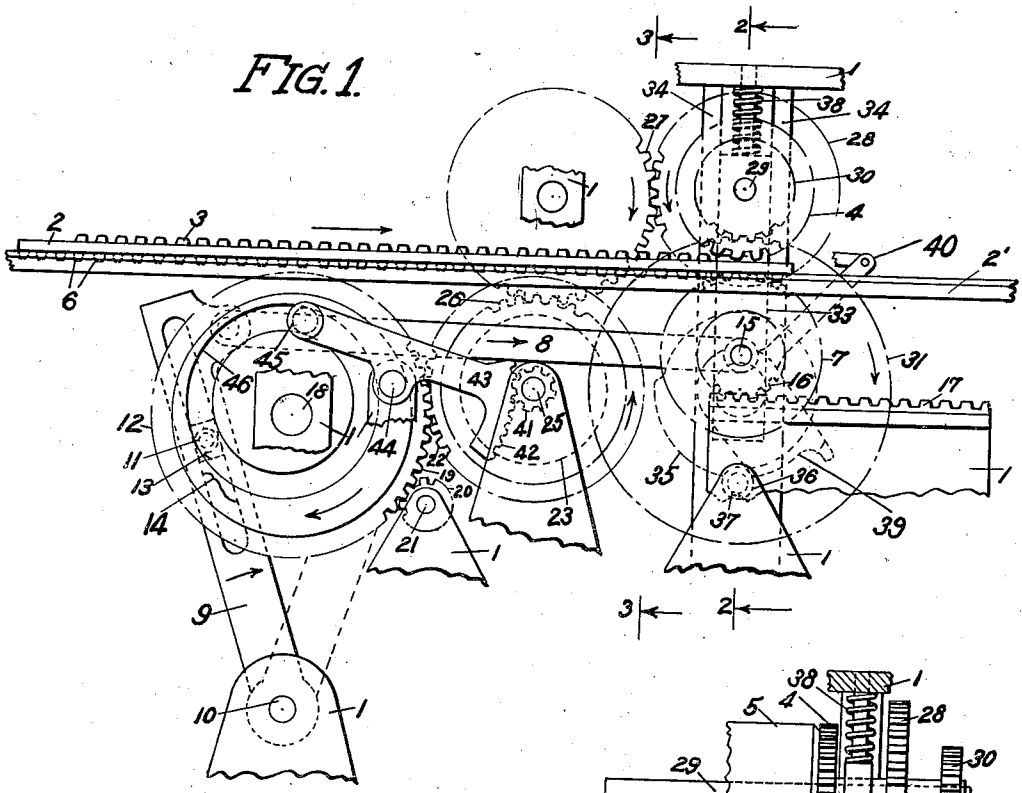
June 18, 1935. A. G. BOWLES 2,005,216

CYLINDER PRESS MOTION

Filed Feb. 14, 1934

FIG. 1.



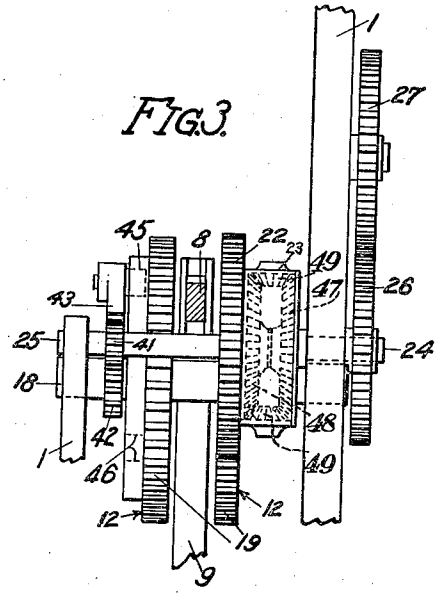


FIG. 3.

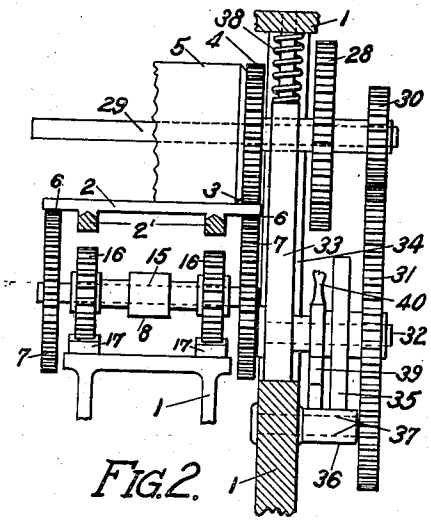


FIG. 2.

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# UNITED STATES PATENT OFFICE

2,005,216

## CYLINDER PRESS MOTION

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Application February 14, 1934, Serial No. 711,147

13 Claims. (Cl. 101—282)

This invention relates to printing presses of the cylinder type provided with a reciprocating bed or platen and the objects of the invention are to provide improvements in the motion controlling means for such presses whereby the cylinder will make one or more revolutions during the printing stroke of the bed so that one or more colors or impressions can be printed from as many forms without releasing the paper from the cylinder. Also means for rapidly returning the bed while the cylinder continues to revolve out of gear with the bed, while always in gear with the bed driving means, yet comes in gear with the bed at the start of each printing stroke. Also such a press in which the number of revolutions of the cylinder on the return stroke of the bed may be less than on the printing stroke. Also positive means for maintaining the registered relation of the gearing during the printing stroke whereby the same two teeth of cylinder gear and bed rack are positively brought to position each time regardless of the fact that the cylinder may make more revolutions during the printing stroke than on the return. Also in such a press movement means for obtaining an extra long stroke for handling an extra long bed with forms arranged in tandem. Also such a press which will be free from objectionable shock at the ends of the stroke. Other features and advantages of my construction will appear in the following description and accompanying drawing.

In the drawing a three-revolution cylinder press adapted to print from two forms arranged in tandem is shown by way of example to illustrate the invention.

Fig. 1 is a longitudinal elevation showing the driving gears, bed, racks, etc., of the press movement.

Fig. 2 is a cross section of Fig. 1 as seen from the line 2—2 of Fig. 1.

Fig. 3 is a cross section of Fig. 1 as seen from the line 3—3 of Fig. 1.

Briefly described the improvements may be said to be a combination of reciprocable press bed with throw multiplying rack and pinion operated by a special crank arm arrangement for quick return, and a one-way constantly revolvable impression cylinder geared to a rack on the bed to make one or more revolutions (as predetermined by the gear ratio, bed throw and cylinder diameter) during the printing stroke so as to pick up one or more forms in register arranged on the bed in tandem, and the cylinder disengaged from the bed during the quick return, while always in gear with the driving crank wheel through means of a differential gear which has its output automatically varied to permit and cause varying degrees of rotation of the cylinder respectively for the printing and return stroke of the bed yet insure correct meshing of the cylinder gear and bed rack teeth at the beginning of each printing stroke.

In the drawing only so much of the conventional press parts are shown as are necessary to illustrate my improved motion, as otherwise the drawing would become too confusing. Also, the gearing at but one side of the press is generally shown, though it is to be understood that it may be duplicated on both sides, or its equivalent used for raising and lowering the cylinder from printing relation to the bed.

The various shafts, bearings or fulcrums and parts which are fixed are shown in the drawing as supported on a fragmentary portion of the frame of the press and these portions are all designated 1. The reciprocable bed 2 is supported on suitable guides 2' and fitted with upper rack or racks 3 engaging the cylinder gears 4 at the ends of the impression cylinder 5 for running in register therewith during the printing stroke, while secured to the under side of the bed are racks 6 for giving motion to the bed from one or two horizontally traveling spur gears 7 moved back and forth by means of a pitman 8 pivotally connected at its other end with the upper end of an upstanding lever 9 pivoted at its lower end to the frame at 10 and which lever is oscillated from the solid line to the dotted line position of Fig. 1 by means of a crank pin 11 fixed to and extending between two revolvable crank disks 12 arranged on opposite sides of the lever with the pin 11 passing through a roller or bearing block 13 slidable in a slot 14 in the lever so that upon rotation of the disks 12 the lever will be oscillated and thereby move gears 7 back and forth. The connection of pitman 8 to gears 7 is a pivotal one around a short shaft 15 to which spur gears 7 are secured and to which shaft a pair of smaller spur gears or pinions 16 are also secured and which pinions roll in engagement with a pair of fixed racks 17 secured to suitable parts of the press frame 1. The pinions 16 are about half the size of gears 7 so that the travel of the pitman is thus multiplied by about three on the bed.

Also, since lever 9 to which the pitman is pivoted is itself pivoted but a short distance below the crank disks 12 it follows that while it takes a considerable portion of the crank disk revolution (about 3/5ths) to advance the bed to the right (the printing stroke) the return is made much

quicker as the crank pin is operating closer to the lever pivot 10, in fact requiring about ⅖ths of a revolution of the disks with the particular pivoting of the lever shown, though this could be made even less with closer setting of pivot 10 to outwardly projecting axles 18 of the crank disks. This crank and sliding box arrangement forms a gradual absorber of the shock of the bed reversing at ends of stroke though additional shock absorbers or dash pots may be used in the manner well understood in the art if desired.

Crank disks 12 are also provided with spur gear teeth 19 as they are also the main driving wheels of the press movement and may receive power from a pair of spur pinions 20 on a drive shaft 21 receiving its power from any desired source and suitably controlled in any suitable manner as well understood.

With the above described features, it is now necessary to lift or otherwise disengage the cylinder gear 4 from the upper bed rack 3 at the end of the printing stroke to permit the bed's quick return without reversing the cylinder, and it is also necessary to keep the cylinder going so as to discharge and take on a new sheet of paper and replace its gear in mesh with the self-same teeth at the start of the next printing stroke, and the means for doing this will now be described.

The press movement is all operated from the driving gears 19 on crank disks 12 as these control the reciprocation of the bed with which all must be synchronized, and to this end one of these gears is in mesh with the outer or master gear 22 of a differential gear assembly which includes a revolvable frame or casing 23 to which the master gear 22 is secured, and which casing carries within it two confronting bevel gears 47, 48 in mesh with idler pinions 49 also carried by the casing. Bevel gears 47, 48 are respectively secured to the inner ends of the two output shafts of the differential which are respectively numbered 24 and 25 and on the latter of which gear 22 is freely supported. The proportions of gears 19—22 are such that one revolution of the disks 12 will revolve the differential casing 1½ revolutions and output shaft 24 three times if output shaft 25 were held from turning, and which is done under special controlled means as will later be described. Output shaft 24 carries at its outer end a spur gear 26 in mesh with an idler gear 27 in turn meshing with a gear 28 of the same diameter as gear 26 and secured to the shaft 29 of the cylinder and which shaft also carries a pinion 30 meshing with a large gear 31 below it and which latter gear is revolvably mounted on a stub shaft 32 projecting from a long bearing block 33 slidable vertically in guides 34 formed in the press frame and through the upper portion of which block the cylinder shaft 29 projects and has bearing, all so that the cylinder and its gears 4, 28 and 30, together with large gear 31 and its stub shaft 32 may all rise and fall with the blocks (the other side of press being duplicated) to disengage or engage the bed rack 3 with gear 4, and which is normally effected by means of a circular cam 35 secured to the inner side of gear 31 and which at a certain part of the revolution rides over a roller 36 mounted on a fixed pin 37 projecting from the frame 1 and bodily lifts the assembly. For the two color or three revolution cylinder press now under consideration and wherein the cylinder makes about two revolutions during the printing stroke and the third one on the return stroke, the gears are of such proportion that gear 31 will revolve one complete revolution during a complete cycle of the press (forward and backward movement of bed from starting point) and therefore cam 35 is of a length equal to about one-third of the circumference of its position on gear 31 and in proper setting to just come into operation at the end of the forward or printing stroke of the bed and thus hold the cylinder out of gear during the return stroke. As soon as the cam has passed over the fixed or fulcrum roller 36 a heavy spring 38 (one on each side of the press) forces the assemblage downward to re-engage the cylinder gear 4 with bed rack 3.

At this point it may be mentioned that any suitable emergency release or throw-off may also be provided such as an additional cam 39 revolvably mounted on pin 37 and provided at some accessible point with a rod or handle 40 by means of which it may be manually operated.

With the above arrangement of gearing each revolution of crank disks 12 would reciprocate the bed and revolve the cylinder three revolutions or one revolution at each third of a turn of the crank disks if the cylinder were held out of gear with the bed rack and if the other output shaft 25 of the differential were locked against turning. However, as it is required that the cylinder make about two revolutions while in gear with and during the one way printing stroke of the bed to pick up two forms arranged in tandem it follows that the moment the cylinder is lowered the bed becomes the driver and revolves gear 4 as well as gears 28 and 26 to make about two revolutions during a time interval in which they would normally make but about 1½ if the other output differential shaft (25) was locked. This extra forward motion of the gears from output shaft 24 would, by working through the differential, tend to move shaft 25 in the reverse direction a sufficient amount to compensate for it, and I make use of this fact by suitably controlling the backward movement of shaft 25 during the increased movement period (the printing stroke) of gears 26 etc., and do this by securing a spur pinion 41 on shaft 25 meshing with a quadrant 42 carried at one end of a lever 43 pivoted at 44 to the frame 1 and at its opposite end provided with a roller 45 operating in a cam groove 46 in the outer face of one of the disk gears 12, the proportion, pivoting of the lever and shape of the cam being such as to permit reverse turning of shaft 25 in the present showing of a two-color press of about one-half turn and then to turn the shaft back again to starting point just as the bed is about to begin a new printing stroke. This puts all gear teeth in exactly the same relation at the moment the cylinder gear 4 engages the first tooth of the bed rack 3. Where the design of the press and gear ratios required but slight compensation through the differential the quadrant lever 43 and pinion 41 could give way to a plain lever directly secured to shaft 25. The proportions of the gearing may be such as to provide any desired number of revolutions of the cylinder on the printing stroke as against any desired number on the return stroke. It is evident that while I show the cylinder as lifting to disengage it from the bed rack the same thing would be accomplished by dropping the bed, and which arrangement could easily be substituted by anyone familiar with the art.

Also to be noted is that instead of the cylinder being raised by a cam and lowered by a spring, these features may be reversed, or a double-acting cam may be used, as my invention is not

predicated on these known features of cylinder press construction.

In the three-revolution cylinder press movement above described, my statement that the cylinder makes "about" two revolutions on the bed rather than "two revolutions" is because the cylinder makes one complete revolution to pick up the first form and then continues to take up the second form in register with the first, though the second revolution need only be enough to clear the effective impression surface of the cylinder (allowing for the grippers, etc.), so as to start on the return stroke without loss of time, and which ordinarily would put a little more than one revolution on the return stroke. The same principle applies to presses arranged to print more than two forms in tandem, and some of the advantages of my invention may be secured in two revolutions on one color presses and wherein there may thus be a greater degree of revolving of the cylinder on the quick return stroke than on the printing stroke.

It is also evident that all the well-known details of press construction required to handle the paper, ink, forms, etc., are to be embodied in a press provided with my improved movement and accordingly the disclosure is confined to the features of the movement which I believe to be new in the art shown with enough of the common construction to make them operative.

I claim:

1. A cylinder press movement comprising a reciprocable bed, guides supporting the bed, means for reciprocating the bed, a rack secured along the edge of the bed, an impression cylinder geared to said rack in the printing stroke, means disengaging said cylinder from the rack during the return stroke, said bed being of a length to revolve said cylinder more than one revolution thereagainst during one printing stroke for printing in register on one place on the cylinder from forms in tandem, means continuing the revolution of said cylinder about one turn during the return stroke of said bed, and means reengaging the cylinder gear to said rack in register for repetition of the printing stroke as above.

2. In the construction specified in claim 1, the means for reciprocating the bed including a revolvable crank disk and connections from the crank to the bed arranged to cause a quicker return movement of the bed, and driving gearing between said crank disk and said cylinder always in mesh.

3. In the construction specified in claim 1, the means for reciprocating the bed including a revolvable crank disk and connections from the crank to the bed arranged to cause a quicker return movement of the bed, gearing between said crank disk and said cylinder always in mesh including a differential gear assembly, and means automatically controlling the output of said assembly to provide for the increased number of revolutions of the cylinder during the printing stroke.

4. A cylinder press movement comprising a reciprocable bed and a cylinder geared to a rack thereon, means for reciprocating said bed including a crank disk, connections from the crank disk to said bed, driving gearing between said crank disk and said cylinder always in mesh, means for throwing the cylinder and bed rack out of gear during the return stroke of the bed, said gearing including differential gearing arranged to permit said cylinder to make more revolutions during one stroke of the bed than during the other stroke.

5. A cylinder press movement comprising a reciprocable bed and a cylinder geared to a rack thereon, means for reciprocating said bed including a crank disk, connections from the crank disk to said bed, driving gearing between said crank disk and said cylinder always in mesh, means for throwing the cylinder and bed rack out of gear during the return stroke of the bed, said gearing including differential gearing arranged to permit said cylinder to make more revolutions during the printing stroke of the bed than during the return stroke.

6. A cylinder press movement comprising a reciprocable bed and a cylinder geared to a rack thereon, means for reciprocating said bed including a crank disk, connections from the crank disk to said bed, driving gearing between said crank disk and said cylinder always in mesh, means for throwing the cylinder and bed rack out of gear during the return stroke of the bed, said gearing including differential gearing arranged to permit said cylinder to make about two revolutions on said bed during the printing stroke of the bed and but about one revolution during the return stroke.

7. In a construction as specified in claim 4, said differential gearing including a master gear carrying around an idler pinion in mesh with a pair of gears respectively carried by one of two output shafts, said crank disk geared to the master gear of the differential, and one of its output shafts geared to the press cylinder, and means controlling the movement of the other output shaft of the differential to permit the different number of revolutions of the cylinder in the opposite strokes of the bed.

8. In a construction as specified in claim 4, said differential gearing including a master gear carrying around an idler pinion in mesh with a pair of gears respectively carried by one of two output shafts, said crank disk geared to the master gear of the differential, and one of its output shafts geared to the press cylinder, means controlling the movement of the other output shaft of the differential to permit the different number of revolutions of the cylinder in the opposite strokes of the bed and bringing said second output shaft to precise position at the beginning of each printing stroke for correct remeshing of the cylinder and rack.

9. In a construction as specified in claim 4, said connections from the crank disk to the bed including a pitman operated by the crank disk and with one end extending under the bed, a pinion gear revolvably carried by said end of the pitman, a larger gear secured to the pinion to rotate therewith, a fixed rack with which one edge of said pinion gear engages and a rack secured to the bed engaged by said larger gear whereby the movement of the bed is greatly increased over the throw or movement of the end of the pitman, a lever adjacent said crank disk pivoted near one end to the opposite end of said pitman, the other end of said lever pivoted to a fixed point, and the crank of said crank disk engaging a bearing slidable in a slot in said lever in a manner to oscillate the same as the crank disk is revolved, the arrangement being such as to swing the crank closer to the fixed pivotal point of the lever during the return stroke for a quicker return than a printing stroke.

10. A cylinder press movement comprising a flat reciprocably mounted bed, an impression cylinder geared to a rack on the bed, said bed being of a length to revolve the cylinder more than one revolution thereagainst during the printing stroke

so as to bring the same impression area on the cylinder more than once against the bed, a revolvable crank disk, means connecting the crank disk and bed arranged and adapted to move the bed in its printing stroke during a major part of a revolution of said crank disk and return the bed during a minor part of said revolution, and means disengaging the cylinder and bed rack during the return stroke.

11. A cylinder press movement comprising a flat reciprocably mounted bed, a cylinder geared to a rack on the bed, said bed being of a length to revolve the cylinder more than one revolution thereagainst during the printing stroke, a revolvable crank disk, means connecting the crank disk and bed arranged and adapted to move the bed in its printing stroke during a major part of a revolution of said crank disk and return the bed during a minor part of said revolution, differential gearing positively connecting the crank disk and said cylinder at all times, and means disengaging the cylinder and bed rack during the return stroke of the bed.

12. In a construction as specified in claim 11, said differential gearing including a master gear carrying around an idler pinion in mesh with a pair of gears respectively carried by one of two output shafts, said crank disk geared to the master gear of said differential and one of the output shafts geared to said cylinder, and means controlling and forcing partial rotation of the other output shaft of the differential whereby but about one revolution of the cylinder is produced during the return stroke of the bed.

13. In a construction as specified in claim 4, said differential gearing including a master gear carrying around an idler pinion in mesh with a pair of gears respectively carried by one of two output shafts, said crank disk geared to the master gear of the differential, and one of its output shafts geared to the press cylinder, means controlling the movement of the other output shaft of the differential to permit the different number of revolutions of the cylinder in the opposite strokes of the bed comprising a gear secured to said second output shaft, a lever pivoted to a fixed point provided with a quadrant at one end engaging said gear, and the other end of said lever extended adjacent said crank disk, and a cam on said crank disk controlling and forcing movement of said lever.

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