

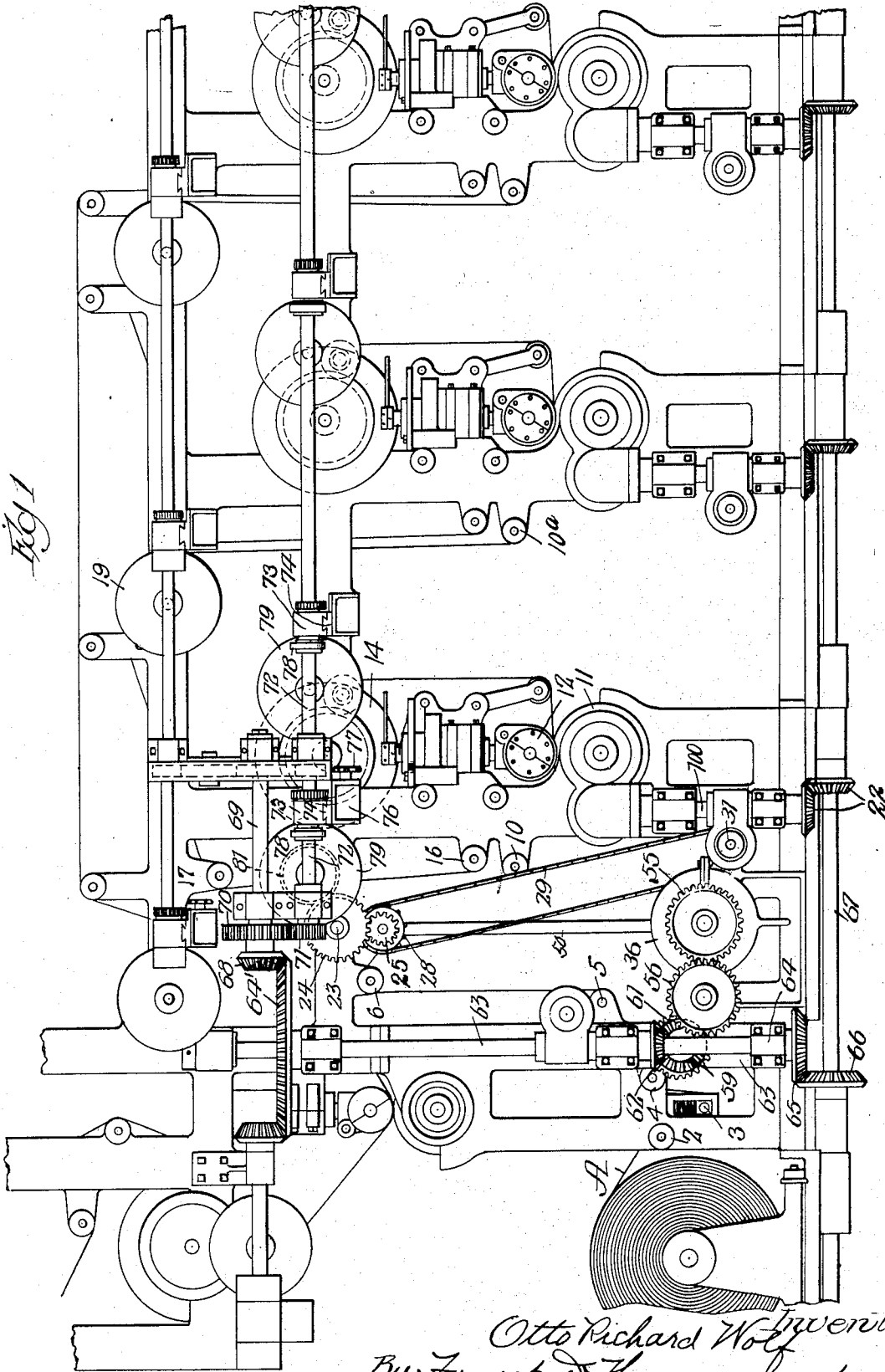
March 6, 1928.

1,661,209

O. R. WOLF
PRINTING PRESS

Filed June 12, 1922

5 Sheets-Sheet 1



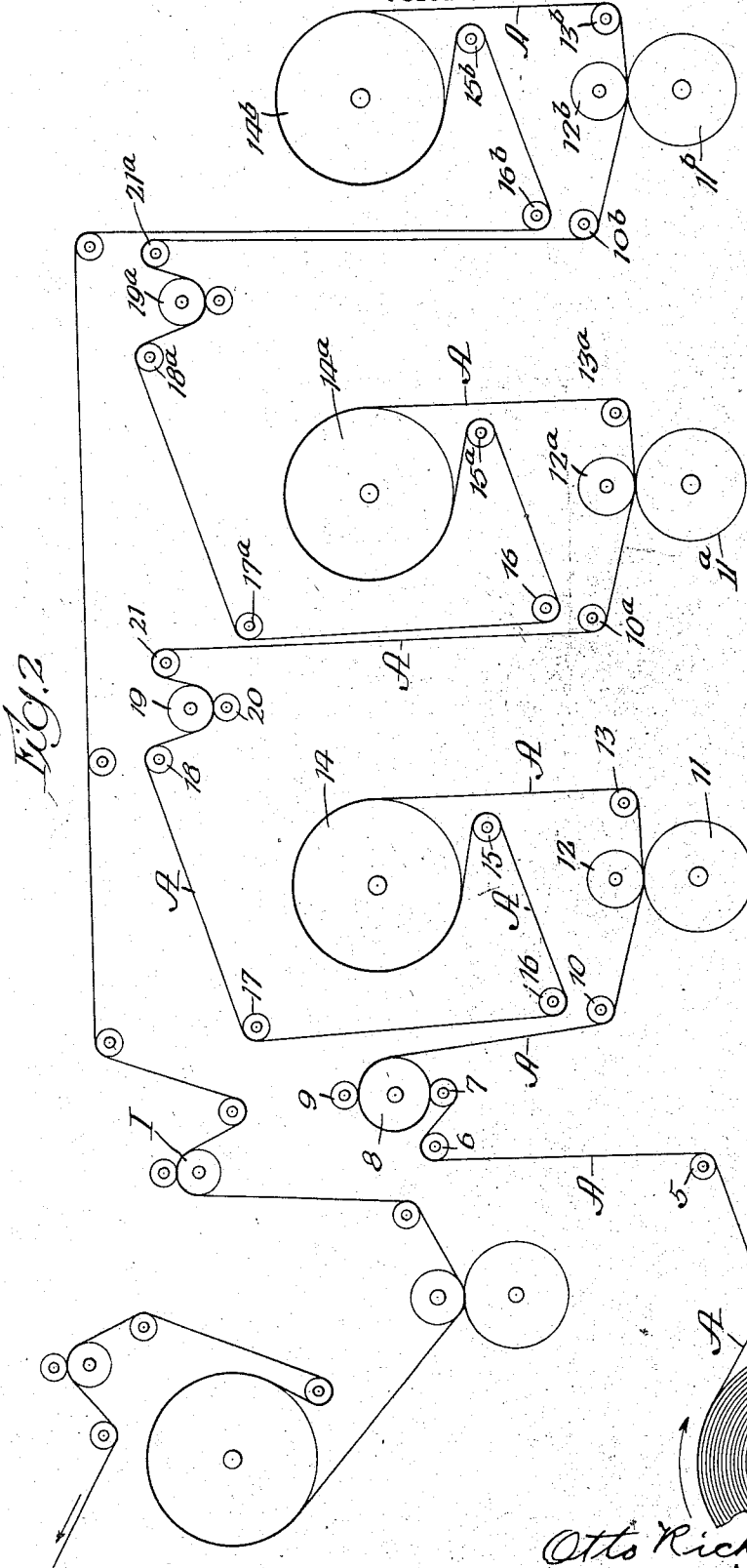
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PRINTING PRESS

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5 Sheets-Sheet 2



Inventor
Otto Richard Wolf.
By Frank D. Thomas, Atty.

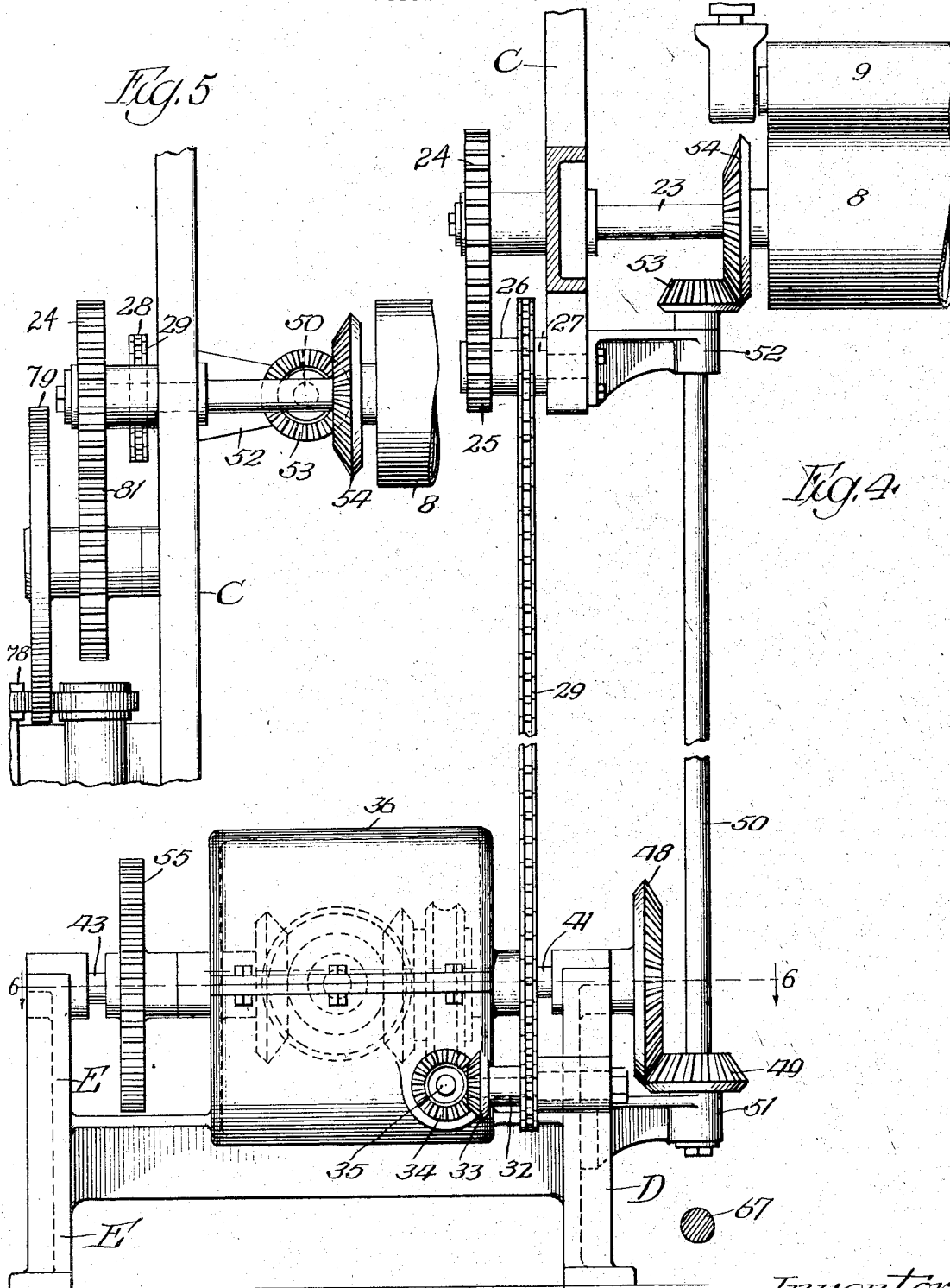
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5 Sheets-Sheet 4



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March 6, 1928.

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O. R. WOLF

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5 Sheets-Sheet 5

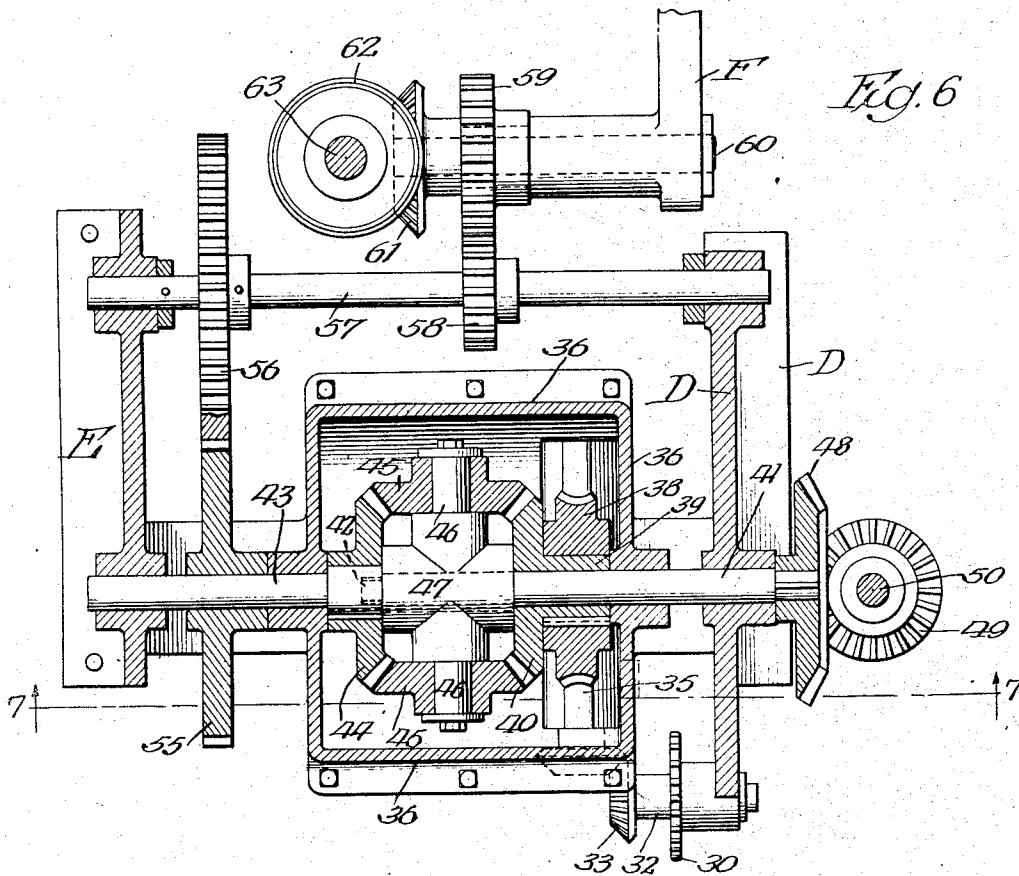


Fig. 6

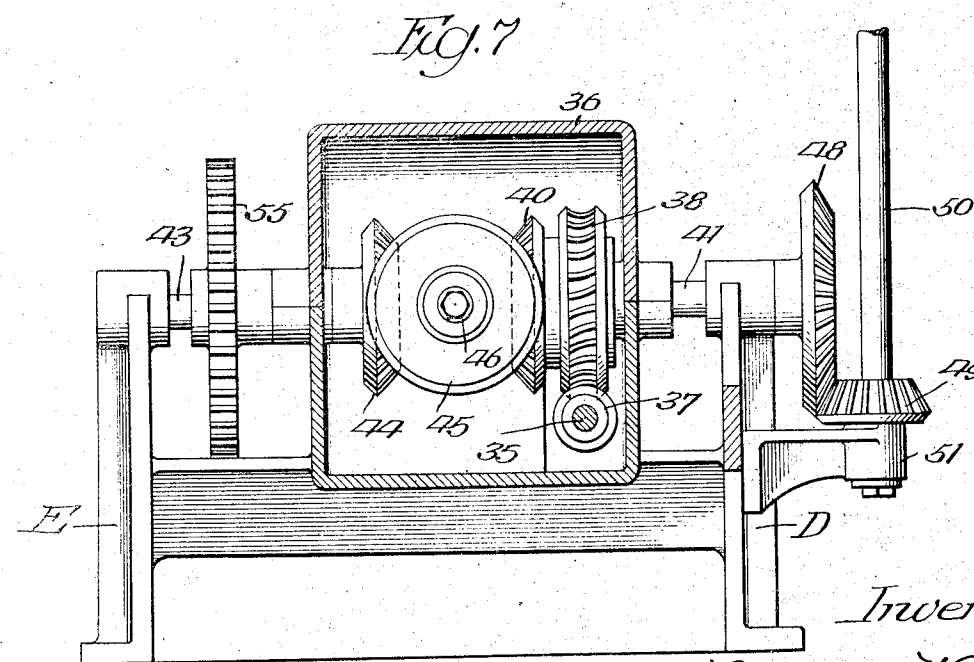


Fig. 7

Inventor

Otto Richard Wolf
By Frank Thomason Atty.

UNITED STATES PATENT OFFICE.

OTTO RICHARD WOLF, OF RIVER FOREST, ILLINOIS, ASSIGNOR TO THE TRIBUNE COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

PRINTING PRESS.

Application filed June 12, 1922. Serial No. 567,624.

My invention relates to driving mechanism and has for its principal object the provision of a device suitable for accurately and easily adjusting the speed of the registration rollers of printing presses whereby the web to be printed may be kept in proper registration with the printing cylinders, this being particularly desirable in the printing of pictures in segments or colors as is commonly done in newspaper printing. As will be understood, the web, in such printing, is acted upon by a plurality of printing cylinders successively, and it is necessary for accurate work that the printed portions of the web should be kept in exact registration with the printing portions of the cylinders. My invention provides mechanism controllable by the operator whereby the speed of the web may be increased or decreased, within the limits necessary for this purpose, with reference to the surface speed of the printing cylinder.

Other objects and advantages of the invention will be apparent as it is better understood from the following description, which, taken in connection with the accompanying drawings, discloses a preferred embodiment thereof.

In the drawings:

Figure 1 is a side view of a broken away forward portion of a press embodying the invention.

Figure 2 is a diagrammatical view of a press embodying my invention, and disclosing the course of the paper web.

Figure 3 is a vertical longitudinal section of a forward end portion of the press.

Figure 4 is a vertical transverse section, taken on line 4, 4, Figure 3.

Figure 5 is a plan view taken from the position indicated by dotted line 5, 5, Figure 3.

Figure 6 is a horizontal section taken on dotted line 6, 6, Figure 4.

Figure 7 is a vertical section taken on dotted line 7, 7, Figure 6.

Fig. 8 is a detail view, partially broken away, of the manually operable adjusting means for the friction pinion or drive disk forming a part of the speed control mechanism.

In Fig. 2, the web of paper A is shown leaving a supply-roll B and passing over

guide roll 2, slack or tightening roll 3, and thence over guide rolls 4, 5, 6 and 7, and around a registration cylinder or roll 8, having a pressure roller 9. The web then passes over a guide-roll 10 and to and between an impression cylinder 11 and a rubber roller 12. The web has only a small amount of contact on the impression cylinder 11 so that there is no driving or drag action by one upon the other. The web then passes over a guide roll 13, a drying drum 14, then to and around a roll 15 so located as to cause the web to remain in contact with about 270 degrees of the circumference of the drum, the web A continuing around guide-rolls 16, 17 and 18 to and between a registration cylinder 19 and idle-roll 20, this arrangement being substantially the same as roll 8 and cooperating elements. The web A then proceeds over guide-rolls 21 and 10^a to and between an impression cylinder 11^a and rubber roll 12^a of a second printing unit.

The course of the web through the second and successive printing units is the same as in the first, just described, the corresponding parts of the successive units being designated by the same numerals together with exponent letter "a" for the second color printing unit and letter "b" for the third color unit, etc., depending upon the number of units used.

The invention, in the particular form of device chosen to illustrate it, comprises means for regulating and controlling the speed of the web A with respect to the surface speed of the printing or impression cylinders, through the medium of the registration cylinders 8, 19, 19^a, etc., but it is to be understood that the invention is applicable to regulating the printing or impression cylinders, and hence the surface speed of such cylinders with respect to the speed of the web, as may be desired and without departing from the spirit of the invention.

Each cylinder 11, 11^a, 11^b is driven from a main-drive shaft 67 by way of a suitable train of driving elements including a vertical shaft 100 and gears 22 fastened to the shafts 100 and 67 as clearly shown in Fig. 1 of the drawings. Each rubber roll 12 is actuated by and with its respective printing cylinder 11, 11^a or 11^b, and has substantially the same surface speed of the cylinder ac-

tuating it. Each registration cylinder 8 or 19 is rotatably mounted upon a transverse shaft 23 journaled in the supporting frame portion C of the press. Upon a projecting end of the shaft 23 is loosely carried a gear 24 which meshes with a pinion 25 having a hub 26 loosely mounted upon a stud 27 secured to frame C, below the bearing of shaft 23. To the hub 26 is secured a sprocket wheel 28 connected by a link chain 29 to a sprocket wheel 30 having a hub 32 loosely mounted upon a stationary stud 31 secured to a lower frame portion D. The hub 32 has a bevel gear 33 engaging a like gear 34 fast to an end of a worm shaft 35 having bearings in the sides of a housing 36 and also having a worm 37 in mesh with a worm gear 38 mounted upon and keyed to a hub 39 of a differential gear 40 loosely mounted upon a transverse shaft 41. The housing 36 may be of any desired shape to enclose the differential gearing hereinafter described.

The shaft 41 is journaled, near an end thereof, in an end of housing 36 and also in frame portion D, and has its opposite end 42 reduced and loosely journaled in an enlarged adjacent end of an alining shaft 43 journaled in the other end of said housing 36 and also in a frame portion E. To the inner end of shaft 43 is keyed a differential gear 44 differentially connected to gear 40 by way of two gears 45, 45 loosely mounted upon trunnions 46, 46 projecting at right angles to the axes of shafts 41 and 43, and from a cross block 47 securely keyed to shaft 41.

To the other end of shaft 41 is keyed a beveled gear 48 which meshes with a pinion 49 fast to the lower end of a vertical shaft 50 suitably journaled at its lower and upper ends in suitable brackets 51 and 52 secured to frame portions D and C respectively. The upper end of shaft 50 has keyed to it a bevel gear 53 which meshes with a bevel gear 54 secured to the registration cylinder 8, or 19, and to which it imparts motion.

The end of shaft 43 journaled in frame portion E, has keyed to it a gear 55 in mesh with a gear 56 keyed to a transverse shaft 57 journaled in frame portions D and E. The shaft 57 has a gear 58 meshing with a gear 59 keyed to a transverse shaft 60 journaled in a frame portion F.

A bevel gear 61 is keyed to the end of shaft 60 and meshes with a beveled gear 62 keyed to the vertical shaft 63 journaled in bearings 64, 64 secured to a portion G of the supporting frame of the press. The lower end of shaft 63 has a beveled gear 65 keyed to it and in mesh with a beveled gear 66 keyed to the drive shaft 67 of the press.

To the upper end portion of shaft 63 is keyed a large gear 64' meshing with a pinion

68 fastened on an end of a short longitudinal shaft 69 suitably journaled in bearing blocks carried by the supporting frame of the press. The shaft 69 has a gear 70 meshing with a gear 71 keyed to an end of a longitudinal shaft 72 journaled in suitable bearing blocks 73 carried by the supporting frame of the press, the shaft 72 extending longitudinally to the rear of the press, as clearly shown in Fig. 1 of the drawing. Each block 73 is supported and transversely movable upon a dove-tailed plate 74 which in turn is supported by a longitudinally adjustable dove-tailed tenon 75 carried by a bracket 76, the longitudinal adjustment of the plate 74 being made by a hand screw 77.

Attached to the shaft 72 so as to rotate therewith and to be adjustable longitudinally thereon is a friction pinion or drive disc 78 which engages with the adjacent face of a large disc 79 and, accordingly, as it is made to approach or recede from the center of the disc 79, it will increase or decrease the speed of said disc.

The disc 79 is fast with a transverse shaft 80 journaled in the frame of the press and the shaft has a gear 81 secured to it, the gear 81 meshing with the gear 24 loosely mounted upon the shaft 23 and in mesh with the pinion 25.

It is to be understood that the mechanism above described for driving the roll 8 is duplicated for each one of the rolls 19 ahead of each printing cylinder 11^a, 11^b, etc., a duplication of the illustration of this mechanism not being made upon the drawing for the purpose of convenience and clarity. Such mechanism will include, in each case, a set of differential gears and a set of friction discs, the latter being shown in Fig. 1 of the drawing.

After the web of paper leaves the registration roller 8 it passes through the first color printing unit, consisting of the guide roller 10, etched or printing cylinder 11 and rubber roller 12, guide roller 13, heating drum 14, guide rollers 15, 16, 17 and 18, registration roller 19 and rollers 20 and 21. After passing through this unit, the web proceeds to the second unit consisting of guide rollers 10^a, etched or printing cylinder 11^a, rubber roller 12^a, guide roller 13^a, heating drum 14^a, guide rollers 15^a, 16^a, 17^a and 18^a, registration roller 19^a and rollers 20^a and 21^a, and thence to the third unit comprising guide roller 10^b, etched or printing cylinder 11^b, impressing roller 12^b, guide roll 13^b, heating drum 14^b, guide rolls 15^b and 16^b.

The web is then directed back over the color printing units, and is printed in type on the opposite side, but, I lay no claim to this operation, I desire, however, to call attention to the fact that before it is printed upon its opposite side, it is passed through the registration cylinder I and the web

thereby kept taut after it leaves the last color printing unit.

It is to be understood that the invention is not limited to printing presses or the like, but is also applicable to other devices or mechanisms employing driving means whereby it may be desired to vary or adjust the rate of drive of the devices or mechanisms, or the drives among parts of a device or mechanism. The invention also comprehends other constructions, details and arrangements of parts without departing from the spirit thereof.

In the operation of this particular form or embodiment of the invention, one of the objects is to control the speed of the web by means of the registration cylinders, and it will be noted that the contact of the web with the printing cylinders 11, 11^a, 11^b, is over only a small portion of the surface of the cylinders so that the cylinders have no tendency to effect a driving or retardation of the web itself, the travel of the web being substantially fully under control of the registration cylinders.

At the side of the printing press is the main driving shaft 67 from which the several mechanisms are driven. The printing rolls 11, 11^a, 11^b, in the illustrative embodiment of the invention, are driven at constant or uniform speed from said shaft 67 through the meshed gears 22, shaft 100 and a suitable train of gears connected between shaft 100 and the etched or printing cylinders.

Each registration cylinder device is also operated from the same main shaft 67, the registration cylinder device ahead of the first cylinder 11 being shown in Fig. 1 of the drawing and operated from shaft 67 through the gears 66, 65 and shaft 63. From the latter the drive is split, so to speak, and one side of the differential mechanism is operated from the shaft 63 by way of the gears 62, 61, 59, 58, shaft 57, gears 56, 55, shaft 43 and gear 44 of the differential device.

For the other side of the differential device the drive is by way of shaft 63, gears 64 and 68, shaft 69, gears 70 and 71, shaft 72, and frictional driver 78 in frictional contact with the friction disc 79. The drive continues from this disc through or by way of gears 81, 24 and 25, sprocket 28, chain 29, sprocket 30, gears 33 and 34, worm 37, worm gear 38 and differential gear 40.

The proportions of the various trains of gears and friction discs are so arranged that the shaft 43 may operate at greater speed than, or at the same speed of, or at a lesser speed than the shaft 41. In the actual devices in operation it was found convenient to run the shaft 43 at about twice the speed of the shaft 41. Therefore, the gear 40 is operated at the proper speed so that as the shaft 43 drives the gear 44 the differential idle gears 45 will have a certain amount of

riding over the gear 40 and also a travel, as a unit, with the block 47 fastened to the shaft 41 so that the shaft 41 drives through gears 48 and 49, shaft 50, gears 53 and 54, and hence the roll 8.

It will therefore be apparent that if the gear 40 is caused to travel at a greater rate than or at a slower rate than the rate at which it may be driving at any instant, the speed of the shaft 41 and hence the roll 8 may be increased or decreased accordingly. In order to increase or decrease such speed, the same is effected by hand turning the hand wheel 77 to cause the friction disc 78 to move toward or recede from the center of the large disc 79 whereby the driving speed of the disc 79 may be increased or decreased accordingly.

Assuming that the printed portions of the web should be out of register with the web printing portion of the cylinder, and it is desired to either increase or decrease the speed of the web with reference to the surface speed of the cylinder, the operator will then adjust the proper friction disc relation to effect said result. The effect of the cylinder 8, or the cylinder 19 in the case where the succeeding registration cylinders are adjusted, is to hasten or retard the flow or travel of the web through the press. Inasmuch as the paper is already under a certain amount of tension as it travels through the press, the effect is to produce either an added tension or a subtracted tension on the paper so that it will have the result of passing a little faster or a little slower through the printing unit, that is, between the cylinders 11 and 12, or 11^a and 12^a, or 11^b and 12^b. The web has a sufficient amount of elasticity to permit a forward gain or rearward retardation in travel of the web. Inasmuch as the necessary adjustment is within but a very small fraction of an inch, the amount of necessary adjustment will always be within the limits of increased or decreased stretch of the web as it is traveling through the press.

It will be apparent from the above that one of the important objects of the invention is that the web shall travel through the press at a uniform rate of speed, and where there is a slight mis-registration between the web and the printing parts of the cylinders the registration cylinders are interposed in the means for causing the travel of the web so as to either hasten or retard the travel of the web slightly, so that it will return to its uniform speed with respect to the surface of the printing cylinders and in proper registration therewith, the speed then being maintained uniform for a long period of time. Adjustment of the speed is usually necessary where there is a considerable change in temperature of the working room or the temperature of the printing cylinder

and from various other causes which has a tendency to cause a slight discrepancy in the registration of the printed portions of the web and the corresponding printing portions of the cylinders.

While I have herein described, and upon the drawings, shown one illustrative embodiment of the invention, it is to be understood that the invention is not limited to the particular construction, details and arrangement of parts shown and described, but that other constructions, details and arrangements of parts, such as that for varying or adjusting the surface speed of the printing cylinder or like element with respect to the travel or speed of the web, or varying or adjusting the speed of both the surface of the cylinder and the web, one with respect to the other, without departing from the spirit of the invention. Also, the invention is not limited to a multi-color press but is applicable to presses applying two or more impressions, or multi-impressions, whether all of the same color or of different colors.

What I claim as new is:

1. In a printing press having printing units, a web feed device and a drive, the combination of driving means for said device and driven by said drive, said means including differential driving elements, and continuously operated adjustable elements for varying the driving effect of one side of the differential driving elements.

2. In a printing press having printing units, a web feed device and a drive, the combination of driving means for said device and driven by said drive, said means including continuously operated differential driving elements, and continuously operated adjustable driving elements for changing the driving speed of the driving elements.

3. In a printing press having printing units, a web feed device and a drive, the combination of driving means for said device and driven by said drive, said means including variable driving elements, and constantly operated friction driving elements operatively connected to said variable driving elements for controlling the driving effect of said variable driving elements.

4. In a printing press having printing units, a web feed device and a drive, the combination of driving means for said device and driven by said drive, said means including constantly operated driving sections driven by said drive and each having differential elements, one of said sections having means for varying the driving effect of said differential elements.

5. In a printing press having printing units, a web feed device and a drive, the combination of driving means for said device and driven by said drive, said means including driving sections driven by said drive and each having differential elements, a final

driving section driven by said elements and operatively connected to said device, and constantly operated means in one of said sections and variable for adjusting the driving effect of said elements.

6. In a printing press having printing units, a web feed device and a drive, the combination of driving means for said device and driven by said drive, said means including a differential driving mechanism, and constantly operated adjustable means for varying the differential effect of said mechanism whereby the driving speed of said device may be changed.

7. In a printing press having printing units, a web feed device and a drive, the combination of driving means for said device and driven by said drive, said means including driving sections driven by said drive and each having differential elements, one of said sections having friction driving members for controlling the driving effect of one of said elements, and means for adjusting the relation of the friction driving members whereby the speed of the device may be adjusted.

8. In a printing press having printing units, a web feed device and a drive, the combination of driving means for said device and driven by said drive, said means including a differential gearing, driving mechanism driven by said gearing and driving said device, and constantly operated means connected to said differential gearing and having means for varying the driving effect of said gearing for correcting the feeding speed of said device.

9. In a printing press having printing units, a web feed device and a drive, the combination of driving means for said device and driven by said drive, said means including a differential gearing, an adjustable constantly operated friction drive effective to vary the driving effect of the differential gearing.

10. In a printing press having printing units, a web feed device, a main drive, and driving mechanism driven from the main drive and for each unit, the combination of a differential drive, said device having a registration roll for the web, means driven by the differential drive and driving said roll, a drive train operatively connected to one side of the differential drive and driven by the main drive, a second drive train constantly operatively connected to the other side of the differential drive and driven by the main drive, said second train having adjustable means for varying the driving effect of the differential drive whereby the speed of the web is corrected relative to the printing units.

11. In a printing press, a member having a traveling surface, a device for causing a travel of a web, means for driving said mem-

ber and said device, and means including friction elements for correcting the driving effect of the driving means whereby said traveling surface and said web may have the same speed of travel.

12. In a printing press, a printing member having a traveling surface, a web feed device for moving the web for receiving an impression from said surface, means for driving said member and said device, another driving means connected to said first driving means and including adjustable friction driving elements whereby the speed of travel of said surface and said web may be made the same.

13. In a printing press comprising printing units, web feeding means and a drive, a printing cylinder in each unit, a registration roller for the web, a differential gearing operated by the drive and operating the registration roller, and adjustable friction means constantly operated by the drive and controlling the speed of the registration roller.

14. In a printing press comprising printing units, web feeding means and a drive, a printing cylinder in each unit, a registration roller for the web, a differential gearing operated by the drive and operating the registration roller, and constantly operated means including relatively adjustable friction members for regulating the driving speed of the differential gearing.

15. In a multi-impression printing press comprising a plurality of printing units, web feeding means and a main drive, a printing cylinder in each unit, a web registration roller for each unit, differential gearing controlling the speed of said registration rollers, and constantly operated means including an adjustable friction member for regulating the speed of said differential gearing.

16. A multicolor printing press comprising a paper supply roller, several distinct printing units each having an etched cylinder and an impression cylinder, registration cylinders, one in front of the first unit and one between each pair of units thereafter, differential gearing controlling the speed of said registration cylinders, means including friction members for regulating the speed of said differential gearing, and a registration cylinder after the last printing unit for keeping the web of paper taut.

17. A multicolor press comprising several distinct color printing units each having an etched cylinder and a superposed impression cylinder, a registration cylinder, a differential gearing deriving motion from the same source as said etched and impression cylinders and controlling the speed of said registration cylinder, and means operated by said source and driving one side of said differential gearing at a different rate than the

other side thereof and a heating drum located after each printing unit for drying the paper.

18. In a multi-color printing press comprising a paper supply roller, several distinct color printing units, each having an etched cylinder and an impression cylinder, a registration cylinder between said printing units, differential gearing controlling the speed of said registration cylinder, means including friction members for regulating the speed of said differential gearing, and heating drums for drying the paper located after each printing unit.

19. A multi-color printing press comprising a paper supply roller, several distinct printing units each having an etched cylinder and an impression cylinder, registration cylinders one in front of said first unit and one between each pair of units thereafter, differential gearing controlling the speed of said registration cylinders, means including friction members for regulating the speed of said differential gearing, and heating drums for drying the paper located after each printing unit.

20. A multicolor printing press comprising a paper supply roller, several distinct printing units each having an etched cylinder and an impression cylinder, registration cylinders, one in front of the first unit and one between each pair of units thereafter, differential gearing controlling the speed of said registration cylinders, means including friction rollers for regulating the speed of said differential gearing, a roller after the last printing unit for keeping the web of paper taut, and heating drums for drying the paper located after each printing unit.

21. In a multicolor printing press, an etched cylinder and impression cylinder co-operating therewith, a vertical shaft for actuating the same, and drive-shaft for turning said first mentioned shaft, in combination with another vertical shaft actuated by the drive-shaft differential gearing connected thereto, a friction member, a friction roll adapted to be adjusted in engagement with the same from its center to its circumference, said pinion deriving motion from said second mentioned vertical shaft, and mechanically connected to and actuating said differential gear, a registration cylinder actuated by said differential gear.

22. A multicolor printing press, comprising a friction member, a friction roll adapted to be adjusted in engagement with the same from its center to its circumference, differential gearing comprising two alining independent shafts capable of operating at different speeds, a gear secured to one of said shafts, a gear loosely rotatable with the other of said shafts, a block fixed to said second shaft, gears on the block and meshed with said other gears, said second gear being

operatively connected to said friction member and friction roll and said first gear being driven from the main driving source of the press, and a registration roll operatively connected to said second gear.

23. In a device of the class described having a printing roll and means for causing a travel of the web to be printed by said roll at substantially the same speed as the surface speed of said roll, said means comprising a gear drive and constantly operated and adjustable friction means for varying the drive effect of said first mentioned means for regulating the travel of the web.

24. In a device of the class described having a printing roll and means for causing a travel of web to be printed by said roll at substantially the same speed as the surface speed of said roll, said means comprising a differential drive and a continuously operating and adjustable friction control drive cooperating with the differential drive for effecting a variation in the driving effect of the differential drive.

25. In a drive of the class described having a printing roll and a registration roll for feeding the web over the printing roll for printing, driving means for said rolls, the driving means for the registration roll having continuously operating and adjustable friction drive members and means for regulating the driving speed of the roll for varying the speed of the web to obtain correct registration with the printing roll.

26. A multi-impression printing press having a plurality of printing units to print different portions of the complete design, and means to vary the speed of the web to

each printing unit without stopping the travel of the web, to insure accurate registering of the different portions of the design being printed by the different printing units, said means comprising variable driving mechanism and variable friction driving means effective to vary the driving effect of the driving mechanism.

27. A multi-impression printing press having a plurality of printing units to print different portions of the complete design, and means to vary the speed of the web to the first printing unit and independently to the other printing units without stopping the travel of the web, to insure accurate registering of the different portions of the design being printed by the different printing units, said means comprising variable driving mechanism and variable friction driving means operative to adjust the driving operation of the driving mechanism.

28. A multi-impression printing press having a plurality of printing units to print different portions of the complete design, and means to independently vary the speed of the web to the first printing unit and to independently adjust the speed of the web to the other printing units without stopping the travel of the web, to insure accurate registering of the different portions of the design being printed by the different printing units, said means comprising variable driving mechanism and variable friction driving means operative to adjust the driving operation of the driving mechanism.

In witness whereof I have hereunto set my hand this 9th day of June, 1922.

OTTO RICHARD WOLF.