No. 734,758. PATENTED JULY 28, 1903.

L. SEARING.

HEAD MOTION FOR ORE CONCENTRATING TABLES.

APPLICATION FILED MAR. 19, 1901.

NO MODEL. 2 SHEETS—SHEET 1.

Fig. 1.

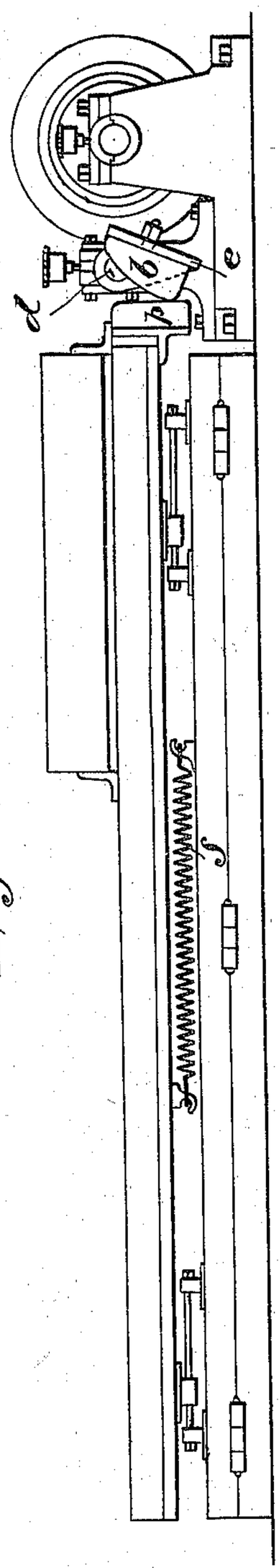


Fig. 4.

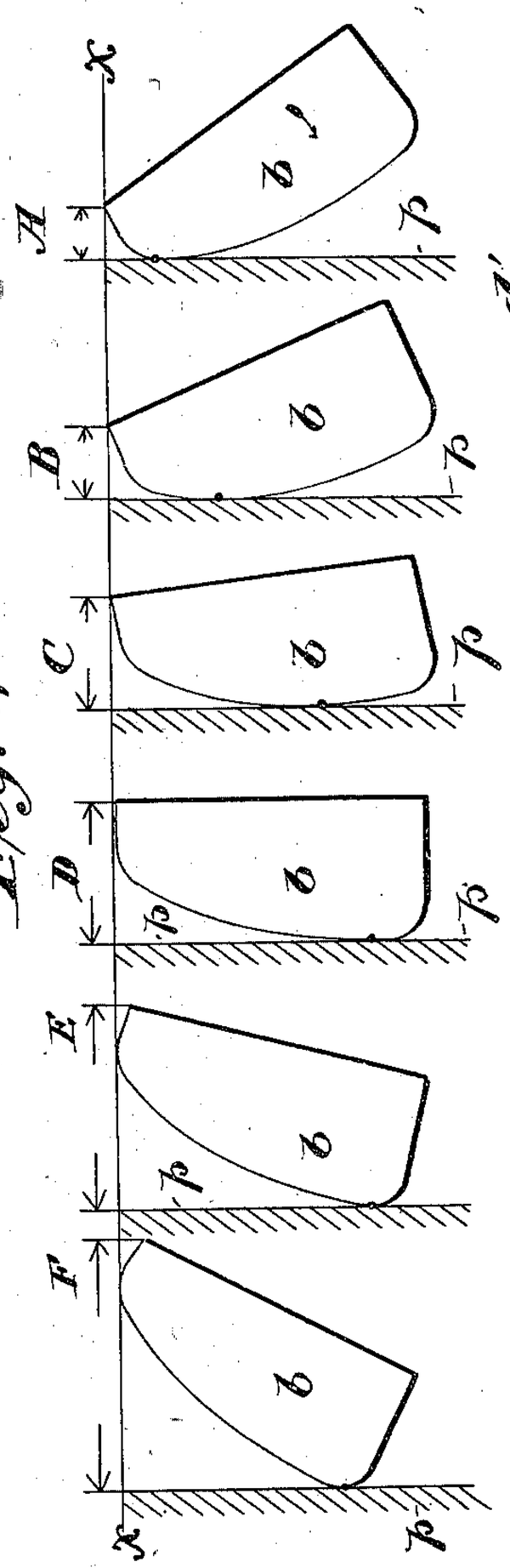


Fig. 6.

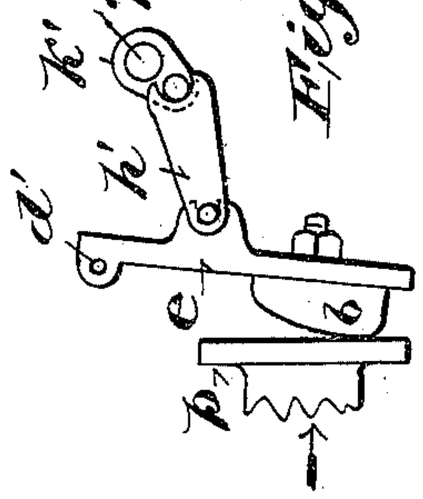
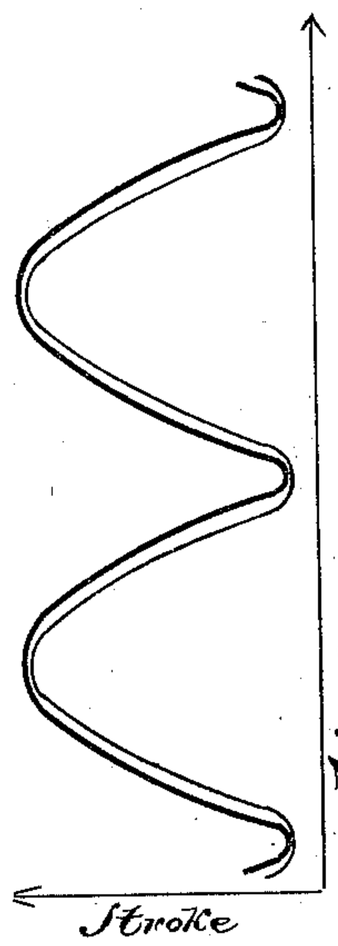


Fig. 5.



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NO MODEL. 2 SHEETS—SHEET 2.

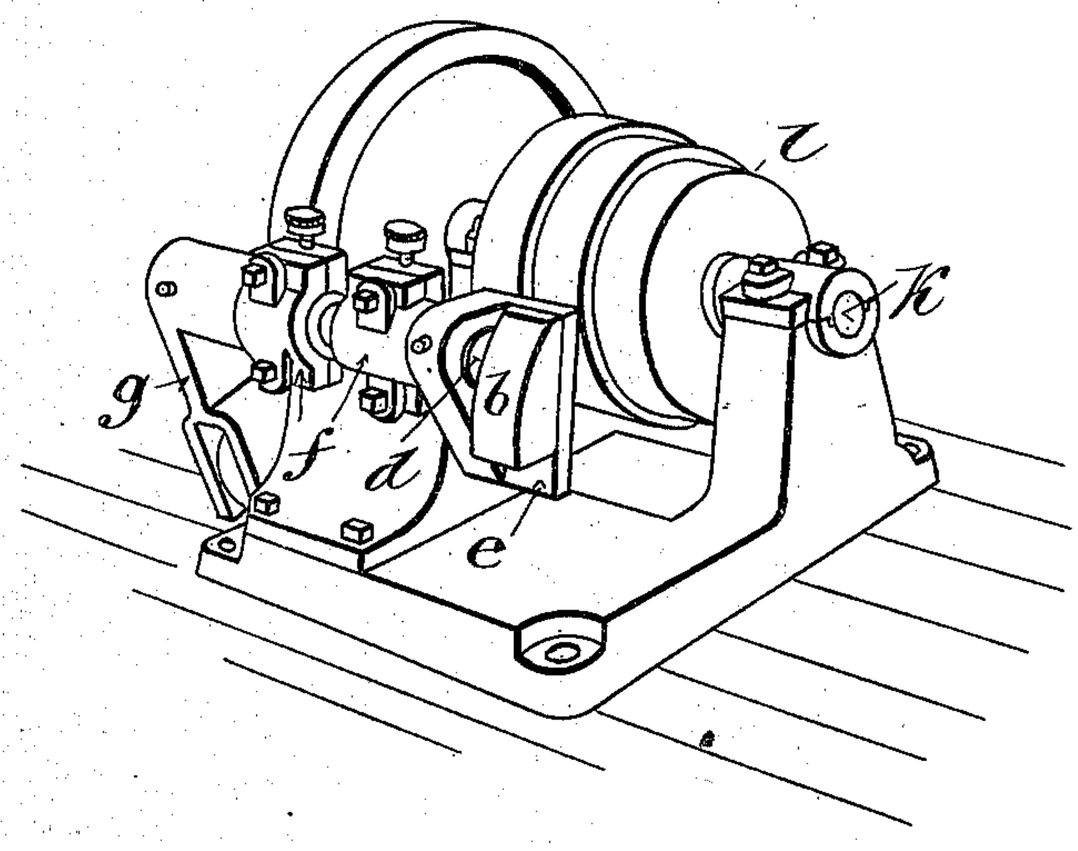

Fig. 2.

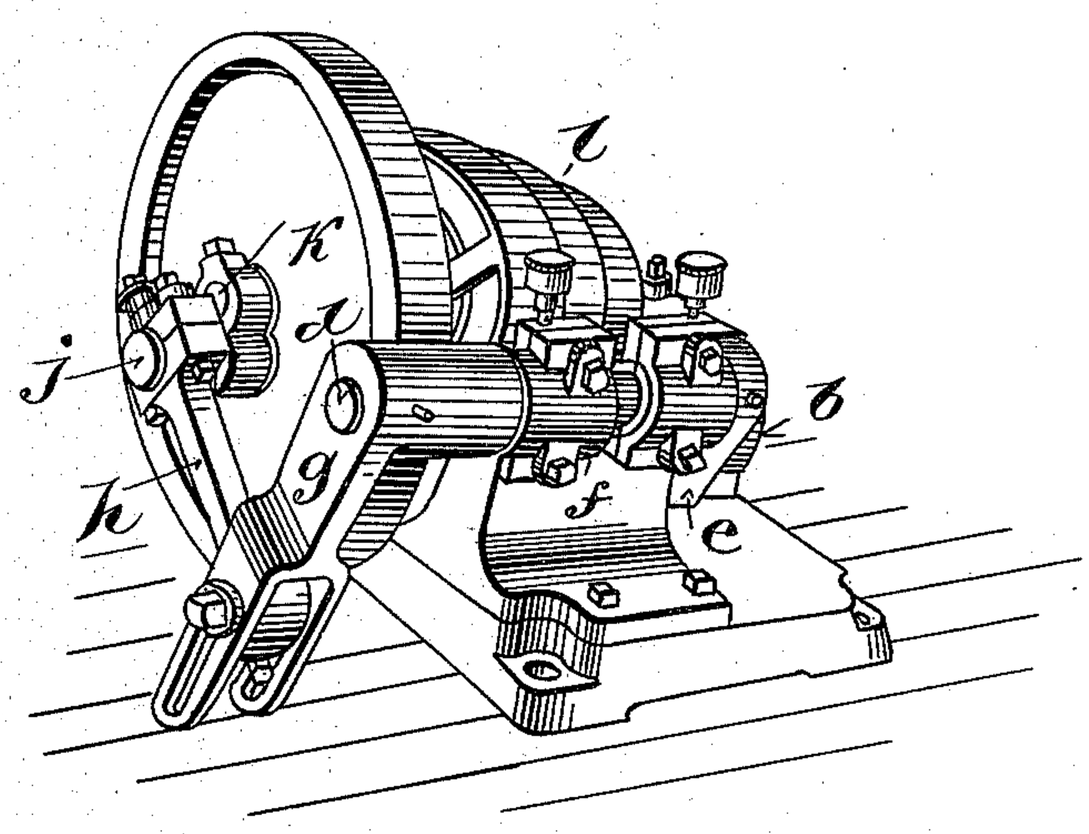

Fig. 3

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No. 734,758. Patented July 28, 1903.

UNITED STATES PATENT OFFICE.

LEWIS SEARING, OF DENVER, COLORADO.

HEAD-MOTION FOR ORE-CONCENTRATING TABLES.

SPECIFICATION forming part of Letters Patent No. 734,758, dated July 28, 1903.

Application filed March 19, 1901. Serial No. 51,869. (No model.)

To all whom it may concern:

Be it known that I, LEWIS SEARING, of Denver, in the county of Arapahoe and State of Colorado, have invented certain new and useful Improvements in Head-Motions for Ore-Concentrating Tables and other Uses, of which the following is a description illustrated by drawings.

The invention relates to head-motions for giving vibratory movement to ore-separating tables of the Cammett, Wilfley, Rittinger, and other types.

The invention is of such a nature as to be best understood by an immediate description of the drawings and diagrams which show one embodiment of it.

In the drawings, Figure 1 is a side elevation of one form of the head-motion as applied to one form of concentrating-table, some parts of the table being omitted. Fig. 2 is a perspective view of the head-motion detached from the table. Fig. 3 is another perspective view of the same as seen from the farther side of Fig. 2. Fig. 4 is an explanatory diagram consisting of six parts, A, B, C, D, E, and F. Fig. 5 shows the curves produced by such a motion when traced on a moving surface analogous to the manner of taking an indicator-card of a steam-engine. Fig. 6 shows another and less preferred form of the head-motion.

This improved head-motion primarily consists of a peculiar rocking shoe or button *b*, which rocks against a coöperating surface movable with the table. I find that it is a far better construction to have a plane surface on the part that moves with the table and have a curved surface for the button or shoe upon the rocking member; but so far as the reverse construction may be used under proper conditions it is of course the equivalent. The rocking button or shoe *b* is carried upon a short arm and actuated by a rock-shaft *d* in the preferred construction shown in Figs. 1, 2, and 3. The button or shoe *b* is secured upon a rocker-head *e* on one end of the shaft *d*. The shaft *d* is mounted in suitable fixed bearings *f* and carries at its other end a crank-arm *g*. The arm *g* is actuated by a link *h* and crank *j*. The crank *j* is carried by the rotary shaft *k*, which is driven by cone-pulleys *l*, as illustrated. The curved wearing-surface of the rocking shoe or button *b* is designed to produce the peculiar end-shake motion required for the table. The design of the curve may be such as to produce a much more sudden reversal of movement at one end of the stroke of the table than at the other end, or, on the other hand, it may be so designed (as will be well understood by engineers) that the difference is not very great; but with any given design the length of stroke may be greatly changed by adjusting the position of the shoe or button upon the rocker-head *e*. Preferably the button or shoe is detachably bolted to a plane surface upon the rocker-head *e*, as shown in the figures, and by loosening the bolt it may be adjusted upon the said surface toward or away from the center of the rock-shaft *d*.

Fig. 4 shows the action of the shoe or button *b* against the plane surface of the buffer *p* at the end of the table. For convenience in explaining the action of the rocker button or shoe *b* it may be supposed that the center of its rocking movement is at or near its upper right-hand corner, as seen in Fig. 4. Assuming for the purpose of explanation that the rock-shaft turns at an even speed throughout the forward vibration of the button *b*, it is clear that the speed which the motion of the rock-shaft and button gives to the buffer *p* will be proportional to the vertical distance at each instant between the center of motion and the point of contact, where the button touches the buffer. In other words, the point of contact between the buffer and the shoe shifts along the surface of the buffer, or transversely to the direction of the movement of the parts during reciprocation. Thus in diagram *a*, Fig. 4, a small movement of the button produces a very slight movement of the buffer-surface *p*. In diagrams *b* and *c* the resulting movement is rapidly increasing. In diagram *d* or *e* it reaches its maximum, because the button now bears against the surface of the buffer *p* at a very considerable distance from the center of the rocking motion. By raising the button or shoe *b* by adjusting it on the head *e* the motion produced by it upon the buffer *p* will be modified, and the difference between the two ends of the stroke will be decreased.

Owing to the way the rock-shaft *d* is driven, its own vibratory motion is gradually retarded and reversed at each end of the stroke, somewhat similarly to harmonic motion. I make no point of this as an essential of the invention, because I contemplate actuating the button *b* by various different means—such, for instance, as those shown in Fig. 6, which will be presently described.

Fig. 5 illustrates two different curves, which represent the motion of the table-top and which may be actually produced on paper by a pencil secured to the table-top and by then drawing a piece of paper transversely while the table-top moves the pencil over the paper. The heavy curve in Fig. 5 shows a very quick reversal at the outer end of the stroke, which is indicated by the sharper points of the curve at the bottom of the figure, while the light-line curve shows a minimum of quick reversal at the outer end of the stroke. Indeed, this curve is a close approximation to a sinusoidal curve.

Other things being equal, the more convex the button *b* the less will be the difference between the two ends of the stroke, because the less will be the point of contact between the button and the buffer travel up and down. Where the curvature of the button is very sharp, the adjustment upon the rocker-head *e* is of great value and importance, but the adjustability may be omitted. When the button is fixed upon the head *e* in the relative position shown in Fig. 1, it will be seen that the curved face of the button passes directly through the axial line (prolonged) of the shaft *d*. This has obvious advantages, but it is by no means essential.

In Fig. 6 the rocker-button *b* is shown actuated by a different mechanism from that already described. It rocks about the pivotal point *d'*, but instead of a separate crank *g*, described above, the link *h'* bears directly against the rocker-arm or rocker-head *e*. The link is driven, as before, by a short crank *k'* on the shaft *k''*, and this shaft *k''* may either be rotated continuously or rocked to and fro by any suitable mechanism. Indeed, the means for rocking or vibrating the button or shoe *b* are very numerous. I will not attempt to describe or enumerate them. In the form shown in Fig. 6 lost motion at the two ends of the link *h'* is prevented by the constant thrust of the table and buffer *p* in the direction indicated by the arrow. Such a constant thrust may be produced by the table-spring *s*, Fig. 1, which also serves to keep the buffer *p* in contact with the button or shoe *b*.

It will thus be seen that according to my invention the buffer constitutes an actuated part, and there are variable-speed actuating means provided in connection therewith, consisting of a curved reciprocating shoe for varying the relative motion of the actuated part and the shoe by shifting the point of contact between the shoe and the actuated part along the surface of said actuated part during reciprocation, and means are also provided for adjusting the shoe to vary its path of travel.

My apparatus is in reality a simple means for varying the inertia at the two ends of the stroke, and in order to accomplish this end the mechanism is so constructed that the curved surface of the actuating body or shoe makes contact with the part to be actuated at increased distances from the center of the motion of the shoe as measured perpendicular to the travel of the actuated part, or buffer, as the shoe or actuating means approaches one end of its stroke, whereby the ratio of the speed of the buffer to the speed of the actuating-shoe is greater at that end of the stroke than at the other.

What I claim, and desire to secure as the novel and characteristic features of my invention, are the following:

1. In a head-motion for ore-concentrators, the combination of a part to be actuated, and variable-speed actuating means consisting of a curved reciprocating shoe for varying in one direction of movement of the actuated part and at a speed gradually increasing throughout said movement the relative motion of the shoe and the part to be actuated, by shifting the point of contact between the two along the surface of the part to be actuated during reciprocation, substantially as and for the purposes set forth.

2. In a head-motion for ore-concentrators, the combination of a part to be actuated, and variable-speed actuating means consisting of a curved reciprocating shoe for varying the relative motion of the shoe and the part to be actuated, by shifting the point of contact between the two along the surface of the part to be actuated during reciprocation, and means for adjusting said actuating mechanism to vary the path of travel of the shoe, substantially as and for the purposes set forth.

3. In a head-motion for ore-concentrators, and in combination for substantially the purposes set forth, as a simple means for varying the inertia at the two ends of the stroke, a part to be actuated, a coöperating curved actuating part or shoe mounted for vibratory motion, the curved surface of the actuating body or shoe being of gradually-increased radius from one end of its wear-surface to the other makes contact with the part to be actuated at increased distances from its center of motion as measured perpendicular to the travel of the part to be actuated as the parts approach one end of the stroke, and means for vibrating said shoe whereby the ratio of the speed of the part to be actuated to the speed of said actuating-shoe is greater at said end of the stroke than at the other.

4. In a head-motion for ore-concentrators, and in combination for substantially the purposes set forth, as a simple means for varying the inertia at the two ends of the stroke, a

part to be actuated, a coöperating curved actuating part or shoe mounted for vibratory motion, the curved surface of the actuating body or shoe making contact with the part to be actuated at increased distances from its center of motion as measured perpendicular to the travel of the part to be actuated as the parts approach one end of the stroke, means for vibrating said shoe whereby the ratio of the speed of the part to be actuated to the speed of said actuating-shoe is greater at said end of the stroke than at the other, and means for adjusting said shoe, to alter its path of travel.

5. In a head-motion for ore-concentrators, the combination of a pivotally-supported button or shoe and means for reciprocating the same, means for maintaining the buffer and shoe in contact, one at least of the surfaces in contact having a curve of gradually-increased radius from one end of its wear-surface to the other, and means whereby the point of contact between said surfaces is shifted transversely to the direction of motion during reciprocation of the parts.

Signed this 12th day of March, 1901, at Denver, Colorado.

LEWIS SEARING.

Witnesses:
FRANK E. SHEPARD,
EDWIN H. PLATT.