H. E. GOLDBERG.

BED MOVEMENT FOR PRINTING PRESSES.

APPLICATION FILED JUNE 12, 1911.

1,048,681.

Patented Dec. 31, 1912.

2 SHEETS—SHEET 1.

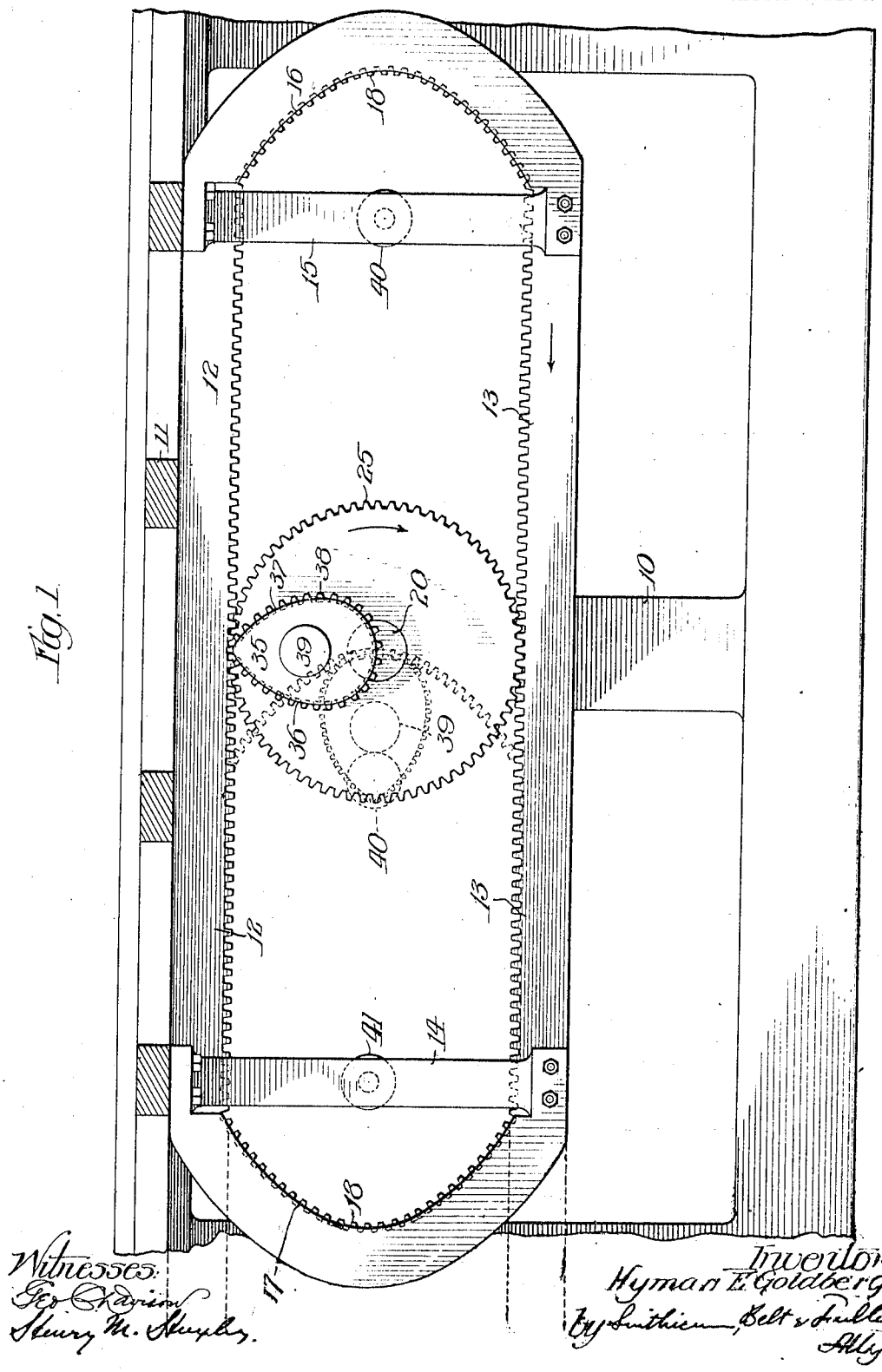

Fig. 1.

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Inventor:
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By Smith, Belt & Fuller
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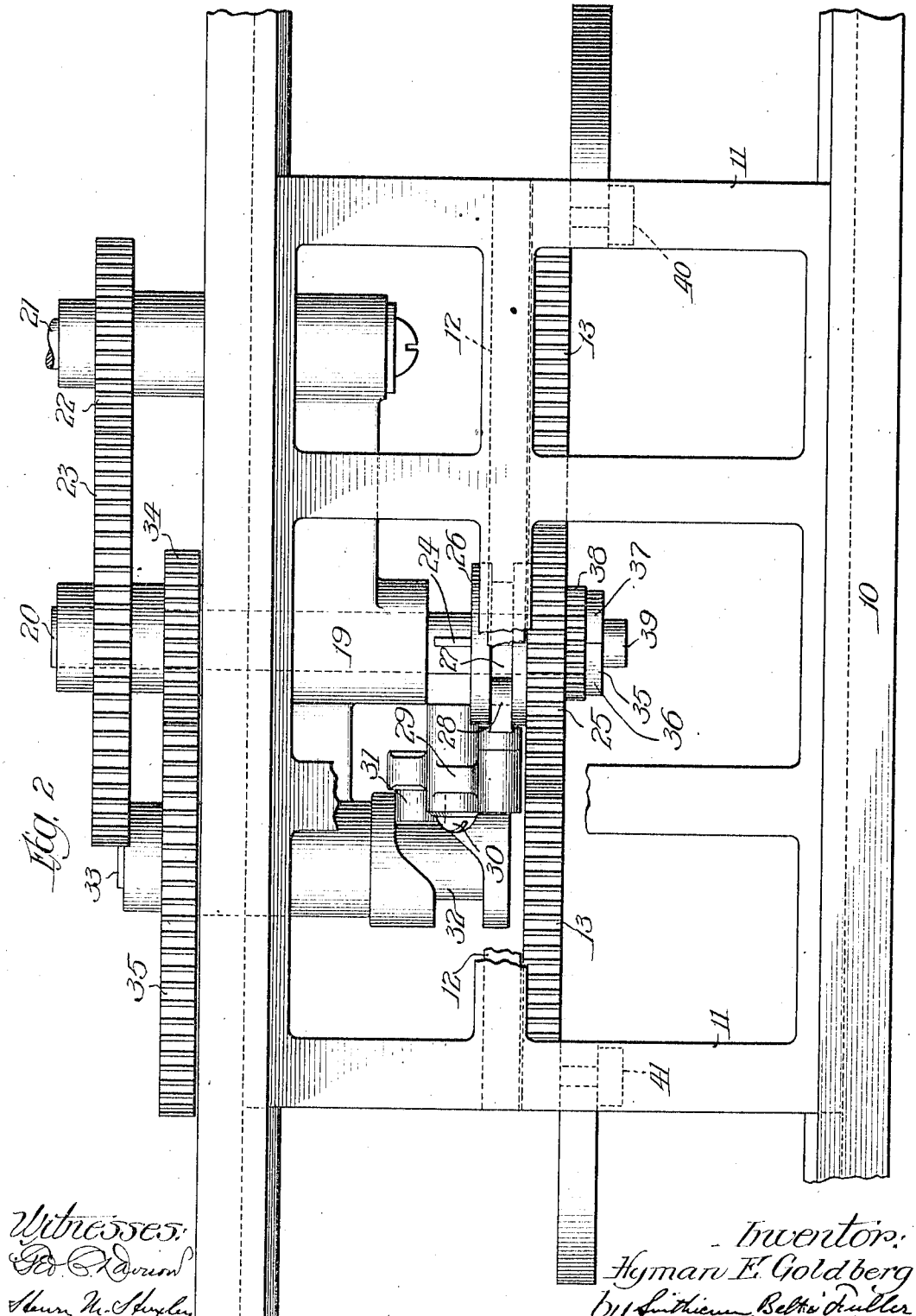

Fig. 2

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UNITED STATES PATENT OFFICE.

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BED-MOVEMENT FOR PRINTING-PRESSES.

1,048,681. Specification of Letters Patent. Patented Dec. 31, 1912.

Application filed June 12, 1911. Serial No. 632,649.

To all whom it may concern:

Be it known that I, HYMAN E. GOLDBERG, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Bed-Movements for Printing-Presses, of which the following is a specification.

In printing presses of the reciprocatory bed type such bed necessarily has to be of considerable weight to withstand the strains and stresses to which it is subjected in the printing or impression operation of the machine. Consequently, the speed at which the press can be run with the greatest economy or rather with the greatest rapidity of production depends to a considerable extent upon the manner of reversing the movement of the bed at the ends of its travel or stroke. If presses of this type are operated at an undue or excessive speed, there is a considerable tendency for the entire machine either to shift position on its foundation or else shake the building in which it is contained, and the mechanism itself is subjected to great and wearing strains.

The leading object and purpose of my invention is to give the bed of a printing press of this type such a motion, particularly at the ends of its stroke, that the machine can be operated at a maximum speed without detrimental jarring or other objectionable results. I have determined that the most satisfactory movement of the bed during its retardation, change in direction of travel, and acceleration in the opposite direction is a parabolic motion, and by this I mean that the reversal of movement of the bed is brought about at such a rate that the distance traveled over by the bed measured from the point of reversal varies directly as the square of the time of travel measured from the instant of reversal. This is called a parabolic motion, because if the time be laid out along one coördinate axis and the distance along the other coördinate axis at right angles to the first, then the curve of travel should be a parabola as is well shown in many treatises on physics. This sort of motion or movement of the bed may be brought about by a variety of different mechanisms, only one of which I have deemed it necessary to describe herein and illustrate in detail in the accompanying drawings which form a part of this specification and to which reference should be had for a full comprehension of the invention and its advantages.

Throughout the various views of these drawings like reference characters refer to the same part, and in these drawings I have not attempted to illustrate the entire printing press, but have merely shown in simple form a reciprocatory bed for such a press and a mechanism for producing the desired parabolic reversing movement.

In these drawings Figure 1 is a longitudinal section through a fragment of the mechanism; and Fig. 2 is a plan view of the construction shown in Fig. 1, certain parts being broken away to more clearly show the structural features of the various elements.

By reference to these drawings it will be apparent that the printing press mechanism includes a suitable supporting frame 10 in which the sliding bed 11 is guided in its reciprocating movement. This bed has beneath and attached to it a rack 12 disposed longitudinally of the bed, and opposite such upper rack but displaced laterally thereof is secured another rack 13, the teeth of which face those of the upper rack, as is clearly shown in Fig. 1. As is illustrated, these two racks are properly spaced apart the requisite amount by two bars or standards 14 and 15. Each end of the reciprocating bed is equipped with a member having an inner parabolic surface 16 and 17, respectively, and at one side of each of said surfaces is a toothed rack or sector 18 of the same shape and form, the parabolic surfaces 16 and 17 being in register with the pitch lines of the two parabolic racks or sectors 18.

Extended transversely of the machine at its center and rotatable in a suitable bearing 19 on the main frame is a shaft 20 driven from the driving shaft 21 through the intermeshing gears 22 and 23. Slidable on the inner portion of shaft 20, but rotatable therewith because of a feather or key connection 24, I employ a gear 25 adapted to be shifted laterally to alternately operatively engage the racks 12 and 13. In order to bring about the shifting or sliding of this gear on the shaft 20 in properly timed relation to the movement of the other parts, I provide the hub 26 of this gear with an annular groove 27 in which fits the curved finger 28 pivoted on the upper end of a rocker

arm 29 fulcrumed on a stud 30 on the machine frame, the lower end of such arm having a roller 31 traveling in the groove of a cam 32 fixed and rotatable with a suitably mounted cam-shaft 33 revolved from the shaft 20 by means of the intermeshing gears 34 and 35.

The inner end of shaft 20 has integral therewith or fastened thereto a cam 35 having two symmetrical surfaces 36 and 37, each in the form of a spiral of Archimedes. Just at one side of the cam 35 is a similarly-shaped toothed gear 38, the cam surfaces of the part 35 being on the pitch lines of the teeth of gear 38. The two parts 35 and 38 are in the same vertical planes with the parabolas 16 and 17, and the toothed parabolic sectors 18, respectively, it being understood that the parts 35 and 38 do not move longitudinally of the shaft 20 as does the large gear 25. The exposed face of the cam 35 is supplied with an auxiliary cam 39 adapted to coöperate with the rollers 40 and 41 on the brackets 14 and 15, the axes of such rollers being in the same horizontal plane as the axis of shaft 20.

The operation of these mechanisms takes place substantially as follows: Assuming that shaft 20 and the gear 25 associated therewith are rotated in the direction indicated by the arrow in Fig. 1 and that such gear is in mesh with the teeth of the lower rack 13, as is illustrated in Fig. 2, then the bed will be traveling toward the left as the machine is viewed in both figures. When the end of the rack 13 reaches the gear, the cam 35 and the toothed member 38 will be positioned with their apexes downwardly. In other words, they will occupy a position at 180° to that shown in full lines in Fig. 1. Then the apex portions will immediately contact and coöperate with the lower portion of the parabolic surface 16 and the parabolic rack 18, and inasmuch as the shaft 20 and the parts 35 and 38 revolve at a uniform speed, the travel of the bed will be retarded and its motion will be parabolic until the cam 35 and the toothed member 38 reach the position shown in dotted lines in Fig. 1, which represents the point of reversal of the direction of travel of the bed. As the parts 35 and 38 continue their uniform rotation about the axis of shaft 20 the bed will be caused to travel in the opposite direction—that is, to the right—and accelerated, the motion still remaining parabolic until the gear 25 engages the rack 12, and then, of course, the movement of the bed will be uniform, it being understood that as is customary in printing presses of this type, the gear 25 is shifted at the proper time from one rack to the other by means of a constantly rotated cam 32 and the lever-arm 29, which coöperates with the gear by means of the finger 28 fitting in the slot 27.

In order to prevent an overshot or excessive movement of the bed the cam 39 passes around the roller 40 on the bed during the half revolution of the parts 35 and 38, in which interval of time they are retarding, reversing and accelerating the motion of the bed. The relative position of these two parts 39 and 40 at the instant of reversal of travel is shown in dotted lines in Fig. 1. The reason that the toothed parabolic and spiral of Archimedes members 18 and 38, respectively, are employed is to provide a construction wherein the bed can be started properly if it has been stopped in any position of its travel. Stated otherwise, these toothed members are adapted to prevent relative displacement between the parabola on the bed and the spiral of Archimedes cam, except the rolling movement of the cam on the parabolic member. If the parabolis and spiral of Archimedes members 18 and 38 were smooth, and not provided with teeth, the spiral of Archimedes cam would be effective to retard, stop and reverse the movement of the bed as long as the machine was in continuous operation. This would be accomplished by continually pushing upon its driven cam. But should it happen that the machine be slowed or stopped at some time during the interval of reversal then the driving spiral of Archimedes cam might lag behind the driven parabolic cam, and the two might therefore become improperly separated from each other. This is prevented by the teeth with which the cams are provided.

A corresponding parabolic motion of the bed is brought about when the other ends of the racks reach the constantly rotating shaft 20 and its parts, but the position of the cam 35 and the toothed correspondingly-shaped member 38 will be just reversed. That is to say, they will be in their uppermost position instead of their lowermost position when they first engage the cam surface 17 and the parabolic rack 18. The lengths of the racks 12, 13 and 18 are such that the gear 25 makes a complete rotation while in engagement with each of the racks 12 and 13, and a half rotation when gear 38 is co-acting with either of the racks 18.

It will of course be undestood that at each end of the travel of the bed the main gear 25 is shifted from one longitudinal rack to the other during the interval that the parabolic and spiral of Archimedes members are cooperating to retard the movement of the bed and accelerate the same in the opposite direction. This sliding gear and pair of racks for this general purpose is not new with me, my invention relating to the means for providing the parabolic reversal of the bed at the ends of its stroke.

Although I have described one of the cooperating cams as having a parabolic sur-

face and the other as being in the form of a spiral of Archimedes, I do not wish to have it understood that the production of the parabolic reversing motion is in any way limited to the use of cams either of these styles or shapes, because the requisite motion or movement of the bed can be brought about by mechanisms which employ cams of neither of these forms, but such mechanisms, however, must have a parabola for the centrode of the bed and a spiral of Archimedes as the centrode of the driving means. Of course, any other cams employed to produce the required movement would not be centrodes, and they will therefore have no pure rolling motion upon each other but a combined rolling and slipping motion.

The term "centrode" has been employed several times in this application. It is defined in the *Standard Dictionary* as "a locus traced out by the successive positions of the instantaneous centers of pure rotation." But it is well established in many standard treatises on physics that where any two bodies, a driving body and a driven body, have any movement relative to each other, no matter how complicated that relative movement may be, there may be determined two curves, one imagined to be rigidly fastened to the driver end and the other to the driven body. These curves are the centrodes as defined in the *Standard Dictionary*. Moreover during the relative motion of the driving and driven bodies these two centrodes are the only pair of curves which have pure rolling motion on each other. Among the myriad possible pairs there is not one other pair whose motion would be pure rolling. It would invariably be rolling and slipping combined.

Inasmuch, therefore, as various changes may be made in the structural features of the machine described in this application without departing from the substance of the invention, I do not wish to have the appended claims interpreted as being limited and restricted to the precise and exact structural features shown and described.

What I claim is:

1. In a bed movement, the combination of a reciprocatory bed, and means to reverse the movement of the bed at a rate in which the distance traveled over by the bed measured from the point of reversal varies directly as the square of the time of travel measured from the instant of reversal, substantially as described.

2. In a bed movement, the combination of a reciprocatory bed having a parabolic surface, a spiral of Archimedes cam rolling thereon to give the bed a parabolic movement, and means to rotate said cam uniformly, substantially as described.

3. In a bed movement, the combination of a reciprocatory bed having a parabolic surface, a spiral of Archimedes cam rolling thereon to give the bed a parabolic movement, means to rotate said cam uniformly, and means having said parabolic surface and spiral of Archimedes as centrodes and adapted to prevent relative displacement between said surface and spiral except said rolling movement, substantially as described.

4. In a bed movement, the combination of a reciprocatory bed, and uniformly-rotating driving means for reversing the travel of said bed, the centrodes of said bed and means being a parabola for the bed and spiral of Archimedes for the driving means, substantially as described.

5. In a bed movement, the combination with a reciprocatory bed, and a constant driving means therefor, of a speed changing and driving connection between the driving means and the bed to vary the speed of the latter approaching and leaving the point of reversal at the extremes of its path whereby the distance traveled measured from the point of reversal is varied directly as the square of the time of travel measured from the same point, substantially as described.

6. In a bed movement, the combination of a reciprocatory bed having a toothed parabolic surface, a toothed spiral of Archimedes cam meshing therewith to give the bed a parabolic movement, and constant driving means for the cam, substantially as described.

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