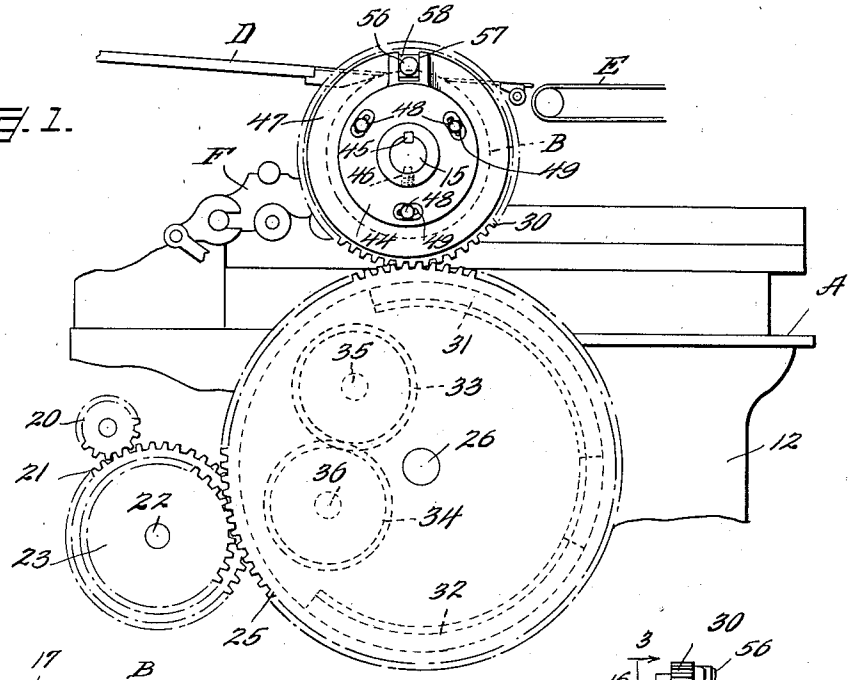
June 8, 1937. F. W. SEYBOLD 2,083,099

PRINTING PRESS

Filed Jan. 17, 1936 2 Sheets-Sheet 1

FIG. 1.



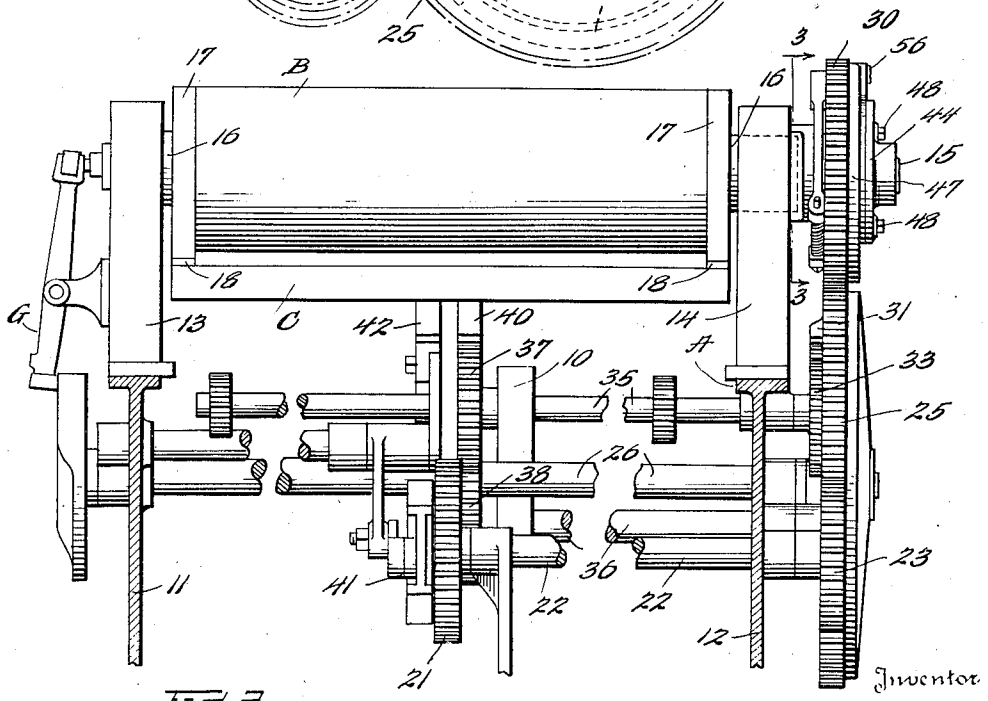


FIG. 2.

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PRINTING PRESS

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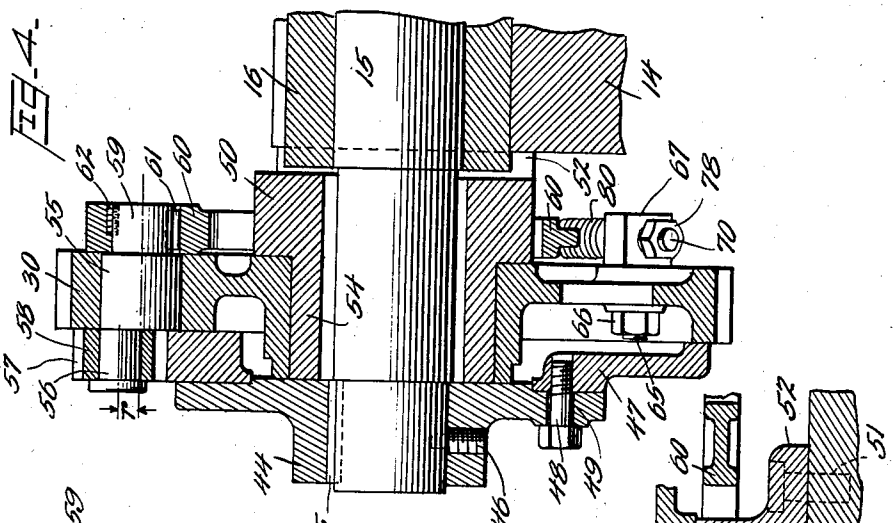


FIG. 4.

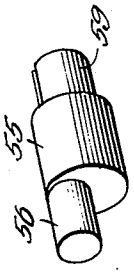


FIG. 6.

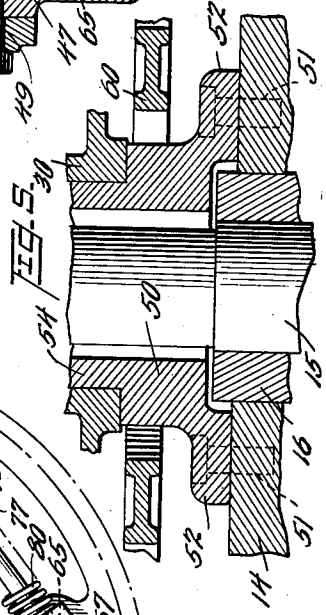


FIG. 5-A.

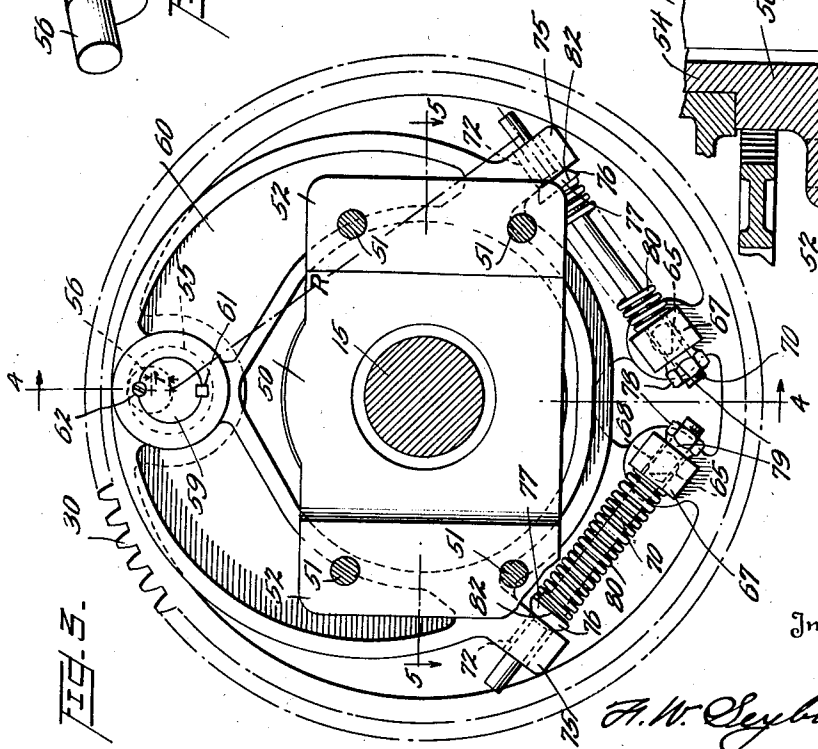


FIG. 5.

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Patented June 8, 1937 2,083,099

UNITED STATES PATENT OFFICE

2,083,099

PRINTING PRESS

Frederick W. Seybold, Westfield, N. J., assignor, by mesne assignments, to American Type Founders, Incorporated, a corporation of New Jersey

Application January 17, 1936, Serial No. 59,604

13 Claims. (Cl. 101—286)

This invention relates to printing presses and more particularly to flexible compensating gearing which is adapted to be applied to a member of a printing couple to permit the two members of the couple to operate with true rolling contact regardless of any slight inequalities of speed or displacement in the separate transmission means employed in driving the individual members.

The general object of the invention is to provide a novel and improved compensating device of this type which is capable of adaptation to a wide variety of printing presses and other mechanisms; but, for purposes of simplicity and clarity of disclosure, the present invention will be illustrated and described herein as applied to a printing press of the bed and cylinder type.

Even in cases in which the members of the printing couple are driven from a common ultimate source of power, the linear speeds of the two may differ slightly, so that although the members are placed in rolling contact the friction of such contact must yield to the driving gearing of the couple and slippage between the members will occur. This slippage results in the imperfections of the printing impression which are termed "slurs" and is due to the resulting slight relative movement between the type form and the paper during contact. Small errors in the pitch of the cylinder driving gears are also the cause of "slurs" and of what are known as "gear streaks".

In order to overcome these difficulties and to permit the frictional rolling contact between the members of the couple to control their movement, at least during the actual printing operation, my invention contemplates the provision of a flexible driving connection between one of the members and the driving transmission thereof. In the preferred embodiment, this connection is interposed between the impression cylinder and the last gear of the train which drives it and thus ensures that the linear speed of the cylinder will conform, during the printing interval, to that of the bed. Any forcing ahead or retardation of the cylinder through the cylinder gear, which would otherwise result in slippage between the bed bearers and those of the cylinder, is taken up by the compensating device, which may yield in either direction, and true frictional rolling contact between the cylinder and bed is maintained. Relief from such conflict in speeds is had when the cylinder is separated from the bed bearers before the beginning of the return stroke, and at this time the cylinder is permitted to resume its original relative position with respect to the cylinder driving gear.

In the present example of the reduction of my invention to practice, the compensating drive is applied to a press in which the cylinder driving gear centers are not separated when the impression cylinder is raised off the bed bearers to clear the type form during the return stroke of the bed. The device may, however, be applied to that type construction wherein the cylinder gear is raised a fraction of an inch out of mesh with its driving gear during the return stroke.

Other objects and features of novelty will be apparent from the following specification when read in connection with the accompanying drawings in which one embodiment of my invention is illustrated by way of example.

In the drawings:

Figure 1 is a fragmentary view in side elevation of a bed and cylinder press, being an illustrative example of the application of my invention;

Figure 2 is a transverse vertical sectional view of the press;

Figure 3 is a fragmentary vertical sectional view on line 3—3 of Figure 2, and showing the flexible impression cylinder drive;

Figure 4 is a view in vertical transverse section taken on line 4—4 of Figure 3;

Figure 5 is a horizontal sectional view taken on line 5—5 of Figure 3; and

Figure 6 is a view in perspective of an eccentric pin forming part of the impression cylinder drive.

The printing press selected as an illustrative example of the application of my invention is one of the type disclosed in the patent to William M. Kelly, No. 1,777,092, and comprises essentially the supporting frame A, the impression cylinder B, the reciprocating type bed C, the sheet feeding board D and the sheet delivery mechanism E. A portion of the inking mechanism is indicated at F and the impression cylinder gripper actuating mechanism is indicated generally by the reference character G. The specific details of these devices are not comprised in the present invention and are illustrated only fragmentarily or in general outline.

The supporting frame A comprises the center frame members 10 and the lower side frame members 11 and 12 upon which are supported the impression cylinder supporting side frames or brackets 13 and 14. These side frame portions are braced and secured together by suitable transverse members not shown. The im-

pression cylinder shaft 15 is supported in these side brackets or housings 13 and 14 in suitable bearing boxes, one of which is indicated at 16.

The bed C is supported by suitable anti-friction means (not shown) which permit its reciprocating movement beneath the impression cylinder. During the printing portion of the cycle of movement of the press, the impression cylinder B and the bed C are disposed in rolling contact through the impression cylinder bearers 17 and the bed bearers 18. Suitable mechanism may also be provided for raising the impression cylinder out of contact with the bed during other portions of the cycle.

The impression cylinder B and the type bed C, in this illustrative example, comprise the printing couple referred to in connection with the broad description of the present invention. Trains of driving mechanism for the impression cylinder B and the bed C may derive their power from any suitable source, but preferably, as in the case of the present embodiment, they are driven from a common source comprising a motor (not shown) which serves to actuate the gear 20 which in turn meshes with and drives the gear 21 carried upon the shaft 22, upon the opposite end of which, outside of the side frame member 12, is disposed the gear 23. The gear 23 meshes with and drives a large external ring or disc gear 25 which is carried upon the shaft 26 and houses certain gear mechanism which comprises a portion of the reciprocating bed drive. The gear 25 is disposed in meshing engagement with the impression cylinder gear 30 which is disposed concentrically with the impression cylinder shaft 15 and operatively connected therewith by means of the compensating device forming an essential feature of the present invention.

The disc gear 25 carries upon its inner periphery a pair of gear sectors 31 and 32 which are brought alternately in engagement with the gears 33 and 34 carried respectively by the shafts 35 and 36 having bearings in the side and center frame members of the press. Upon inner portions of the shafts 35 and 36 are respectively disposed the gears 37 and 38 which are in meshing engagement with each other. The gear 37 also meshes with the rack 40 carried upon the underside of the type bed C. It will be understood from this brief description, an amplification of which will be found in the Kelly patent referred to, that through the alternate engagement of the gear sectors 31 and 32 with the gears 33 and 34 the drive will be transmitted through the shaft 35 and the gear 37 to the bed rack 40 during reciprocation of the bed in one direction and through the shaft 36, gear 38 and gear 37 to the bed rack during reciprocation in the opposite direction.

The means just described constitute the main driving mechanism for the type bed C which is essential to an understanding of the present invention. Certain additional mechanism may be employed to control the movement of the bed at the ends of its strokes. These devices retard the movement of the bed, bring it to a stop, and initiate the movement in the reverse direction. A portion of this mechanism is indicated generally at 41 of the drawings and at 42 is shown one of a pair of auxiliary racks through which this movement is applied to the bed. Again, for a detailed disclosure of this mechanism, reference is made to the Kelly Patent 1,777,092.

It will be seen from the description thus far that the bed and cylinder, which comprise the printing couple, are each positively driven through separate trains of gearing and also during a portion of the cycle of movement are disposed in rolling contact. The separate driving means for the bed and cylinder are so designed as to give them the same linear velocity so far as possible. Due to unavoidable inaccuracies and other causes, however, there may be a slight conflict between the normal drive of the impression cylinder and the bed, and the mutual frictional contact between the respective bearers. This conflict is obviated by means of the feature of my invention which will now be described.

Referring now more particularly to Figures 3–6 of the drawings, the details of my novel compensating drive will be described. The end of the impression cylinder shaft 15 which projects outwardly beyond the bearing 16 in the side frame bracket 14 is provided at its extreme outer portion with a disc 44 which is secured to the shaft by means of the key 45 and the set screw 46. Adjustably secured to the disc member 44 for slight rotative displacement is the adjustable flange ring 47. This adjustable attachment may be made by means of the bolts 48 which are threaded into openings in the flange 47 and adapted to pass through arcuate slots 49 in the disc 44. This adjustment is for attaining the proper setting of the cylinder grippers with relation to the type form on the bed.

A hollow trunnion or stub shaft member 50 surrounds the shaft 15 and is secured to the side bracket 14 of the impression cylinder housing by means of the bolts 51 which pass through the laterally extending flanges 52. The impression cylinder gear 30 is rotatably disposed upon the cylindrical bearing portion 54 of the trunnion member in a plane which is parallel and closely adjacent to that of the disc and plate members 44, 47. Rotatably mounted within the gear 30 adjacent the periphery thereof and disposed transversely thereto is the eccentric pin 55. The eccentric portion 56 of the pin projects into a slot 57 formed in the periphery of the disc flange 47 and rotatably carries a block 58 which is slidable within said slot. The opposite end 59 of the pin 55 passes through an opening in a yoke-like compensating lever arm 60 which may be bifurcated or ring-shaped to surround the impression cylinder shaft 15. The lever arm 60 is rigidly secured to the end 59 of the eccentric pin 55 as by means of the key 61 and the screw 62.

Upon the opposite side of the impression cylinder gear 30 from the pin 55 are secured the spaced pins 65 as by means of the nuts 66. These pins are provided with squared heads 67 which are bored as at 68 for the reception, with considerable clearance, of the spring rods 70. Each of these rods 70 also passes through the openings 72 in the abutment lugs 75. One end of each of the openings 72 is countersunk slightly to provide a seat for the partly spherical portion 76 of the flange 77 provided on the spring rod 70. Upon the end of each of the rods which pass through the heads 67 of the pins 65 are provided the nuts 78, which are also formed with partly spherical surfaces 79 seated in correspondingly chamfered or countersunk portions of the heads 67 adjacent the margins of the openings 68. Surrounding each of the rods 70 is the coil spring 80 which is seated at one end against the head 67 of the bolt 65 and at the opposite end against a shoulder 82 formed on the flange 77 on the rod 72.

It will be seen that the eccentric pin 55 and the rigidly attached lever arm 60 comprise a

cranked lever of the first class having long and short arms R and *r* respectively. These moment arms are indicated in Figures 3 and 4 of the drawings. Although the pin **55** and arm **60** could conceivably be made integral, for manufacturing considerations it is preferred that they be made separately and rigidly connected together as disclosed.

The operation of my compensating gear will now be described. The driving force transmitted to the impression cylinder gear **30** from the large disc or ring gear **25** causes the gear **30** to rotate upon its trunnion **54**. The projecting end **56** of the eccentric pin **55** is engaged with the disc flange **47** by means of the block **58** slidably disposed within the slot **57** and causes the flange **47** together with the disc **44** to which it is secured to rotate. Since the driving disc **44** is keyed to the impression cylinder shaft **15**, the shaft is also rotated and the impression cylinder driven. The bed C which is driven in this case from the same source of power is, of course, so geared as to ensure its movement with the same approximate linear speed as the impression cylinder.

However, as already described, my novel connection permits a certain flexibility in the drive of the impression cylinder so as to permit the cylinder itself to be driven during the printing stroke by frictional contact between the impression cylinder bearers and the bed bearers. The slight relative movement necessary to provide this flexibility or compensation takes place between the gear **30** and the driving disc assembly **44**, **47** by means of the eccentricity of the pin portion **56** with relation to the central fulcrum portion of the pin **55**. The resilient resistance to the turning of the pin **55** is afforded by the springs **80** which are disposed between the abutments **75** carried by the compensating lever arm **60** and the pins **65** carried by the gear **30**. One of the springs will naturally resist the movement in the opposite direction. Furthermore, the resisting forces of the springs **80** will be effective at a considerable mechanical advantage, the ratio of the spring resistance torque arm to the eccentricity of the pin portion **56** being expressed by R:*r*. In other words, a comparatively small spring force acting on the torque arm R of the lever can oppose a considerable torque applied to the eccentric pin.

From the foregoing description of my invention it will be seen that there has been provided means for causing the normal gear drive of the impression cylinder to yield to some degree and permit the impression cylinder to be driven during a portion of the printing stroke by direct frictional contact between the bed and impression cylinder bearers. This yielding is resisted by the resilient force exerted by the springs acting on the compensating lever. It will also be noted that by the provision of springs acting in both directions, the frictional contact between the bearers may control the movement of the impression cylinder not only in cases where the bed may be moving a little faster than the cylinder would move under the control of its normal driving gear, but also when the bed is lagging behind the impression cylinder.

Various changes and modifications may be made in the embodiment of my invention illustrated and described herein without departing from the scope of the invention as defined by the following claims. It will also be understood that my invention can be applied to certain other similar machines where such control as is effected thereby may be necessary and is not strictly limited to printing presses.

Having thus described the invention, what is claimed as new and desired to be secured by Letters Patent is:

1. In a printing press or the like, in combination, a printing couple, means for driving each member of the couple at approximately the same linear velocity, a driving shaft for one of said members and a gear for transmitting the driving force to said shaft, and a compensating connection between the said gear and said shaft for permitting said member to be directly driven by the other member of said couple at the same linear velocity, regardless of inequalities in the velocities imparted by said first named driving means, said connection comprising a crank carried by said shaft, a lever fulcrumed upon said gear at a point upon one side of the axis thereof, the axis of said fulcrum being perpendicular to the plane of said gear, and having a resilient connection with a portion of said gear, the other arm of said lever being slidably connected with said crank.

2. In a printing press or the like, in combination, a printing couple, means for driving each member of the couple at approximately the same linear velocity, a driving shaft for one of said members and a gear for transmitting the driving force to said shaft, and a compensating connection between the said gear and said shaft for permitting said member to be directly driven by the other member of said couple at the same linear velocity, regardless of inequalities in the velocities imparted by said first named driving means, said connection comprising a crank disc carried by said shaft, a lever fulcrumed upon said gear at a point upon one side of the axis thereof, the axis of said fulcrum being perpendicular to the plane of said gear, and having a resilient connection with a portion of said gear, the other arm of said lever having a pin and slot connection with said crank disc.

3. In a printing press or the like, in combination, a printing couple, means for driving each member of the couple at approximately the same linear velocity, a driving shaft for one of said members and a gear for transmitting the driving force to said shaft, said gear and shaft being coaxial, and a compensating connection between the said gear and said shaft for permitting said member to be directly driven by the other member of said couple at the same linear velocity, regardless of inequalities in the velocities imparted by said first named driving means, said connection comprising a crank disc carried by said shaft, a lever fulcrumed upon said gear at a point upon one side of the axis thereof, the axis of said fulcrum being perpendicular to the plane of said gear, and having a resilient connection with a portion of said gear upon the opposite side of said axis, the other arm of said lever having a pin and slot connection with said crank disc.

4. In a printing press or the like, in combination, a printing couple, one member thereof arranged in rolling contact with the other, means for driving each member of the couple at approximately the same linear velocity, a resilient flexible driving connection in the means for driving one of said members, whereby said member may be driven for at least part of the time by rolling contact with the other member, said connection including a resilient element and means for multiplying the resistance of said resilient element as opposed to the torque of the driving means.

5. In a printing press or the like, in combination, a printing couple, one member thereof arranged in rolling contact with the other, means for driving each member of the couple at approximately the same linear velocity, a resilient flexible driving connection in the means for driving one of said members, whereby said member may be driven for at least part of the time by rolling contact with the other member, said connection including a spring member and a compensating lever having a torque arm and an arm against which said spring means bears, whereby the resistance of said spring means as opposed to the torque of the driving means is multiplied.

6. In a printing press or the like, in combination, a printing couple, one member thereof arranged in rolling contact with the other, means for driving each member of the couple at approximately the same linear velocity, a resilient flexible driving connection in the means for driving one of said members, whereby said member may be driven for at least part of the time by rolling contact with the other member, said connection including a spring member, a compensating lever having a short torque arm and a much longer arm against which said spring means bears, whereby the resistance of said spring means as opposed to the torque of the driving means is multiplied.

7. A flexible transmission mechanism of the class described comprising, in combination, a wheel, a shaft substantially co-axial with said wheel, and resilient driving connections therebetween, said connections comprising a lever fulcrumed upon said wheel upon one side of the axis thereof and disposed in parallel relation with said wheel, a short arm of said lever extending toward the adjacent portion of the periphery of said wheel, the other arm of said lever extending beyond the axis of the wheel and resiliently connected therewith upon the opposite side of the axis from the fulcrum point, a lever arm carried by said shaft and slidably connected with the short arm of said lever.

8. A flexible transmission mechanism of the class described comprising, in combination, a wheel, a shaft substantially co-axial with said wheel, and resilient driving connections therebetween, said connections comprising a lever fulcrumed upon said wheel upon one side of the axis thereof and disposed in parallel relation with said wheel, a short arm of said lever extending toward the adjacent portion of the periphery of said wheel, the other arm of said lever extending beyond the axis of the wheel, a crank arm carried by said shaft and slidably connected with the short arm of said lever, spring connections between said other arm and points on the opposite side of the axis from the fulcrum point, whereby swinging of said lever in either direction is resiliently opposed.

9. In a printing press or the like, in combination, a printing couple, means for driving each member of the couple at approximately the same linear velocity, means for driving one of said members by the other of said members at exactly the same linear velocity, the first named driving means for the one of said members being resiliently yieldable to permit the second named driving means to control, and means associated with said first named means for giving the resilient driving force of said first named means a greater mechanical advantage than the opposing force of said second named driving means.

10. In a printing press of the bed and cylinder type, in combination, a reciprocating bed, a rotary impression cylinder adapted to be brought into and out of rolling contact with said bed during the cycle of operation thereof, driving means for said bed, driving means for said cylinder, said cylinder driving means including a resilient flexible connection whereby during the period of rolling contact said flexible connection will yield whenever the velocity imparted to the impression cylinder by the bed exceeds or falls short of that of the cylinder driving means and to restore the velocity of the impression cylinder to normal when said bed and cylinder are separated during non-printing portions of the cycle, elements included in said flexible connection for giving the resilient velocity restoring forces of the cylinder driving means a greater mechanical advantage than the frictional driving force imparted by said reciprocating bed.

11. In a device of the class described, in combination, a driven shaft, a crank arm secured to said shaft, a driving gear surrounding said shaft, a radially disposed slot in said crank arm, an eccentric pin rotatably carried by said gear the eccentric portion of said pin having a rotatable and slidable driving connection within said slot, a bifurcated lever secured to said pin and extending parallel with said gear and surrounding said shaft, abutment portions on said lever and cooperating abutment elements carried by said gear, compression springs disposed between said respective abutments for resisting the swinging of said lever in opposing the driving force transmitted through the eccentric pin.

12. In a device of the class described, in combination, a driven shaft, a crank arm secured to said shaft, a driving gear surrounding said shaft, a radially disposed slot in said crank arm, an eccentric pin rotatably carried by said gear the eccentric portion of said pin having a rotatable and slidable driving connection within said slot, a ring-shaped lever secured to said pin and extending parallel with said gear and surrounding said shaft, abutment portions on said lever and cooperating abutment elements carried by said gear, compression springs disposed between said respective abutments for resisting the swinging of said lever in opposing the driving force transmitted through the eccentric pin.

13. In a printing press of the class described, in combination, a frame including side frame members, an impression cylinder, an axle for said cylinder rotatable in bearings carried by said side frame members, a hollow trunnion secured to one of said side frame members and surrounding said axle, a driving gear rotatable on said trunnion, a driving disc carried by the outer end of said axle, an eccentric pin and slot connection between said gear and said disc, a spring pressed lever arm connected with said pin for resisting relative rotation between said gear and said disc whereby a resiliently yieldable connection is introduced in said impression cylinder drive.

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