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PATENTED JUNE 26, 1906.

A. C. CAMPBELL.  
JIG OR ORE CONCENTRATOR.

APPLICATION FILED SEPT. 19, 1903. RENEWED FEB. 17, 1906.

2 SHEETS—SHEET 1.

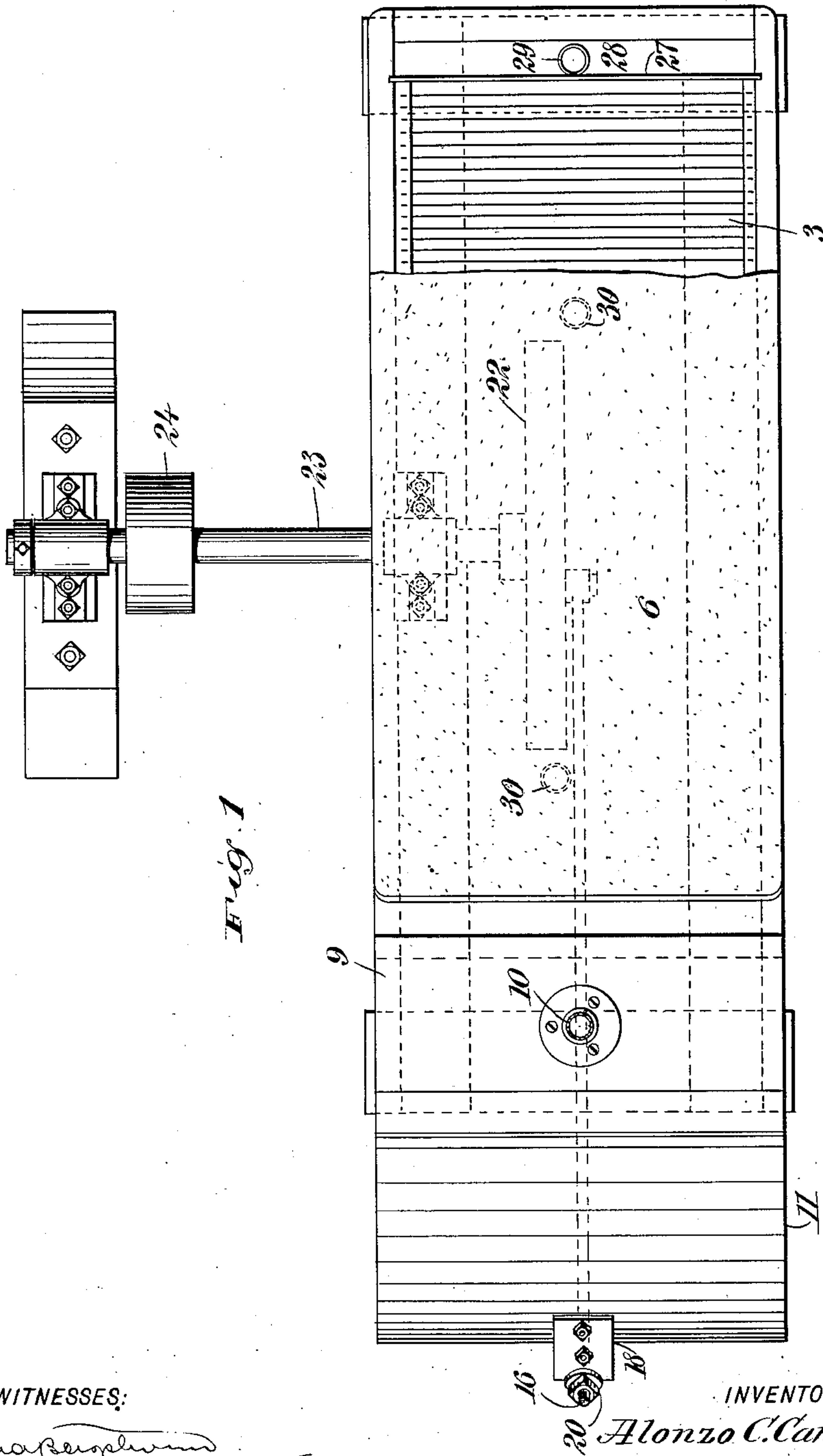


Fig. 1

WITNESSES:

*John Campbell*  
*C. R. Ferguson*

INVENTOR

*Alonzo C. Campbell*

BY

*Mumford*  
ATTORNEYS

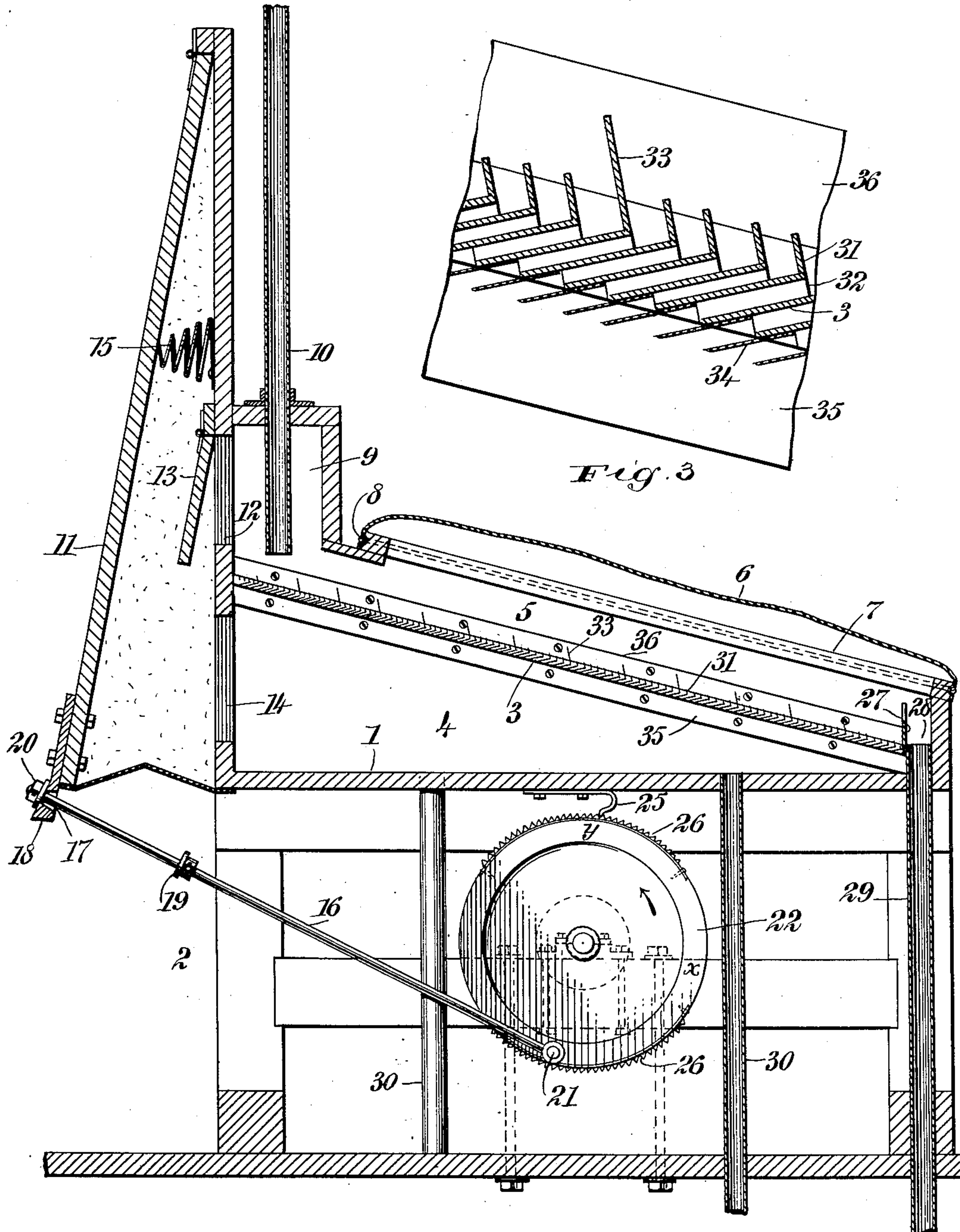
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WITNESSES:  
*John Ferguson*  
*C. R. Ferguson*

Fig. 2

INVENTOR  
*Alonzo C. Campbell*

BY *Mumme*  
ATTORNEYS



# UNITED STATES PATENT OFFICE.

ALONZO C. CAMPBELL, OF ASHEVILLE, NORTH CAROLINA.

## JIG OR ORE-CONCENTRATOR.

No. 824,623.

Specification of Letters Patent.

Patented June 26, 1906.

Application filed September 19, 1903. Renewed February 17, 1906. Serial No. 301,633.

*To all whom it may concern:*

Be it known that I, ALONZO C. CAMPBELL, a citizen of the United States, and a resident of Asheville, in the county of Buncombe and State of North Carolina, have invented a new and Improved Jig or Ore-Concentrator, of which the following is a full, clear, and exact description.

This invention relates to improvements in jigs or pneumatic ore-concentrators, an object being to provide a machine of this character that will be simple in its construction, having no parts liable to get out of order, and by means of which the work may be thoroughly done and rapidly carried on.

Other objects of the invention will appear in the general description.

I will describe a jig or ore-concentrator embodying my invention and then point out the novel features in the appended claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the figures.

Figure 1 is a plan view of a jig or ore-concentrator embodying my invention. Fig. 2 is a sectional elevation thereof, and Fig. 3 is a fragmentary section showing the arrangement of the riffles.

The machine comprises a box or casing 1, here shown as supported on a frame 2, and arranged in this box is a series of riffles 3. These riffles practically form the top wall of a lower chamber 4, and it will be noted the said riffles are inclined downward toward the outlet end of the machine, and thus what I term a "converging" chamber is formed, the object of which will be hereinafter described.

Above the riffles 3 is a chamber or space 5, which has a canvas or similar flexible cover 6. This cover 6 is secured at its edges to frame members 7, extended around the opening in the top of the box or at the top of the chamber 5. The frame members are channeled on the outer side, and the material of the cover 6 is drawn tightly in the channel by a binder 8, consisting of cord or other suitable material, and thus an air-tight connection is made. This cover 6 fits loosely—that is, its area is considerably larger than the opening through the top of the box.

The chamber 5 communicates with a receiving casing or chamber 9, and through the top wall of this receiving-chamber a feed-

pipe 10 extends, the said feed-pipe leading from a bin or source of supply from above and terminating slightly above the riffles, as clearly indicated in Fig. 2. This casing or chamber 9 communicates with a compressor 11 through an opening 12, and this opening is controlled by a valve, here shown as a flap-valve 13. This valve will be closed and opened by air-pressure, as will be hereinafter described. It may be here stated that only one valve is necessary, as the stuff on the jig-box acts as a valve to check the backflow of air—that is, when the stuff is buoyed by the air from under the riffles all the passages are thoroughly opened; but at the instant of cessation of the blast the stuff drops and packs, so that the backward flow is practically cut off. The compressor also communicates with the converging chamber 4 through an opening 14. This compressor is shown in the form of a bellows, and a distending-spring is arranged within it, bearing against its outer or swinging wall and also against its opposite fixed wall. The compressor is operated at intervals by means of a rod 16, passing loosely through an opening 17 in a strap 18, attached to the movable portion of the bellows. The rod 16 is designed to have a lost-motion movement with relation to the bellows, and for this purpose I provide it with an adjustable collar 19, between which and a nut or collar 20 on the outer end of the rod the lost motion occurs.

The rod 16 connects with a crank or wrist pin 21 on a large wheel 22, mounted on a shaft 23, on which is a band-wheel 24. As before stated, this wheel 22 is quite heavy, and it not only serves as a crank-wheel and a balance-wheel to balance the motion of the machine, but it also serves as a portion of a device for imparting a slight vibratory motion to the whole machine. This vibratory motion is caused by a spring yielding hook 25, attached to the bottom of the jig-box and engaging with rasping-surfaces 26, arranged at various points on the periphery of the wheel 22, and these rasping surfaces or areas are preferably removable.

Extended across the jig-box at the discharge end of the series of riffles is a dam consisting of a sheet of metal 27. The ends of the dam fit in grooves formed in the side portions of the jig-box. Outward of the dam is a space 28, into which the tailings fall and



from which the tailings discharge through a pipe 29. At suitable places the jig-box is provided with discharge-pipes 30 for the concentrates.

5 The riffles 3 are made of galvanized iron or steel, and at the outlet edge of each riffle there is an upward extension 31. The body portions of the riffles are overlapped, as clearly indicated in Fig. 3, and adjacent riffles are  
10 spaced apart by blocks 32 at the ends. It may be here stated that the spaces between the riffles are large as compared to the size of a grain of the material to be treated. The body portions of the riffles are inclined up-  
15 ward toward the outlet end of the machine. When the riffle-surface is loaded, the material will flow into the spaces and form a natural angle in each space of about forty-five degrees. The material cannot flow through by  
20 the force of gravity alone; but it may be induced to flow by additional force or action coupled with that of gravity, as will appear.

The passages between the riffles serve a double purpose—namely, for the flow of the  
25 concentrates on the lower surface of the riffles, also for the flow of air or water toward the outlet end of the machine. At intervals along the series of riffles there are long projections 33, which act to stop the too rapid  
30 flow down the inclined surfaces of the riffles, the least dense material thus flowing in a more or less thin sheet over the tops, while the more dense stuff is somewhat retarded.

35 The object of the convergent chamber 4 is to afford an equal pressure at all points in the length of the jig-surface.

Connected to the edges of the riffles toward the inlet end of the machine are pliable flaps 34. These flaps serve substantially as valves  
40 to regulate and provide the impulse of air. If any portion of the material on the working surface should become too thin or scattered, thus giving too free vent to the passage of air or water, these flaps act as valves or dampers  
45 and close in a greater or less degree or, entirely, by the increased pressure against them, thus automatically insuring a more even pressure in all parts of the bed. Again, the flaps or valves serve by sudden impact to cut off the  
50 blasts instantaneously and give individual particles of material a free fall, thus favoring the desired classification of density. The flaps are adjustable to suit any case by their thickness or degree of pliability and by the  
55 spaces, so they may be made sensitive to any given impulse of air or water and respond to suit the demands.

The riffles rest on strips 35, secured to the opposite sides of the jig-box, and above the  
60 riffles and secured to said sides are strips 36, provided with channels for receiving the up-turned portions of the riffles and holding them in place.

Having described the different parts of the  
65 mechanism, I will now describe the process of

operation. Supposing it to be applied as an air-jig for washing coal. The coal from the storage-bin above flows through the pipe 10 and enters the jig slightly above the riffles at the upper end, as before mentioned. Mate- 70  
rial falling into the pipe piles upon the riffles in a cone-shaped mass. This accumulation will stop the flow of stuff unless it is removed to give place to a continuous flow. The wheel 22 rotates in the direction indicated by 75  
the arrow thereon and through its movements operates the rod 16, which gives a maximum and instantaneous motion to the compressor. The crank and rod then take on a retarded motion until the wrist-pin 80  
reaches approximately the point indicated by  $x$ , when the bellows is at rest. As the wrist-pin passes from  $x$  to  $y$  the rod takes a reverse motion and the link between the col-  
lars 19 20 slides through or wholly in the 85  
strap 18 until the collar 19 strikes said strap. Then the bellows begins to open, if it has not in the meantime been distended by the spring  
15, which serves also to keep it distended un- 90  
til it is given an instantaneous impulse, when the crank again passes its lowermost position, a like impulse of air passing through the open-  
ing 14, whence into the chamber 4, thence through the spacings of the riffles, and  
95 through the bed of material on the riffles that is being jigged. The dense stuff settles upon the riffles according to the well-known law, and it closes up the spaces and flows be-  
tween the slightly-inclined surfaces of the riffles and forms a fixed angle that is given to 100  
that particular kind of material. The more dense stuff having the preference will repose upon the lowest areas, the lighter stuff rising to the top of the spaces, and it is constantly  
105 urged back by the very rapid succession of blasts of air that traverse the upper margins of the spaces. This classification into heads of density is further augmented by the trem-  
ulous or acoustic vibration given the whole machine, and particularly to the metallic rif- 110  
fles, by the rasping-surfaces 26 engaging with the spring 25. These vibrations serve another and most necessary purpose—namely, to cause the accumulated dense stuff to flow along the extended margins of the riffles and  
115 into the chamber 4. It keeps the individual particles constantly disengaged, thus favoring nicety of assortment of the dense from the less dense. It also insures an uninterrupted flow into and through the pipes 30. 120  
The least dense material—that is, the clean coal—flows down the inclined top surfaces and passes over the dam 27 and drops into the space 28 and flows out through the pipe  
29. When the air passes through the bed of 125  
stuff, it accumulates in the chamber 5 and casing 9 and inflates the loose cover 6, so that no air is allowed to escape into the open at-  
mosphere to vitiate it with dust. At this in-  
stant a reverse action of the bellows exhausts 130



the air from the chamber, causing the inflated cover to collapse. The same air is thus used over and over again.

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

1. In a concentrator, a jig-box, overlapping riffles arranged therein, the series of riffles being inclined downward toward the outlet end of the box, and a wheel having rasping-surfaces for engaging with a part attached to the box.
2. In a concentrator, a jig-box, and overlapping riffles arranged therein, the said riffles having upward extensions at their outlet sides.
3. In a concentrator, a jig-box, overlapping and spaced riffles arranged therein, the series of riffles being inclined downward toward the outlet end of the box, and a loose covering for the box arranged over the riffles.
4. In a concentrator, a jig-box, overlapping riffles arranged therein, the said riffles having upturned extensions at their outlet sides, and a wheel having rasping-surfaces for engaging with a part attached to the box.
5. In a concentrator, a jig-box having an opening in the top provided with a flexible cover, a series of riffles arranged in the box, and a compressor having communication with the box above and below the riffles.
6. A concentrator, or washer, comprising a jig-box, a series of riffles arranged therein and overlapping, and flaps on the under edges of said riffles.
7. An ore-concentrator, comprising a jig-box, riffles arranged therein, a flexible cover for the box, a compressor having communication with the box above and below the riffles, a crank-wheel, and a rod connecting with said crank-wheel and having lost-motion connection with the movable part of the compressor.
8. A concentrator or washer comprising a jig-box, a series of riffles arranged therein, a flexible cover for the box, a compressor communicating with the box above and below the riffles, a valve for the upper opening or communication, a crank-wheel, and a rod

having connection with said crank-wheel, and a lost-motion connection with the movable part of the compressor.

9. A concentrator or washer comprising a jig-box, a series of riffles arranged therein at a downward inclination toward the outlet end of the box, a flexible cover above the riffles, a dam at the lower end of the riffles, a receiver for material passing over the dam, a discharge leading from said receiver, discharging devices leading from the box, and means for causing the circulation of air through the box.

10. In a concentrator, a jig-box, overlapping riffles arranged at a downward inclination therein and spaced apart, upward extensions on the discharge edges of said riffles, certain of said extensions having a greater height than the others, flaps on the lower edges of the riffles, and means for causing a circulation of air through the box.

11. A concentrator comprising a jig-box, a series of riffles arranged therein, a compressor for causing a circulation of air through the box, a wheel for operating the said compressor at intervals, rasping devices on said wheel, and a spring-hook attached to the under side of the box for engaging with said rasping devices, the said wheel also serving as a balance-wheel.

12. A concentrator comprising a jig-box, a series of riffles arranged therein and forming the upper wall of the lower chamber in the box and the bottom wall of the upper chamber in the box, a feed-casing with which the upper end of the upper chamber communicates, a feed-pipe extended into said casing and terminating slightly above the riffles, a compressor for causing a circulation of air through the box, and means for operating said pneumatic.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ALONZO C. CAMPBELL

Witnesses:

D. T. JANETT.

KATE B. HACKNEY.