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T. S. FITCHETT ET AL

GEAR TRAIN FOR MULTICOLOR PRESSES, INCLUDING COMPENSATING DEVICES

Filed Nov. 10, 1921

4 Sheets-Sheet 1

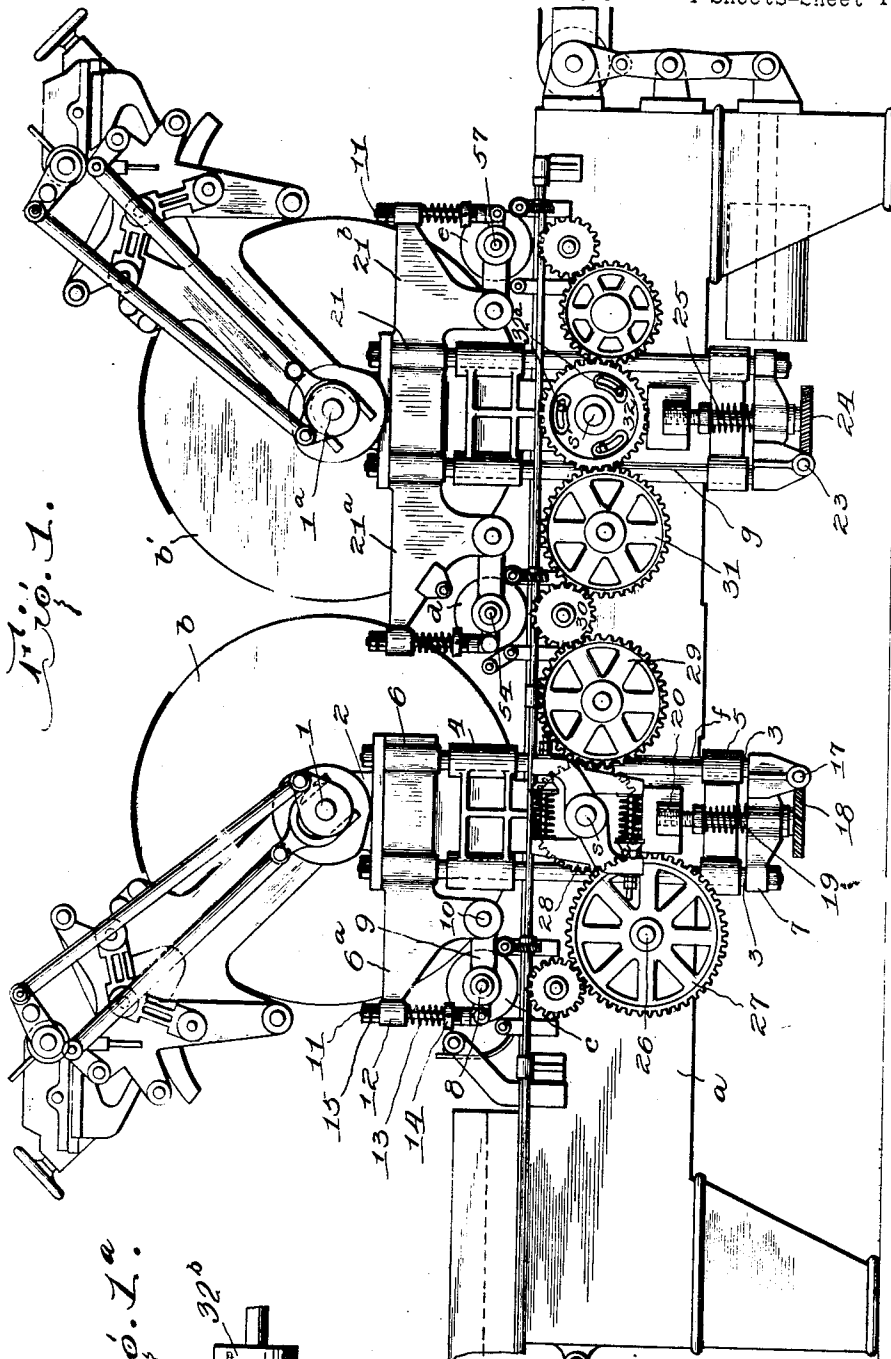
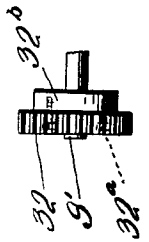


Fig. 1.

Fig. 1a.



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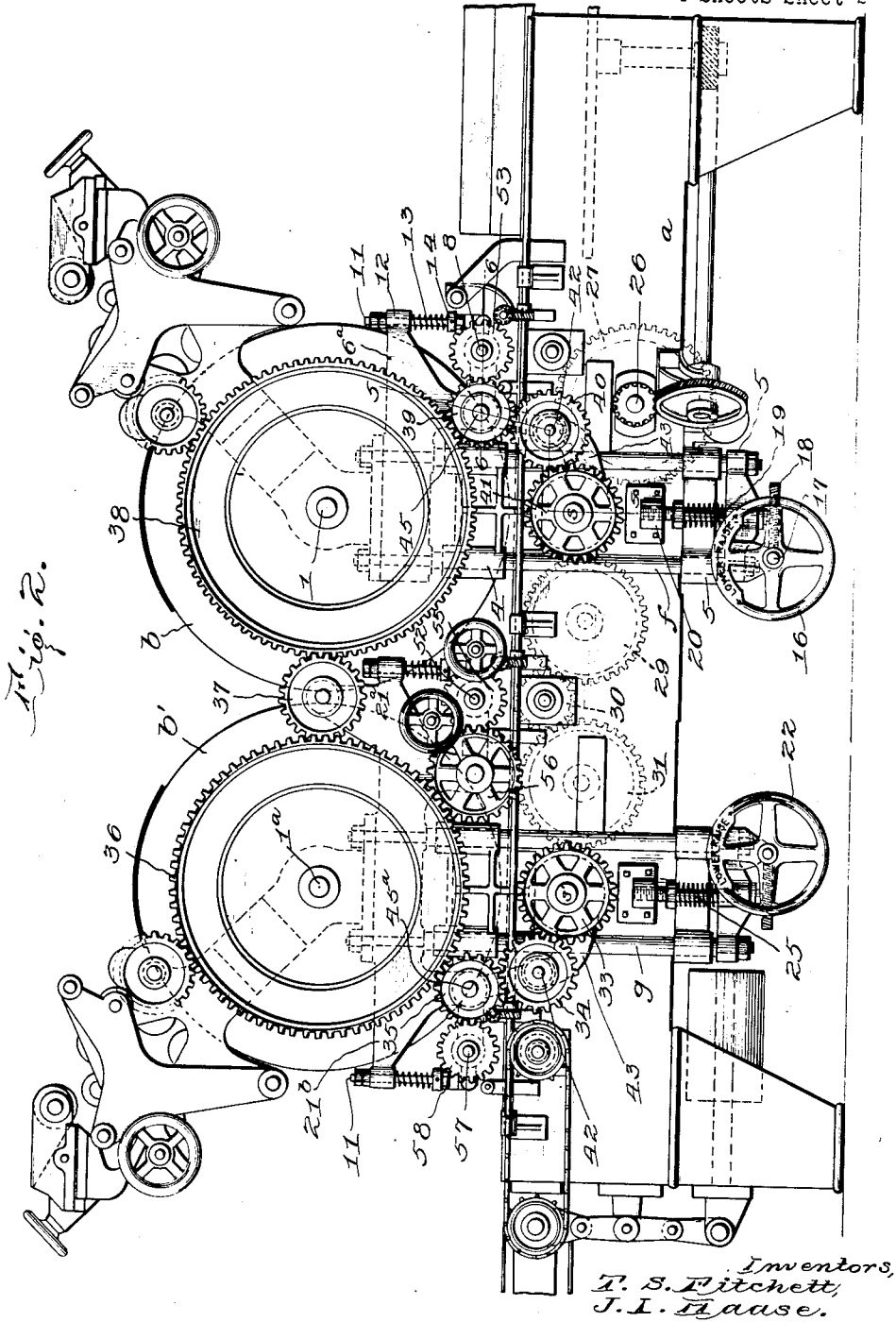
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4 Sheets-Sheet 2



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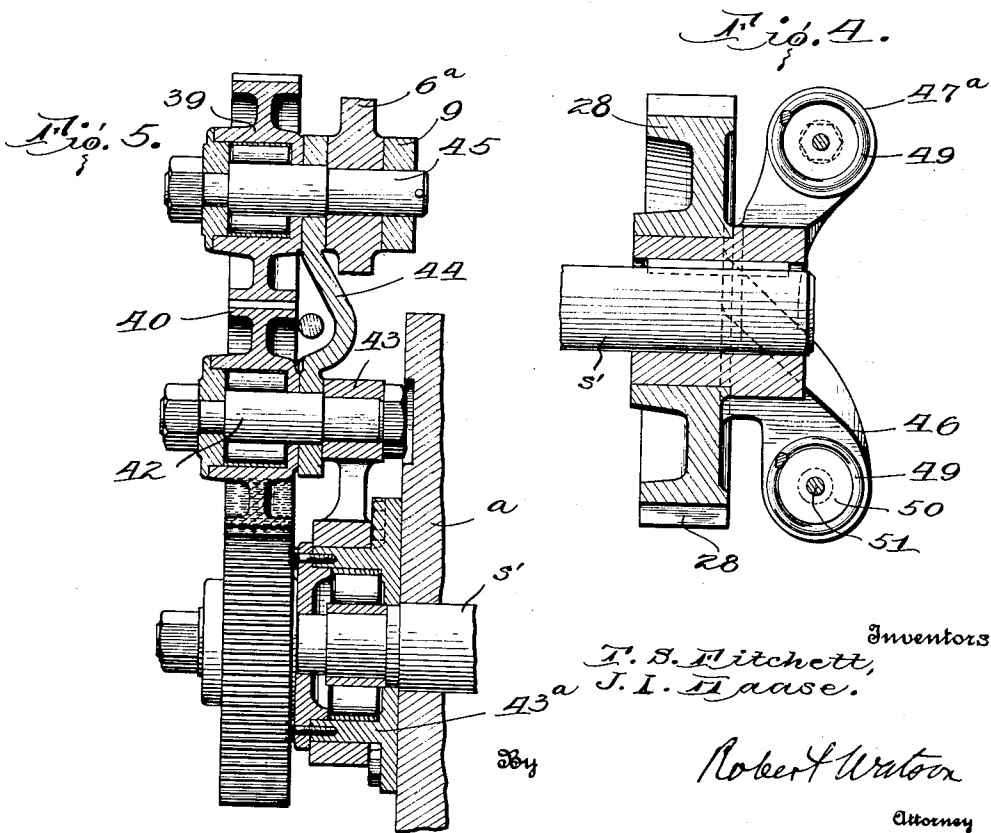
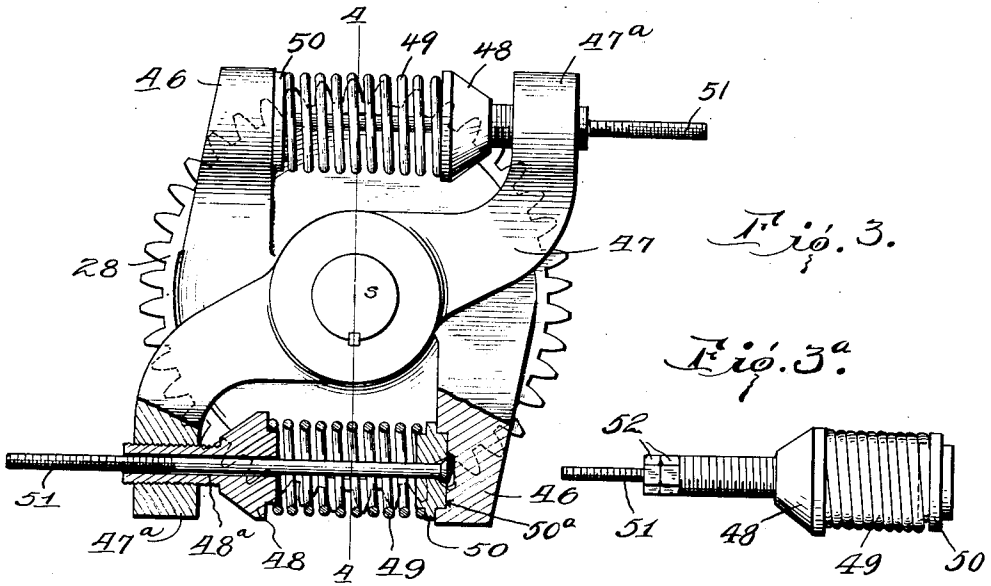
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GEAR TRAIN FOR MULTICOLOR PRESSES, INCLUDING COMPENSATING DEVICES

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4 Sheets-Sheet 3



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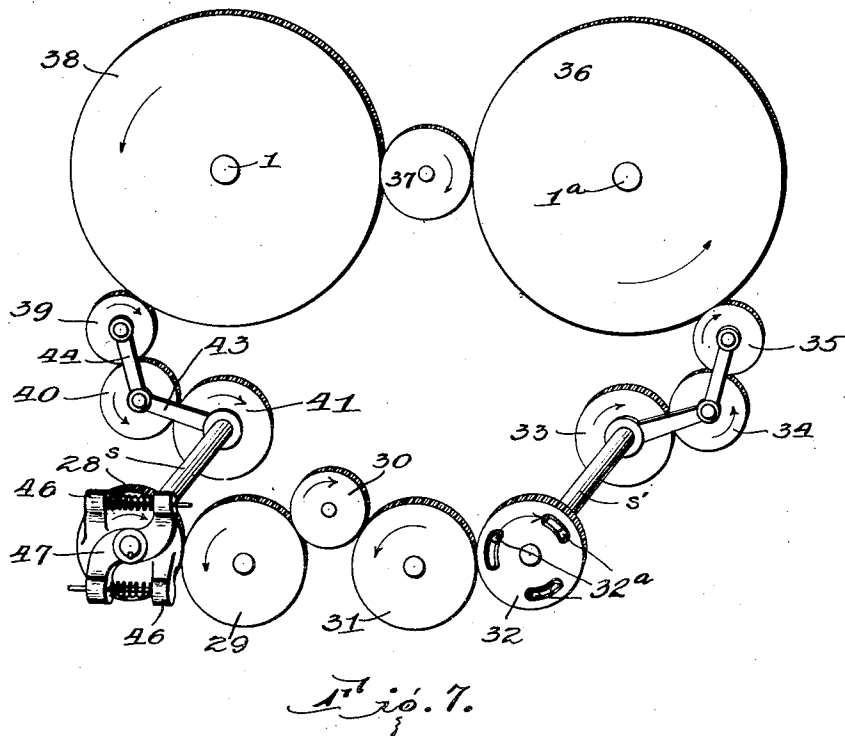
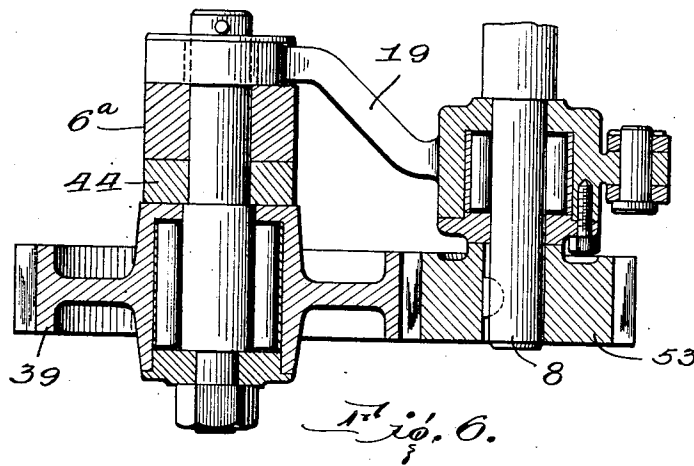
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GEAR TRAIN FOR MULTICOLOR PRESSES, INCLUDING COMPENSATING DEVICES

Filed Nov. 10, 1921 4 Sheets-Sheet 4



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UNITED STATES PATENT OFFICE.

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GEAR TRAIN FOR MULTICOLOR PRESSES, INCLUDING COMPENSATING DEVICES.

Application filed November 10, 1921. Serial No. 514,157.

To all whom it may concern:

Be it known that we, THOMAS S. FITCHETT, a citizen of the United States, residing at Glenarm, and JORGEN I. HAASE, a subject of the King of Denmark, residing at Towson, both in the county of Baltimore and State of Maryland, have invented certain new and useful Improvements in Gear Trains for Multicolor Presses, Including Compensating Devices, of which the following is a specification.

This invention relates to improvements in multi-color printing presses of the type having printing cylinders arranged to make successive impressions on sheets of fibre-board, wood, or other like stock which are moved along a stationary bed between the printing and impression cylinders by pull rollers, the cylinders being independently adjustable vertically to suit the thickness of the stock. The invention relates more particularly to an arrangement of gearing for operating the cylinders, whereby the forms or printing surfaces on the cylinders are caused to register with accuracy, and whereby the cylinders and pull rollers may be adjusted relatively to the bed without disturbing the working relations of the gears.

In carrying out the invention, we provide an endless gear train for operating the printing cylinders, this train including the main or driving gears on the cylinder shafts and also including concentrically mounted gears which are adjustable relatively to one another to take up the slack in the train. Certain of the parts in the train are mounted in fixed relation to the bed, while others are adjustable with the printing cylinders toward and from the bed, and we therefore provide in the train two intermediate floating gears, each of which adjusts itself automatically about the axis of one of the gears on the bed and about the axis of one of the gears which is adjustable with the printing cylinders, whereby the close working relation of these gears is maintained in all positions of the printing cylinders. As the vertical adjustment of one printing cylinder relatively to the other, after the slack in the train has been taken out, would tend to exert a binding force on the gears in part of the train, we provide a spring compensating device which automatically introduces the

necessary amount of slack in this part of the train to prevent binding and takes up this slack when the printing cylinders are restored to their original relative positions. The invention also includes improved means for mounting the pull rollers and certain details of construction which will be hereinafter pointed out.

In the accompanying drawing,

Fig. 1 is a side elevation of part of a press having our improvements thereon;

Fig. 1^a is a detail view, showing the adjustable mounting of one of the gears;

Fig. 2 is a view, similar to Fig. 1, taken from the opposite side of the press;

Fig. 3 is a side elevation, partly in section, of the devices for taking up the slack in the gear train;

Fig. 3^a is a side view of one of the springs and its seats, assembled as a unit;

Fig. 4 is a section on the line 4—4 of Fig. 3;

Fig. 5 is a section on the line 5—5 of Fig. 2;

Fig. 6 is a section on the line 6—6 of Fig. 2; and,

Fig. 7 is a diagrammatic view illustrating the arrangement of the gears in the gear train.

Referring to the drawing, *a* represents the bed of the press, and *b* and *b'* are two printing or form cylinders carrying forms for printing in different colors upon sheets of wood, fibreboard, or like stock, which are moved along the bed beneath the cylinders, from left to right in Fig. 1, by pull rollers *c*, *d*, and *e*. The shaft 1 of the cylinder *b* is journaled in bearings 2, which are mounted upon vertically adjustable frames *f*, arranged at opposite sides of the bed. These frames are alike, each comprising parallel rods 3, which are movable vertically in brackets 4 and 5, and cross-heads 6 and 7 which are secured to the upper and lower ends of the rods, respectively. The bearings 2 rest upon the cross-heads 6 and the latter have extensions or brackets 6^a which support the pull rollers *c*. A shaft 8, which carries the pull rollers *c*, is journaled in horizontal links 9, pivoted at 10 to the brackets, the free ends of the links being pivotally connected to rods 11, which extend vertically through bearings 12 on the brackets. Springs 13, coiled about the

rods and interposed between the bearings 12 and adjustable nuts 14 on the rods, serve to apply tension in a downward direction to the pull rollers to cause the latter to grip the stock which is fed by the rollers to the printing cylinders. The pull rollers are adjustable toward and from the bed with the printing cylinders by raising and lowering the frames *f*, and they are further adjustable relative to the bed by turning the lock nuts 15, which serve as stops for limiting the downward movement of the pull rollers. The frames *f*, at the opposite sides of the printing cylinder *b*, are simultaneously adjustable by means of a hand wheel 16 upon a worm shaft 17, journaled in the lower cross-heads 7 and having worms thereon which engage worm wheels 18 on vertically arranged screw shafts 19, which latter shafts extend through bearings in the cross-heads 7 and engage internally threaded bosses 20 on the sides of the bed frame. It will be evident that by turning the hand wheel in one direction or the other, the printing cylinder *b* and pull rollers *c* will be raised or lowered with respect to the bed.

The shaft 1^a of the printing cylinder *b'* is mounted upon two frames *g*, which are the same as the frames *f* and similarly adjustable. The upper cross-heads 21 of the frames *g* have oppositely extending brackets 21^a and 21^b on which pull rollers *d* and *e* are supported in the same manner as the pull rollers *c* are supported on the brackets 6^a. The frames *g* are vertically adjustable by means of a hand wheel 22, upon a worm shaft 23 which operates worm gears 24 upon vertically arranged adjusting screws 25, mounted in the same way as the screws 19, associated with the frames *f*. One of the brackets 21^a (Fig. 2) has an upward extension on which is supported a gear 37.

The printing cylinders are driven in unison by an endless train of gearing. Some of the gears in the endless train are mounted in fixed relation to the bed, while others are adjustable with the printing cylinders, and we therefore provide in the train certain gears, intermediate the gears on the bed and those adjustable with the cylinders, having floating bearings which cause the gears to remain in mesh in any position of adjustment of the printing cylinders. As shown in the drawing, 26 represents a countershaft upon which is mounted a gear 27, which drives the endless gear train. This driving gear meshes with a gear 28, (Figs. 1 and 7) which may, for convenience, be considered the initial gear of the train, although the driving force may be applied to any other convenient gear in the train. The gear 28 is loosely mounted upon one of the impression roller shafts *s*, and engages a gear 29, and the latter drives the

intermeshing gears 30, 31 and 32. The last mentioned gear is adjustably secured by bolts 32^a to a hub 32^b on the other impression roller shafts *s'*, and, at the opposite side of the machine (Fig. 2) this shaft carries a gear 33 which meshes with a gear 34 and the latter drives gear 35 which engages a main gear 36 on the shaft 1^a of the cylinder *b'*. This main gear meshes with an idle gear 37, journaled on the bracket 21^a, and the latter meshes with a main gear 38 on the shaft 1 of the cylinder *b*. A gear 39, which meshes with the gear 38, also meshes with a gear 40 which, in turn, meshes with a gear 41 which is fixed to the shaft *s* on which the initial loose gear 28 is mounted. It will be apparent by an inspection of Fig. 7 that the train of gearing described is endless.

The gears 28 to 33, inclusive, and the gear 41 are mounted in fixed relation to the bed frame of the press while the gears or pinions 35 and 39, which engage the gears on the printing cylinders are journaled on studs 45^a and 45, in the brackets 21^b and 6^a, respectively, (Fig. 2) and are adjustable with the cylinders toward and from the bed. The bearings for the gears 34 and 40 are therefore mounted so that when the cylinders are adjusted vertically, each of these gears may swing about the axes of the two gears with which it meshes. As shown in Fig. 5, the gear 40 is journaled upon a stud 42, which is secured in one end of a link 43, sleeved upon the bearing 43^a of the shaft *s'*, and a link 44 is connected between the shaft 42 and a stud 45 upon which the gear 39 is mounted. With this arrangement, it will be evident that when the printing cylinder *b* and the gears 38 and 39 are adjusted vertically, the gear 40 will swing about the axis of the gear 41 and also about the axis of the gear 39 and will remain in mesh with both of said gears. The gear 34 is mounted in the same way as the gear 40 so as to swing about the axes of the gears 33 and 35 when the cylinder *b* and the gears 36 and 35 are adjusted vertically.

With the endless train of gearing shown, assuming the gear 41 (Fig. 7) to be held stationary, all of the slack in that part of the train between said gear and the gear 33 may be taken up by adjusting these gears in the direction of the arrows, and all of the slack in the balance of the train between the gears 32 and 28 may be taken up by adjusting these latter gears in a direction opposite to that of the arrows. If the gears 32 and 28 were then secured to their respective shafts, the entire train, including the gears on the printing cylinders, would run without appreciable slack or back lash, providing no adjustment of either of the printing cylinders were made. However, it is necessary at times to adjust one of the printing cylin-

ders relatively to the other, and this causes a binding action in a part of the train unless some provision is made for introducing automatically a certain amount of slack in that part of the train. Thus, for instance, if the cylinder *b'*, which carries the gear 36 (Fig. 7) is moved upwardly, while the gear 38 on the cylinder *b* remains in its previous position of adjustment, this upward movement of the gear 36 would tend to turn the idle gear 37 and the successive gears 38, 39, etc. in the train backward and cause these gears to bind. A downward adjustment of the cylinder carrying the gear 38 relatively to the cylinder carrying the gear 36 would tend to reverse the direction of movement of the gears 37, 36, 35, etc. and cause these gears to bind.

In order to permit of the vertical adjustment of the printing cylinders relatively to one another without causing the gears to bind, we provide a spring compensating device which automatically introduces sufficient slack in the train to prevent the gears from binding when one cylinder is adjusted relatively to the other and which removes the slack as the cylinders are restored to their original relative positions. This compensating device also takes up any slack due to wear and keeps the gears in close mesh at all times. As shown in the drawing, the gear 28, which is loosely mounted on the shaft *s*, is provided with laterally projecting arms or brackets 46, extending at opposite sides of its axis, and upon the shaft is keyed a bracket 47, having arms 47^a, at opposite sides of the shaft, the ends of these arms being opposed to the lugs or brackets on the gear 28. Between the arms 47^a on the shaft and the brackets on the gear are interposed helical compression springs 49 which tend to force the gear 28 in one direction and the gear 41, which is keyed to the shaft *s*, in the opposite direction. With this arrangement, assuming the driving force to be applied to the gear 28, in the direction of the arrow, Fig. 7, the driving force will be applied directly to the gear 29 and thence onward through the gears 30, 31, etc. of the train, and it will also be applied yieldingly to the gear 41 and thence backward through the train. If the cylinder carrying the gear 36 should now be raised, which action would tend to cause the gears 37 to 41 to bind, the yielding connection between the gear 41 and the gear 28 will allow the gear 41 to advance with respect to the gear 28, and the subsequent gears 40, 39, 38 and 37 will also be allowed to advance sufficiently to operate without binding. Upon the return of the cylinder to its original position the compensating device will automatically remove the slack from the train. If the cylinder carrying the gear 38 is lowered with respect to the

companion cylinder, the tendency of the gears 37, 36, 35, etc. in the train to bind will be relieved at the spring compensating device which will allow relative movement of the gears 28 and 41, and thus the necessary slack will be introduced to prevent the gears in this part of the train from binding. The compensating device will take up this slack as the cylinder is restored to its original position.

The details of the spring compensating device are shown in Figs. 3 and 3^a. In these figures, each spring is shown compressed between two spring seats 48 and 50. The seat 48 has a tubular stem 48^a which is externally threaded and adapted to fit into a threaded opening in one of the arms 47^a, while the seat 50 is adapted to fit into a socket 50^a in one of the brackets 46. A threaded rod 51 extends through the seat 50, the spring 49 and the tubular stem of the seat 48. By applying nuts 52 to the rod 51 and tightening these nuts against the end of the tubular stem, the spring seats may be drawn toward one another as shown in Fig. 3^a, so that the seats and spring may be readily assembled between the arms 47^a and brackets 46. In applying the assembled units to the brackets, the stems of the seats 48 are threaded into the openings in the arms 47^a and the nuts 52 are then removed and the seats 50 are pressed by the springs into the sockets 50^a. The rods 51 serve no purpose after the parts have been assembled in the machine and are used only as a means for drawing the seats together, for convenience in assembling or removing them from the brackets and as a means for holding the seats and springs together as a unit when removed from the machine.

While we have referred to the driving force for the gear train as being applied initially to the gear 28, by the driving gear 27, the driving force may be applied to any other suitable gear in the train, such as the gears 29 or 31, without affecting the action of the compensating means. While the compensating means illustrated and described is particularly useful in connection with endless gear drives for the cylinders of multi-color presses, it will be evident that the compensating means in an endless gear train may be used for other purposes.

The pull rollers *c* on the shaft 8 are operated by a gear 53 on said shaft which meshes with gear 39 of the gear train. The pull rollers *d* on the shaft 54 are operated by a gear 55, which meshes with a gear 56 driven by the main gear 36, and the pull rollers *e* on a shaft 57 are driven by a gear 58, which meshes with the gear 35 in the gear train. The stock to be printed upon is carried along the bed, between the printing cylinders and impression rollers, by these pull rollers which bear frictionally upon it,

and the pressure of the pull rollers upon the stock may be varied by adjusting the tension of the springs on the rods 11. These pull rollers and their driving gears are adjustable vertically with the cylinder frames to suit the thickness of the stock to be printed upon.

What we claim is:

1. In a multi-color printing press, the combination with two printing cylinders of an endless gear train for operating said cylinders in unison, said train including main gears on the cylinders and two concentrically mounted gears, said latter gears being relatively adjustable about their common axis to take up the slack in the gear train.

2. In a multi-color printing press, two printing cylinders and means for adjusting the same vertically relatively to one another, an endless gear train for driving said cylinders including gears on the cylinders, and a yielding driving connection between two successive gears in the train.

3. In a multi-color printing press, the combination with two printing cylinders, of an endless gear train for operating said cylinders in unison, said train including main gears on the cylinders, two concentrically mounted gears, and a spring driving connection between said latter gears.

4. In a multi-color printing press, the combination with two printing cylinders of an endless gear train for operating said cylinders in unison, said train including main gears on the cylinders, a shaft, tight and loose gears on the shaft, arms on the latter gear and shaft, and a spring driving connection interposed between said arms.

5. In a multi-color printing press, the combination with two printing cylinders of an endless gear train for operating said cylinders in unison, said train including main gears on the cylinders, a shaft, tight and loose on the shaft, arms on the latter gear and shaft, a spring driving connection interposed between said arms, and means for adjusting the tension of said spring.

6. In a multi-color printing press, the combination with two printing cylinders of an endless gear train for operating said cylinders in unison, said train including main gears on the cylinders, a shaft, tight and loose gears on said shaft, arms projecting from the latter gear and shaft, a spring seat having a stem threaded into the arm on the shaft, and a spring interposed between said seat and the arm on the loose gear.

7. In a multi-color printing press, the combination with two printing cylinders, of an endless gear train for operating said cylinders in unison, said train including main gears on the cylinders, a shaft, tight and loose gears on said shaft, opposing arms on

the latter gear and shaft, and a yielding driving connection between said arms comprising two spring seats, one having a threaded connection with one of said arms and the other adapted to fit against the opposing arm, and a compression spring between said seats.

8. In a multi-color printing press, the combination with two printing cylinders of an endless gear train for operating said cylinders in unison, said train including main gears on the cylinders, a shaft, tight and loose gears on said shaft, a pair of arms on the gear at opposite sides of the shaft, a pair of opposing arms on the shaft, and springs interposed between said pairs of arms.

9. The combination with a machine and an endless gear train for driving the same, including two concentrically mounted gears, of a spring driving connection between said latter gears.

10. The combination with a machine and an endless gear train for driving the same, including two concentrically mounted gears, of a removable spring driving connection between said latter gears comprising two spring seats, a spring between said seats, and a rod connected to one seat and passing through the other, said rod having a threaded end adapted to receive a nut.

11. The combination with a machine, of an endless gear train for driving the same comprising two concentrically mounted gears, means for adjusting said gears angularly with respect to one another to preliminarily take up the slack in the train, two concentrically mounted gears, one rotatable with respect to the other, and a spring driving connection between said latter gears adapted to keep the slack out of the train under working conditions.

12. In a multi-color printing press, the combination with a bed, printing cylinders and means for adjusting said cylinders vertically with respect to the bed, of an endless train of gearing for operating said cylinders comprising main gears on the cylinder shafts, pinions engaging said main gears and adjustable with the cylinders, gears mounted in fixed relation to the bed, and floating gears intermediate said latter gears and pinions, each floating gear being adjustable about the axes of the two gears with which it meshes.

13. In a multi-color printing press, the combination with a bed, two printing cylinders arranged over the bed, means for adjusting said cylinders vertically and an endless gear train for operating the cylinders including gears on the cylinder shafts, of pull rollers, adjustable with the cylinders and geared to said train.

14. In a multi-color press, the combination with a bed, two printing cylinders ar-

ranged over the bed, means for adjusting said cylinders vertically and an endless gear train for operating the cylinders including gears on the cylinder shafts, of pull rollers, adjustable with the cylinders and geared to said train, and means for adjusting said pull rollers relatively to the cylinders and bed.

15. In a multi-color printing press, the combination with two printing cylinders, vertically adjustable frames supporting said cylinders, gears on the cylinder shafts and pinions adjustable with the frames for driving said gears, of links supported by said frames and adjustable about the axes of said pinions, pull rollers journaled in said links and geared to said pinions, vertically movable rods supported by said frames and supporting the free ends of the links, and springs for applying downward pressure to the pull rollers.

In testimony whereof we affix our signatures.

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