2 Sheets—Sheet 1.

E. G. CUSHING.

Mill-Spindle Bushes and Trams.

No. 200,436. Patented Feb. 19, 1878.

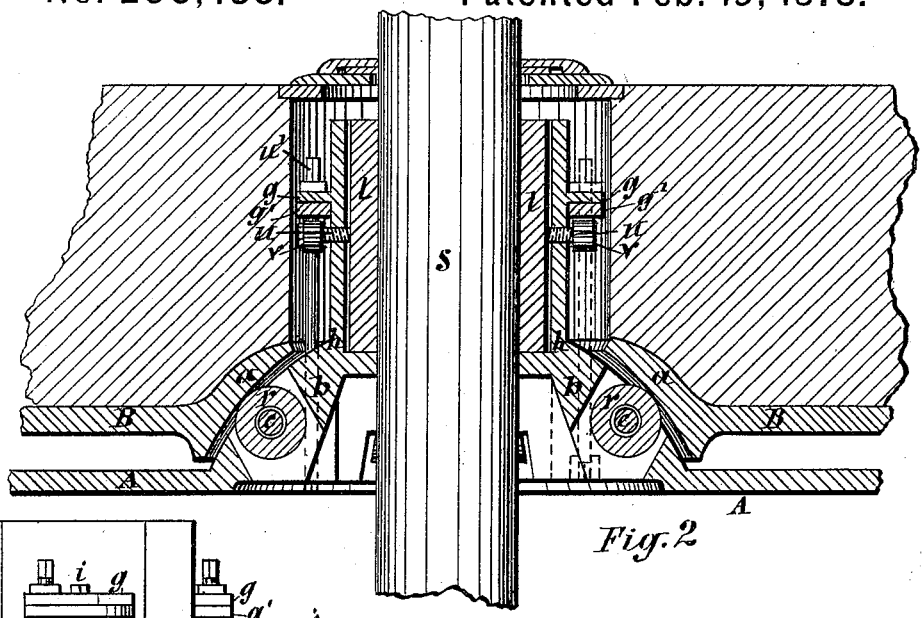

Fig. 2

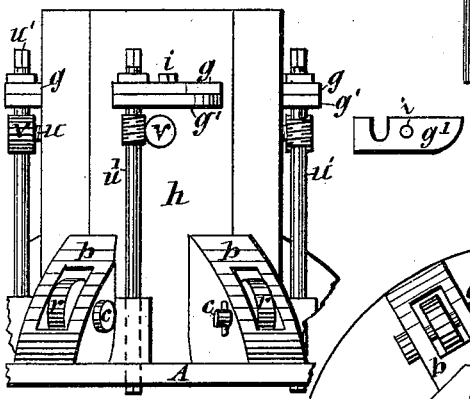

Fig. 2½

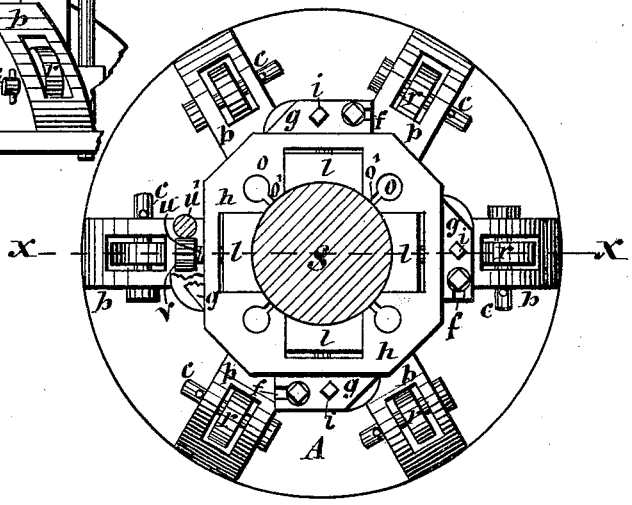

Fig. 1

WITNESSES:

A. W. Smith

E. Bendixen

INVENTOR:

Elbridge G. Cushing

per E. Lauss Atty.

2 Sheets—Sheet 2.

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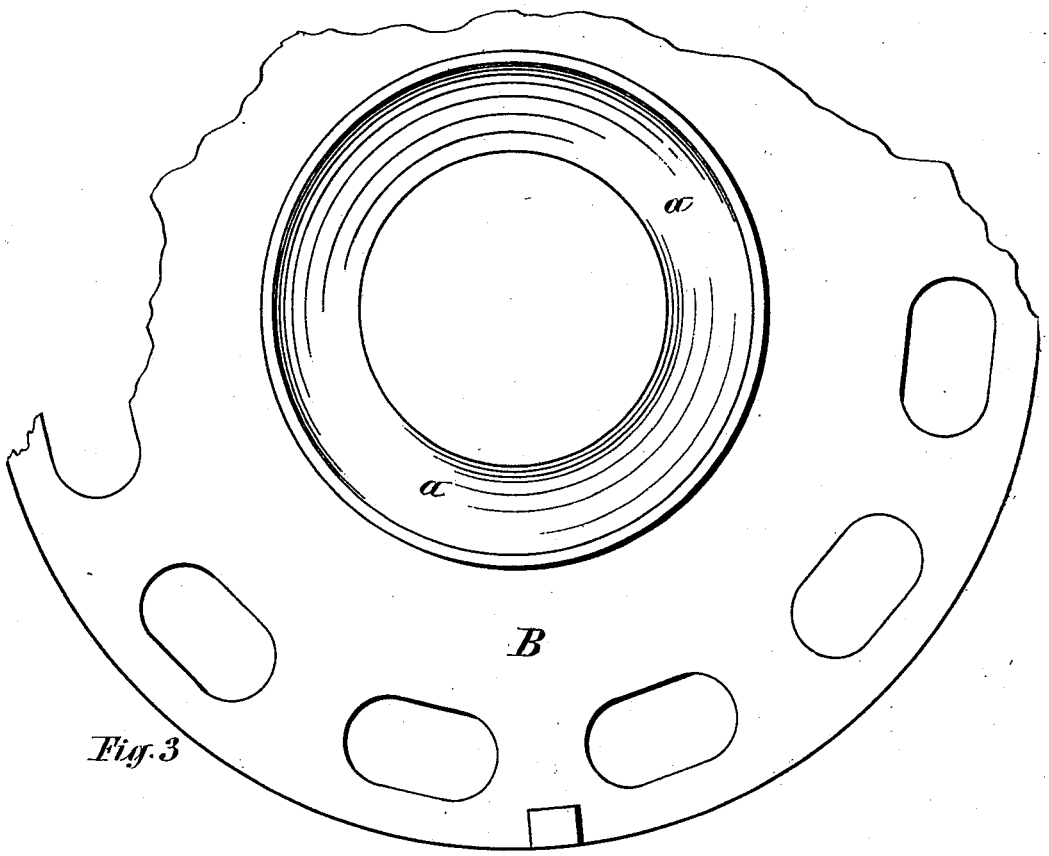

Fig. 3

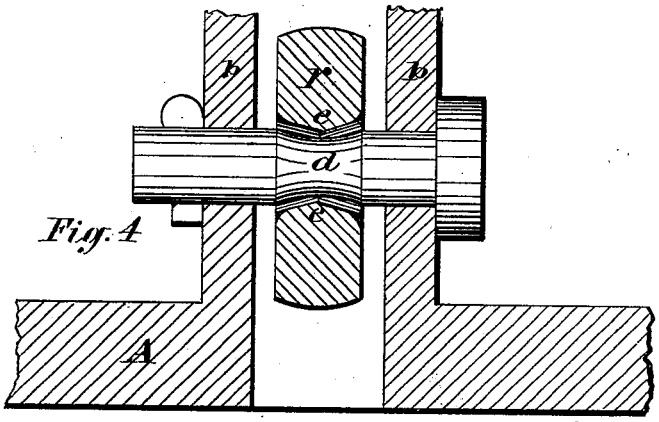

Fig. 4

WITNESSES:

A. W. Smith

E. Bendixen

INVENTOR:

Elbridge G. Cushing

per E. Lauss Atty.

UNITED STATES PATENT OFFICE.

ELBRIDGE G. CUSHING, OF OSWEGO, NEW YORK, ASSIGNOR OF ONE-HALF HIS RIGHT TO HILAND H. KENDRICK, OF SAME PLACE.

IMPROVEMENT IN MILL-SPINDLE BUSHES AND TRAMS.

Specification forming part of Letters Patent No. **200,436**, dated February 19, 1878; application filed June 27, 1877.

To all whom it may concern:

Be it known that I, ELBRIDGE G. CUSHING, of Oswego, in the county of Oswego and State of New York, have invented new and useful Improvements in Mill-Trams and Spindle-Bushes, of which the following, taken in connection with the accompanying drawings, is a full, clear, and exact description.

The purpose of this invention is to render the bed-stone perfectly self-adjusting to the face of the runner when in motion; and also has for its object to adjust the spindle in its relative central position in the bed-stone by devices which shall be effective and reliable in their operation, and convenient of access for manipulation from underneath the bed-stone as well as above the same.

The invention consists principally, first, in the combination and arrangement, with the bed-stone, of a concavo-convex bearing, analogous in principle to a ball-and-socket joint, and a series of peculiarly constructed and arranged anti-friction rollers interposed between the respective bearing-surfaces, by means of which the bed-stone is afforded a sensitive universal vibratory movement, respondent to that of the runner when in operation, and thus renders the former perfectly self-adjusting to the face of the latter.

The second part of my invention consists in the combination and arrangement, with the followers or bushing surrounding the spindle, of set-screws passing horizontally through the hub, and provided on the outer end with a cylindrical head, having in its periphery oblique or spiral grooves, and auxiliary set-screws arranged vertically at right angles to the set-screws proper, engaging the cylindrical head of same, and having its ends extended respectively above and below the bed-stone, all constructed, combined, and arranged substantially in the manner hereinafter fully described.

The invention is clearly illustrated in the accompanying drawings, wherein—

Figure 1 is a plan view with the bed-stone removed; Fig. 2, a vertical section on line *x x* of Fig. 1; Fig. 2½, an exterior view of the hub through which the spindle passes, showing more fully the arrangement of the set-screws for adjusting the bush of the spindle, also a top view of the plate constituting a part of the device for securing the auxiliary set-screw in its position; Fig. 3, a plan view of the under side of the bearing attached to the bottom of the bed-stone, and Fig. 4 an enlarged transverse section of the friction-roller upon which the bed-stone is mounted.

Similar letters of reference indicate corresponding parts.

A is the bed-plate, properly secured to the husk-frame, and provided in its center with a hub, *h*, through which the spindle *s* passes. From the base of the hub radiate a series of bearings, *b*, in the form of sections of a ball-joint or of a sphere described from a point in the center of the spindle some distance below the bed-plate. In a slot in the center of the said bearing is a roller, *r*, pivoted on a pin or axle, which passes through the bearing *b* at such relative depth as to cause a portion of the periphery of the roller *r* to project above the bearing-surface.

To the under side of the bed-stone is rigidly secured a plate, B, provided in its center with a concave bearing, *a*, in the form of an annular section of a hemisphere of somewhat greater radius than and concentric with the spherical lower bearing *b*. The bed-stone rides with its concave bearing *a* on the friction-rollers *r r* in the lower bearing *b*.

The runner, although intended to be kept in perfect balance, will, when in motion, vibrate more or less in various directions, and cause inequality in the bearings between the respective grinding-surfaces; and since the runner frequently attains a very high speed of revolution, accompanied with a correspondingly accelerated vibratory movement, it is essential that the seat of the bed-stone should be sufficiently sensitive to allow the bed-stone to readily yield to the vibrations or oscillations of the runner. In order to attain this result, I provide the axle *c* in its periphery with a circumferential centrally-inclined depression, *d*, and the roller *r* with an enlarged centrally-contracted eye, *e*, of such a bevel as to cause the roller to rest on the central interior ridge, and allow it to rock freely without bringing the outer edges of the eye in contact with the pin. The inclination of the depression *d* in

the axle retains the roller in its central axial position.

The second part of my invention has reference to devices connected with the bush of the spindle for the purpose of adjusting the same in its relative central position in the bed-stone.

l l represent the bushing or followers, fitted in vertical recesses in the hub *h*. *u* is a set-screw, working horizontally through the shell of the hub, and engaging with its inner end the rear of the bush. Its outer end is provided with a cylindrical head, *v*, having longitudinal grooves or threads in its periphery. *u'* is an auxiliary set-screw, arranged vertically on the exterior of the hub *h*, and at the side of the head *v* of the set-screw proper, and engaging the same by screw-threads on its periphery. One end of the auxiliary set-screw is extended through the bed-plate A, and provided underneath the same with a suitable head for manipulation. The upper end passes through a slot, *f*, in a flange, *g*, projecting from the exterior of the hub *h* above the set-screw proper, and is retained therein by a plate, *g'*, attached to the flange *g* by a bolt, *i*, and having a slot transverse to that of the flange *g*, thus facilitating the attachment and detachment of the auxiliary set-screw.

It will be observed that by this construction and arrangement of the said set-screws the adjustment of the bush is accomplished with accuracy and dispatch, and from underneath as well as above the bed-stone, thus obviating the necessity of stopping the operation of the burr.

o o are cellular receptacles for lubricants, having communication with the spindle by slots *o'*.

Having thus described my invention, what I claim is—

1. In combination with the bearings *a* and *b*, the pin *c*, having the beveled circumferential depression *d*, and the roller *r*, having the eye *e*, beveled in a relatively greater angle from each side to form a circumferential ridge in the center, constructed substantially as described and shown, for the purpose set forth.

2. In combination with a spindle-bush, the set-screw *u*, having cylindrical head *v*, with longitudinal grooves or threads in its periphery, and the auxiliary set-screw *u'*, arranged vertically by the side of the head *v* of the set-screw proper, and provided thereat with external screw-threads, substantially in the manner and for the purpose set forth.

3. The combination and arrangement, with the spindle-bush, of the set-screw *u*, having on its outer end the cylindrical head *v*, with longitudinal grooves in its periphery, and the auxiliary set-screw *u'*, arranged vertically by the side of the head *v* of the set-screw proper, and provided with external screw-threads thereat, and having one end extended through the bed-plate A, and its opposite end through a projection on the exterior of the hub, above the set-screw proper, substantially as and for the purpose specified.

4. In combination with the set-screw *u'*, the flange *g* on hub *h*, having slot *f*, and the plate *g'*, attached to said flange by bolt *i*, and having a slot transverse to that of the flange, substantially as and for the purpose set forth.

In testimony whereof I have hereunto set my hand in the presence of two attesting witnesses at Oswego, N. Y., this 30th day of May, 1877.

ELBRIDGE G. CUSHING.

Witnesses:

W. G. ROBINSON,

B. E. WELLS.