

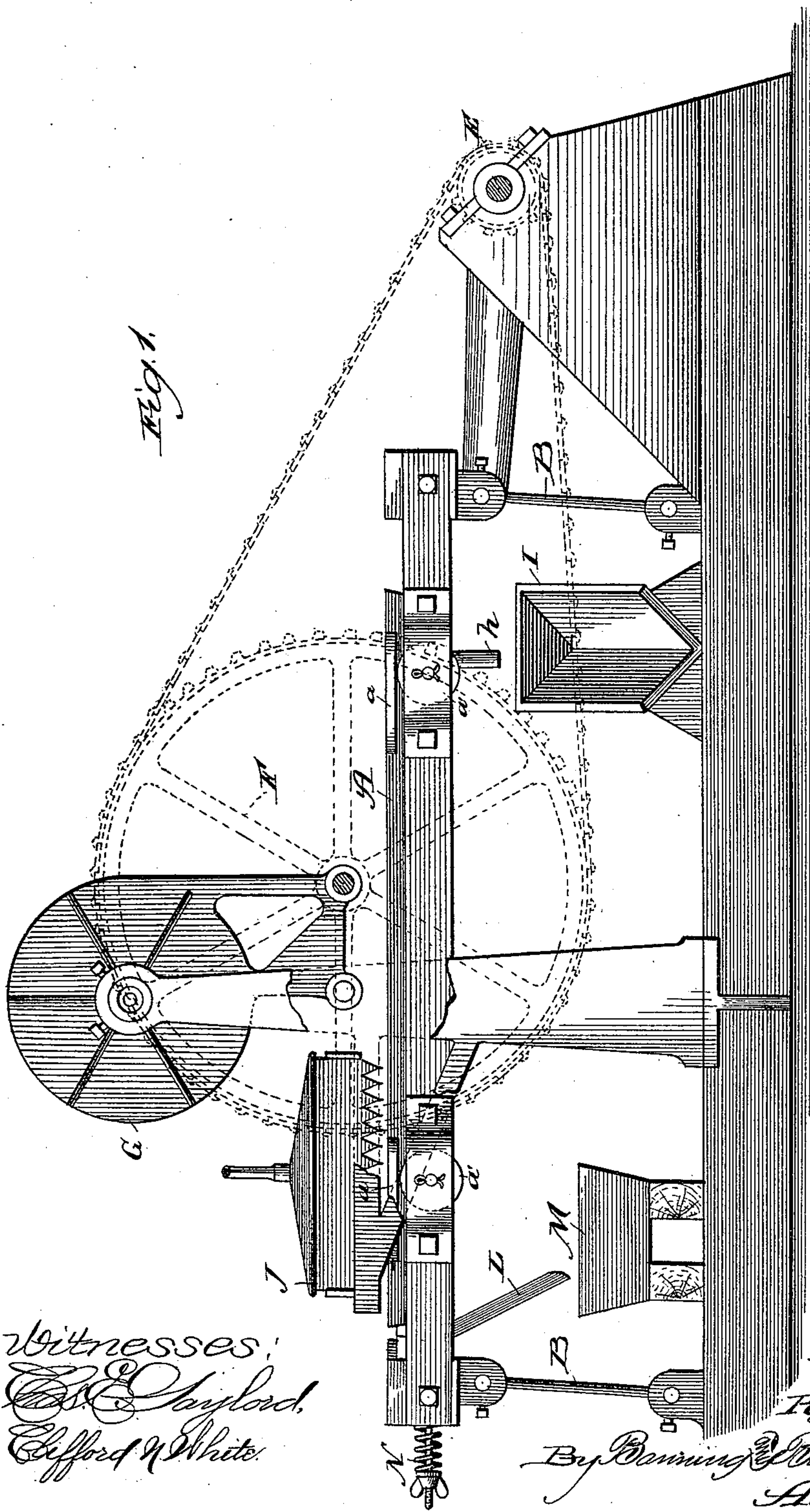
(No Model.)

3 Sheets—Sheet 1.

R. D. GATES.  
CONCENTRATING APPARATUS.

No. 451,926.

Patented May 12, 1891.



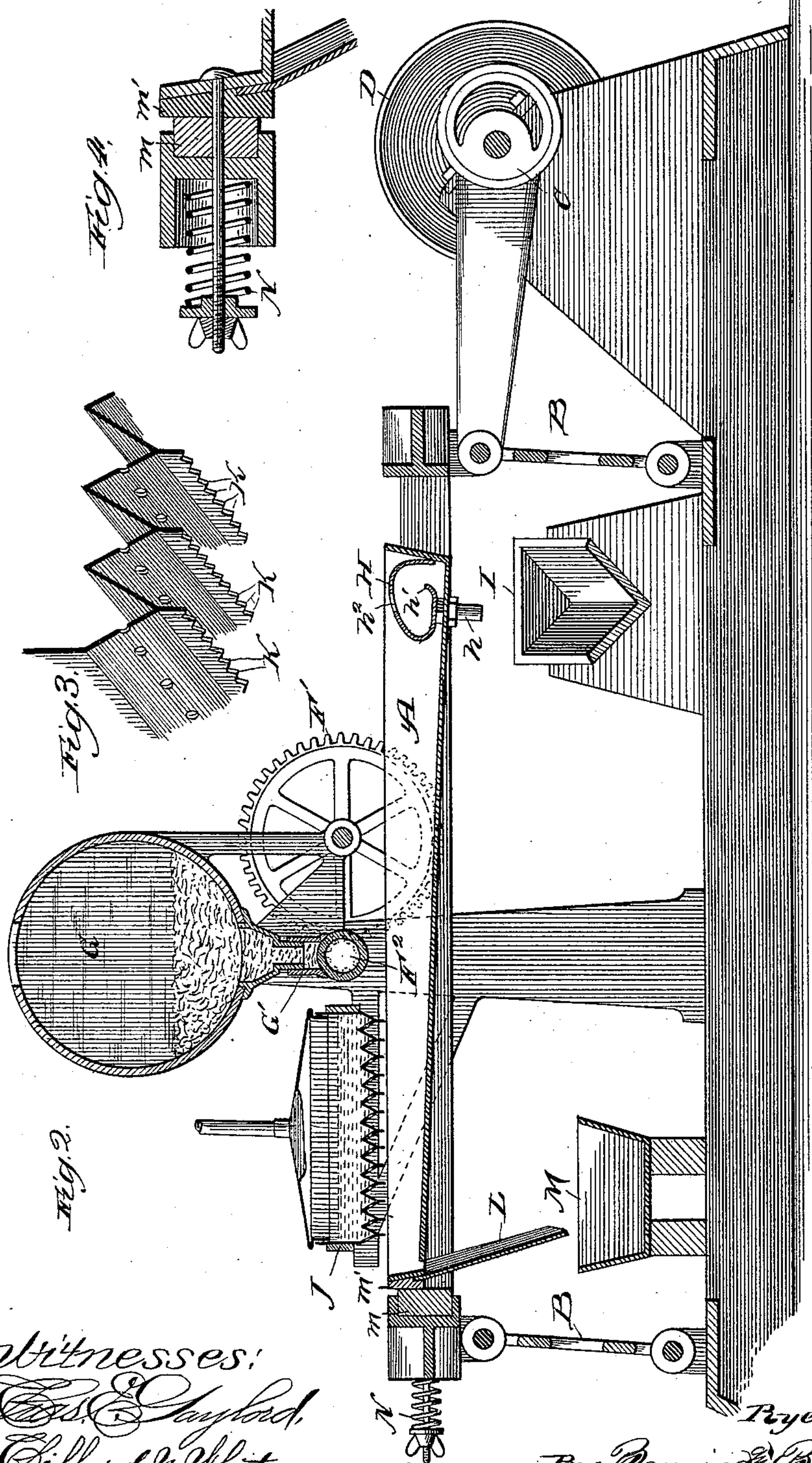
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3 Sheets—Sheet 2.

No. 451,926.

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Witnesses:  
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3 Sheets—Sheet 3.

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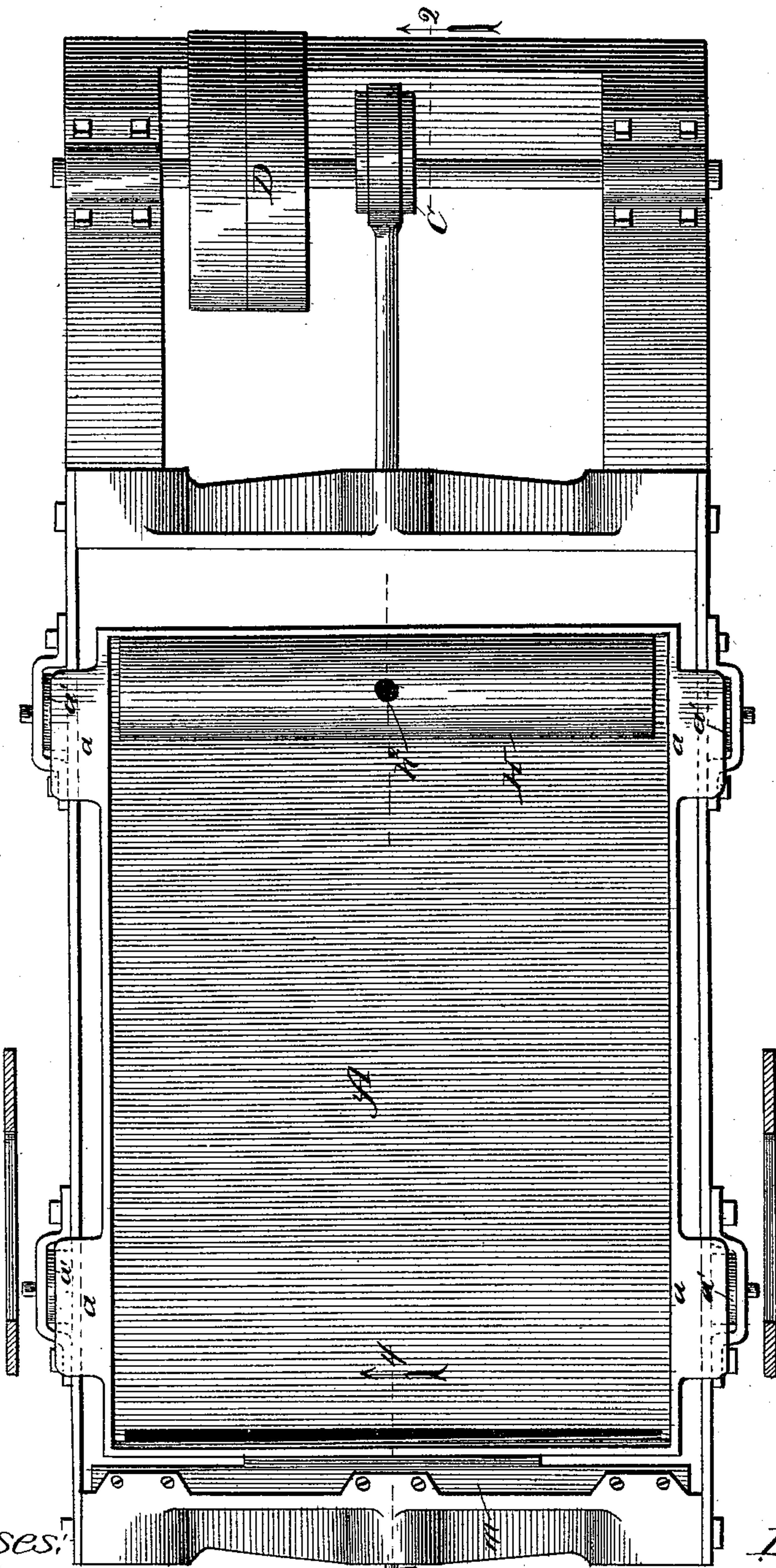


Fig. 5.

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# UNITED STATES PATENT OFFICE.

RYERSON D. GATES, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE GATES IRON WORKS, OF SAME PLACE.

## CONCENTRATING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 451,926, dated May 12, 1891.

Application filed August 23, 1890. Serial No. 362,801. (No model.)

*To all whom it may concern:*

Be it known that I, RYERSON D. GATES, a citizen of the United States, residing at Chicago, Illinois, have invented certain new and useful Improvements in Apparatus for Concentrating Minerals or Ores, of which the following is a specification.

The object of my invention, in general terms, is to improve the apparatus described and claimed in Letters Patent No. 420,933, issued February 11, 1890; and my invention consists in the features and details of construction hereinafter described and claimed.

In the drawings, Figure 1 is a side elevation of my improved apparatus. Fig. 2 is a longitudinal vertical section of the same. Fig. 3 is an enlarged perspective view of the bottom of the water-feeder. Fig. 4 is a longitudinal section of the spring for regulating or determining the shock imparted to the concentrating-pan, and Fig. 5 is a plan view of the concentrating apparatus with some of the parts removed.

In making my improved concentrating apparatus I make a concentrating-pan A, in which the material to be treated is introduced. The bottom of this pan is arranged on an incline or slant from the rear to the front end. It is arranged loosely in a frame carried by pivoted supports B, so that a vibratory movement can be imparted to it through means of the eccentric C, mounted on a shaft carrying a pulley D, which is connected by a belt to any convenient motive power, so as to be rotated. The pan is provided with lugs *a*, resting on rollers *a'*, arranged in the frame, so that it may readily move forward and backward as the vibratory movement is imparted to the frame within the limits determined by the tension of the spring, as hereinafter described. A sprocket-wheel E is mounted on the same shaft as the pulley D and connected by a sprocket-chain to another sprocket-wheel F, mounted on a shaft carrying a gear F', which engages with a pinion F'', mounted on a feed-roller F''', which is rotated by it. Above this shaft or roller is arranged a hopper G, and resting loosely upon the roller is arranged a feed-regulator G', which prevents the material to be treated from being fed

into the concentrating-pan more rapidly than desired.

The ores to be treated, it will be understood, are in a pulverized or powdery condition, and as the feed-roller F''', rotated by the pinion F'', is revolved the fine or powdery material escapes slowly and regularly under the edge of the feed-regulator G', resting loosely on top of the roller. While the roller may be slightly corrugated, if desired, I prefer to make it with a smooth surface, as the loosely-mounted feed-regulator will allow sufficient quantities of material to constantly escape or feed through into the concentrating-pan as the roller revolves.

At the forward end of the concentrating-pan I arrange an automatic discharge for the water and the gangue, which consists, preferably, of a copper plate H, inasmuch as such material does not corrode, bent and fastened to discharge-pipes *h*, so that its lower side is held somewhat above the bottom of the concentrating-pan, and with its edge *h'* somewhat bent up, so that the water and the gangue or waste material being discharged pass down beneath its under side and over the edge *h'*, so as to be discharged through the pipes H into a trough I, where they may be carried off and disposed of as desired. The upper side of the discharge-plate H is preferably bent over, as shown, and down near the bottom at the front end of the concentrating-pan. This causes the water to be deflected back, so that it passes over the edge *h'* and is discharged through the pipes. Otherwise the vibratory motion of the concentrating-pan would cause it to flow or splash over the front end. The top of the plate is provided with a hole *h''* to admit water into the interior of the discharge-plate. Otherwise a vacuum would be created, which would prevent the water from being properly discharged.

In order to supply the concentrating-pan with water, I arrange a water-feed J near the rear end of the machine. This water-feed consists of a pan provided with a cover, into which a pipe communicating with some suitable water-supply is led, and with a corrugated bottom having a series of points or teeth K arranged on the lower ridges of the bottom.



A series of holes are made, preferably, through the sides of the corrugations, as shown in Fig. 3, so that the water may pass through the corrugations and run down along the sides of the bottom and fall from the points or teeth in drops.

Although the perforations in Fig. 3 are shown for convenience as of uniform size, yet I desire it to be understood that I prefer to make them of larger size at the front side of the feed-water and decreasing gradually in size to the rear side of the feed-water. This will permit the water to drop more rapidly into the concentrating-pan at the front edge than at the rear and enable me to secure a more perfect separation of the gangue and concentrates. I provide a discharge L at the rear of the concentrating-pan, through which the concentrates are discharged and deposited in a receptacle M, where they may be preserved for further treatment. At the rear end of the concentrating-pan I arrange blocks of wood *m* and *m'*. The block *m* is held in any suitable manner in the end of the frame, while the block *m'* is attached to the end of the concentrating-pan. As the pan is thrown forward in its vibratory motion the two blocks are separated; but as it returns in its alternate forward and backward movement the block *m'* strikes against the block *m*, so that there is a constant blow, shock, or jar imparted to the concentrating-pan.

In order to regulate or adjust the intensity of the blows or shocks, I arrange a spring N at the rear of the apparatus on a rod passing through the end of the frame and the blocks *m* and *m'* and connecting with the end of the concentrating-pan, which spring may be adjusted by means of a thumb-screw and the intensity of the shocks regulated as desired. For instance, if the tension of the spring be arranged weak the forward movement of the concentrating-pan will be farther and cause a further separation between the blocks *m* and *m'* than if it be arranged strong, and consequently the blow or shock caused in its backward movement by the blocks coming together will be greater than if the separation be but small. As the pan is thrown forward by the vibratory movement of the frame in which it is loosely mounted it draws the coils of the spring N together. The tension of the spring, aside from the backward movement of the frame, jerks the concentrating-pan back, so that it is in position to be again carried forward at the next forward movement of the frame. This forward movement of the pan caused by the forward movement of the frame and backward jerking of the pan caused by the tension of the spring are constantly and successively repeated as the apparatus is operated. It is thrown forward and then jerked back, causing a quick shock or blow between the blocks *m* and *m'* at each backward movement of the pan.

In operation the ores to be treated in a fine or powdery condition are emptied into the

hopper G, whence they pass down onto the roller and escape into the concentrating-pan beneath the edge of the loosely-mounted feed-regulator resting on the roller. Water is introduced into the water-feed, and as the powdered ores fall onto the bottom of the concentrating-pan the water dropping onto the pan mingles with them. The gangue or worthless portion of the ores is carried by the water down the incline toward the front end of the concentrating-pan, while the concentrates or valuable portions of the ores are caused by the constant jars, blows, or shocks to which the pan is subjected to move gradually up the incline toward the rear end of the concentrating-pan. The concentrates even though of almost incalculable fineness as compared with the size and gravity of the gangue, are carried up the incline and separated from the gangue, and discharged by themselves through an opening at the rear of the concentrating-pan. The gangue, on the other hand, is carried to the front end of the concentrating-pan and discharged. In this way I am able to effect a practically complete separation of the valuable from the worthless materials of the ores without sizing them or classifying them according to size or specific gravity.

What I regard as new, and desire to secure by Letters Patent, is—

1. In a concentrating apparatus, the combination of a concentrating-pan loosely mounted in a vibratory frame that moves it forward and a spring for limiting the forward movement of the pan and drawing it back to its initial position in readiness for another forward movement, substantially as described.

2. In a concentrating apparatus, the combination of a concentrating-pan loosely mounted in a vibratory frame that moves it forward and provided at its forward end with a discharge-opening to accommodate the gangue and at its rear end with a discharge-opening to accommodate the concentrates, and means for drawing the pan back and imparting to it a quick shock or jar as it reaches its initial position, substantially as described.

3. In a concentrating apparatus, the combination of a concentrating-pan and a water-feeder to supply the pan with water, provided with a corrugated bottom and perforations through the sides to permit the water to drip into the pan, substantially as described.

4. In a concentrating apparatus, the combination of a concentrating-pan and a water-feeder to supply the pan with water, provided with a corrugated bottom having teeth on the lower ridges and perforations through the bottom to permit the water to flow through and drop from the teeth into the pan, substantially as described.

5. In a concentrating apparatus, the combination of a concentrating-pan and an ore-feeder comprising a roller on which the ore falls and a loosely-mounted feed-regulator resting on the roller, and between the edge of



which and the roller the ore passes in a thin stream or sheet into the pan, substantially as described.

5 6. In a concentrating apparatus, the combination of a concentrating-pan and a discharge for the gangue comprising a bent sheet held up from the bottom of the pan by pipes opening through the sheet and the bottom

bent up at its forward lower edge and over and down at its forward upper edge to prevent the water from splashing over the front end of the pan, substantially as described.

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