rolls;

Figures 13 and 14 are views similar to Figure 12 showing the sheet trip means in different positions;

Figure 15 is an elevation, partly in vertical section, showing the manual valves included in the flow circuits of the press cylinder supporting and ink form roll operating mechanism;

Figure 16 is a vertical sectional view through the axes of the valves shown in Figure 15;

Figure 17 is a sectional view of the manual "Impression" valve disc shown in Figures 15 and 16;

Figure 18 is a front elevation of the seat on which the valve disc of Figure 17 operates;

Figure 19 is a sectional view of the manual "Ink" valve disc shown in Figures 15 and 16;

Figure 20 is a front elevation of the seat on which the valve disc of Figure 19 operates;

Figure 21 is a horizontal sectional view of the automatic valve mechanism taken on the line 21—21 of Figure 22;

Figure 22 is a vertical sectional view taken on the line 22—22 of Figure 21;

Figure 23 is a horizontal sectional view taken on the line 23—23 of Figure 22;

Figure 24 is a diagrammatic view showing the fluid flow circuits of the press cylinder supporting and ink form roll operating mechanism; and

Figures 25 to 27 are views similar to Figure 24 showing the valves of the fluid flow circuits in various operating positions.

Summary of construction and operation

The construction and operation of the press may be generally described as follows:

Referring to Figure 1, the numeral 38 indicates the upper or plate cylinder of the press which receives ink from the ink form rollers generally designated by the numeral 40. Beneath the plate cylinder there is provided the intermediate or transfer cylinder 41 which is provided with a transfer blanket to receive the impression from the plate cylinder 38 and print it upon a sheet S as the latter passes through the printing couple formed by the transfer cylinder 41 and the lower or impression cylinder 42. The sheet to be printed upon is fed from the feed table 43 by a pusher bar 44, the sheet being properly positioned with respect to the printing couple by a gauging mechanism generally indicated by the numeral 45. In the normal operation of the press, at a predetermined moment in each rotary movement of the cylinders, a sheet to be printed or lithographed should be positioned on the feed table 43. If the sheet is so positioned, it will force a trip finger 46 downwardly and the sheet trip mechanism 47 will thereby operate in the normal manner to maintain an automatic valve mechanism 48 (Figure 9) controlling fluid flow circuits in such position that the fluid-pressure in such circuits will support or hold the impression cylinder 42 upwardly in contact with the transfer cylinder 41. However, assuming that a pair of manual valves 49 and 50 also included in the fluid flow circuits are in their normal position for the running of the press, should no sheet be on the feed table at the proper moment, the trip finger 46 will remain in the upward position shown in Figure 1, with the result that the operation of the trip mechanism 47 will be varied and the automatic valve mechanism 48 will be actuated to so change the fluid pressure flow that impression cylinder 42 will drop out of contact with the transfer cylinder 41, thereby preventing the transfer cylinder from printing upon the impression cylinder, as it would do if the two cylinders were left in normal position with no sheet passing between them.

Actuation of manual valve 49, the "impression" valve, to "off" position, will permit the ink form rolls 40 to be manually moved either into or out of contact with the plate cylinder 38, and will cause the impression cylinder 42 and the transfer cylinder 41 to drop with respect to the plate cylinder 38, the impression cylinder dropping a greater distance than the transfer cylinder, thereby avoiding contact with the transfer cylinder, all regardless of whether sheets are passed through the printing couple. Actuation of manual valve 50, the "ink" valve, to "on" position will permit the ink form roll throw-out mechanism to be manually operated regardless of whether sheets are passed through the printing couple.

The roll dampening mechanism of the press includes an oscillating ductor roll 51, the frequency of the oscillations of the ductor roll being adjustable through a tappet mechanism 52. The speed of rotation of the fountain roll of the dampening mechanism is controlled through a variable frictional gear drive 53 shown in Figure 2.

Press cylinder drive

In the following description of the press, the front is regarded as the feed table end and the rear is regarded as the side from which printed sheets emerge.

The press includes a base 60 having side plates extending upwardly therefrom, the left hand side plate being designated 61 and the right hand side

plate being designated by the numeral 62. Power is provided from a motor 63 which acts through a belt or the like 64 to drive a large pulley 65 fixed to a shaft 66 journalled in the right hand side plate 62. At its inner end, the shaft 66 is provided with a relatively small herringbone gear 67 which meshes with a herringbone gear 68 fixed to the right-hand end of the shaft 69 which carries the impression cylinder 42. The shafts 70 and 71 of the transfer cylinder 41 and the plate cylinder 38, respectively, are likewise provided with herringbone gears 68a and 68b, through which these cylinders are driven from the herringbone gear 68. The plate cylinder 38 is journalled in the upper portion of the side plates of the press and has no vertical movement but the shafts 69 and 70 of the impression and transfer cylinders, respectively, are journalled in boxes 72 and 73, respectively, vertically movable in the side plates of the press through a mechanism hereinafter described.

The ink cylinder 80 and the form rollers associated therewith are driven (Figure 4) from a drive gear 81 provided on the shaft 71 of the plate cylinder 38, the gear 81 meshing with a small pinion 82 journaled on a stud 83, pinion 82 driving a pinion 84 fixed to the shaft 85 carrying the ink cylinder 80. The above mechanism is provided within the left hand side plate 61 of the press. The ink cylinder 80 and the distributor and form rolls are reciprocated axially of the plate cylinder 38 by suitable means.

The dampening mechanism 115 (Figure 1) of the present press is of the usual construction and includes the ductor roll 51 which transfers water from the fountain roll 116 to a form roller 117 which in turn places the water upon a pair of dampening or water rolls 118. The mechanism for oscillating the water ductor roll 51 comprises an arm at each end of the press, the arm at the left-hand end being in the form of a bell crank 119, one arm of which supports the adjacent end of the roll shaft and the other arm of which has a rod 120 extending downwardly therefrom, the lower end of the rod being guided in a sleeve 121 (Figures 9 and 12) formed integrally with a bracket 122 fixed to the side frame 61 of the press. The lower end of rod 120 bears on the upper end of a rod 123 having its upper portion guided in a slot 124 in bracket 122 for a purpose hereinafter set forth. The lower end of rod 123 is connected to a bar 129 pivoted on a stud 130 fixed to the side frame 61. The rod 123 is preferably connected to the bar 129 adjacent the free end of the latter, the free end of the bar being joined by a link 131 to a rocker arm 132 pivoted on a stud 133 fixed to a bracket 52a within the side frame 61. The opposite end of the rocker arm 132 is provided with a roller 134 adapted to contact with a cam mechanism 52 comprised of a plurality of cam rings 135 axially spaced upon and fixed to a shaft 136 journaled in bracket 52a. The shaft 136 is driven by means of a pinion 137 (Figure 9) fixed to its inner end and which meshes with a smaller pinion 138 on a shaft 139, shaft 139 having a sprocket 140 fixed thereto which is driven through a chain 141 from a sprocket provided on a sheet trip cam shaft 142, the drive of which will be hereinafter described.

Four of the cam rings 135 are preferably provided upon sheet 136, as shown in Figures 10 and 11. As shown in Figure 11, one of the cams is provided with one rise 146, the next one may be provided with two rises arranged diametrically opposite, and the third and fourth rings 135 may be provided with three and four rises, respectively, equidistantly spaced about the rings. Figure 10 illustrates how the roller 134 is mounted on a pin 147 mounted in spaced arms at the free end of arm 132. Roller 134 is flanged and by sliding this roller upon the pin 147, it may be positioned opposite the desired cam ring 135, being held in that position by its flanges. This selective positioning of the roller 134 will control the number of rocking motions which may be given the ductor roll 51 through the rocker arm and rods 120 and 123 upon each rotation of the press cylinders. The roller 134 is held in contact with the cam mechanism 52 by a spring 148 positioned between the free end of rocker arm 132 and the press base.

A readily adjustable mechanism for varying the amount of water transmitted to the plate cylinder is thus provided.

The amount of moisture placed upon the plate cylinder may be further regulated by varying the speed of rotation of the water fountain roll 116. This roll is driven through a shaft 150 (Figs. 1 and 2), the shaft being geared to the roller through any suitable gearing, not shown. The lower end of shaft 150 is provided with a worm wheel 151 meshing with a worm on a horizontally extending shaft 152 as shown in Figure 2 journaled in the right hand side frame 62 and in a standard 154. Near its inner end the shaft 152 has a relatively large friction disc 155 fixed thereto with which a friction driving roller 156 is adapted to engage, the roller 156 being arranged with its axis at right angles to the axis of the disc 155 and also engaging a driving disc 157 fixed to a shaft 158 journaled in standards 159 to extend parallel to shaft 152.

It will be apparent that when power is supplied to shaft 158, roller 156 will be rotated causing the driven disc 155 to be likewise rotated and thereby rotating, through shafts 152 and 150, the water fountain roll 116.

It will be obvious that the position of the roller 156 with respect to the axes of the friction discs 157 and 155 may be varied and the speed of rotation of the water fountain roller 121 may thus be regulated to a very fine degree.

The driving friction disc 157 is rotated through a spur pinion 175 on its shaft 158 and which meshes with a larger spur pinion 176 on a shaft 177, the shaft 177 also carrying a smaller herring-bone pinion 178 which is driven by a large gear 179 on the sheet trip cam shaft 142, gear 179 being driven by a herring-bone pinion 180 on a stub shaft 181 carried in the side frame 62, pinion 180 also being in engagement with and driven by the herring-bone gear 68 on the impression cylinder shaft 69.

The ink form rolls 40 provided for the purpose of transferring from each large form roll 190 to the plate cylinder 38 are mounted in suitable brackets such as 192 in Figure 7. The brackets 192 are supported on hangers 194 (Figures 1, 4 and 7), a pair of which are swung from a collar 195 secured to each side frame of the press in alignment with the ink cylinder shaft 185.

When it is desired to perform any operation upon the plate cylinder preliminary to running of the press, it is desirable to have the ink form rolls 40 moved out of engagement with the plate cylinder. To obtain this action, the hangers 194 at each side of the press, being hung upon the sleeves 195 (Figure 4) may be swung apart at their lower ends. The hand operating means

for this purpose is best shown in Figures 6 and 7 and comprises a hand lever 215, one on each side of the press, each lever being mounted on a stud 216 fixed in a plate 217 overlying the corresponding end of the shaft 71 of the plate cylinder 38. Each lever 215 has a collar 218 formed integrally therewith which fits upon the pin 216, the collar 218 having its peripheral surface provided with two rises 220 which are adapted to act upon rollers 221 rotatably mounted on studs 222 fixed to the lower inner corners of the hangers 194. It will be apparent from this that swinging movement of the levers 215 will cause the rises 220 to force the rollers 221 apart, thereby swinging the hangers outwardly so that the ink form roll 40 will be out of contact with the plate cylinder 38. The ends of the studs 222 are partially cut away to provide inclined faces 223, as shown in Figures 5, 6 and 7, and the outer portion of the sleeve 218 is slotted to carry keepers 224 adapted to respectively engage the inclined faces 223 of the studs 222 to lock the hangers in inward position. The keepers 224 are adjustable with respect to the collar 218 to permit the keepers to draw the hangers tightly together, each keeper being provided with a guide slot 226 through which a machine screw extends and being movable by means of an adjusting bolt 227 in an offset extension at its inner end which bolt is adapted to bear upon a shoulder on the collar. A lock screw engages each bolt 227 to hold it in adjusted position.

The levers 215 at each side of the press are connected by a shaft 230 rotatable in the frames of the press, each end of the shaft having a lever 231 fixed thereto, the outer ends of these levers being joined to the throw-out levers 215 by links 232 so that operation of one lever will cause the other lever to be similarly actuated. As will be hereinafter described, the throw-out levers 215 are also arranged to be operated by fluid pressure to swing the hangers either inwardly or outwardly.

Separating movement of the hangers 194 will actuate a bell crank mechanism 194*a* (Figures 1 and 7) to throw out the driving pawl connection to the ink fountain 80*a* in well-known manner.

Referring to Figures 2 and 9, the feed table 43 is formed of longitudinally extending metal strips 240 fixed to longitudinally spaced and fixed cross members 241. At the front end of the feed table (the right-hand end of Figure 9) there is provided the sheet pusher device 44 which includes blocks 242 to engage the rear edge of a sheet after it has been deposited upon the feed table by a sheet feeder, the sheet pusher then moving the sheet to the printing couple. The sheet pusher mechanism 44 is reciprocated by a lever 245 (Figures 2 and 9) having its lower end pivoted in a trunnion 246 on the press base, the lever being provided with a roller 247 adjacent its lower end which engages a grooved cam 248 carried on the sheet trip cam shaft 142.

In order that the sheet will be properly positioned longitudinally of the press cylinders, and in order to assist the pusher mechanism 44 in moving the sheet toward or between the cylinders in a straight line and with its forward edge parallel to the axes of the press cylinders, a pair of sheet gauging or guiding elements 45 are provided on the feed table 43 adjacent the printing couple.

A plurality of depending stop fingers 300 (Figure 2) are spaced along a rod 301 journaled in the press side frames just above the gauge mechanism. The rod 301 is tended to a position to hold the fingers downwardly as shown in dotted lines in Figure 9 by a spring 302 (Figure 2) connected at one end to an arm 302*a* extending from rod 301 and at its other end to the press frame. A cam 303 (Figure 1) is provided on the shaft 70 of the transfer cylinder 41. An arm 303*a* pivoted at its lower end to the side frame 61 and connected at its upper end by a link to an upstanding arm 304*a* on rod 301 carries a roller 304 which engages cam 303. The cam 303 is so shaped as to swing the stop fingers upwardly at the proper moment in the usual manner.

As the sheet S is dropped upon the feed table 43 in advance of the pusher mechanism 44, the stop fingers will be tended by the spring 302 to the downward position shown in dotted lines in Figure 9 and the sheet will be brought to a momentary stop by contact of its forward edge with the stop fingers 300. Immediately thereafter, the blocks 242 of the pusher mechanism 44 will contact with the rear edge of the sheet to advance it, the sheet will be centered by the gauge members 45, the stop fingers 300 then raising sufficienty far by the action of cam 303 to permit the sheet to move beneath their curved lower ends. The stop fingers will thereby exert a slight downward pressure upon the sheet to properly guide it between the transfer cylinder 41 and the impression cylinder 42. The downward pressure of the stop fingers on the sheet also forces the forward edge of the sheet downwardly to the extent necessary to permit it to move beneath the grippers 305 on the impression cylinder. The grippers then descend and grip the sheet to draw it through the printing couple. The grippers 305 may be of any well known construction and are controlled by a cam 306 on the impression roll shaft in the usual manner.

The press cylinder supporting structure

Referring to Figures 3 and 9, the shafts 70 and 69 of the transfer cylinder 41 and impression cylinder 42, respectively, are supported in boxes 73 and 72, respectively, which are vertically movable in guide openings 310 in each side frame of the press.

Referring to Figure 3, the shaft 69 of the impression cylinder 42 carries an anti-friction bearing 311 at each of its ends and similar bearings are provided on the transfer cylinder shaft.

It will be noted that the anti-friction bearings 311 of both the shafts 69 and 70 are held securely on the shafts between shoulders 312 and clamped washers 313 and that space is left, as indicated at 314, between the inner edges of the anti-friction bearings and the inner walls of the boxes 72 and 73. This space is provided to permit the bearings to move to the right on the tendency of the cylinder herringbone gears to simultaneously shift the cylinders axially when tooth wear occurs. As shown in Figure 4, similar space is left for axial movement of the plate cylinder shaft 71. When herring-bone gears are used to drive a series of shafts only one of these shafts can be rigidly held in position sidewise and all the other shafts must be located by the herring-bone gears. In the present construction, the plate cylinder 38 is rigidly held by one bearing on the right hand side of the press and all of the other shafts provided with herring-bone gears.

Each box 72 is provided with inner lateral flanges 315 (Figure 9) and an outer cover plate 316 (Figure 3) which extends past its lateral

edges to retain the box in the guide opening 310. A suitable packing ring 317 is provided in the box about the shaft as shown in Figure 3. The lower face of the journal box 72 bears upon a pair of angled supporting members 318 having their outer ends resting upon the upper edges of a piston chamber 319 as best shown in Figure 8, the remainder of the length of each supporting member extending into a diametrical slot 320 in the upper face of a piston 321 within the chamber 319, with the inner ends of the supporting members spaced from each other by a block on shoulder 318a loose in the slot 320. The upper edges of the supporting members 318 are each provided with inclined surfaces extending upwardly from their ends to an apex 322 midway of the length of each member, and the lower surface of journal box 72 normally bears upon the apices 322 of these supporting members. The undersurface of the supporting members 318 are cut away intermediate their length as indicated at 323 with the result that the two members may have their inner ends dropped, by the lowering of the piston 321, without any portion of the supporting members coming into contact with the upper and inner edge of the wall of chamber 319. The apex of each member 318 and its under bearing surfaces and end surfaces are all slightly rounded so that it may not become jammed or seized in any position. It will be understood that the provision of the supporting members 318 between the undersurface of the journal box 72 and the upper surface of the piston 321 results in the exertion of leverage upon the journal box by rising movement of the piston 321.

Each piston 321 has a packing 325 surrounding the same and, on its lower face, is equipped with a boss 326 which, in the lowered position of the piston, bears upon a hard-metal plunger 327 supported upon a relatively strong spring 328 mounted in a spring chamber 329. The purpose of the boss 326 is to assure that the lower wall of the piston 321 will always be spaced from the bottom of the piston chamber 319 so that fluid pressure may act upon the underside of the piston. The spring 328 is provided to permit the piston 321, journal box 72, and the impression roll 42 to drop regardless of fluid pressure in the cylinder 319, in the event that a large object or a considerable number of superposed sheets should be moved between the cylinders 41 and 42, and to thereby prevent injury to the printing couple.

The spring 328 is sufficiently strong to support the impression cylinder 42 when fluid pressure beneath the piston 321 is released, when the boss 326 will contact with the upper surface of the plunger 327. Tension of the spring may be adjusted by rotation of a head 330 threaded in the lower end of chamber 329, a packing member 331 preferably being interposed between the lower end of the spring and the head 330 to prevent leakage of fluid pressure from the chamber.

The shaft 70 of the transfer cylinder 41 is supported in a journal box 73 which is identical with the journal box 72, but as shown in Figure 3 box 73 is supported directly upon a piston 335 movable in a piston chamber 336, which piston and chamber are identical with the chamber 319 except that the entire lower wall of chamber 336 is closed except for the fluid ports, no spring being provided beneath the piston 335, the boss 326 of piston 335 being adapted to contact with a hard metal wear-plate 337 seated in the lower wall of the chamber when the piston drops. The spring 328 associated with the impression cylinder 42 will naturally permit the latter cylinder to move downwardly if a large object passes through the printing couple, rendering it unnecessary to make any provision for movement of the transfer cylinder in such a contingency.

As best shown in Figures 8 and 9, the chambers 319 and 336 are provided with horizontally extending ribs 319a and 336a, respectively, which bear upon shoulders 319b and 336b formed by slots in the side frames 61 and 62. By this arrangement, the chambers may be slid into position in the side frames, their inward movement being stopped by transverse shoulders 319c and 336c (Figure 1) on the front edges of the ribs 319a and 336a, and the chambers being secured against outward movement by small plates such as 319d in Figure 8, bolted to the rear edge of the chambers and bearing on the inner surfaces of the side frames of the press.

As shown in Figure 3, the upward movement of each of the journal boxes 72 and 73 is limited by a wedge 340 provided in the side frame above each box, the upper surfaces of the wedges being flat and the lower surfaces being inwardly and downwardly inclined to cooperate with outwardly and upwardly inclined upper surfaces 341 on the journal boxes. The wedges 340 may be moved inwardly or outwardly in the side frames of the press by operating screws 342 rotatable in apertures in the press frames, the screws 342 extending through bosses 343 on the upper surfaces of the wedges. It will be apparent that the position of the wedges with respect to the upper faces of the journal boxes may be adjusted as may be necessary to limit the upward movement of the boxes and therefore the press cylinders, or to regulate the position of the cylinders with respect to each other.

The sheet trip mechanism

In order to cause the impression cylinder to be dropped from the transfer cylinder in the event that a sheet is not presented upon the feed table at the proper moment, the mechanism hereinafter described is provided.

As best shown in Figures 2, 9 and 12, the sheet trip finger 46 is positioned substantially mid-way of the width of the feed table 43, the finger being fixed upon a shaft 345 extending to the left side frame of the press and having a latch 346 extending rearwardly therefrom within and adjacent the side frame 61. As best shown in Figure 12, a trip lever 347 pivoted on the shaft 130 is provided at its upper end with a detent 348 arranged to cooperate with the latch 346 in a manner hereinafter set forth. Trip lever 347 is bifurcated at the shaft 130, one arm 349 being provided with a roller 350 arranged to bear upon a trip lever cam 351 fixed to the main cam shaft 142. The trip lever 347 is urged to the left by a spring 352 having one end fixed to the upper end of the lever and the other end suitably connected to a fixed point on the press frame, so that the roller 350 is thereby held in close engagement with the cam 351. The other arm 353 of the trip lever has a link 354 pivotally connected to its outer end, the lower end of the link being pivotally connected to one arm of a bell crank 355 which bell crank is pivoted upon a rod 356. The other arm of the bell crank 355 is connected by a link 358 with a second link 359 at a point mid-way of the latter. The ends of the second link 359 are pivotally connected to pusher arms 360 and 361, respectively, extending upwardly

from the respective ends of a rocker arm 362, which rocker arm is pivoted intermediate its ends upon the housing 363 of automatic valve mechanism 48.

The upper ends of the pusher arms 360 and 361 are intended to receive a roller 365 carried at the outer end of a cam follower lever 366 pivoted on the rod 356 and having a spring 367 connected to its opposite end to draw that end downwardly and thereby hold the roller 365 in contact with a pusher arm cam 368 fixed to the cam shaft 142.

The operation of the structure described above is as follows: The trip finger 46 is normally held in the tilted position shown in Figure 9 by the weight of the latch 346 but will be moved to the horizontal position shown in Figure 12 when a sheet S upon the feed table is in position to bear upon the trip finger. At the moment that a sheet should be upon the feed table for delivery to the printing couple in the normal operation of the press, the upper end of trip lever 347 will be in the right hand position shown in Figure 14 by reason of the fact that the rise 351*a* of trip lever cam 351 will at that moment be beneath its arm 349. Arm 353 of the trip lever will therefore be in the position shown in Figure 14, bell crank 355 will be swung to the left and the pusher arms 360 and 361 will be swung to the left as shown in Figure 14. A sheet being present upon the trip finger 46, the finger will be in the position indicated in Figure 12 and the latch 346 will be up and out of the path of movement of the trip lever 347. Continued rotation of the trip lever cam 351 will bring its dwell 351*b* beneath the roller 350 of arm 349, with the result that the upper end of the trip lever 347 will swing to the left hand position shown in Figure 12. This swinging movement of the trip lever will draw the bell crank 355 from the position shown in Figure 14 to the position shown in Figure 12, pulling the link 358 to the right from the position shown in Figure 14 to that shown in Figure 12, thereby positioning the pusher arm 360 beneath the roller 365 on cam follower lever 366. Until this moment, the dwell 368*b* of pusher arm cam 368 has been opposite the roller 365 but immediately the trip lever 347 and bell crank 355 have been positioned as described above, the rise 368*a* of pusher arm cam 368 will move opposite the roller 365, forcing the roller and the cam follower lever 366 downwardly against the action of spring 367 so that the roller will be seated in the socketed upper end of pusher arm 360.

Although the pusher arms 360 and 361 have swung back and forth on their pivots on the rocker arm 362 during the foregoing action, the position of rocker arm 362 (with its right-hand or forward end up) has not been changed because the only downward pressure exerted by pusher arm cam 368 has been through pusher arm 360, connected to what was already the lower or left-hand end of the rocker arm.

In the event that no sheet is present upon the feed table 43 at the proper moment, that is, at the moment that trip lever 347 begins to swing to the left from the position shown in Figure 14, the trip finger 46 will remain in tilted position as shown in Figure 13. Because of this, when the trip lever 347 begins to swing to the left, its movement in that direction will be stopped at the position shown in Figure 13 by the engagement of detent 348 with latch 346. The roller 350 on trip lever 347 will thereby be held out of engagement with trip lever cam 351 and the pusher arm mechanism will be held toward the left (Figure 13) so that the pusher arm 361 will remain in the path of movement of cam follower roller 365. When the pusher arm cam 368 has rotated sufficiently far to bring its rise 368*a* against the roller 365, roller 365 will thereupon be moved downwardly into the socketed upper end of pusher arm 361, causing the rocker arm 362 to be swung in a clockwise direction to the position indicated in Figure 13, thereby changing the position of the automatic valve mechanism 48 in the manner hereinafter set forth to cause the impression cylinder 42 to drop and the ink form rollers 40 to move away from the plate cylinder.

On the next cycle of operation of the trip lever 347, this lever will be swung slightly to the right from the position shown in Figure 13 by reason of the fact that in the first stage of the cycle the rise 351*a* of trip lever cam 351 will come beneath the roller 350. The latch 346 of trip finger 46 will thus be momentarily released from the detent 348 and if a sheet is then placed upon the feed table 43, the trip finger will be depressed and its latch moved upwardly. As a result, the trip lever 347 will be free to swing to the left or in a counter-clockwise direction on its axis 130, drawing the pusher arm 360 to the left to the position shown in Figure 12. When the rise 368*a* of pusher arm cam 368 comes in contact with the cam follower roll 365, the pusher rod 360 will be pressed downwardly, causing the rocker arm 362 to be rotated in a counter-clockwise direction from the position shown in Figure 13 to that shown in Figure 12. Because of this, the position of the valves of valve mechanism 48 will be reversed as hereinafter described, with the result that the impression cylinder 42 will move up against the transfer cylinder and the form rolls 40 will return to contact with the plate roll.

It will be understood from the above that in the normal running of the press, with a sheet being positioned at each proper moment upon the trip finger 46, the trip lever 347 will cause the pusher arms 360 and 361 to be swung on their pivots on the rocker arm 362 and from the position shown in Figure 12 to that shown in Figure 14, and the reverse, but without changing the position of the rocker arm 362, any change in the position of the rocker arm depending upon which pusher arm is in alignment with the cam follower roller 365 when the rise 368*a* of cam 368 moves into contact with that roller.

In order to prevent the trip finger 46 from affecting the movement of trip lever 347 under certain circumstances, a manual control cam 370 (Figure 12) is arranged for rotation into the path of movement of these two elements, cam 370 being fixed to a stub shaft 371 journaled in the side frame 61 of the press and having an operating handle 372 fixed to its outer end, which handle is provided with a pointer to cooperate with a dial plate on the side plate of the press. A spring stop member 373 cooperates with indentations on one surface of the cam to hold the cam in adjusted position.

Cam 370 includes a flat surface 374 which, during the normal operation of the press, when operating handle 372 and the cam 370 are in intermediate position shown in Figures 1 and 9, is just below the lower end of the path of movement of a lateral extension 375 of latch 346, permitting the latch to swing downwardly far enough to engage detent 348 should no sheet be present upon the feed table 43 at the proper moment.

If it is desired to lock the trip finger 46 in down-

ward position so that it will lie flat upon the feed table 43 regardless of whether a sheet is positioned upon that table, the operating handle would be moved in a counter-clockwise direction (Figure 1), thereby swinging the outer end of the flat portion 374 of cam 370 upwardly and beneath the plate 375 on latch 346, holding the latch up and the trip finger 46 down. In this position, the trip lever 347 will move backwardly and forwardly without contacting with the latch.

In some instances, it is desirable to lock the trip lever 347 to the right so that it may not swing into contact with the latch 346. Such operation is obtained by turning the operating handle 372 to its limit position in a clockwise direction, at which time the outer end 376 of the cam 370 will contact with a lateral projection 377 on the trip lever 347, holding that lever in its extreme right hand position and so that its arm 349 cannot contact with the trip lever cam 351. With this setting, the trip lever 347 will not swing and therefore the valves of the automatic valve mechanism 46, if they were at the position shown in Figure 13, will not be changed from that position, or, if at their other position, will move to the position shown in Figure 13.

Dampening roll throw-out

The feed of dampening water to the plate cylinder 38 will also be discontinued by the action of the sheet trip mechanism resulting from the lack of a sheet on the feed table and the resultant clockwise swinging of rocker arm 362. This throw-out of the dampening roll 51 will be due to the fact that (as shown in Figure 12) the right hand end of rocker arm 362 has a link 379 connected thereto, the upper end of link 379 being joined to one arm of a bell crank 380 pivoted on a cross rod 382 extending beneath the feed table. The opposite arm of bell crank 380 has a pin 383 extending laterally therefrom upon which normally bears the notched end 384 of a trip 385 which trip is pivotally carried adjacent the upper end of the lower rod 123 included in the connection to the water ductor roll 51. When the rocker arm 362 is moved from the position shown in Figure 12 to that shown in Figure 13, and assuming that trip 385 is in the position shown in Figure 14, the bell crank 380 will be swung in a counter-clockwise direction, causing its pin 383 to press the trip 385 to swing the lower rod 123 to the left, as shown in Figure 13, thereby disrupting the operating connection from the water ductor operating cam 52 to the water ductor roll 51. The swinging movement of rod 123 to the left will be limited by the slot 124 in bracket 122 in which its upper end moves. The water ductor roll is so arranged that when the operating connection has been broken, it will fall rearwardly (to the left in Figure 1) against the water cylinder 117, holding the upper rod section 120 in downward position.

In order to permit the continuance of operation of the damping mechanism to be manually controlled, a cam 390 is provided adjacent the rod 123 as shown in Figure 12, cam 390 being fixed to a stub shaft 391 journaled in the side frame 61 of the press, the shaft 391 having an operating handle 392 fixed thereto as shown in Figure 1. Cam 390 is provided with a laterally projecting pin 393 and a rise 394. A spring latch member 395 is positioned adjacent one surface of the cam to engage notches therein to hold the cam in adjusted position. When the press is in normal operation, the operating handle 392 will be so positioned that a pointer provided thereon will be in alignment with a left-hand reading on a cooperating dial and the cam 390 will be so positioned that the water ductor roll will be normally operated but will be subject to discontinuance of operation because the latch 385 will be in the position shown in Figure 14 and in the path of movement of pin 383 on bell-crank 380. As described above, should no sheet be positioned on the sheet trip finger 46 at the proper moment, the pin 383 will exert pressure on latch 385 to swing rod 123 to the left to temporarily discontinue dampening water feed.

Movement of operating handle 392 in a clockwise direction (Figures 1 and 2) from normal position will cause the pin 393 on cam 390 to be moved upwardly and beneath the latch 385, moving the latch to the position shown in Figures 9 and 12, so that the latch 385 will be above the path of movement of the pin 383 on bell crank 380. With this arrangement, the feed of dampening water will not be interrupted, regardless of movement of the bell crank 380 and its pin 383.

Rotation of the cam 390 in a further clockwise direction from the above position will swing the rise 394 against the lower rod 123 of the ductor roll connection, moving this rod from beneath the upper rod 120 so that the drive to the ductor roll 51 will be entirely discontinued.

The flow circuits of the trip mechanism

The automatic valve mechanism 48 for controlling the position of the press cylinders with respect to each other is best shown in Figures 2, 9, 12 and 22 to 23.

The valve mechanism 48 includes the housing 363 carried on a standard 401 fixed to the press frame adjacent the left side frame 61. As shown in Figure 21, the housing 363 is provided with four valve chambers 402, 403, 404 and 405 closed at their forward or outer ends by caps 406 and each cylinder having a bore 407 extending inwardly therefrom in which a valve stem of a tappet valve for that chamber may move, the stem of the valve preferably being guided in the bore by a sleeve 408. The valves of the cylinders 402 to 405 are respectively designated by the numerals 410, 411, 412 and 413 and each valve is tended to its seat by a spring 414 positioned between the head of the valve and the inner surface of the corresponding valve chamber cap 406. The valves are adapted to be operated by tappets 417 freely mounted on a small shaft 418 fixed to the rear side of the standard 401, one of the tappets 417 being provided for each valve. The tappets are provided at their upper ends with adjusting set screws 419 to contact with the outer ends of the valve stems and the lower ends of the tappets carry rollers 420 arranged to bear upon cam sectors 421 fixed to the rock shaft 364 which carries the rocker arm 362, one cam being provided for each pair of tappets. Each cam sector includes a low portion 423 and a high portion 424, the high portions of the cams being indented as shown in Figure 22 so that the rollers 420 will be firmly engaged by the high portions of the cams.

As is shown in Figures 22 and 23, the four cam sectors 421 are so arranged with respect to each other that when the tappets of valves 410 and 412 have low portions 423 of their corresponding cam sectors opposite them, permitting these valves to close, high portions 424 of the other two cam sectors will be opposite the tappets of the valves 411 and 413, holding these two valves open.

The reverse will be true when rockshaft 364 is rocked to its opposite position through the movement of rocker arm 362 by the sheet trip mechanism in the manner hereinbefore described.

When valve 411 is open, valve chamber 403 will communicate with valve chamber 402 through a port 428. When valve 410 is open, the corresponding valve chamber 402 will be placed in communication with the atmosphere through a port 429. Valve chamber 404 communicates with the adjacent outer valve chamber 405 through a port 430 when valve 412 is open, and when valve 413 is open, valve chamber 405 will be placed in communication with the atmosphere through a port 431.

Compressed air is supplied to the housing 363 from a pump or other suitable source of pressure through a line 432 receiving flow from a supply main 433, line 432 opening to the upper portion of the housing through a port 434 communicating with the two central valve chambers 403 and 404.

The automatic valve mechanism 48 communicates with the various pressure chambers of the press through manual valve mechanism 49 and 50, a flow line 436 extending from valve chamber 405 to the manual "ink" valve 50, the line 436 opening to the planar valve seat 437 of the valve through a port 438. A flow line 439 extends from valve chamber 402 to the manual "impression" valve 49, line 439 opening to the planar valve seat of valve 49 through a port 440.

The impression valve seat 437 carries a disc valve 49*a* rotatable upon a bolt 442 extending centrally through the valve seat, the valve disc being operated by means of a radially extending handle 443. The handle 443 is connected by a link 444 (Figure 1) to a lever 445 pivotally mounted on a pin 446 fixed in the rear portion of the side frame 61 of the press. By this arrangement, the manual impression valve 49 may be operated from various convenient points upon the press.

"Ink" valve disc 50*a* is also rotatable on a bolt 442 extending through its planar valve seat 447 and by means of a handle 448. The seats 437 and 446 are bolted in apertures in the side frame 61 as shown in Figure 16 and anti-friction rings 449 are provided between the outer ends of the bolts 442 and the outer faces of the valve discs in order that the discs may turn freely though held tightly clamped against their seats. The valve discs 49*a* and 50*a* are provided with a series of passages opening to their seat faces as indicated in Figures 17 and 19, respectively. The arrangement of these passages as well as the arrangement of the ports in the seats of the two valves will be described in connection with the operation of the valves set forth below.

Flow circuits—normal or "automatic" operation of press

In the normal operation of the press, it is desirable to have the flow passages in such communication with the source of pressure that both the transfer cylinder 41 and the impression cylinder 42 will be in upward position and the ink form rollers 40 will be in contact with the plate cylinder 38, but with the passages further so arranged that if a sheet is not presented on the feed table 43 at the proper moment, the automatic valve mechanism 48 will be actuated to cause the impression cylinder 42 to be dropped from the transfer cylinder 41 and the ink form rollers 40 moved from the plate cylinder 38. The arrangement of the manual valves 49 and 50 to attain this operation and the corresponding position of the various valves of the automatic valve mechanism 48 which will then be maintained so long as sheets are passing through the press at the proper time is illustrated in Figure 24.

Referring to Figure 24, it will be observed that the manual "impression" valve disc 49*a* is at "on" or at left hand position and that the "ink" valve disc 50*a* is at "automatic" or left hand position. At this time, so long as sheets are properly positioned on trip finger 43 of the feed table and the rocker arm 362 is therefore in the position shown in Figures 12 and 22, the cams 421 will be positioned as indicated in Figures 21 to 23, and as diagrammatically indicated in Figure 24, so that automatic valves 410 and 412 will be closed, while the other two automatic valves 411 and 413 will be opened. That is, the high points 424 of the cams 421 operating to valves 411 and 413 will be opposite the tappets of these two valves, while the cams controlling the other two valves will have their low points 423 opposite those valve tappets. With this arrangement, and with sheets properly arriving upon the feed table 43, air will flow to the automatic valve mechanism 48 from the supply main 433 directly through the line 435 to a port 450 in the seat of manual valve 49 and through a passage 451 in the disc 49*a* back to a port 452 leading to a line 453 communicating with the chamber 336 in which the piston 335 supporting the journal box 73 of transfer cylinder 41 is carried, thereby holding the transfer cylinder in upward position and against the plate cylinder 38.

At the same time, pressure will also flow from the supply main 433 and thence into the automatic valve housing 363 through line 432 and the port 434 which opens to the two central valve chambers 403 and 404. Since valve 411 is open and valve 412 is closed, pressure from the line 432 can only flow past the valve 411 and through the port 428 opening to valve chamber 402. Valve 410 being closed, this pressure will flow from that chamber through a line 439 to port 440 in the seat of manual impression valve 49. With disc valve 49*a* in the "on" position referred to, this pressure will flow through a passage 457 in valve 49*a* and through a port 458 in the valve seat to a line 459 which leads to the chamber 319 in which the piston 321 beneath the impression cylinder journal box 72 is carried, thereby holding the impression cylinder 42 in upward position and in contact with the transfer cylinder 41.

Pressure will also flow from the line 459 last referred to and through a branch line 465 to a port 466 in the valve seat of the "ink" valve 50 and through an aligned passage 467 in the ink disc valve 50*a*, through a port 468 in the valve seat and thence through a line 469 to a chamber 470 formed in a casting 215*a* (Figures 6 and 7) fixed to the press side frame 61 beneath the form roller hand operating lever 215 and in which chamber there is positioned a piston 471 of a plunger 472 to which the operating handle 215 is connected by a pin 473 carried intermediate the length of the plunger 472. The opposite end of the plunger 472 has a piston face 475 provided thereon which operates in a chamber 476 and also formed in casting 215*a* and with which a line 477 communicates. The opposite end of line 477 is connected to a port 478 in the valve seat of "impression" valve 49 which at this time is aligned with one end of a passage 479 in the valve disc 49*a*, the opposite end of the passage being aligned

with a port 480 having a line 481 connected thereto extending to a port 482 in the seat of "ink" valve 50, the latter port being aligned as shown in Figure 24 with a passage 483 in the ink valve disc 50a. The opposite end of passage 483 is in communication with the valve seat port 438 with which the line 436 communicates, the opposite end of line 436 opening to the valve chamber 404 of the automatic valve mechanism 48. Since valve 413 of this valve chamber is open, valve chamber 404 is in communication with the atmosphere through the port 431. Thus, no pressure is present in form roller operating pressure chamber 476, and pressure being present in the opposite chamber 470, the ink form rolls 40 will be held locked in contact with the plate cylinder 38 by the locking elements 224 shown in Figure 7.

As shown in Figure 24, a line 459a runs from line 459 to the pressure chamber 319 beneath the right hand end of impression cylinder 42; a line 453a extends from line 453 to the right hand chamber beneath transfer cylinder 41; and lines 469a and 477a extend from ink roll pressure operating chambers 470 and 476, respectively, to the corresponding chambers on the right hand side of the press.

By the above arrangement, the form rollers 40 will be held in contact with the plate cylinder 38 by the pressure exerted in pressure chamber 470, the transfer cylinder 41 will be held upwardly by the pressure in chamber 336, and impression cylinder 42 will be held upwardly by the pressure in chamber 319. Should some object other than a sheet, for example, a wrench, move between the cylinders 41 and 42, the impression cylinder 42 will move downwardly against the action of the spring 328 without varying the pressure flow.

The valves and pressure flow will remain as described above in connection with Figure 24 so long as a sheet is presented at the proper moment upon the trip finger 46 on feed table 43. However, should no sheet be present upon the trip finger 46 at the proper moment, the trip mechanism 47 will be actuated in the manner described above, under the heading "The sheet trip mechanism" and in connection with Figures 12 to 14, to the position shown in Figure 13 so that the rocker arm 362 will be turned clockwise to the position shown in that figure, causing the tappet cams 421 to swing upwardly from their position as shown in Figure 22 to permit the valves 411 and 413 to close and valves 410 and 412 to open as diagrammatically indicated in Figure 25. Referring to Figure 25, with the valves of the automatic valve mechanism now in the position there illustrated, pressure will be maintained in pressure chamber 336 beneath piston 335 which supports the transfer cylinder 41, because this cylinder will still receive pressure from the pressure supply main 433 through line 435, passage 451 of "impression" valve disc 49a and line 453. However, the piston 321 in pressure chamber 319 and supporting impression cylinder 42 will drop by reason of the fact that the line 459, valve passage 457 of "impression" valve disc 49a, and line 439 will now be in communication with the atmosphere through valve chamber 402 wherein the valve 410 is now open to the atmosphere through port 429 and valve 411 of chamber 403, being closed, will prevent pressure flow to chamber 402. The ink form rollers 41 will be moved away from the plate cylinder 38, since the operating handle 215 will be moved rearwardly (to the left with respect to Figures 24 and 25) by the following flow circuit arrangement.

The opening of valve 412 in chamber 404 will permit pressure to flow past that valve through passage 430 and into chamber 405. Valve 413 now being closed, this pressure will move through line 436 to port 438 of "ink" valve 50 and through passage 483 in the valve disc of that valve to line 481. From line 481, the pressure will flow through port 480 of "impression" valve 49, passage 479 and port 478 to line 477, whence the pressure will flow into chamber 476, moving the valve operating lever 215 rearwardly (to the left in Figure 7), thereby rotating the cam 220 to move the hangers 194 apart, thereby moving the ink form rolls 40 away from the plate cylinder 38. The movement of operating handle 215 described above will be permitted due to the fact that pressure is simultaneously relieved from chamber 470 through line 469, passage 467 in "ink" valve disc 50a, and thence through line 465, line 459, passage 457 of "impression" valve disc 49a, line 439, and valve chamber 402, now open to the atmosphere as described above.

Should a sheet be presented upon the trip finger 46 on the next cycle of operation of the trip mechanism 47, as described above under the heading "The sheet trip mechanism," the sheet trip mechanism will rock rocker arm 362 back to the position shown in Figure 9, thereby moving the cams 421 back to the position shown in Figure 22, thereby changing the position of the valves in automatic valve mechanism 48 back to the position diagrammatically shown in Figure 24 so that the fluid flow will be as in that figure, thereby immediately relifting the impression cylinder 42 and moving the ink form rolls 40 back into engagement with the plate cylinder 38.

If no sheet is presented upon the trip finger 46 on the next cycle, the valves of automatic valve mechanism 48 will of course remain as shown in Figure 25 and the impression roll 42 will remain down and the ink form rolls will remain out of contact with the plate cylinder until a sheet is positioned upon the trip finger 46 at the proper moment in a subsequent cycle of operation of the trip mechanism 47.

Flow-circuits—transfer and impression cylinders held down—ink form rolls manually operable

Should the operator desire to drop the transfer cylinder 41 and the impression cylinder 42 and hold them downwardly during turning over of the press cylinders, and regardless of whether or not a sheet is positioned upon the trip finger 46 at the proper moment, the "impression" valve disc 49a may be moved to the position shown in Figure 26, wherein it is at "off" or at right hand position.

In this position of the valve, the pressure in chamber 319 which holds piston 321 and impression cylinder 42 upwardly will be exhausted through line 459, seat port 458 of "impression" valve 49, passage 457 of valve disc 49a and exhaust port 491 (to the atmosphere) in the valve seat. The pressure in chamber 336 which holds the piston 335 and transfer cylinder 41 upwardly will also be exhausted to atmosphere through line 453, seat port 452 of "impression" valve 49, valve disc passage 451 and exhaust port 490. Pressure line 435 will be closed by reason of the fact that a blank portion of the face of valve disc 49a will be moved opposite the valve seat end of that line. The valve seat end of pressure line 439 will also now be opposite a blank

portion of valve disc 49a so that a change in the position of the valves of automatic valve mechanism 48 will not affect the position of the transfer cylinder 41 and the impression cylinder 42.

Pressure will be released from the pressure chamber 476 associated with the ink form roller operating lever 215, this exhaust flowing through line 477, valve seat port 478 of "impression" valve 49, passage 479 of valve disc 49a and exhaust port 492 of the valve seat. The end of line 481 which enters the valve seat of "impression" valve 49 will be opposite a blank portion of the face of the valve disc 49a so that no change in the position of the valves of automatic valve mechanism 48 will affect the position of form roll operating handle 215. Since the pressure chamber 470 also associated with the form roller operating lever 215 is now in communication with the atmosphere through line 469, passage 467 of "ink" valve 50, lines 465 and 459, passage 457 and exhaust port 491 of "impression" valve 49, the ink form roll operating lever 215 is under no pressure whatever and may be operated by hand to whatever position is desirable in the turning over of the press cylinders.

Flow circuits—cylinders up—ink form rolls off

In some instances, it is desirable to have the hand lever 125 associated with the ink form rolls 40 free for manual operation, and while the cylinders 41 and 42 are in upward position. To operate the press in this manner, "ink" valve disc 50a would be moved to the "on" or right hand position as shown in Figure 27. With the valve in this position, if "impression" valve disc 49a is in "on" or normal running position, the chamber 476 associated with form roller operating lever 215 will be in communication with the atmosphere through line 477, "impression" valve disc passage 479, line 481, and "ink" valve disc passage 483, now open to atmosphere through exhaust port 484. Chamber 470 will communicate with the atmosphere through line 469, "ink" valve disc passage 467, and exhaust port 495 in the "ink" valve seat. This position of the ink form rolls, with the transfer and impression cylinders up, is desirable during the performance of numerous preliminary operations upon the press.

In order to move both the transfer cylinder 41 and the impression cylinder 42 downwardly and to have the operating lever 215 free for manual operation, the handle of the "impression" valve 49 and the handle of the "ink" valve 50 are moved to the right. In this position, all of the lines communicating with chambers 319, 336, 470 and 476 will be open to the atmosphere so that no pressure will be present in any of these chambers.

It is thought that the operation of the entire press will be obvious from the summary of its operation given under the heading "Summary of construction and operation" in the opening portion of this specification. The detailed operation of each mechanism has been set forth in the portion of the specification dealing with the construction of that mechanism.

It will be understood that the invention is not limited to the details of construction shown in the drawings and that the examples of the use of the machine and mechanisms which have been given do not include all of the uses of which they are capable, and that the phraseology employed in the specification is for the purpose of description and not of limitation.

Subject matter disclosed but not claimed herein is claimed in the divisional applications of Helene Goebel, administratrix of George Goebel, and Eibe A. Wilckens, Printing press dampening roll control, and Printing press roll structures, both filed May 3, 1940.

We claim:

1. The combination in a printing press, of a printing couple, compressible gaseous fluid pressure supported means to support one of the elements of said couple, and means to control said first-named means in accordance with the delivery of sheets to said couple.

2. The combination in a printing press, of a printing couple, compressible gaseous fluid pressure supported means to hold one of the elements of said couple in contact with another, and means to control said first-named means in accordance with the delivery of sheets to said couple.

3. The combination in a printing press, of a printing couple, compressible gaseous fluid pressure supported means to support one of the elements of said couple, means to control said first-named means in accordance with the delivery sheets to said couple, and means to limit the movement of said element with respect to another element of said couple.

4. The combination in a printing press, of a printing couple, compressible gaseous fluid pressure supported means to support one of the elements of said couple, and sheet trip mechanism operable in accordance with the delivery of sheets to said couple to control pressure flow to said means.

5. The combination in a printing press, of a printing couple, fluid pressure supported means to support one of the elements of said couple, automatic valve mechanism operable in accordance with the delivery of sheets to said couple to control pressure flow to said means, and a manual valve to selectively control the operation of said automatic valve mechanism.

6. The combination in a printing press, of a printing couple, fluid pressure supported means to support one of the elements of said couple, sheet trip mechanism operable in accordance with the delivery of sheets to said couple to control pressure flow to said means, and manually operable means to selectively control the operation of said first-named means by said sheet trip mechanism.

7. The combination in a printing press, of a printing couple, fluid pressure operated means to support one element of said couple in contact with another element thereof, and resilient means to support said first-named element in a position spaced from said last-named element.

8. The combination in a printing press including a printing couple, of means to support one element of the couple comprising a piston, a cylinder with respect to which said piston is movable, means to space said piston from a wall of said cylinder, and means to control the pressure of fluid within said space in accordance with the delivery of sheets to said printing couple.

9. The combination in a printing press, of a plate cylinder, a transfer cylinder, an impression cylinder, journals for said cylinders, pressure chambers beneath the journals of said transfer and impression cylinders, a fluid flow circuit in communication with said chambers to control the position of said transfer and impression cylinders with respect to said plate cylinder and each other, and means to control said circuits

in accordance with the delivery of sheets to said cylinders.

10. The combination in a printing press, of a printing couple, means to support one element of said couple comprising a fixed supporting element, a movable supporting element, an angled member including an apex portion and bearing on said supporting elements, said element of the printing couple bearing on the apex portion of said angled member, and means to move said movable supporting element.

11. The combination in a printing press, of a printing couple, means to support one element of said couple comprising a fixed supporting element, a movable supporting element, a lever member bearing on said supporting elements, said element of the printing couple bearing on said lever member, and fluid pressure connections to said movable supporting element to enable the same to be moved by fluid pressure.

12. The combination in a printing press, of a printing couple, means to support one element of said couple comprising a fixed structure, a fluid operated piston movable with respect to said structure, a plurality of lever members having their respective ends supported on said fixed structure and said piston, respectively, said element of the printing couple bearing on said lever members, and fluid pressure connections communicating with said piston to enable the same to be moved.

13. The combination in a printing press, of a printing couple, means to support one element of said couple comprising a fixed structure, a fluid operated piston movable with respect to said structure, a plurality of angled members including apex portions and having their respective ends supported on said fixed structure and said piston, respectively, said element of the printing couple bearing on the apex portions of said angled members, and fluid pressure connections communicating with said piston to enable the same to be moved.

14. The combination in a printing press, of a printing couple having an element thereof mounted for movement relative to another element, a mechanism to control the position of said first-named element comprising a cam, a member controlled by said cam, a control member operatively connected to said first-named element of the printing couple, a second cam, a key associated with said second cam, means associated with said first-named member and said control member and provided with a plurality of positions for receiving said key to form an operating connection between said second cam and said control member, and a sheet responsive element to control the position of said first-named member with respect to said first cam and therethrough the position of said means at a predetermined point in the cam cycle.

15. The combination in a printing press, of a printing couple having an element thereof mounted for movement relative to another element, of mechanism to control the movement of said element comprising a cam, a lever engaging and adapted to be moved by said cam, a rocker arm, a second cam, a pivotally mounted cam following member associated with said second cam, means including a plurality of positions for receiving said cam following member operatively connected to said lever and associated with said rocker arm to form an operating connection between said second cam and said rocker arm, and a sheet responsive element to control the position of said lever with respect to said first cam and therethrough the position of said means at a predetermined point in the cam cycle.

16. The combination in a printing press, of a printing couple having an element thereof mounted for movement relative to another element, of a mechanism to control the position of said element comprising a cam, a lever engaging and adapted to be moved by said cam, a rocker arm, a second cam, a cam following member associated with said second cam, a plurality of means operatively connected to said lever and said rocker arm to form an operating connection between said second cam and said rocker arm, and a sheet responsive element to control the movement of said lever with respect to said first cam to thereby control the position of said means.

17. The combination in a printing press, of a printing couple having an element thereof mounted for movement relative to another element, a mechanism to control the position of said first-named element comprising a cam, a lever controlled by said cam, a rocker arm, a second cam, a cam following member associated with said second cam, means operatively connected to said lever and said rocker arm and provided with a plurality of positions for receiving said cam following member to form an operating connection between said second cam and said rocker arm, and a sheet responsive element to control the position of said lever with respect to said first cam and therethrough the position of said means at a predetermined point in the cam cycle.

18. The combination in a printing press, of a printing couple having an element thereof mounted for movement relative to another element, a mechanism to control the position of said first-named element comprising a cam, a lever controlled by said cam, a rocker arm, a second cam, a cam following member associated with said second cam, means associated with said lever and said rocker arm and provided with a plurality of positions for receiving said cam following member to form an operating connection between said second cam and said rocker arm, and a sheet responsive element to control the position of said lever with respect to said first cam and therethrough the position of said means at a predetermined point in the cam cycle.

19. The combination in a printing press, of a printing couple having an element thereof mounted for movement relative to another element, a mechanism to control the position of said first-named element comprising a cam, a lever controlled by said cam, a rocker arm, a second cam, a cam following element associated with said second cam, a plurality of members associated with said lever and said rocker arm and providing a plurality of positions for receiving said cam following element to form an operating connection between said second cam and said rocker arm, and a sheet responsive element to control the position of said lever with respect to said first cam and therethrough the position of said members at a predetermined point in the cam cycle.

20. The combination in a printing press, including a printing couple and fluid circuits for controlling the relative position of elements of the same, of manual valve means to control flow through said circuits comprising a ported valve seat fixed to the press frame, and a passaged disc valve movable with respect to said seat.

21. The combination in a printing press including a printing couple, of a chamber, said printing couple having an element thereof movable and supported with respect to the remainder of the couple in said chamber by compressible gaseous fluid pressure, of means to control pressure flow comprising a plurality of alternately seated valves, said valves, in one position thereof, being adapted to close the chamber and in their other position to place the chamber in communication with the atmosphere, and means to control the operation of said valves.

22. The combination in a printing press including a printing couple having an element thereof movable and supported with respect to the remainder of the couple by fluid pressure, of means to control pressure flow comprising a plurality of alternately seated valves, means to control the operation of said valves in accordance with the delivery of sheets to said printing couple, and manual valves to control flow through said first-named valves.

23. The combination in a printing press, of a printing couple, a compressible gaseous fluid pressure supported means to support one of the elements of said couple, and means to control said first named means to permit said supported element of the couple to move away from the remainder of the couple when there is a discontinuance of delivery of sheets to said couple.

24. The combination in a printing press, of a printing couple, compressible gaseous fluid supported means to support one of the elements of said couple, and means to control said first named means including means for permitting the compressible gaseous fluid to be discharged directly to the atmosphere to permit said supported element of the couple to move away from the remainder of the couple when there is a discontinuance of delivery of sheets to said couple.

25. The combination in a printing press, of a series of press rolls, means to hold one of said rolls in fixed position, fluid-pressure controlled means to hold a second of said rolls in contact with said fixed roll and to hold a third of said rolls in contact with said second roll, said second and third rolls being respectively movable to positions wherein they will be out of contact with said fixed roll and each other, rigid means to limit the non-contacting movement of said second roll and resilient means to support said third roll in non-contacting position.

26. The combination in a printing press, of a printing couple having an element thereof mounted for movement relative to another element, fluid-pressure actuated means to support said movable element, a valve mechanism to control said fluid-pressure actuated means, and means to control said valve mechanism comprising a cam, a member controlled by said cam, a second cam, a key associated with said second cam, means associated with said first-named member and said valve mechanism and provided with a plurality of positions for receiving said key to form an operating connection between said second cam and said valve mechanism, and a sheet responsive element to control the position of said first-named member with respect to said first cam and therethrough the position of said means at a predetermined point in the cam cycle.

27. The combination in a printing press, of a printing couple having an element thereof mounted for movement relative to another element, fluid-pressure actuated means to support said movable element, a valve mechanism to control said fluid-pressure actuated means, and means to control said valve mechanism comprising a cam, a lever controlled by said cam, a rocker arm associated with said valve mechanism, a second cam, a cam following element associated with said second cam, a plurality of members associated with said lever and said rocker arm and providing a plurality of positions for receiving said cam following element to form an operating connection between said second cam and said rocker arm, and a sheet responsive element to control the position of said lever with respect to said first cam and therethrough the position of said members at a predetermined point in the cam cycle.

28. The combination in a printing press, of a printing couple, means to support one element of said couple comprising a fixed supporting element, a fluid pressure operated movable supporting element, and power increasing means associated with said fixed supporting element and interposed between said press couple element and said movable supporting element.

29. The combination in a printing press, of a printing couple, fluid pressure operated means to support one of the elements of said couple, a sheet detector, a valve to control flow to said pressure operated means, said sheet feed detector being positively operatively connected to said valve mechanism to control opening movement thereof, and yieldable means operative to close said valve.

30. The combination in a printing press, of a printing couple, fluid pressure operated means to support one of the elements of said couple, a sheet detector, a valve to control flow to said pressure operated means, and means to operatively connect said sheet detector to said valve means, said last-named means being movable relatively to said valve means in one direction of movement.

31. The combination in a printing press, of a printing couple, fluid pressure operated means to support one of the elements of said couple, a sheet detector, a valve to control flow to said pressure operated means, and an operative connection between said sheet detector and said valve including a movable cam to operate said valve in one direction.

32. The combination in a printing press, of a printing couple having an element thereof mounted for movement relative to another element, a mechanism to control the position of said first-named element comprising a cam, a lever controlled by said cam, a rocker arm, a second cam, a cam following element associated with said second cam, a bell-crank connected to said lever, a plurality of members carried by said rocker arms and operatively connected through said bell-crank to said lever, said plurality of members providing a plurality of positions for receiving said cam following element to form an operating connection between said second cam and said rocker arm, and a sheet responsive element to control the position of said lever with respect to said first cam and therethrough the position of said members at a predetermined point in the cam cycle.

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