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LOST MOTION TAKE-UP FOR PRINTING PRESSES OR THE LIKE.

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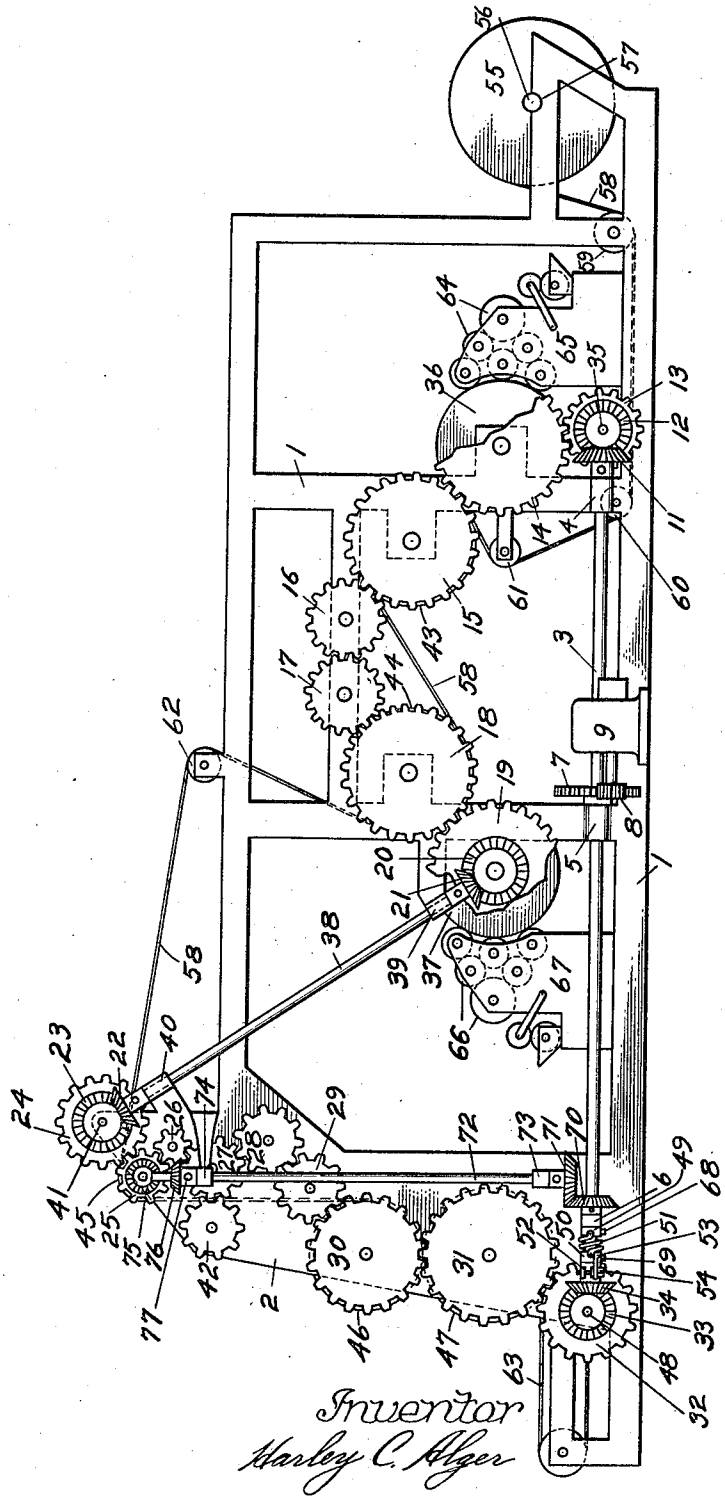

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UNITED STATES PATENT OFFICE.

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LOST-MOTION TAKE-UP FOR PRINTING PRESSES OR THE LIKE.

Application filed November 26, 1917. Serial No. 203,982.

To all whom it may concern:

Be it known that I, HARLEY C. ALGER, a citizen of the United States, residing at Oak Park, in the county of Cook and State of Illinois, have invented a new and useful Lost-Motion Take-Up for Printing Presses or the like, of which the following is a specification.

My invention relates to improvements in devices for eliminating the lost motion or back lash that is common between various moving parts of printing presses or similar machines which are driven by gears and has for its object the construction of a lost motion take up which may be applied to a train of gears or a series of gears driving the various parts of such a machine whereby the lost motion or back lash between the teeth of the gears may be reduced or eliminated. A further object is to provide a mechanism for this purpose which will be simple and effective and which may be applied to a long train of intermeshing gears or to a series of gears which may comprise two or more trains of intermeshing gears operatively connected by shafts, chains or other mechanism. A still further object is the construction of such a device which may be adjustable and which may automatically take up lost motion as it increases due to wear of the parts.

In printing presses it is usally very desirable that each moving part of the press shall move at exactly the same speed or at some definite ratio of the speed of some other part of the press. For example, in the ordinary rotary web printing press it is very desirable that each set of printing cylinders shall revolve at exactly the same surface speed without lost motion or back lash and that the relation of speed between the printing cylinders and the folder mechanism shall be steadily constant without lost motion or back lash. The various parts of such a press are usually driven by a number of gears. Parts of the press may be driven by one set of two or more gears or by a train of gears while other parts may be driven by another set or train of gears and one set or train of gears may be operatively connected by shafts, gears, chains or other suitable connections to drive another set or train of gears, the whole comprising a series of gears operatively connected for driving the press mechanism. In order that a gear may run smoothly and efficiently it is necessary that its teeth be constructed so as to allow a slight clearance between the teeth of the gear with which it meshes. This clearance allows lost motion or back lash between the gears and although when new this lost motion between a single pair of gears may be slight, it is accumulative so that the lost motion between the first and last gears of a train or series of gears may be considerable and may allow a variation in the speed between various parts of the press. This lost motion may allow one set of printing cylinders to jump ahead of another set of printing cylinders due to their momentum, thus causing poor registry which is especially undesirable when printing more than one color, or perhaps causing the web to break, thus delaying the operation of the press. Or the ratio of speed of the folder mechanism to the printing cylinders may vary slightly, breaking the web or causing a variation in the cutting off or folding of the printed signature. Or, again, due to lost motion in the gears of the folder mechanism alone, the cutting off may vary with respect to the collecting or folding, either causing poor quality or perhaps even causing the folder to choke and fill up with the crumpled web. These difficulties are further multiplied as the gears wear and the lost motion consequently increases.

Attempts have been made to reduce lost motion by using double gears on a shaft meshing with double gears on another shaft or by constructing a gear which is split in two perpendicularly to its axis and providing means for adjusting the two parts of the gear to take up wear. These methods however are costly and are not conveniently applied and no method has heretofore been provided which eliminates the lost motion from a whole train of intermeshing gears or from a series of operatively connected gears simply and effectively.

In my invention it will be seen that I operatively connect the last of a train or series of gears back with the first or driving gear of the train or series of gears so that while the gears drive from one to another through the intermediate gears or shafts, each gear is held back by the succeeding gear and cannot move ahead faster than it is driven by the preceding gear. The working surfaces of the teeth of all gears are therefore held in contact so that no one gear can jump ahead but must move

at the exact speed at which it is driven by the preceding gear without lost motion or back lash.

In the drawing, Figure 1 shows a side elevational view of a rotary web printing press to which one form of my invention has been adapted.

Referring to the drawing, 1 represents the frame of the press proper while 2 represents the folder end of the press which may comprise cutting off, collecting, folding and delivering mechanism as will be more fully described. The press may be driven through any convenient connection with the various gears of the press or the press may be provided with a main drive shaft as shown at 3, suitably supported in bearings 4, 5 and 6, extending from the frame of the press. The shaft 3 may be operated by any suitable source of power as, for example, a motor 9 having a driving pinion 8 which meshes with a gear 7 secured to the shaft 3. Pinned to the shaft 3 is the main drive gear 11, in this case a bevel gear, which meshes with a bevel gear 12 forming a part of a series of operatively connected gears for driving the press. The bevel gear 12 is rotatably mounted on a shaft 35 together with a spur gear 13 to which it is securely attached. The gear 13 meshes with a gear 14 which operates the first plate cylinder, shown at 36, through suitable connection, and the gear 14 drives a gear 15, connected to operate the first impression cylinder, shown at 43. The gear 15 drives a suitably mounted idler gear 16 which in turn drives an idler gear 17 and gear 17 then drives a gear 18 which is connected to operate the second impression cylinder shown at 44. The gear 18 drives a gear 19 which operates the second plate cylinder, shown at 37. A shaft 38, rotatably mounted in bearings 39 and 40 extending from the press frame may be used to transmit power from the cylinder drive gears to the folder mechanism. A bevel gear 20 secured to gear 19 meshes with a bevel gear 21 which is secured to shaft 38 and a bevel gear 22 secured to the other end of shaft 38 meshes with a bevel gear 23 which is rotatably mounted on a shaft 41 together with a spur gear 24 to which it is securely attached. The spur gear 24 drives a gear 25 which may carry a roller over which the web passes as shown at 45 for delivering the web to the folder mechanism as will be more fully described. The gear 25 drives a suitably mounted idler gear 26 which in turn drives a gear 27. The gear 27 drives a gear 42 and these two gears may be adapted to operate a pair of rotary shear blade cylinders, not shown, such as are commonly used to cut off the web as it passes between the cylinders. The gear 27 also drives an idler gear 28 which in turn drives an idler gear 29. The gear 29 drives gear 30 which may be arranged to operate a collecting cylinder in line with the gear and shown at 46. The gear 30 drives a gear 31 which may operate a delivery cylinder shown at 47. The gear 31 drives a gear 32 which is mounted on a shaft 48 with and secured to a bevel gear 33. The bevel gear 33 drives a bevel gear 34 which may be mounted co-axially with the gear 11 on the main drive shaft 3. This connection may be made between any two gears having intermediate intermeshing gears between them operatively connected by shafts, teeth of the gears or other mechanism and in the drawing it is shown as forming connection between the driving gear and the final driven gear of a long series of gears. Further this connection may be made rigidly by pinning or otherwise securing gear 34 to shaft 3 but it is preferable in many cases to make the connection yieldable so that it may automatically take up lost motion due to wearing of the gears and it is further desirable to make the connection adjustable.

In the drawing I have shown one means for accomplishing these results. A collar 49 is mounted on the shaft 3 and may be securely attached to the shaft by means of a set screw 68. A second collar 50 is mounted loosely on shaft 3 and may under certain conditions be attached to the shafts by means of a set screw 69. The gear 34 is loosely mounted on shaft 3 and the collars 49 and 50 are connected by a coil spring shown at 51. A lug 52 extends outwardly from the hub of gear 34 and a lug 53 extends from collar 50 to a point in line with lug 52. An adjusting screw 54 is rotatably mounted in lug 53 and lug 52 is threaded to receive the threaded end of the screw so that by turning the screw 54 the gear 34 may be turned on the shaft 3 and the position of the gear with respect to the collar may be adjusted.

A set of inking rollers 64 mounted on a carriage 65 is adapted to apply ink to plate cylinder 36 and a set of inking rollers 66 mounted on a carriage 67 is adapted to apply ink to plate cylinder 37.

A roll of paper 55 is shown mounted on a spindle 56 which is rotatably received in bearings at either side of the press one of which is shown at 57. The web 58 unwinds from the roll 55 as the press is operated and passes over suitable rollers 59, 60 and 61 and between cylinders 36 and 43, where one side of the web is printed. The web then passes around impression cylinder 43 between cylinders 37 and 44 where the other side of the web is printed. The web then passes over a roller 62 and to roller 45 which delivers the web vertically downward between the shearing cylinders which are in line with gears 27 and 42 where the web is cut into sheets of the desired size. The sheets then pass to the collecting cylinder

46 which may collect the sheets in the desired order and transfer them, folded, to the delivery cylinder 47 which delivers the folded sheets or signatures to a belt conveyor or carrier 63 which may be arranged to convey the signatures from the press.

As before mentioned, the press is driven by the motor 9, which revolves pinion 8 in a clockwise direction when viewed from the folder end of the press and gear 7, shaft 3 and gear 11 are revolved in a counter clockwise direction when viewed from the same point. Gears 12 and 13 are therefore driven in a counter clockwise direction and the driving power is transmitted through the train of intermeshing gears from 13 to 19 inclusive through gears 20 and 21, shaft 38, gears 22 and 23 through the train of intermeshing gears 24 to 32 inclusive and through gear 33 to gear 34 which is mounted on shaft 3.

The operation of the press itself will be evident from the preceding description and the operation of the present invention as applied to the press will be better understood from the following description of the connection referred to. In making the connection between gear 34 and shaft 3, the shaft 3 is held stationary by any convenient means and all the gears from 11 to 34 inclusive are held back in a direction reverse to their driving movement by turning gear 34 backward so that each gear holds back on the preceding gear and the working surfaces of the teeth of the gears are held in contact, thereby taking up any lost motion or back lash. Collar 49 is then secured to the shaft 3 by means of the set screw 68. When so set the gear 34 will hold back on gear 33 and each gear in the train or series will hold back on the preceding gear so that each gear will be held from jumping ahead thus eliminating lost motion between the gears. The gear 34 may be adjusted to hold back with still greater force by turning the adjusting screw 54 so that lug 52 will be drawn toward lug 53 thus tightening the coil spring 51. The spring will then form a yieldable connection which will tend to hold gear 34 back so that the working surfaces of the teeth of the gears will be held in contact by the action of the spring even when the gears have become worn which provides for automatically taking up the lost motion as the teeth of the gears wear. If desired the gear 34 may be connected without the yieldable connection by securing collar 53 to shaft 3 by means of the set screw 69 and then adjusting the gear 34 by means of the adjusting screw 54 as above described which will more positively hold back gear 34 and each preceding gear thus eliminating the lost motion. Further when the shaft 3 is long there will be considerable torsional springing of the shaft so that the shaft itself may form a yieldable connection without the use of the spring 51.

When desired, the invention can of course be applied to all of the gears driving any part of the press mechanism or, to a portion of the press driving gears as for example, the folder gears as shown in the drawing. For this purpose the shaft 38 with its connecting gears 20 to 24 inclusive may be removed and the folder mechanism may be driven by means of a bevel gear 70 secured to shaft 3. The bevel gear 70 drives a bevel gear 71 which is secured to a shaft 72 mounted in bearings 73 and 74 extending from the press frame as shown in the drawing. Mounted with and secured to gear 25 near the top of the folder there is a bevel gear 75. A bevel gear 76 mounted on shaft 72 may be moved toward the upper end of the shaft until it meshes with bevel gear 75 in which position it may be secured to shaft 72 by means of a set screw 77. The folder mechanism will then be driven from shaft 3 through gears 70 and 71, shaft 73 and gears 76, 75 and 25 to 31 inclusive, while the connection back to shaft 3 will be made by gears 32, 33 and 34, as before described.

From the foregoing description it will be evident that with this invention several sets of two or more intermeshing gears in various parts of the press may be operatively connected together and the lost motion of the whole series comprising one or more sets of intermeshing gears may be eliminated by a single adjustment. For example the gears 11 and 12 form one set of intermeshing gears, the gear 12 is operatively connected with the gear 13 by means of shaft 35, gears 13 to 19 form a second set of intermeshing gears, gear 19 is connected with gear 20, gears 20 and 21 form a third set of intermeshing gears connected to a fourth set of gears 22 and 23 by the shaft 38, shaft 41 connects gear 23 with gear 24, gears 24 to 32 form a fifth set of intermeshing gears connected by a shaft 38 with a sixth set of intermeshing gears 33 and 34. Shaft 3 connects gear 34 back again with gear 11 thus forming a second connection between the gears at each end of the series. It is evident that the pair of gears 11 and 34 may have one or many sets of intermeshing gears operatively connected between them and the lost motion may be eliminated from the whole series by making a second connection as described between the gears at each end of the series which will hold the working faces of the teeth of the gears in contact.

In the above description I have set forth one form of my invention but I do not wish to confine myself to the particular construction of the device as set forth.

What I claim as my invention and desire to protect by Letters Patent is:

1. In a printing press or the like, a series of operatively connected gears for driving a part of the press mechanism, a gear for driving a series, a gear driven by the series and means including a shaft tending to drive the driving gear from the driven gear whereby lost motion between the gears is elminated.

2. In a printing press or the like, a series of operatively connected gears for driving a part of the press mechanism, a gear for driving the series, a gear driven by the series and means including two coaxial operatively connected gears operatively connecting said driving and driven gears whereby the driven gear tends to drive the driving gear.

3. In a printing press or the like, a series of operatively connected gears for driving a part of the press mechanism, a shaft having at least two gears of the series mounted thereon anl means for yieldably connecting at least one of the two gears to the shaft whereby the working surfaces of the teeth of the gears are held in contact.

4. In a printing press or the like, a series of operatively connected gears for driving a part of the press mechanism, a shaft having at least two gears of the series mounted thereon and an adjustable member for connecting at least one of the gears to the shaft whereby the working surfaces of the teeth of the gears are held in contact.

5. In a printing press or the like, a series of operatively connected intermeshing gears for driving a part of the press mechanism, a shaft adapted to transmit power to a gear at one end of the series and having mounted thereon a gear at the other end of said series and means for connecting said end gears to the shaft whereby the working surfaces of the teeth of the gears in the series are held in contact.

6. In a printing press or the like, a series of operatively connected gears for driving a part of the press mechanism, a shaft having at least two gears of the series mounted thereon and means for connecting the two gears to the shaft whereby the working surfaces of the teeth of the gears are held in contact.

7. In a printing press or the like, two trains of gears each train comprising a driving gear a driven gear and intermediate intermeshing gears between the driving and driven gears, means for transmitting power from the driven gear of the first train to the driving gear of the second train and means for connecting the driven gear of the second train back with the driving gear of the first train whereby lost motion between the gears in both trains is eliminated.

In testimony whereof I have affixed my signature in the presence of two subscribing witnesses.

HARLEY C. ALGER.

Witnesses:
E. H. DUFF,
EMMA ALGER.