July 9, 1946. F. W. SEYBOLD 2,403,760

TWIN CRANK BED MOTION

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FIG. 1.

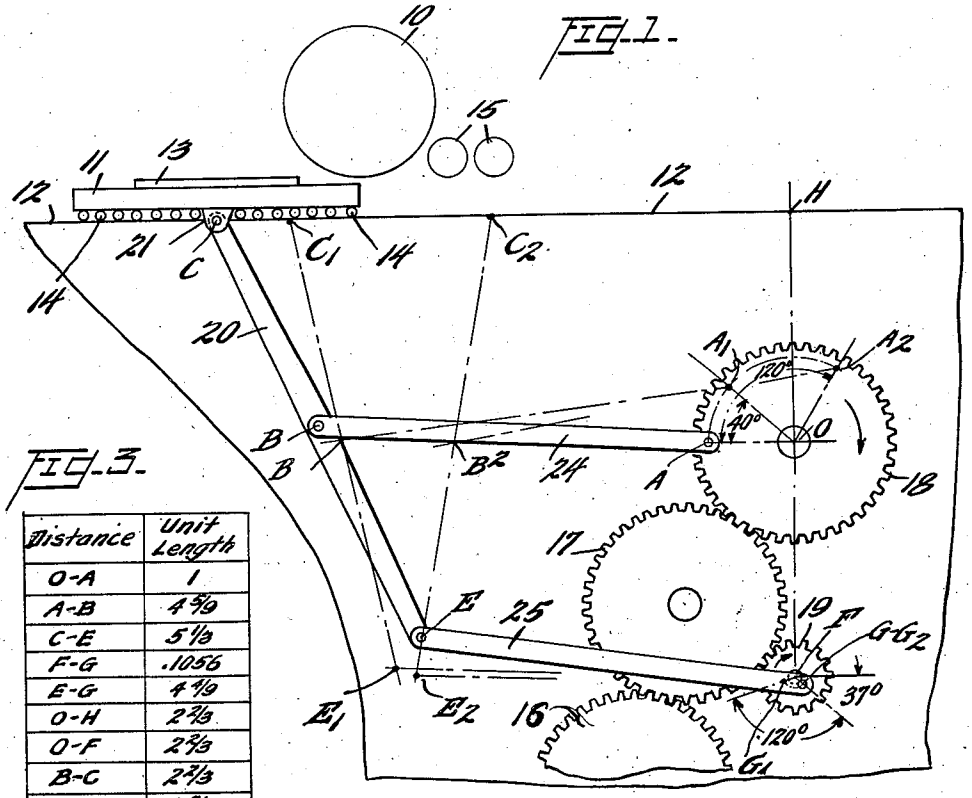
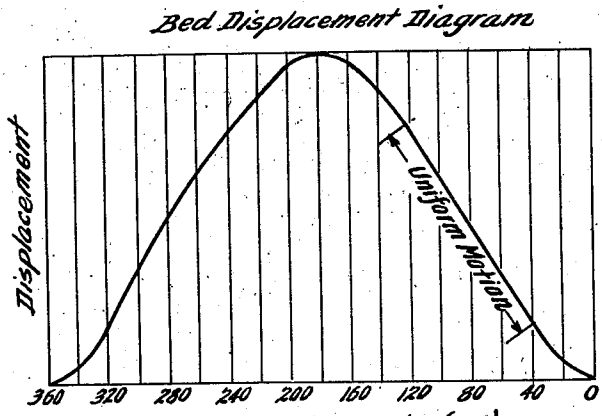


FIG. 3.

Distance	Unit Length
O-A	1
A-B	4 3/9
C-E	5 1/3
F-G	.1056
E-G	4 4/9
O-H	2 2/3
O-F	2 2/3
B-C	2 2/3
B-E	2 2/3

FIG. 2.



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TWIN CRANK BED MOTION

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This invention relates to bed motions and more particularly to such motions which are especially adapted for application to the reciprocating beds of bed and cylinder printing presses.

The general object of the invention is to provide an improved bed motion for printing presses or the like, in which the impression cylinder rotates at a constant linear velocity, and in which a novel transmission is employed to oscillate the bed between two extreme positions, so that during a large portion of its stroke in one direction, when the bed is in printing contact with the cylinder, the bed moves at a uniform linear velocity exactly equal to that of the cylinder. These movements are effected by means of a minimum number of parts, all of which are simple machine elements readily manufactured without special tools or the use of special processes, the entire action of all parts being continuous without periodic engagement and disengagement with each other.

In its preferred embodiment, the invention contemplates the provision of a main bed driving lever pivotally connected with the bed at its upper end and adapted to extend therefrom in a generally downward direction. The lever has a combined pivotal and translatory movement in a plane generally parallel with the direction of movement of the bed. The particular movement of the lever to yield the desired bed velocity curve is effected by the use of two cranks, these cranks being disposed preferably upon one side of the lever and having their axes substantially perpendicular to the plane of swinging movement of the lever. The two cranks are out of phase with each other as well as having different throws and angular velocities.

The crank pins of the cranks are connected respectively with an intermediate point on the lever and the lower end thereof by means of links which extend in generally horizontal directions.

To attain the velocity curve shown in Figure 2 of the drawing, for example, in which the period of uniform bed movement extends from approximately 40° to approximately 120° of the cycle of movement, the crank which is connected with the lower end of the lever is driven three times as fast as the crank connected to the intermediate point and is initially set 217° in advance of the intermediate crank, the intermediate crank at that initial point of the bed movement being horizontal and extending toward the lever. Both cranks are rotated in the same direction, and the ratio of the length of the intermediate crank to that of the end crank is 1 to .1056. Also, in order to provide the particular bed velocity curve shown in Figure 2, the other dimensions and distances involved in the novel bed motion should be in the proportions indicated in the table comprising Figure 3 of the drawing.

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

In the drawing,

Figure 1 is a diagrammatic view in side elevation of a bed and cylinder press embodying the principles of the invention;

Figure 2 is a graph comprising the displacement curve in which displacement of the bed is plotted against the crank angle of the intermediate crank; and

Figure 3 is a tabulation of the relative proportions of the dimensions and distances shown in Figure 1, in order to attain the displacement curve of Figure 2.

In the diagrammatic view constituting Figure 1 of the drawing there is illustrated a bed and cylinder press, the rotating impression cylinder being indicated at 10 and the reciprocating bed at 11. A suitable bearing surface 12 is provided along which the bed is adapted to move, carrying the printing form 13 into and out of contact with the paper on the impression cylinder 10. Suitable antifriction elements for facilitating the movement of the bed are indicated at 14. During part of its travel, the form may be brought into contact with conventional inking mechanism of which the two form rollers 15 are representative. The impression cylinder 10 is driven from the main power means of the press through suitable gearing which also may be conventional and which it is unnecessary to show in the present disclosure.

A drive gear 16 suitably connected with the power means so as to be driven with uniform motion and in synchronism with the impression cylinder is rotatably mounted at the lower portion of the press frame. The gear 16 meshes with an idler 17, which is preferably of the same diameter as the driven gear 18, which provides one of the cranks for moving the bed 11. A smaller gear 19 is also driven by the idler 17 but this gear is only one-third the size of the gears 17 and 18. The gears 18 and 19 are driven in the same direction of rotation, shown in the illustrated example as being clockwise.

A lever 20 has its upper end pivotally connected to an ear or lug 21 secured to the reciprocating bed 11, the pivot point being designated C, and being for convenience of illustration situated on the level of the bearing surface 12. A link 24 pivotally connects an intermediate point B of the lever 20 with a point A of the crank gear 18. Another link 25 connects the lowermost point E of the lever 20 with a point G on the smaller crank gear 19. The center of the larger crank gear 18 is indicated at O and the center of the smaller gear 19 is designated F; and thus the driving

crank for the intermediate portion of the lever **20** is of the length O—A and the crank length for the lower end of the lever is F—G.

The centers O and F are in vertical alignment and a line connecting these centers intersects the surface **12** (which, in this case, is the path of the pivot point C) at the point H.

In Figure 1 of the drawing, all of the parts are shown in their initial positions with the bed at its extreme left hand point. Under these conditions, the crank O—A is horizontal and extending to the left of the center of the crank gear **18**, and this horizontal position will be taken as the zero position in diagramming the movement of the bed. The initial position of the crank F—G is one which is displaced 37° below the horizontal in a clockwise direction, in other words, 217° in advance of the crank O—A.

It has been found that in order to give uniform motion of the bed for a substantial portion of the stroke in one direction (a little more than 80° in this case) the various cranks, linkages, lever portions, and distances should have the relative lengths set forth in the following table:

Distance	Unit length
O—A	1
A—B	4 5/16
C—E	5 1/2
F—G	.1056
E—G	4 4/16
O—H	2 7/8
O—F	2 7/8
B—C	2 3/4
B—E	2 7/8

With these dimensions, and the initial positions of the points A and G as indicated, the displacement diagram of the bed will be as shown in Figure 2 of the drawing. In this graph, the bed displacement is plotted against the crank angle of the crank O—A. It will be seen that the curve is practically a straight line beginning a little below the 40° point and extending slightly beyond the 120° point.

The positions of the principal points of the bed drive, at the start of the uniform motion period are indicated by the same letters but with the subscript "1." For example, the pivotal connection between the lever **20** and the bed will be at the point C_1 and the lever will be defined by the points C_1, B_1, and E_1. At this time, the pivotal connection of the link **24** with the crank gear **18** will have moved to the point A_1, displaced by 40° from the zero point A. Since the initial position of the point G was at 217°, and since the gear **19** rotates three times as fast as the gear **18**, the point of pivotal connection with the link **25** and the gear **19** at the beginning of the period of uniform motion, will be at G_1 spaced 337° from the zero point.

At the end of the period of uniform motion the bed connected lever **20** will be in position

$$C_2—B_2—E_2$$

the main crank will have moved through 120°, the pivot point being at A_2; and the point G will have made a complete revolution around the center F, whereby the positions G and G_2 are identical.

After the period of uniform motion is concluded the bed moves on to the end of its printing stroke and then through its return stroke, which does not necessarily have any uniform velocity portion, back to the zero point at the left hand end of its travel.

Suitable mechanism for lifting the impression cylinder during the return stroke of the bed is provided, and it is understood that all other necessary or convenient parts usually associated with presses of this character may be employed, although only that much of the press as is necessary for a disclosure of the present invention is shown in the drawing.

It is understood that terms of orientation used in the specification and claims, such as "above," "below," "horizontal," etc. are used in an exemplary sense only, and if the plane of movement of the bed is changed from the horizontal, the terms describing the positions or movements of the other parts must be altered accordingly to preserve the relative positions and relationships of the various parts, within the principles of the invention.

Various changes and modifications may be made in the embodiment illustrated and described herein without departing from the scope of the invention as defined by the following claims.

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

1. A bed motion of the class described comprising, in combination, a reciprocating bed, means for driving the bed comprising a lever having one end pivotally connected with the bed and extending at an angle to the direction of movement of the bed, a power driven crank operatively connected with an intermediate portion of said lever, another power driven crank operatively connected with the end of said lever remote from said bed, and power means unconnected with said lever or bed except through said cranks for driving said cranks at different angular velocities.

2. A bed motion of the class described comprising, in combination, a reciprocating bed, means for driving the bed comprising a lever having one end pivotally connected with the bed and extending at an angle to the direction of movement of the bed, and adapted to swing about its pivotal connection with the bed during operative movement, and a power drive crank the axis of rotation of which is substantially perpendicular to the plane of swinging movement of the lever, means operatively connecting said crank to said lever at an intermediate point, another power driven crank the axis of which is also substantially perpendicular to said plane, means operatively connecting said second crank with the end of said lever remote from said bed, and power means unconnected with said lever or bed except through said cranks for driving said cranks at different uniform angular velocities, the velocity of one of said cranks being an even multiple of that of the other.

3. A bed motion of the class described comprising, in combination, a reciprocating bed, means for driving the bed comprising a lever having one end pivotally connected with the bed and extending in a generally perpendicular direction therefrom, and adapted to swing about its pivotal connection with the bed during operative movement, and a crank the axis of rotation of which is substantially perpendicular to the plane of swinging movement of the lever, a link operatively connecting said crank to said lever at an intermediate point, another crank the axis of which is also substantially perpendicular to said plane, another link operatively connecting said second crank with the end of said lever remote from said bed, and means for driving said cranks at different uniform angular velocities,

the velocity of the end crank being an even multiple of that of the intermediate crank.

4. A bed motion of the class described comprising, in combination, a reciprocating bed, means for driving the bed comprising a lever having one end pivotally connected with the bed and extending at an angle to the direction of movement of the bed, and adapted to swing about its pivotal connection with the bed during operative movement, and a crank the axis of rotation of which is substantially perpendicular to the plane of swinging movement of the lever, means operatively connecting said crank to said lever at an intermediate point, another crank the axis of which is also substantially perpendicular to said plane, means operatively connecting said second crank with the end of said lever remote from said bed, and means for driving said cranks at different uniform angular velocities, the velocity of one of said cranks being an even multiple of that of the other, both of said cranks being spaced from said lever in the direction of longitudinal movement of said bed and positioned so that the projection of a line joining the axes of said cranks intersects the plane of movement of the bed substantially at right angles.

5. A bed motion of the class described comprising, in combination, a reciprocating bed, means for driving the bed comprising a lever having one end pivotally connected with the bed and extending in a generally perpendicular direction therefrom, and adapted to swing about its pivotal connection with the bed during operative movement, and a crank the axis of rotation of which is substantially perpendicular to the plane of swinging movement of the lever, a link operatively connecting said crank to said lever at an intermediate point, another crank the axis of which is also substantially perpendicular to said plane, another link operatively connecting said second crank with the end of said lever remote from said bed, and means for driving said cranks at different uniform angular velocities, the velocity of the end crank being three times that of the intermediate crank, both of said cranks being spaced from said lever in the direction of longitudinal movement of said bed and positioned so that the projection of a line joining the axes of said cranks intersects the plane of movement of the bed substantially at right angles.

6. The bed motion set forth in claim 5, in which both cranks rotate in the same direction and when the bed is in one of its extreme positions, the intermediate crank is parallel with the direction of movement of said bed and the end crank is 217° in advance of the position of said intermediate crank.

7. In a bed motion of the class described, in combination, a supporting frame, a horizontally reciprocating bed, a lever pivotally connected at its upper end with said bed and adapted to swing about its pivotal point in the general direction of movement of said bed, a crank rotatably mounted upon said frame at one side of said lever and having its axes perpendicular to the plane of swing of said lever, a link operatively connecting said crank with the midpoint of said lever, a second crank mounted for rotation on said frame with its axes directly below that of said first named crank, the projection of a line joining said axes being perpendicular to and intersecting the extension of the locus of the point of pivotal connection between the bed and the lever, means for driving said first named crank, means for driving said second named crank at three times the angular velocity of the first named crank, the relative dimensions of the parts being as follows:

	Units
Length of lever	5⅓
Length of first named crank	1
Length of first named link	4⅝
Length of second named crank	.1056
Length of second named link	4⅛
Distance of axes of first named crank from locus of lever and bed pivot	2⅔
Distance of axes of second named crank from locus of lever and bed pivot	5⅓

8. In a bed motion of the class described, in combination, a supporting frame, a horizontally reciprocating bed, a lever pivotally connected at its upper end with said bed and adapted to swing about its pivotal point in the general direction of movement of said bed, a crank rotatably mounted upon said frame at one side of said lever and having its axes perpendicular to the plane of swing of said lever, a link operatively connecting said crank with the midpoint of said lever, a second crank mounted for rotation on said frame with its axes directly below that of said first named crank, the projection of a line joining said axes being perpendicular to and intersecting the extension of the locus of the point of pivotal connection between the bed and the lever, means for driving said first named crank, means for driving said second named crank at three times the angular velocity of the first named crank, the relative dimensions of the parts being as follows:

	Units
Length of lever	5⅓
Length of first named crank	1
Length of first named link	4⅝
Length of second named crank	.1056
Length of second named link	4⅛
Distance of axes of first named crank from locus of lever and bed pivot	2⅔
Distance of axes of second named crank from locus of lever and bed pivot	5⅓

the position of said first named crank being horizontal and extending toward said lever when the bed is in its remote position from said crank, and the position of said second named crank at that time being 217° in advance of said first named crank, both cranks rotating in the same direction.

9. A bed motion of the class described comprising, in combination, a reciprocating bed, means for driving the bed comprising a lever having one end pivotally connected with the bed and extending in a generally perpendicular direction therefrom, and adapted to swing about its pivotal connection with the bed during operative movement, and a crank the axis of rotation of which is substantially perpendicular to the plane of swinging movement of the lever, means operatively connecting said crank to said lever at an intermediate point, another crank the axis of which is also substantially perpendicular to said plane, means operatively connecting said second crank with the end of said lever remote from said bed, and means for driving said cranks at different uniform angular velocities, the velocity of one of said cranks being an even multiple of that of the other, both of said cranks being spaced from said lever in the direction of longitudinal movement of said bed and positioned so that the line joining the axes of said cranks is generally parallel with said lever.

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