(No Model.) 4 Sheets—Sheet 1.

G. D. HUSEMANN.

ORE CONCENTRATOR.

No. 448,961. Patented Mar. 24, 1891.

Fig. 1.

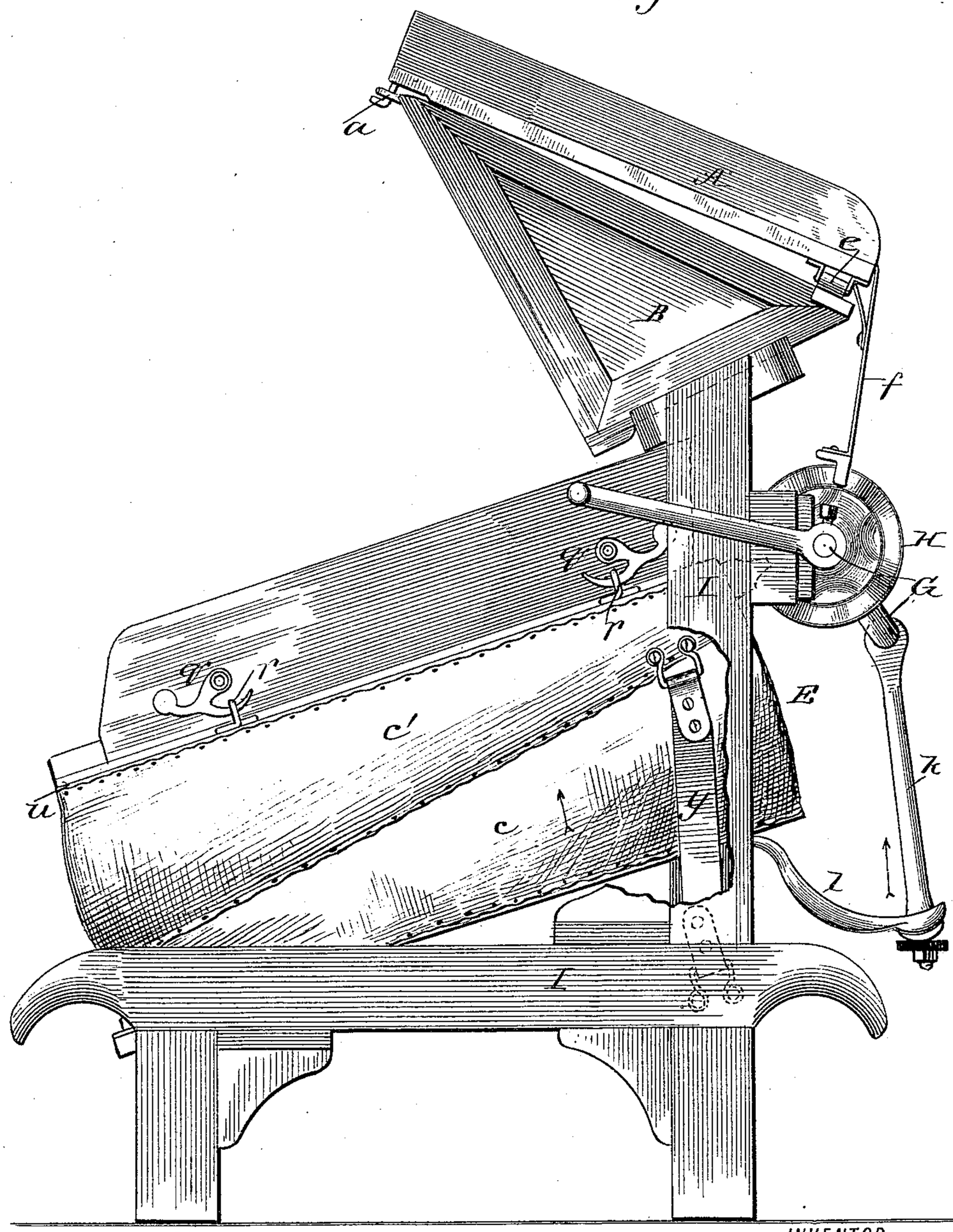

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Fig. 2.

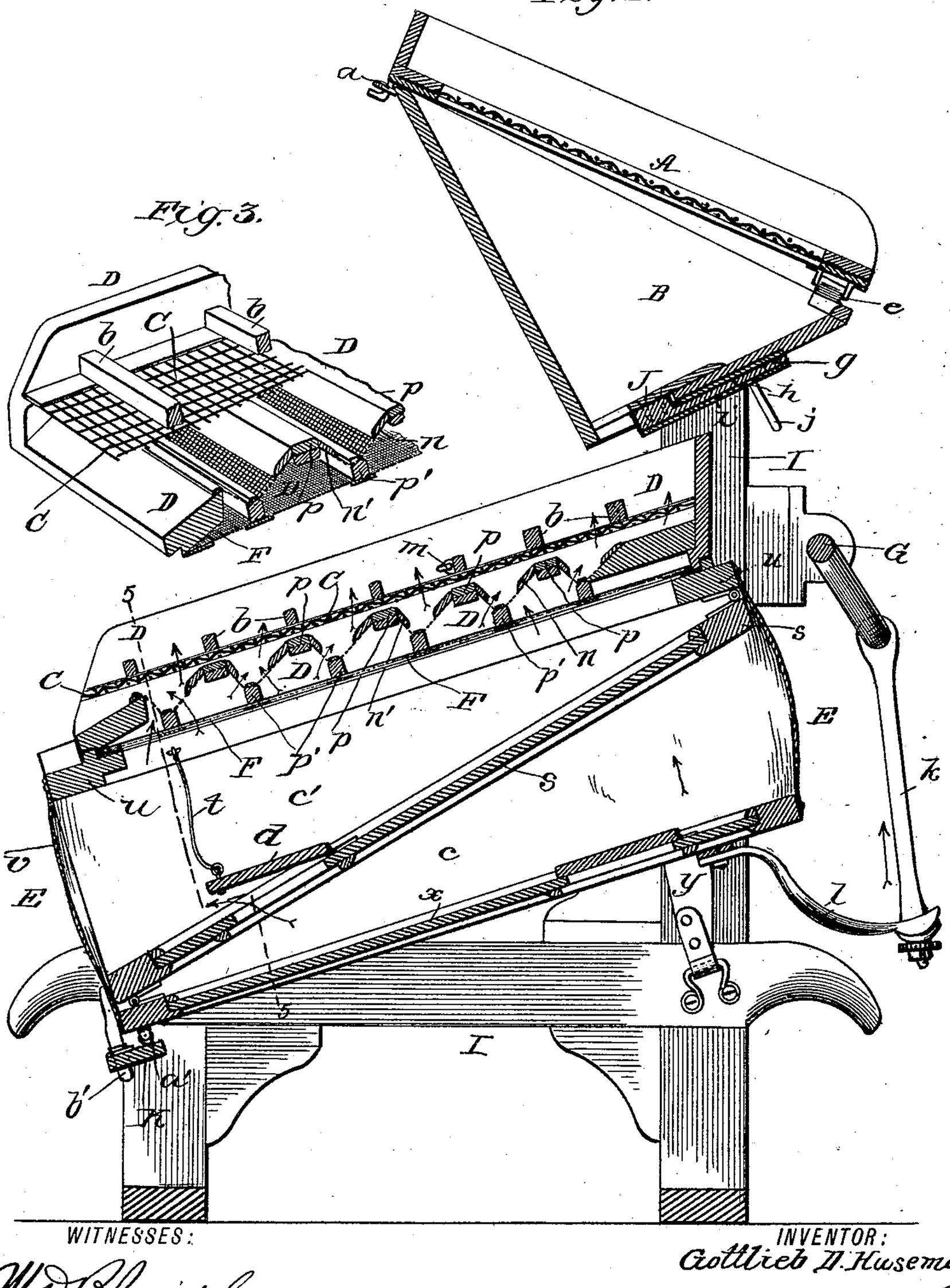

Fig. 3.

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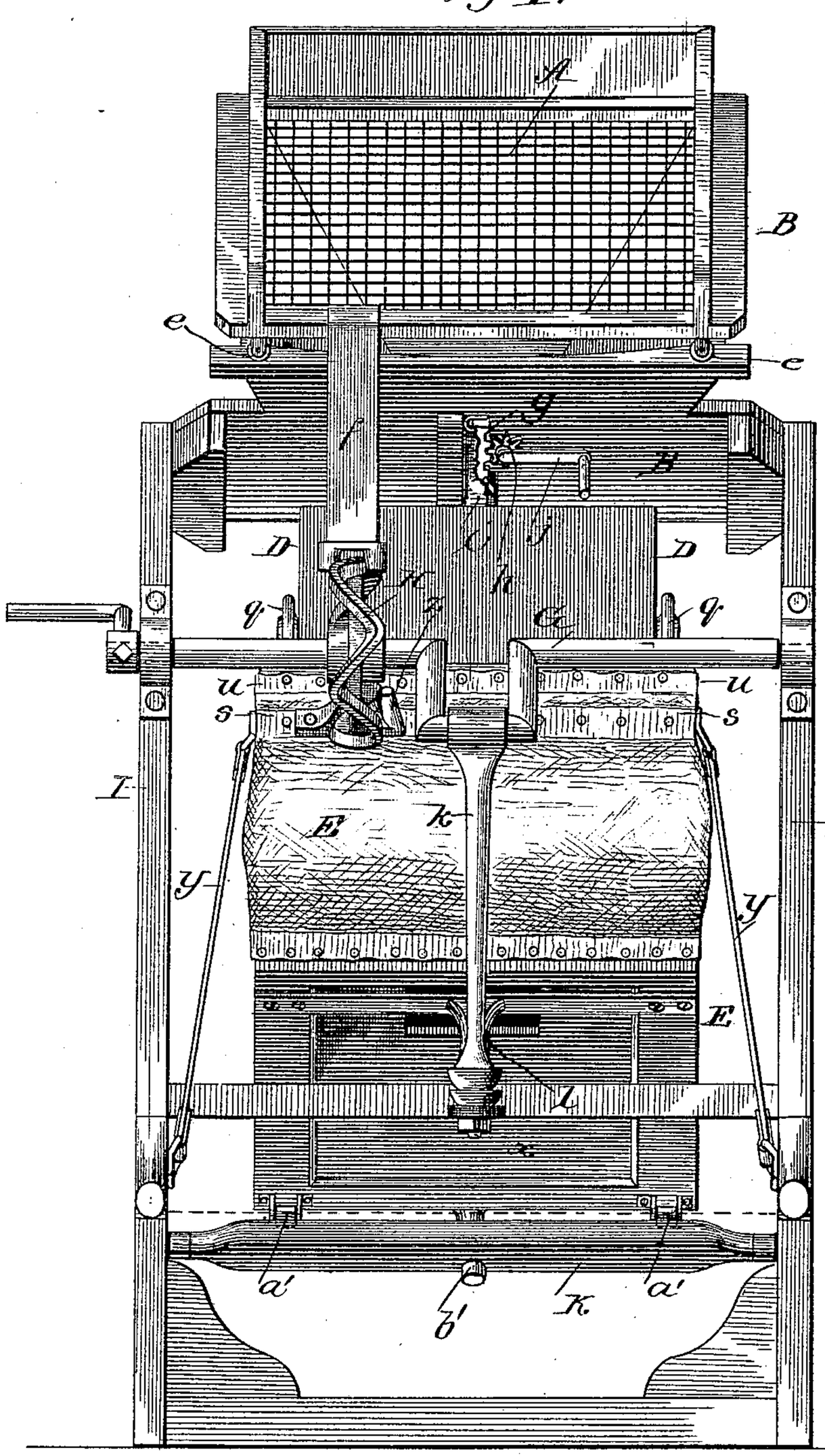
Fig. 4.



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No. 448,961. Patented Mar. 24, 1891.

Fig. 5.

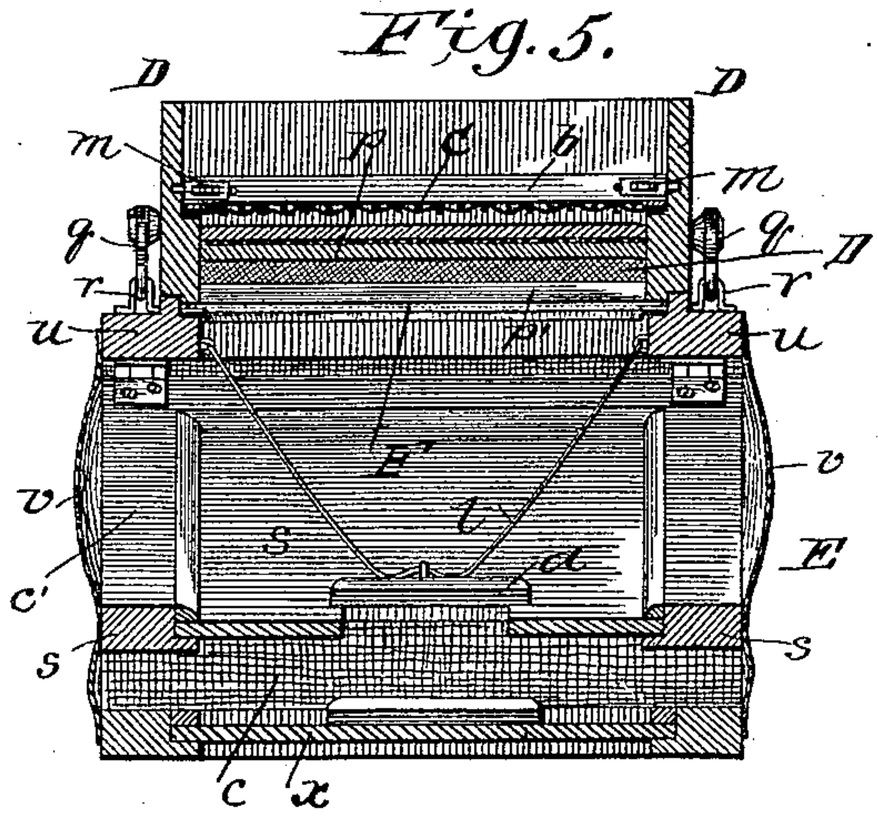
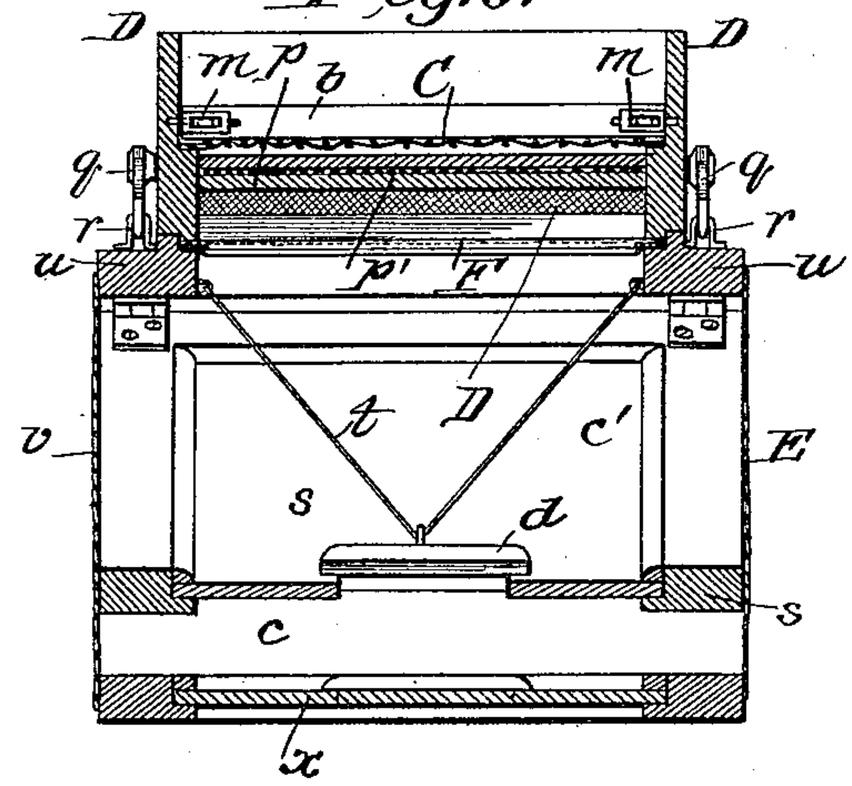


Fig. 6.



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UNITED STATES PATENT OFFICE.

GOTTLIEB D. HUSEMANN, OF ST. LOUIS, MISSOURI.

ORE-CONCENTRATOR.

SPECIFICATION forming part of Letters Patent No. 448,961, dated March 24, 1891.

Application filed November 21, 1890. Serial No. 372,214. (No model.)

To all whom it may concern:

Be it known that I, GOTTLIEB D. HUSEMANN, of St. Louis, Missouri, have invented an Improvement in Ore-Concentrators, of which the following is a specification.

My invention is an improvement in the well-known class of "dry" concentrators in which the desired separation of the metal or metal-bearing particle of ore is effected by means of an air-blast directed upward through a reticulated table or screen provided with riffles or pockets for arresting and retaining the precious metal or heavier particles contained in the material passing over the screen. In the use of such concentrators on gold-bearing ore much of the "float gold" or dust is lost, owing to the accumulation of the ore at points beneath or laterally adjacent to the cross-bars or riffles, so that the blast is obstructed to a corresponding extent in certain portions of the screen, and consequently concentrated and directed with increased force through the unobstructed portions, with the result of carrying away much of the float or dust. I have overcome the defect in such concentrators, and am able to effect a great saving of the valuable ore previously lost. I attain this result chiefly by an improved construction of the pockets in the screen and of the bellows or blower by which the blast is regulated to a practically uniform velocity. I have likewise made other improvements, as will be hereinafter indicated.

In accompanying drawings, four sheets, Figure 1 is a side elevation of the machine. Fig. 2 is a central longitudinal section. Fig. 3 is a detail perspective view of certain parts enlarged. Fig. 4 is a rear elevation of the machine. Fig. 5 is a transverse section on line 5 5 of Fig. 2. Fig. 6 is a similar section at the same point, but showing the inlet-valve held open automatically by tension of its cord.

I will preface the description of the details of construction and operation of my machine by a general reference to the main or larger parts composing it.

The material to be treated is delivered by hand or otherwise upon the upper vibrating wire screen A, Fig. 2, having a very coarse mesh, and by it the finer portion is separated from the other and delivered into the hopper B below, whence it passes onto the finer wire screen C, which has a series of riffle-bars *b* and forms the detachable inclined top of the pocket-screen D. The latter is detachably secured to the double bellows E, and between them is placed the air-distributer and screen F, Fig. 2, formed of a sheet of muslin stretched on a suitable frame. The air taken into the lower compartment *c* of the double bellows is forced into the upper compartment *c'*; but whenever the pressure in the latter exceeds a certain degree its valve *d* is opened automatically and the pressure thereby instantly reduced.

The riffle-screen C and subjacent pocket-screen D, being attachments of the bellows E, necessarily partake of its compound movement, which is a lateral and vertical vibration. The means for imparting such motion and also for vibrating the upper screen A is a crank-shaft G, Fig. 3, having a cam-wheel keyed in it.

The details necessary to a fuller understanding of the machine are as follows: The hopper B is fixed on the upright portion of the frame I. The coarse upper screen A is pivoted at *a* on the rearwardly-inclined top of the hopper B, and provided at its lower end with anti-friction rollers *e*, that travel on the lower edge of the hopper. Lateral vibration of the lower end of the screen A is effected by a rigid pendent arm *f*, whose lower end is provided with fingers that embrace the periphery of the cam-wheel H, Fig. 4, on the crank-shaft G. The discharge from the hopper B of the mingled ore and gangue that pass through the screen A is regulated by a slide J, Fig. 2, that is adapted to contract more or less the opening in the base of the hopper and which is adjusted by a rack *g* and pinion *h*. The rack is attached to the slide J and works in a guide *i*, affixed to the hopper. The pinion *h* is operated by a crank *j*, and pivoted to the under side of the hopper contiguous to rack-guide *i*. The crank-shaft has its bearings on the rear side of the uprights I, and from its cranked portion a rod *k* extends down to and is loosely pivoted to the rigid rearwardly-projecting arm *l*, attached to the under side of the bellows E. The latter is arranged in an inclined position in order to facilitate the passage of the ore, &c., over the screens C and D, attached to its up-

per side. (I will hereinafter further describe the construction and operation of the bellows.)

The riffle-screen C, Figs. 2 and 5, is detachably secured to the pocket-screen D by means of sliding bolts *m*, that enter the sides of the latter. It has a coarse mesh and a series of transverse riffle-bars *b*, of which the two upper are thicker and therefore higher than the others. The mingled fine ore and gangue delivered from the hopper B upon this screen are divided into two portions, the coarser passing off over its lower end and the finer through its mesh into the pockets of the screen D below. The latter is trough-like in its general form, having high vertical sides save at the lower end, which is entirely open.

The peculiar construction of the pockets constitutes an important feature of my invention. They are approximately right angular in cross-section. Their upper sides *n*, Fig. 3, are the longer and less inclined, having an angle of about forty-five degrees, and instead of being reticulated over their entire surface all but the lower portion or half of such sides is imperforate. The other shorter sides *n'* of the pockets are perforated, as shown. A transverse wooden bar *p*, Fig. 2, intervenes every two pockets, and another *p'* is arranged directly below the angular bottom of each pocket. To these bars and to the wooden piece forming the upper portion of each pocket the wire-gauze that forms the reticulated portion of the pocket is permanently secured, as shown.

In practical operation the pockets soon become filled with ore and gangue, and the free gold and gold-bearing mineral particles sink toward the bottom by their superior gravity. It is obvious that if the upper rear and less inclined sides *n* of the pockets were perforated the air-blast would be driven through such portions with much greater force than through the lower angular portions of such pockets, since the lesser quantity in weight of the material resting on the upper would offer the least obstruction. The consequence would be that the blast thus increased in intensity at such points would carry off the lighter or float gold, so that it would be irretrievably lost; but by making the upper rear side *n* of the pockets imperforate the air-blast is compelled to pass through the lower portion of the pockets, and hence through the body of material contained in the latter. The blast is thus reduced in force or intensity, whereby the material acted on by it is not only kept in constant ebullition in the several pockets, which greatly promotes the desired separation of the valuable from the worthless portion, but loss of most of float or finest gold is avoided, which result is so important to a paying success in operating on a certain class of low-grade ores.

Beneath the pocket-screen D, Fig. 2, or between it and the bellows E, is placed the so-called "air-distributer" F, which, as before stated, is formed of a sheet of muslin stretched taut by a rigid frame. It is divided by transverse bars into perforate and imperforate portions, the perforate portions coinciding in position with the pockets of the screen above. This device serves to render the passage and distribution of the air-blast more uniform, which is essential to operating on ore containing a large percentage of float or dust gold, and it also catches such portion of the latter as may pass down through the wire-gauze bottoms of the pocket, &c. It covers the open top of the upper compartment *c'* of the bellows E and is held in place by the pocket-screen D. The latter is attached to the top of the bellows by means of pivoted hooks *q*, that engage staples *r*. The hooks *q* have extensions that serve as levers or thumb-pieces for convenience in disengaging the hooks when it is required to detach the screen D.

The bellows E is divided into the two compartments *c c'*, before referred to, by a rigid diaphragm *s*, Fig. 2, which has an opening, normally closed by the upwardly-opening valve *d*. A cord *t*, Figs. 2, 5, and 6, which performs an important function, (hereinafter stated,) is attached to said valve *d* and to the movable bellows-frame *u*, on which the pocket-screen D is secured, and to which the bag *v*, forming the upper compartment *c'*, is attached, as shown. Air is admitted to the lower compartment *c* through the valve-closed opening in the lower but movable bottom *x* of the bellows. Hinged arms *y*, Figs. 1 and 4, support the rear upper end of the bellows and permit it free lateral movement. Fingers *z* project from the rear end of the bellows and embrace the edge of the cam-wheel H, whence the vibratory movement is derived. The lower end of the bellows is pivoted centrally, Figs. 2 and 4, on a rocking bar K, which is journaled in the frame I. A roller *a'* is affixed to the bellows on each side of the pivot *b'* and works on the flat surface of the rocking bar K, thus supporting the bellows E, and also relieving friction incident to its lateral movement.

When the crank-shaft G is rotated, the rear ends of the upper primary screen A and the bellows E are both vibrated laterally on their respective pivots *a* and *b'*. The hinged bottom *x* of the bellows is at the same time worked vertically, whereby air is alternately taken into the lower compartment *c* of the bellows and expelled from it into the upper compartment *c'*.

In case the shaft G is rotated too rapidly an excess of air-pressure would be attained in such upper compartment *c'*, with the result of increasing the force of the blast through the pocket-screen D beyond the point of safety for the float or dust gold; but this result is avoided by the valve *d* and cord *t*, for whenever the upper compartment *c'* becomes full or nearly full of air then, as shown in Fig. 6, the lower end of the upper frame *u* (on which the pocket-screen D is secured) rises far enough to pull the cord *t*, and thereby open

the said valve, so that the surplus quantity of air in the upper compartment *c'* may pass into the lower one *c*, which occurs upon the downward movement of the rigid bellows-bottom *x*. Thus the air-pressure and air-blast are regulated and rendered practically uniform, and this, coupled with the peculiar construction of the pockets of the screen D, insures a great saving of the float gold, which would otherwise be lost.

It will be seen that the vibration of the upper bellows-frame *u* vertically aids materially in the separation of the valuable from the valueless portion of the material in the pocket-screen D, and this result is increased by the lateral vibration of the bellows and screen together.

It will be further noted that the material held in the pockets of the screen D serves to weight the bellows, and that the blast passing through the screen is varied in force according to the quantity and weight of such material that may at any time be in said pockets, so that the action of the blast on a relatively large and dense quantity of the material will be stronger than on a lesser and higher quantity.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In an ore-concentrator, an inclined screen provided with a series of angular pockets having reticulated bottoms and the upper half of their upper sides being imperforate, as and for the purpose specified.

2. In an ore-concentrator, a screen provided with a series of transverse angular pockets having reticulated bottoms and upper sides, which are longer and less inclined than the lower and also imperforate in the upper portion, as shown and described.

3. In an ore-concentrator, the combination, with the inclined screen having a series of pockets whose lower portions are reticulated and the rear portions of their upper sides imperforate in the upper half, of a bellows on which said screen is secured and from which an air-blast is directed up through said pockets, as shown and described.

4. In an ore-concentrator, the combination, with a bellows having an upper portion which vibrates vertically, and a fixed central portion provided with the opening, and a valve *d*, and means for connecting the latter with such vibrating portion, of a screen secured thereon and having a series of reticulated pockets through which an air-blast is forced by said bellows, as shown and described.

5. In an ore-concentrator, the combination, with the bellows having an upper portion that vibrates both vertically and laterally, of a pocket-screen secured thereon, and thus participating in its compound movement, as shown and described.

6. In an ore-concentrator, the combination, with the vibrating bellows, of a screen D, secured thereon, and having a series of reticulated pockets, and the combined air-distributer and screen F, composed of a sheet of fabric and a stretcher-frame, which is interposed between said bellows and screen D, as shown and described.

7. In an ore-concentrator, the combination, with a screen, of a bellows having two compartments and an upwardly-opening valve in their separating-diaphragm, and a means of connection between such valve and the vibrating frame of the upper compartment, whereby the valve is automatically opened to relieve an excess of pressure, as shown and described.

8. In an ore-concentrator, the combination, with a screen, of the bellows and the rocking bar on which its lower end is pivoted, and means for vibrating the bellows laterally and vertically, as shown and described.

9. In an ore-concentrator, the combination, with a screen and the rocking bar K, of the bellows pivoted thereto at its lower end and having an anti-friction roller located on either side of the pivot, the crank-shaft, and the cam-wheel H, which is fixed on said shaft and engages a bifurcated projection on the rear end of said bellows, a rod pendent from the crank-shaft, and rigid arm loosely attached thereto, as shown and described.

GOTTLIEB D. HUSEMANN.

Witnesses:
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AMOS W. HART.