

(No Model.)

3 Sheets—Sheet 1.

W. E. MENDENHALL.
ORE CONCENTRATOR.

No. 604,061.

Patented May 17, 1898.

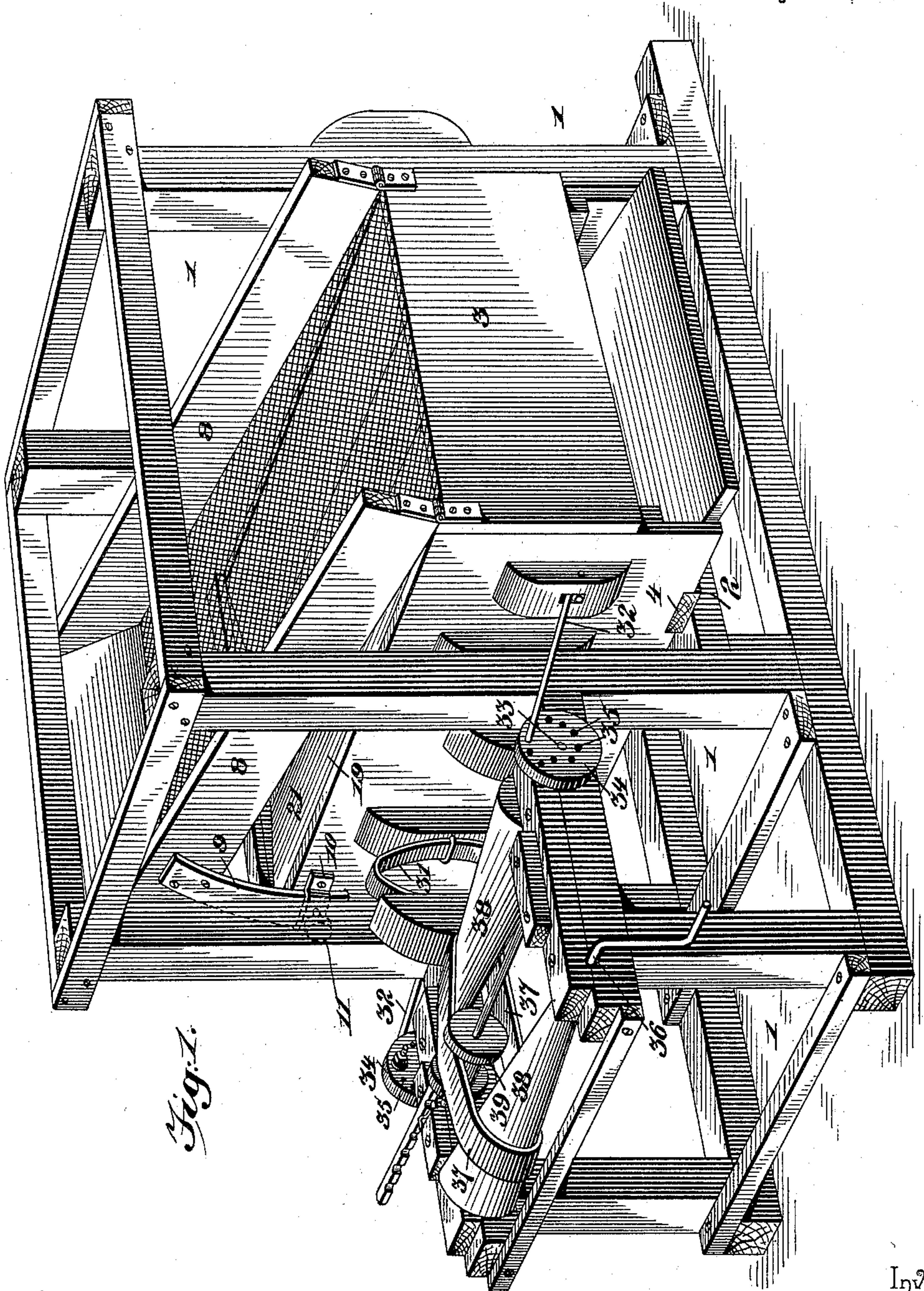


Fig. 1.

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Witnesses

H. J. Dieterich

By his Attorneys,

C. E. Mendenhall

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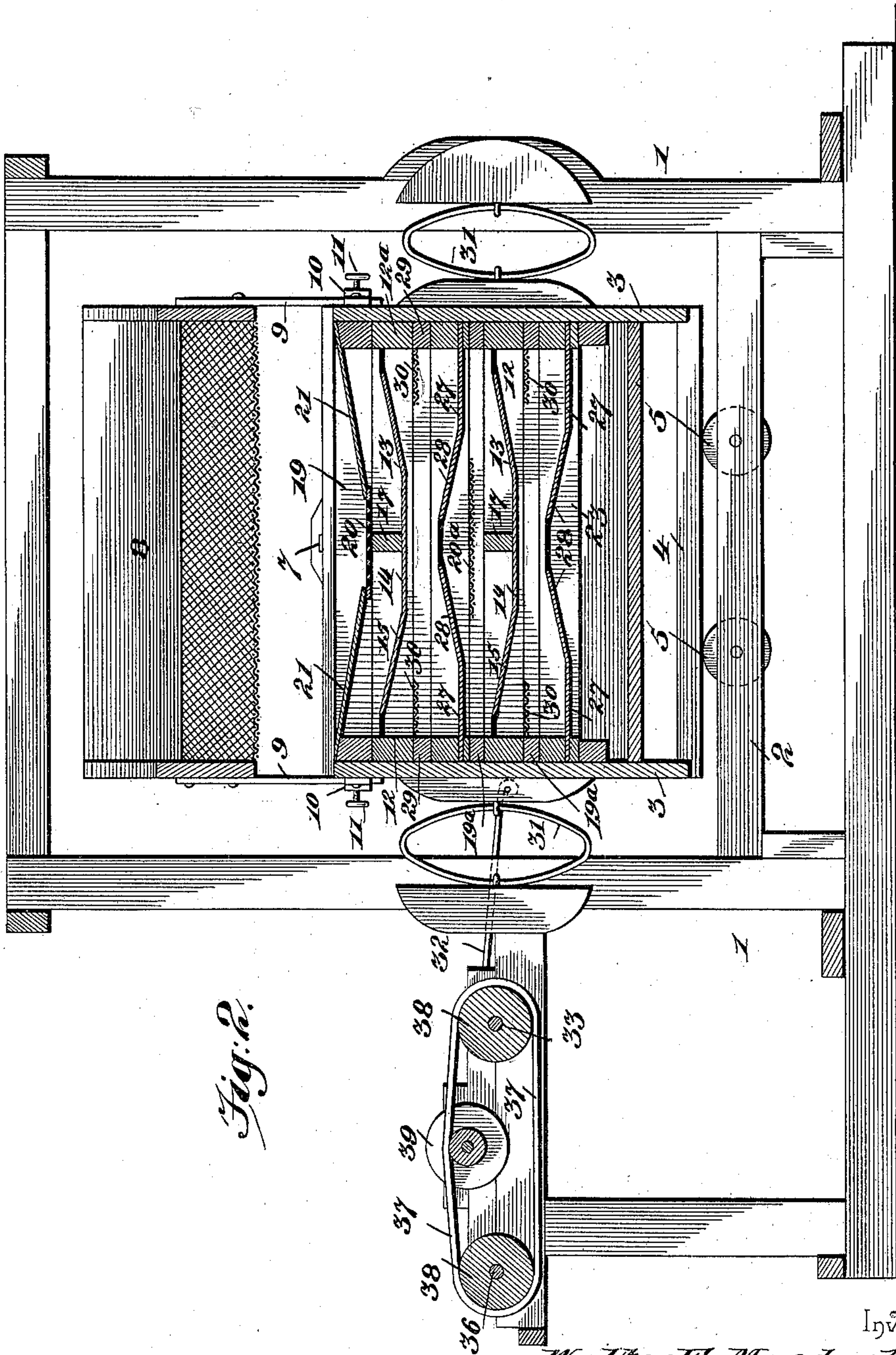


Fig. 2.

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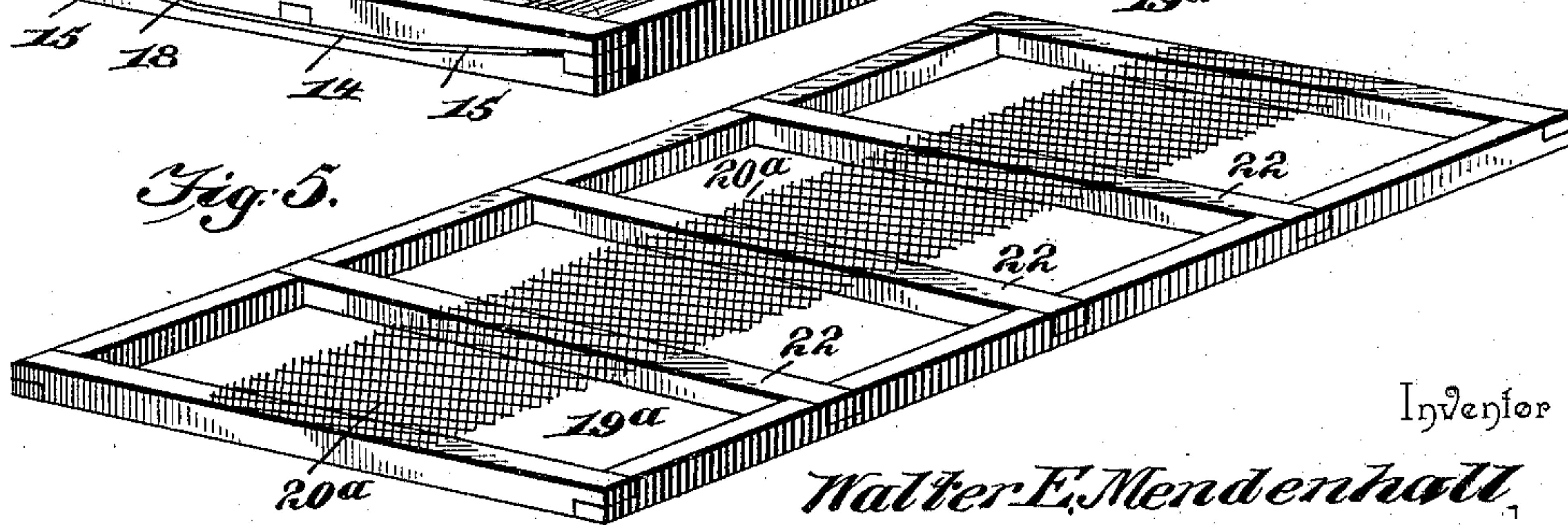
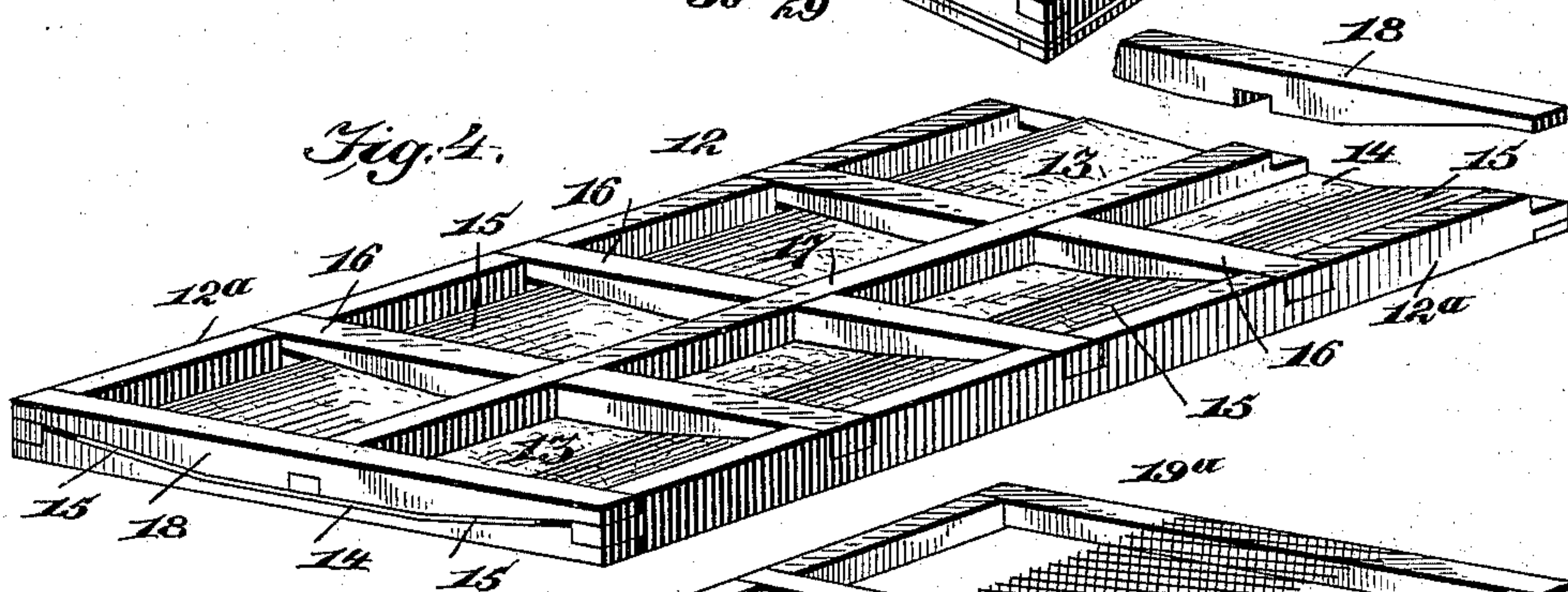
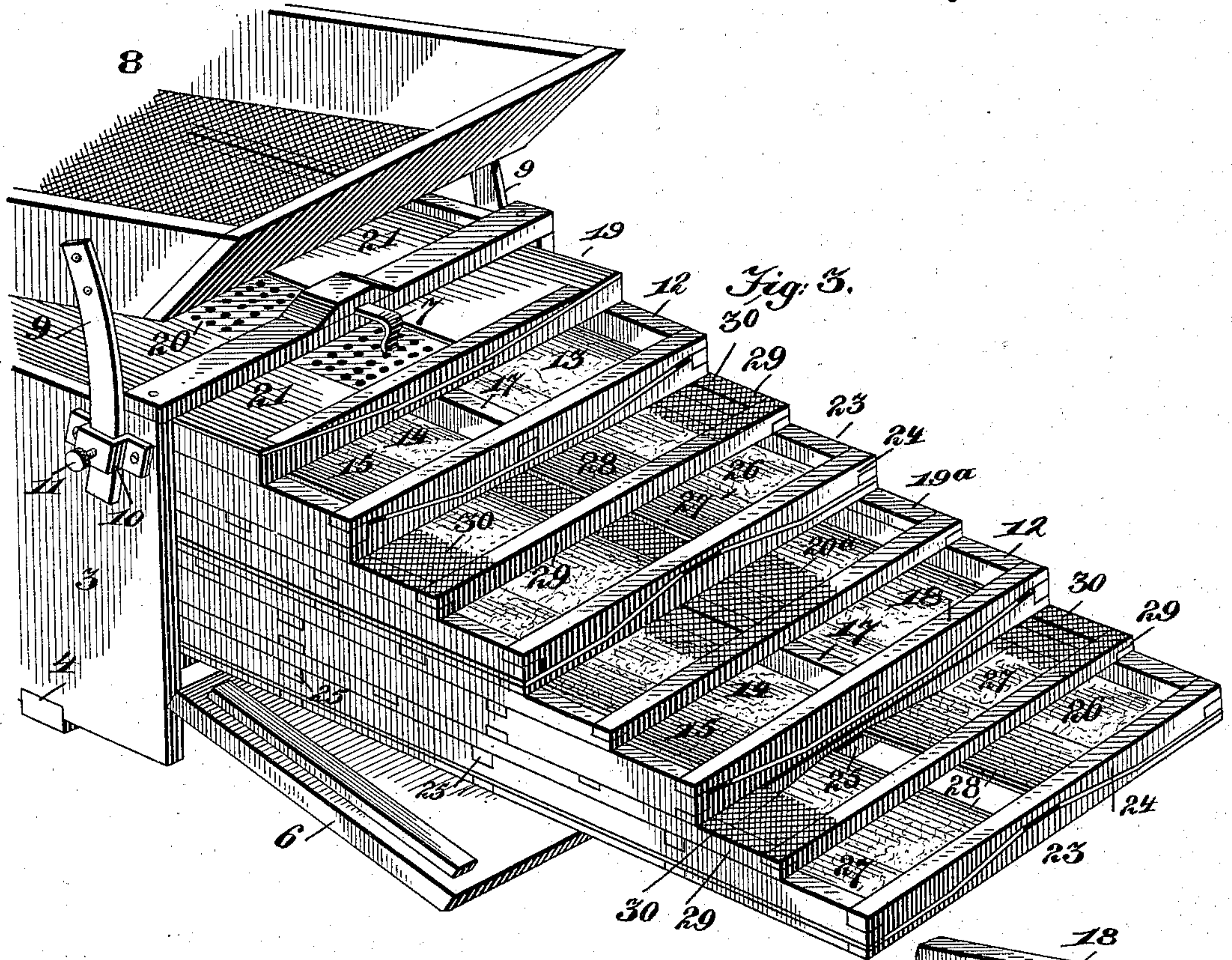
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3 Sheets—Sheet 3.

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Inventor

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UNITED STATES PATENT OFFICE.

WALTER E. MENDENHALL, OF FLAGSTAFF, ARIZONA TERRITORY, ASSIGNOR
OF ONE-HALF TO EZRA S. GOSNEY, OF SAME PLACE.

ORE-CONCENTRATOR.

SPECIFICATION forming part of Letters Patent No. 604,061, dated May 17, 1898.

Application filed April 28, 1897. Serial No. 634,281. (No model.)

To all whom it may concern:

Be it known that I, WALTER E. MENDENHALL, a citizen of the United States, residing at Flagstaff, in the county of Coconino and Territory of Arizona, have invented a new and useful Ore-Concentrator, of which the following is a specification.

My invention relates to ore washing and separating or concentrating apparatus, and particularly to that class of machines employed for working placer-gravel, and designed to accomplish the separation of precious metals and minerals from baser materials through the medium of their respective specific gravities; and the primary object in view is to provide mechanism adapted to accomplish the saving of fine light gold or other precious metal, or that which is known in the art as "flour" gold, silver, lead, or other mineral.

In reducing my invention to practice it has been my object to provide such a construction and arrangement of parts as to secure a motion which will overcome the tendency of running water to carry fine particles of precious minerals out of the concentrating devices and will be essentially analogous to that of an ordinary gold-pan when operated manually, whereby the successful concentration of precious minerals may be accomplished when the difference in weight between the waste or "tailings" and the valuable particles is small.

Further objects and advantages of this invention will appear in the following description, and the novel features thereof will be particularly pointed out in the appended claims.

In the drawings, Figure 1 is a perspective view of an ore-concentrating apparatus constructed in accordance with my invention. Fig. 2 is a longitudinal section of the same. Fig. 3 is a detail perspective view of the series of concentrating, conveying, and deflecting trays projecting successively to different distances beyond the open end of the box to show the relative arrangement thereof. Fig. 4 is a detail view in perspective of one of the concentrating trays or pans. Fig. 5 is a similar view of one of the distributing or check trays or pans.

Similar numerals of reference indicate corresponding parts in all the figures of the drawings.

Mounted in a supporting-framework 1, upon horizontal longitudinal guide-beams 2, is a reciprocatory box or receptacle 3, preferably provided at its bottom with longitudinal bars 4, which rest upon antifriction guide-rollers 5, journaled upon the guide-beams 2, to facilitate the vibration of the box or receptacle with the minimum friction. This box is adapted to contain a plurality of trays or pans of different constructions, arranged in a specific order to be hereinafter explained, and the introduction and removal of said trays or pans is accomplished through an open side of the box or receptacle, which is normally closed by means of a door 6, said door being held in its closed position by means of a spring-catch 7.

Mounted above the open top of the box or receptacle and supported thereby is a washing-trough 8, having a reticulated or screen bottom and adapted to be supplied with water from any suitable source, such as a superjacent tank, (not shown,) the lower or outlet end of the washing-trough being hinged to the upper edge of the box or receptacle, while the upper end of said trough is provided with supporting-arms 9, adjustably fitted in guides 10 on the sides of the box or receptacle. Set-screws 11 are employed in connection with said guides for securing the supporting-arms, and hence the upper end of the tray, at the desired adjustment, whereby the preferred angle of inclination may be secured for the trough to suit the character of the gravel which is being washed.

Arranged within the box or receptacle is a series of trays or pans, of which the concentrating pan or pans 12 consist of open frames having flexible bottoms 13, separated throughout their front and rear edges from the contiguous bars of the frame to form outlets for the escape of tailings, said bottom being depressed at its center to form a horizontal portion 14 and rising toward its edges to form the inclined portions 15. Each tray or pan is preferably divided by longitudinal braces 16 to form compartments of equal areas, said braces also serving to strengthen the frame

of the tray, and, furthermore, the compartments are divided by transverse bars 17, arranged at the center of the horizontal depressed portion of the bottom 13. This flexible bottom is preferably arranged in the frame of the tray or pan by extending it between the members of the sectional side bars 18 and braces 16, the lower members of said sectional side bars and braces being permanently secured to the end bars 12^a and having their upper sides, between said end bars, cut away to form a seat corresponding with the proposed cross-sectional shape of the flexible bottom. The upper members of said sectional side bars and braces are arranged in place after the bottom has been placed upon the lower members, the lower edges of said upper members being of a shape corresponding with that of the upper edges of the lower members to hold the flexible bottom firmly in place and prevent warping and kinking.

Above each of the concentrating-trays, of which any desired number may be used, according to the size of the box employed in the apparatus, is a distributing-tray adapted to deposit the placer-gravel equally upon opposite sides of the transverse partition-bars 17. Above the uppermost concentrating-tray is a conveyer-tray 19, having a sectional construction similar to that described in connection with the concentrating-tray, with a central horizontal perforate portion 20, through which the ore is adapted to pass, and upwardly and outwardly inclined imperforate portions 21, which serve to convey the ore toward the perforate central portion. The distributing-tray 19^a, which is arranged above an intermediate concentrating-tray, consists merely of a frame provided with suitable transverse braces 22 and having a central transversely-extending foraminous guard 20^a, designed to distribute the placer-gravel deposited thereon and prevent the same from "boiling" or "cutting" the contents of the subjacent concentrating-tray, the mesh of said guard being so fine as to prevent any but fine particles of ore from passing therethrough. This foraminous guard is horizontally disposed throughout and extends equally upon opposite sides of the transverse center of the tray.

Arranged under the concentrating-trays 12, which are provided, as above described, with terminal outlets, are auxiliary concentrating-trays 23, constructed substantially in the same manner as the main concentrating-trays, but having a central or intermediate outlet adapted to cooperate, respectively, with superjacent main concentrating-trays and receive tailings discharged, respectively, therefrom. These auxiliary concentrating-trays are provided with sectional side bars and braces 24 and 25, between the members of which are arranged the flexible bottoms 26; but said bottoms in the auxiliary concentrating-trays are of sectional construction with the contiguous edges of their sec-

tions separated to form said central outlet, the remote portions of the bottoms being depressed and arranged in horizontal planes, as indicated at 27, from which points the bottoms rise or are inclined upwardly and inwardly, as shown at 28, toward the intermediate outlet. Interposed between each main concentrating-tray and the subjacent auxiliary concentrating-tray is a distributing-tray 29, corresponding in function with the distributing-trays 19 and 19^a and having foraminous guards 30, arranged under the terminal outlets of the superjacent concentrating-tray. These guards 30 serve, as do the guards in the trays 19 and 19^a, to prevent gravel from boiling or cutting the deposits in the subjacent concentrating-trays.

From the above description it will be seen that above each main and auxiliary concentrating-tray is disposed a distributing-tray, having guards to prevent the discharged gravel of the superjacent concentrating-tray from disturbing the deposit already accumulated in the first-mentioned concentrating-tray, and the concentrating-trays are alternately arranged with their discharge-openings respectively at their extremities and at their intermediate or central points, whereby the discharge opening or openings of each concentrating-tray is arranged above the depressed portion or portions of the subjacent concentrating-tray, and it will be understood that while in the drawings I have illustrated a series of trays, including two main and two auxiliary concentrating-trays, with their cooperating distributing-trays, this number may be either increased or diminished, according to the requirements of the apparatus, by varying the size of the box or receptacle, the same relative arrangement of parts, however, being preserved.

In order to impart to the trays the desired vibration which shall be sufficient to maintain the contents thereof in a state of agitation adequate to separate the waste from the valuable minerals, I employ cushion-springs 31, arranged, respectively, in front and in rear of the box or receptacle or in the path thereof, with their outer sides secured to the supporting-framework and their inner sides to the contiguous walls of the box or receptacle. By this arrangement the box or receptacle is normally and yieldingly held at an intermediate point of its path.

Connected with the box or receptacle by means of pitmen 32 is an operating-shaft 33, driven by any suitable means, said pitmen having connection with the operating-shaft by means of crank-disks 34, provided with a plurality of perforations 35, spaced at different distances from the axis of the shaft, whereby the amplitude of vibration of the box or receptacle may be varied to suit the quality of gravel under treatment. The pitmen are provided with terminal wrist-pins for engagement with the perforations of the crank-disks.

In the construction illustrated said shaft receives motion from a driving-shaft 36 by means of a belt 37, traversing oppositely-disposed cones 38 on said shafts and controlled in its position by means of a belt-shifting apparatus 39.

The apparatus may be used without the washing-trough, if preferred, the ore being placed primarily in the uppermost distributing-tray 19.

The resilience of the cushion-springs herebefore described as being interposed between the box or receptacle and fixed objects, such as portions of the supporting-framework, equalizes the motion in opposite directions which is imparted to the box or receptacle and insures, in connection with the anti-friction supporting devices, a regularity of movement which is analogous to that sought to be imparted to a gold-pan when manually operated, while obviously the capacity of the mechanism, by reason of the plurality of concentrating-trays, is vastly increased, and the desired uniformity of motion is attained with less exercise of care upon the part of the operator. The driving-shaft may be operated either manually or mechanically, as may be preferred.

In the drawings and description I have set forth a construction and arrangement of parts especially adapted for placer-work, the main difference between the apparatus designed for placer-work and that which is more particularly adapted for ore concentration residing in the fact that in the former the concentrating or saving trays 12 are provided with the partitions 17, arranged transversely to the direction of movement of the trays in vibration, whereas for ore concentration or millwork these transverse partitions are preferably omitted, as they are liable to hinder rather than increase the efficiency of the pans in the last-named class of work. Furthermore, in ore concentration or millwork the auxiliary concentrating-trays 23 may be omitted, a conveyer-tray 19 being arranged above each of the concentrating-trays, the imperforate inclined portions 21 of a conveyer-tray being adapted to receive ore discharged from the lateral edges of the bottom of the superjacent concentrating-tray to conduct such ore to the center or perforate portion 20. I have deemed it unnecessary to illustrate this relative arrangement of the parts, inasmuch as it is similar to that disclosed in the drawings as applied to placer-work. The alternate or reversed arrangement of the main and auxiliary concentrating-trays is desirable only in placer-work, and in connection with this reversed arrangement of the trays I employ the distributing or check screens for preventing the boiling or cutting of the deposit in the subjacent concentrating-tray.

Various changes in the form, proportion, and the minor details of construction may be resorted to without departing from the spirit

or sacrificing any of the advantages of this invention.

Having described my invention, what I claim is—

1. In an ore-concentrating apparatus, the combination with a reciprocatory receptacle, and means for imparting motion thereto, of a tier of concentrating-trays arranged within the receptacle, alternate trays having spaced terminal elevated outlets, from which the floor declines inwardly to a depressed central pocket and the intermediate trays having central elevated outlets from which the floors decline outwardly in both directions, substantially as specified.

2. In an ore-concentrating apparatus, the combination with a reciprocatory receptacle, and means for imparting motion thereto, of a tier of concentrating-trays arranged within the receptacle, alternate trays having spaced terminal elevated outlets from which flat floor-surfaces decline inwardly to a depressed center, and intermediate trays having elevated central outlets from which flat floor-surfaces decline in both directions to form depressed terminal pockets, substantially as specified.

3. In an ore-concentrating apparatus, the combination with a vibratory receptacle, and means for imparting motion thereto, of a tier of concentrating-trays arranged within the receptacle, the alternate trays having spaced terminal outlets from which the floor declines inwardly to form a central pocket, and having a central transverse dividing-partition, and the intermediate trays having elevated central outlets, arranged respectively over the depressed pockets of the alternate trays, the floors of the intermediate trays declining in both directions from their outlets to form terminal depressed pockets, substantially as specified.

4. In an ore-concentrating apparatus, the combination with a vibratory receptacle, and means for communicating motion thereto, of a tier of concentrating-trays arranged within the receptacle, the alternate trays having elevated terminal outlets from which the floor declines inwardly to form a central depressed pocket, and the intermediate trays having central elevated outlets from which the floor declines outwardly to form terminal depressed pockets, and distributing-guards spanning the depressed pockets of said alternate trays beneath the outlets of the intermediate trays, substantially as specified.

5. In an ore-concentrating apparatus, the combination with a vibratory receptacle, and means for communicating motion thereto, of a tier of concentrating-trays arranged within the receptacle, the alternate trays having elevated terminal outlets from which the floor declines inwardly to form a central depressed pocket, and the intermediate trays having central elevated outlets from which the floor declines outwardly to form terminal de-

pressed pockets, and separate distributing-trays interposed between the alternate and intermediate trays, and having guards spanning the depressed pockets of the alternate trays beneath the outlets of the intermediate trays, substantially as specified.

6. In an ore-concentrating apparatus, the combination with a vibratory receptacle, and means for communicating motion thereto, of a tier of concentrating-trays arranged within the receptacle, each tray having its bottom constructed to form duplicate oppositely-inclined plane surfaces with an outlet at the most elevated point of each inclined surface, and a distributing-tray interposed between each two concentrating-trays, and provided with a reticulated guard arranged under and spaced from each outlet of the superjacent concentrating-tray and free at one edge to discharge into the subjacent tray, substantially as specified.

7. In an ore-concentrating apparatus, the combination with a vibratory receptacle and means for operating the same, of a tier of alternately-disposed main and auxiliary concentrating-trays having their discharge-openings disposed respectively in longitudinally-different vertical planes, the main concentrating-trays having terminal, and the auxiliary concentrating-trays central, elevated discharge-openings, transverse partitions arranged at the depressed portions of the main concentrating-trays between the discharge-openings thereof to form separated ore-receiving pockets, and distributing-trays arranged under the central discharge-openings of the auxiliary concentrating-trays, and hence over the dividing-partition of the subjacent main concentrating-trays to cover said pockets, substantially as specified.

8. In an ore-concentrating apparatus, the combination with a longitudinally-vibratory receptacle, and means for communicating motion thereto, of a tier of alternately-disposed main and auxiliary concentrating-trays having their discharge-openings disposed respectively in longitudinally-different vertical

planes, the main concentrating-trays having terminal, and the auxiliary concentrating-trays central, elevated discharge-openings, transverse partitions arranged at the depressed portions of the main concentrating-trays between the discharge-openings thereof to form separate ore-receiving pockets, distributing-trays arranged under the central discharge-openings of the auxiliary trays and spanning the depressed pockets of the main concentrating-trays, and a second distributing-tray arranged above the uppermost main concentrating-tray and having its bottom provided with a central depressed perforate portion and upwardly and outwardly inclined imperforate portions, substantially as specified.

9. In an apparatus of the class described, an ore-concentrating tray having a skeleton frame, a taut flexible bottom provided with a depressed portion, an elevated discharge-opening, and an inclined plane portion rising from the plane of the depressed portion to the discharge-opening, and means for vibrating the tray in a direction transverse to the length of the discharge-opening, and parallel with the direction of inclination of the bottom, substantially as specified.

10. The herein-described ore-concentrating tray having a skeleton frame provided with sectional side bars, of which the lower members are cut away to form seats having a central depressed portion and contiguous upwardly-inclined side portions, and upper members having their lower edges constructed to fit said seats, and a flexible bottom of textile fabric interposed between the contiguous faces of said members of the side bars, and secured in place thereby, to correspond in cross-section with said seat, substantially as specified.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

WALTER E. MENDENHALL.

Witnesses:

E. S. GOSNEY,
J. E. JONES.