(No Model.) 2 Sheets—Sheet 1.

E. L. DOYLE & G. S. BURR.

ORE CONCENTRATOR.

No. 290,008. Patented Dec. 11, 1883.

Fig. 1.

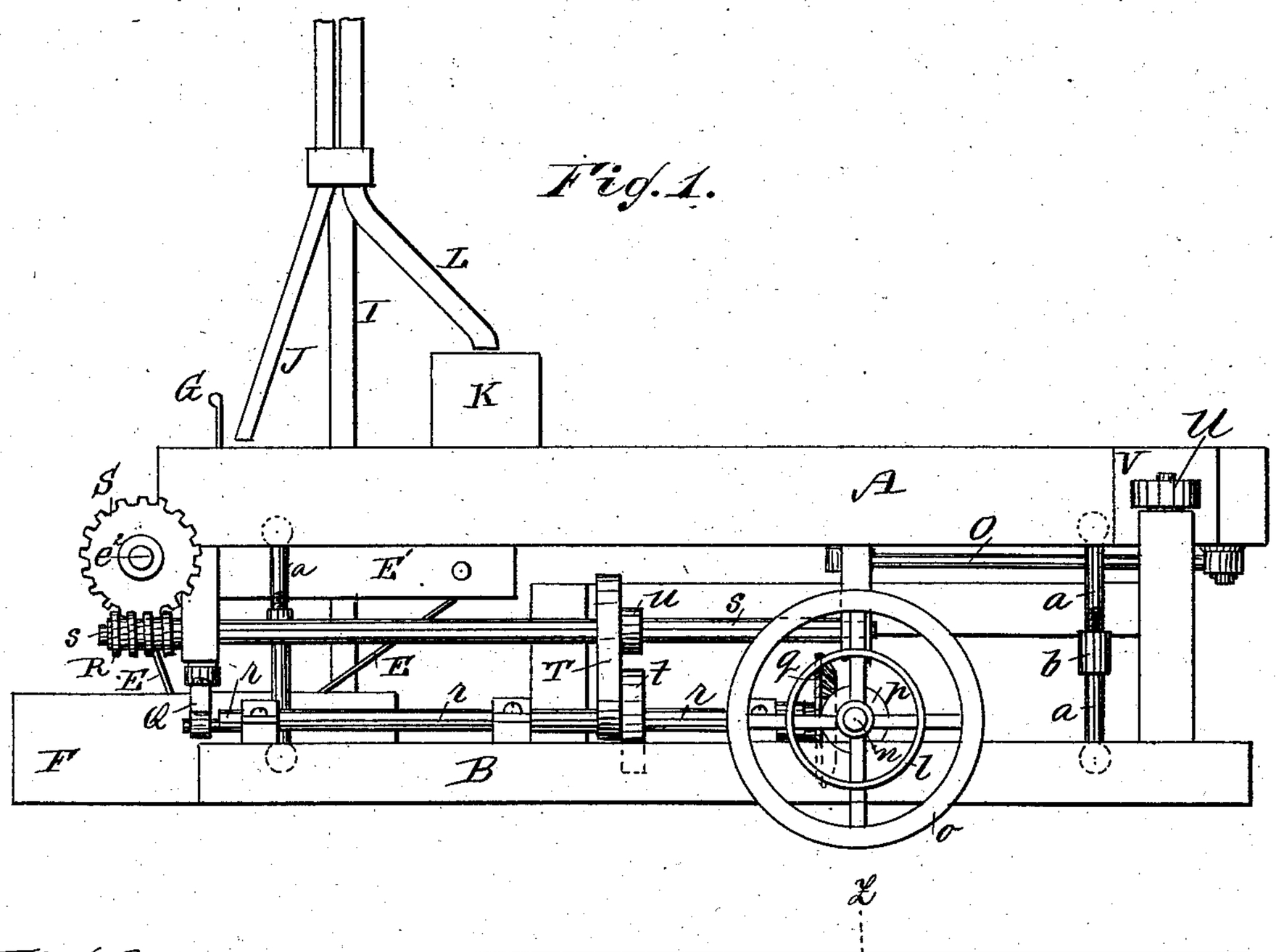


Fig. 2.

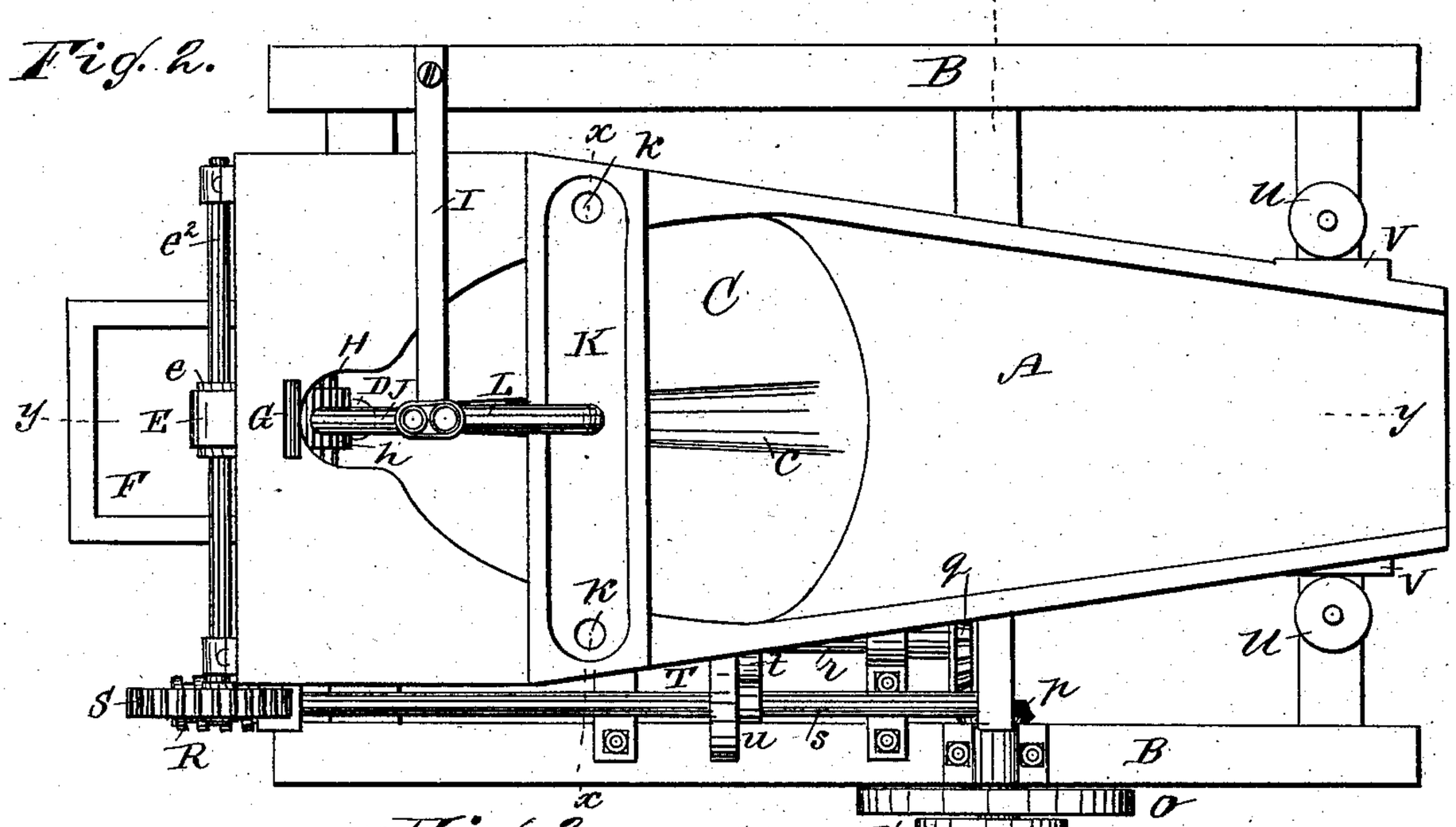
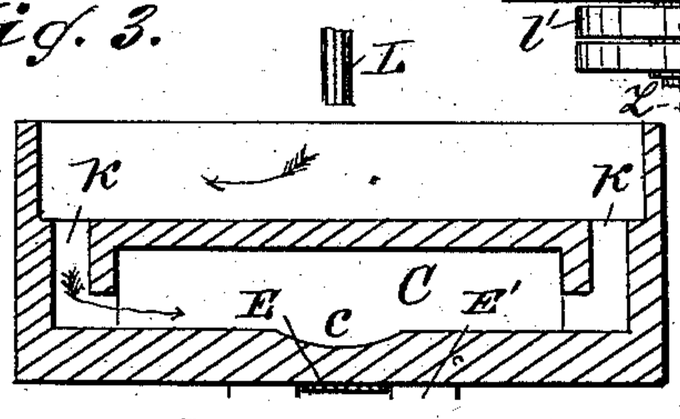


Fig. 3.



WITNESSES:

Theo. G. Hoster

C. Sedgwick

BY

INVENTOR:

E. L. Doyle

G. S. Burr

Munn & Co

ATTORNEYS.

(No Model.) 2 Sheets—Sheet 2.

E. L. DOYLE & G. S. BURR.

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Fig. 4.

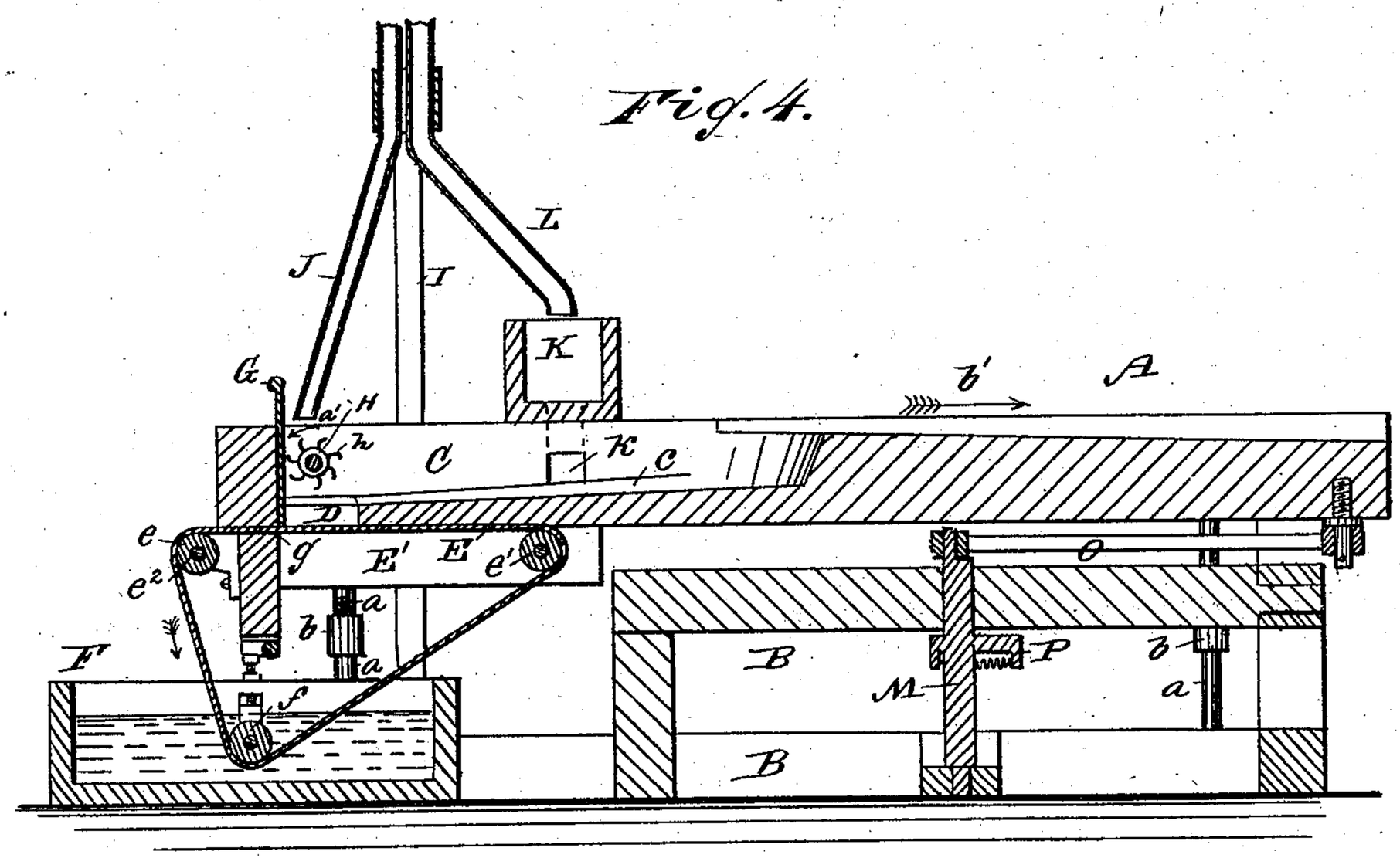

Fig. 5.

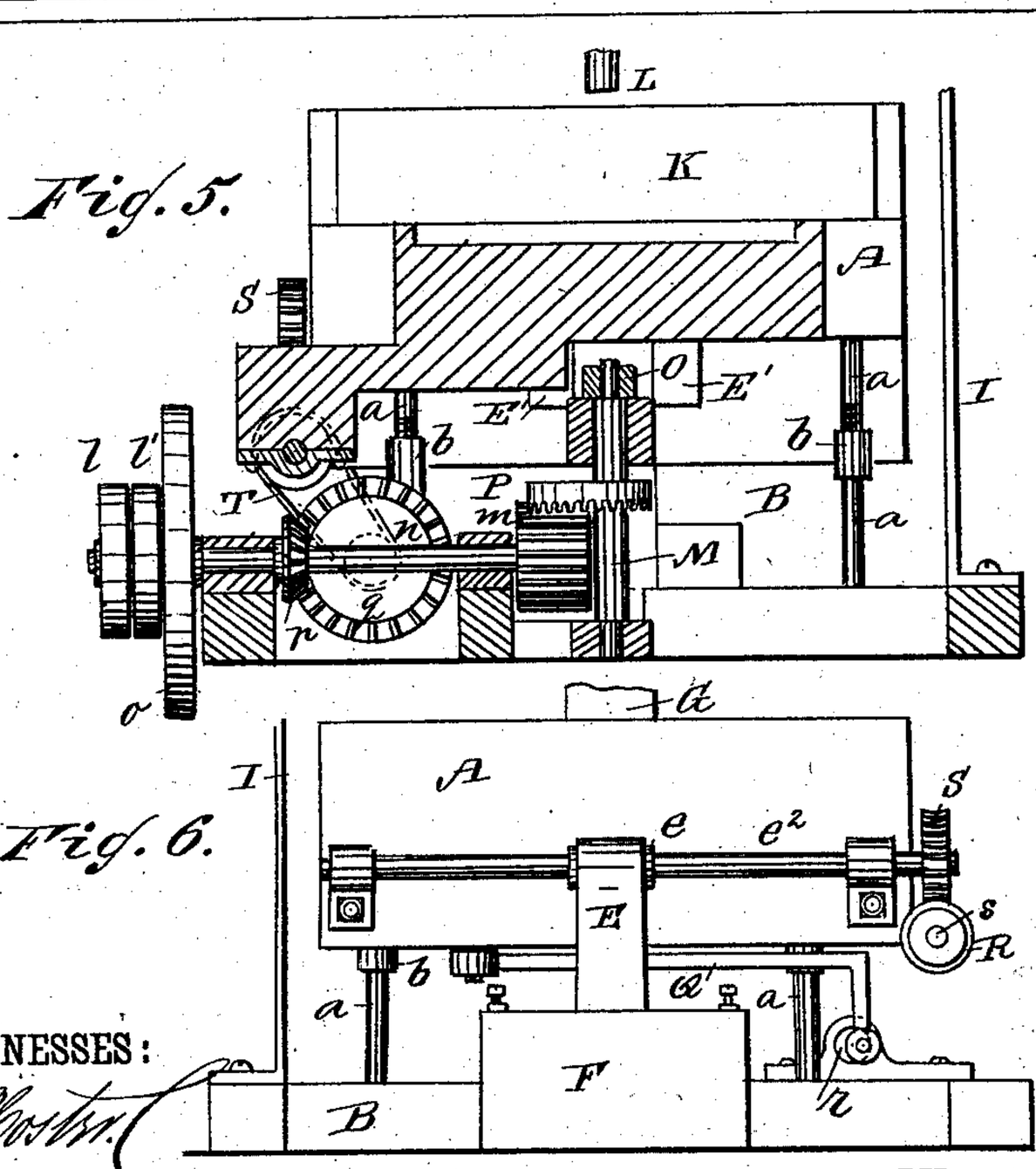

Fig. 6.

WITNESSES:

Theo. G. Hoster.

C. Bedgwick

INVENTOR:

E. L. Doyle

G. S. Burr

BY

Munn & Co

ATTORNEYS.

UNITED STATES PATENT OFFICE.

EDWARD L. DOYLE, OF LYNN, MASSACHUSETTS, AND GEORGE S. BURR, OF MONTEZUMA, COLORADO; SAID BURR ASSIGNOR OF ONE-HALF HIS RIGHT TO SAID DOYLE.

ORE-CONCENTRATOR.

SPECIFICATION forming part of Letters Patent No. 290,008, dated December 11, 1883.

Application filed January 8, 1883. Renewed October 16, 1883. (No model.)

To all whom it may concern:

Be it known that we, EDWARD L. DOYLE, of Lynn, Essex county, Massachusetts, and GEORGE S. BURR, of Montezuma, Summit county, Colorado, have invented a new and Improved Ore-Concentrator; and we do hereby declare that the following is a full, clear, and exact description of the same.

The object of our invention is to provide a new and improved device for washing pulverized ore to separate the metal particles from the gangue, sand, mud, &c.

Figure 1 is a longitudinal elevation of our improved ore-concentrator. Fig. 2 is a plan view of the same. Fig. 3 is a cross-sectional elevation of the same on the line *x x*, Fig. 2. Fig. 4 is a longitudinal sectional elevation of the same on the line *y y*, Fig. 2. Fig. 5 is a cross-sectional elevation of the same on the line *z z*, Fig. 2. Fig. 6 is a front elevation of the same.

A trough or recessed platform, A, is supported at or near its ends by a series of standards, *a a*, which rest on the base-frame B, the said standards being provided with ball-and-socket joints at their ends, to permit a free rocking movement of the trough both longitudinally and laterally.

The standards are composed of two sections, having the adjoining ends screw-threaded in opposite direction and screwed into screw-threaded sleeves *b*, whereby by turning the said sleeves in one direction or the other the standards can be lengthened or shortened, as the desired position of the trough A may require.

The trough or platform A has its sides constructed tapering toward the rear end, and at the front end it is provided with an oval or like recess, C, the bottom of which is slightly inclined toward the front end of the trough, and is provided along its center line with a concavity or flat groove, *c*.

At the front end of the recess C an opening, D, is formed in the bottom of the trough, through which opening the particles of metal can pass upon a belt, E, held against the under side of the trough, and passing over rollers *e e'*, pivoted to the bottom of the trough, and over an adjustable roller, *f*, in a trough, F, below the front end of the trough A, which trough F contains water. The belt E, guided by blocks E', is held very closely against the under surface of the trough A by the rollers, and passes through a horizontal slot, *g*, in the front end of the same. A vertically-sliding gate, G, in the front end of the trough and above the belt E can be adjusted higher or lower, so that its lower edge will be a greater or less distance above the belt E.

Above the opening D a transverse shaft, H, provided with a wheel, *h*, like an overshot water-wheel, is journaled, and water is conducted upon the said water-wheel through a pipe, J, either fixed or flexible, and attached to an arm, I, on the frame B. A trough, K, is secured transversely on the top of the trough or platform A, and is provided at its ends with channels or ducts *k*, which conduct the pulp under the surface of the water contained in the recess C. A fixed or flexible pipe, L, held by the arm I, conducts the pulp into the trough K. A vertical shaft, M, is journaled in the frame B, and to the upper end of the same a connecting-rod, O, is eccentrically pivoted, which is also pivoted to the bottom of the platform or trough A. A crown-wheel, P, is eccentrically mounted on the shaft M, and engages with a cog-wheel, *m*, on a horizontal shaft, *n*, on which are mounted fixed and loose pulleys *l l'*, a fly-wheel, *o*, and a bevel cog-wheel, *p*, engaging with a bevel cog-wheel, *q*, of double the diameter, and mounted on a shaft, *r*, to the front end of which a connecting-rod, Q, is pivoted eccentrically, which is also pivoted to the under side of the trough A. The radii of wheel P varying in length, the leverage by which it acts on wheel *m* must continually vary, and the wheel *m* will consequently turn with greater velocity as said radii decrease in length. A shaft, *s*, is journaled in the frame B parallel with the shaft *r*, and on its free end is mounted a worm, R, which engages with a worm-wheel, S, on the shaft e^2, on which the roller *e* is mounted. On each shaft *r* and *s* are

mounted a large and a small belt-pulley, *t u*, respectively, which are so arranged that the large pulley on one shaft will be opposite the small pulley on the other shaft, and vice versa. A belt, T, is passed over two corresponding pulleys, and thus the shaft *s* can be driven from the shaft *r*. Accordingly as the belt is passed over the large pulley *t* or the small pulley *u* on the shaft *s*, the said shaft will be rotated more or less rapidly. At the rear end of the trough A straight guide-blocks V are attached to the sides, against which blocks vertical guide-rollers U, held on the frame B, rest for the purpose of preventing the rear end of the trough from being vibrated laterally.

The operation is as follows: The rod O vibrates the trough A longitudinally, and as the crown-wheel P is mounted eccentrically on the shaft M, the movements of the rod O will alternately be slower and faster, and the trough A will be vibrated irregularly. The connecting-rod Q vibrates the front end of the trough A transversely about half as rapidly as the trough is vibrated longitudinally. The pulp, which is prepared in a stamp-mill or by rollers in the usual manner, passes through the channels *k* in the recess C. The slimes will be drained and will not float on the surface of the water. This is a matter of great importance, for if the pulp is fed on the surface of the water the slime floats on the surface of the water and is carried off. In our improved concentrator this is avoided. The water issuing through the pipe J turns the wheel *h* in the direction of the arrow *a'*, and this movement of the wheel causes the water to flow through the recess C in the direction of the arrow *b'*—that is, from the front to the rear of the trough A. The water carries the gangue with it, and the particles of metal collect on the concavity or groove *c* and slide to the opening D, through which they fall upon the belt E, and are carried by the same into the trough F, in which they are washed from the belt E. The belt E fits so closely against the bottom of the trough that no water can escape from the trough at the opening D. The gate G is not raised very much if the ore is poor; but if the ore is rich and a greater quantity of particles of metal adhere to the belt E, the gate G must be raised more. The vibrations of the trough cause a rapid settling of the metal particles, for the water and sand, metal particles, &c., are all thoroughly agitated by the different vibrating movements of the trough A.

What we claim is—

1. In an ore-concentrator, the combination, with the agitating-trough A, provided with a recess, C, of the feed-trough K, secured transversely on the trough A, and having channels *k*, which extend to the bottom of the recess C, substantially as herein shown and described, and for the purpose set forth.

2. In an ore-concentrator, the combination, with the agitating-trough A, having an aperture, D, of the belt E, held against the under side of the trough A, and the trough F, substantially as herein shown and described, and for the purpose set forth.

3. In an ore-concentrator, the combination, with the agitating-trough A, having an opening, D, of the belt E and the vertically-movable gate G, substantially as herein shown and described, and for the purpose set forth.

4. In an ore-concentrator, the combination, with the agitating-trough A, of the belt E, the rollers *e e'*, the trough F, and the adjustable roller *f*, substantially as herein shown and described, and for the purpose set forth.

5. In an ore-concentrator, the combination, with the agitating-trough A, of the water-wheel *h* and the water-pipe J, substantially as herein shown and described, and for the purpose set forth.

6. In an ore-concentrator, the combination, with the agitating-trough A, of the belt E, the gate G, the water-pipe J, and the water-wheel *h*, substantially as herein shown and described, and for the purpose set forth.

7. In an ore-concentrator, the combination, with an agitating-trough, of devices for vibrating the same longitudinally and variably and devices for agitating one end transversely, substantially as herein shown and described, and for the purpose set forth.

8. In an ore-concentrator, the combination, with the agitating-trough A, of the shaft M, the connecting-rod O, the crown-wheel P, mounted eccentrically on the said shaft M, and devices for rotating the shaft M, substantially as herein shown and described, and for the purpose set forth.

EDWARD L. DOYLE.
GEORGE S. BURR.

Witnesses to the signature of Doyle:
HIRAM NETTIS,
J. B. STEVENS.
Witnesses to the signature of Burr:
JAMES W. SWISHER,
ERNST C. FECHNER.