

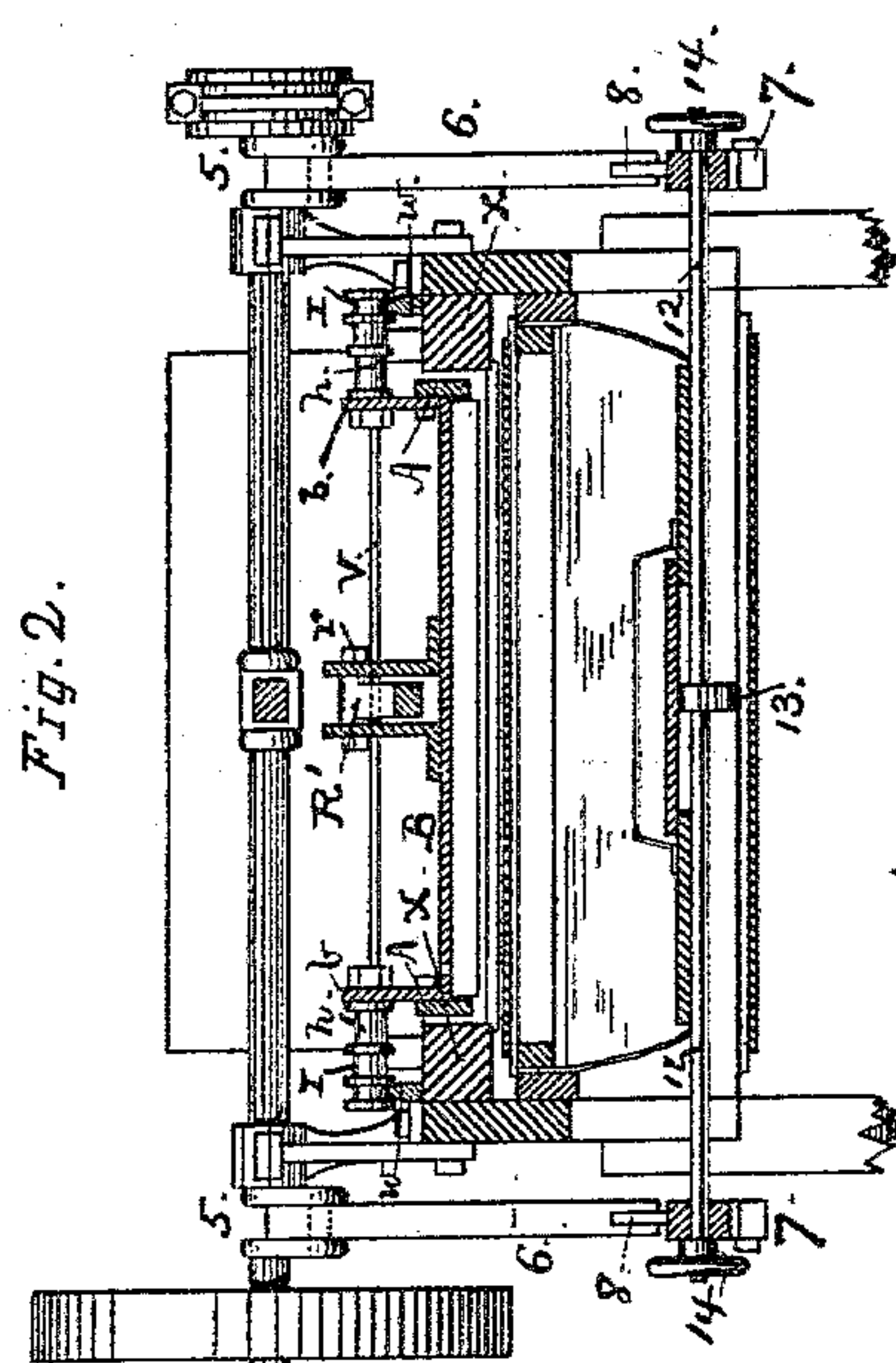
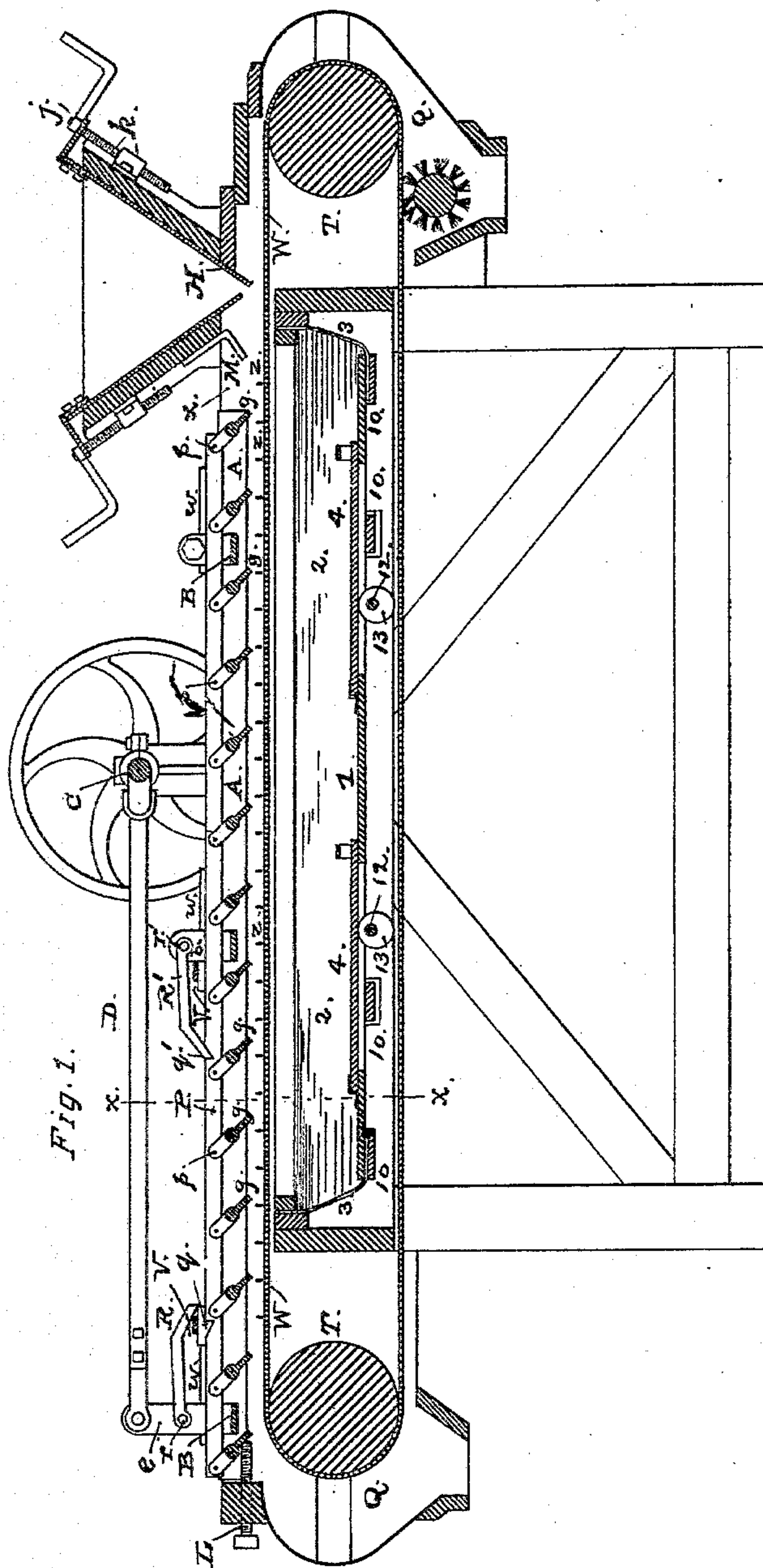
(No Model.)

2 Sheets—Sheet 1.

W. B. FARWELL.
DRY ORE CONCENTRATOR.

No. 274,581.

Patented Mar. 27, 1883.



WITNESSES:

Cym York
D. Selleck

INVENTOR:

Willard B. Farwell

By *his Atty.,* *Edw. J. Osborn*

(No Model.)

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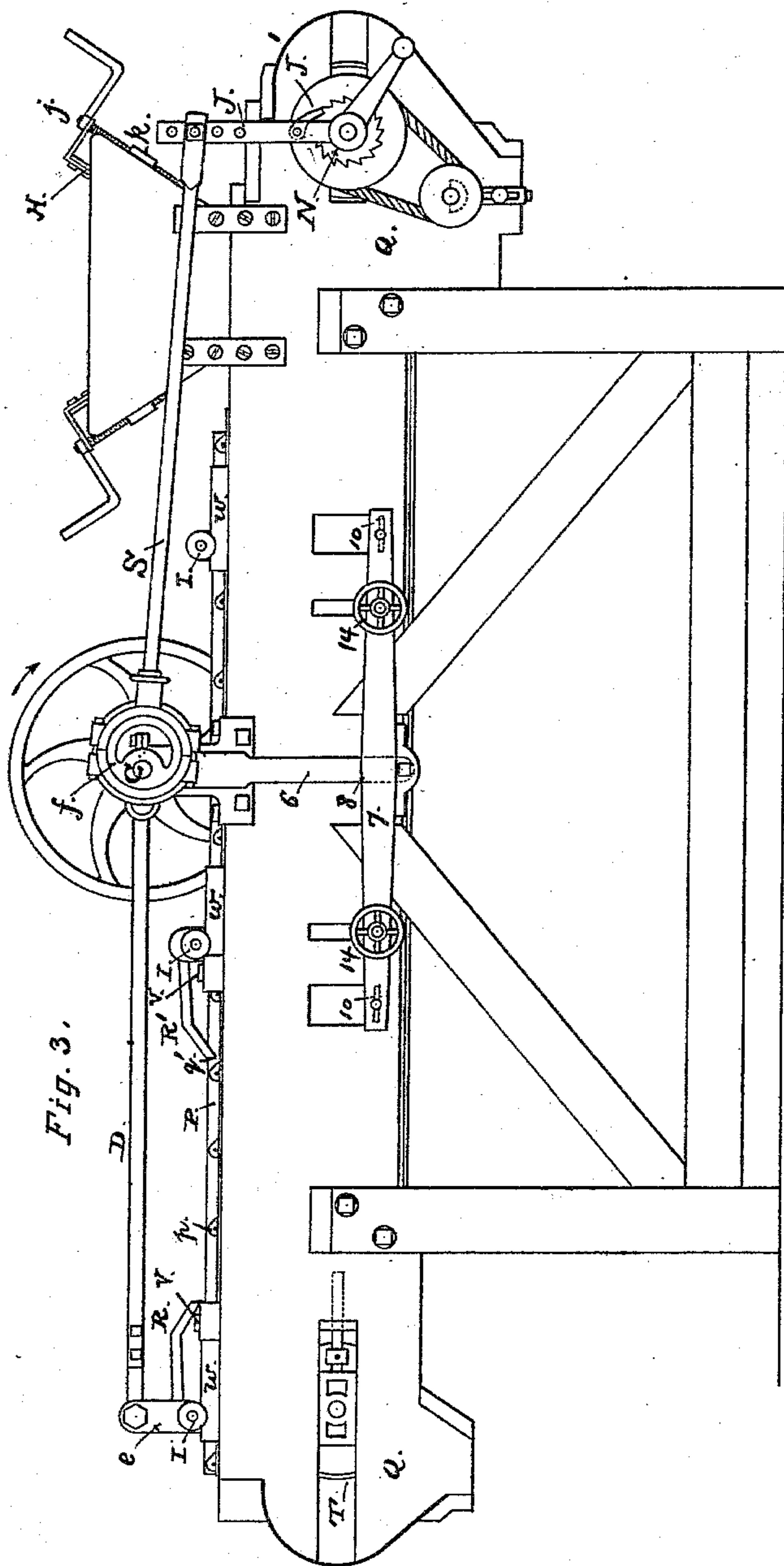


Fig. 3.

Witnesses:
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Inventor:
Willard B. Farwell
By his Atty., *Edw. D. Stone*

UNITED STATES PATENT OFFICE.

WILLARD B. FARWELL, OF NEW YORK, N. Y., ASSIGNOR OF FIVE-EIGHTHS,
BY DIRECT AND MESNE ASSIGNMENTS, TO JOHN LANDERS AND I. M.
TAYLOR, OF SAN FRANCISCO, CALIFORNIA.

DRY-ORE CONCENTRATOR.

SPECIFICATION forming part of Letters Patent No. 274,581, dated March 27, 1883.

Application filed April 8, 1882. (No model.)

To all whom it may concern:

Be it known that I, WILLARD B. FARWELL, of the city, county, and State of New York, at present sojourning in San Francisco, State of California, have invented certain new and useful Improvements in Ore-Concentrators; and I do hereby declare that the following is a full, clear, and exact description of my invention, reference being had to the accompanying drawings.

The present invention has reference to improvements upon a concentrating-machine for which a patent was granted me May 9, 1882, No. 257,681. In that invention the distribution and progression of the pulverized ore upon and over the perforate bed is effected by a number of pivoted scraping blades or edges carried in a frame, to which a reciprocating motion is given over the ore-supporting surface by mechanism that turns the blades at an angle and out of action when moving backward over the ore, and brings them into the perpendicular and into operation again at the return movement to come in contact with and move the upper portion of the ore-body forward and from off the lowest portion, and finally discharge it from the end of the bed.

My present improvement consists, first, in the means for suspending and operating the frame or carriage in which these scrapers are mounted, and in the mechanism for throwing the scrapers into and out of action.

It consists, also, in certain novel construction of bellows, actuating mechanism, and in devices for regulating the force of the blast.

In the drawings referred to in the following description by letters, Figure 1 shows an elevation in vertical section of a dry-ore concentrator constructed according to my invention. The section is taken longitudinally through the center of the machine. Fig. 2 is a cross-section taken through the line *xx*, Fig. 1. Fig. 3 is a side elevation of the machine.

A rectangular frame is formed of side slats, *A A*, and cross-bars *B B*, to receive and carry the scrapers *g g*. Said frame is supported horizontally, and is reciprocated in a longitudinal direction over the ore-supporting bed to operate the scraping-blades. These scraping-blades

are pivoted in the sides of the frame at regular distances apart, and are required to take an inclined position out of contact with the ore during the movement of the carriage in one direction, but to maintain a perpendicular position, so as to penetrate below the surface of the ore, while moving in the opposite direction, thereby moving the upper part of the ore-body regularly forward in one direction from one end to the other of the bed as the carriage or frame is moved back and forth. Such movements and action I effect as follows: To the carriage *A B*, I give reciprocating motion from the shaft *C* through a pitman, *D*, pivoted to an upright post or standard, *e*, on the outer end of the frame, and connected with a crank on the center of the shaft. On the frame or carriage are provided upright suspension-bars or hangers *b*, to carry wheels or traction-rollers placed in pairs at the ends and at one or more intermediate points along the sides. These hangers have studs or short axles *h h* projecting horizontally outward over the side timbers, *xx*, of the machine to form journals for the rollers *I I*, which, being grooved or flanged to run upon horizontal rails *vv*, constitute the supporting-points of the carriage to maintain it in horizontal set position while allowing it to travel freely back and forth in the space between the sides of the machine. By this construction a smooth even movement is given to the scrapers, and all loose lateral play of this frame is prevented. The side slats of the carriage are therefore kept clear and out of contact with the sides of the machine-frame, between which it travels, and the friction of the running parts is greatly reduced. For cleaning and repairing the carriage and other parts of the machine this construction affords a means of readily detaching and removing the carriage from its place over the ore-bed. In the operation of spreading and moving the ore forward, as before stated, these scrapers are held in vertical position at the forward movement of the carriage, which is in a direction away from the supply-hopper; but at the backward movement they are turned up so as to clear the ore. To throw these scrapers into and out of this ver-

tical position I provide two stops, L M, one consisting of an adjustable screw, L, working through a block or fixed part of the machine-frame, at the front end, and the other formed of a projecting bar or rod, M, fixed against the side of the supply-hopper. These two stops are set in line to strike against the face of the outside blades, and below the center of oscillation in each outside one as the carriage finishes its movement in either direction. The backward motion of the carriage will therefore bring the face of the outside blade, or the first one of the set, against the stop M, and all the blades will be thrown into the vertical position before the carriage is moved forward, this action of the stop being transmitted to the whole set of blades by means of the connecting-bar P, to which each blade is pivoted at the point *p*. While being turned into this position a notch, *q*, upon the top of the bar P is brought back underneath and in line with the end of a gravity-pawl, R, that is hinged at *r* to the standard at the front end of the carriage over the bar P. This pawl holds the blades in working position during the forward movement of the carriage. The other stop, L, operates after the same manner to turn the blades into the required angular position as the forward movement is completed, and to hold them in such position while moving back, a second pawl, R', pivoted at *r'* to the upright *b*, is caused to engage with a notch, *q'*, located on the bar P at such point in its length that the end of the pawl shall drop into this notch as the blades reach the required angle. Each pawl has a downwardly-bent end, and plays over a trip formed of bars or plates V, that project from the side of the machine-frame over the carriage, and are interposed in the path of the pawls R R' in such manner as to throw their ends up out of the notches *q q'* in the bar P, when the carriage approaches the end of travel in either direction. By the position of these tripping-bars one pawl is thrown out of action just before the blades are turned and the other pawl comes into service, so that the stop at that end of the machine toward which the carriage is moving shall then be free to reverse the blades and bring the other pawl into play as the outer blade strikes it. These bars therefore throw the pawls alternately out of action, while they drop by their own weight into place when their respective notches are brought into line.

The ore-supporting bed consists of an endless belt or apron, W, carried over two horizontal rollers, T T, that are mounted in compartments Q Q at the ends of the machine. This bed has a travel in a longitudinal direction against the movement and progression of the top portion of the ore-body, so that while this upper part is being carried forward and discharged from the front end by the action of the blades, the lowest portion of matter consisting of the metallic concentrations is being drawn backward, or to the opposite end of the machine, from beneath the transverse slats *z z*

by the intermittent movement given to the ore-bed.

In order to obtain the most effective action of the air-blast against the ore, I find it desirable to have a period of rest in the ore-bed occur simultaneously with each blast, and then to produce the movements of the ore-bed during the intervals of interruption in the pulsations while the bellows is taking air. This intermittent movement of the ore-bed is produced from the driving-shaft C, through the agency of an eccentric, *f*, fixed on it at one end, a rod, S, worked by this eccentric and extending to the rear end of the machine, and an upright rocking lever, J, to which the end of the rod is connected. This lever plays loosely on the journal of the rear roller T of the ore-supporting-bed against the side of a ratchet-wheel, N, fixed on the journal, and it carries a pawl, J', to engage with the ratchet-wheel at each rocking movement of the lever in a backward direction, but to slip over the teeth of the wheel while being drawn forward. The eccentric on the driving-shaft is so timed with respect to the cranks by which the cross-heads 77 are worked that the lever is thrown forward at each downward stroke of the pitman, and the roller T is then rotated a certain distance while the bellows is taking air. This length of intermittent travel of the bed can be varied by making the attached end of the eccentric-rod adjustable upon the lever to and from the center of motion. For this purpose the end of this lever is provided with several holes for changing the length of stroke.

To regulate the depth of the concentrations that are carried out by this movement of the ore-bed, I provide a cut-off, H, which is adjustable in its action upon the ore. It consists of a sliding plate fixed in guides upon the inner side of the hopper and projecting through the discharge-mouth over and across the ore-bed for the entire width of its working-surface. To move and adjust this cut-off a hand-screw, *j*, working through a fixed nut, *k*, on the hopper-back, is connected with the upper end of the plate. The manner of applying this means for setting the cut-off plate is shown in Fig. 1 of the drawings.

The bellows, beneath the perforate bed, consists of the vibrating board 1, with flexible sides 2 2 3 3, secured to its longitudinal and transverse edges, and the usual air-inlets covered by the hinged flaps 4 4. The movements of this bellows to produce the pulsation of air are effected from the single central shaft by means of the cranks 5 5 on the ends of the shaft, the pitman-bars 6 6, and the horizontal cross-heads 7 7. The pitmen 6 are attached by the hinge-joints 8 to the center of the cross-heads 7, and these in turn are connected together by cross-slats 10 10, that pass across the machine from side to side underneath and against the bellows-bottom.

From each of the horizontal bars or cross-heads 7 7 rods or small shafts 12, having bearings in the cross-heads, are carried across be-

neath the bellows, under the valves, to operate small eccentric disks or cams 13, fixed on the shafts in position just under the centers of the valves.

5 By means of hand-wheels 14 on the outer ends these shafts can be turned and the valves raised and held up to give a greater or less amount of opening through the action of the eccentrics whenever the full effect of the bel-
10 lows requires to be modified or reduced.

This construction provides a simple means of operating all the parts of the machine from a single driving-shaft and also for regulating the air-blast while the machine is at work, by
15 which the operation of concentration can be controlled with exactness, and the air-blast can be regulated in frequency and force or intensity as the ore being treated is found to vary in quality or richness.

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

1. The combination, with the carriage or frame A, provided with the pivoted blades *g g*,
25 of mechanism for imparting to said frame a horizontal reciprocating movement, and the stationary stops L M, for the purpose set forth.

2. The combination, with the carriage or frame A, provided with the pivoted blades *g g*
30 and the longitudinal notched rod P, of mech-

anism for giving longitudinal reciprocation to said carriage, the stationary stops L M, the gravity-pawls R R', the bars V, and the stationary frame, substantially as described.

3. The combination, with the side timbers, *x* 35
x, rails *w w*, an ore-supporting bed, and the reciprocating carriage consisting of the longitudinal slats A, cross-bars B, upright hangers *b b*, the traction-rollers I I, and the post *e*, of the pitman D, the crank-shaft C, the set of 40
blades *g g*, pivoted in the sides of the carriage, and means for turning said blades into and maintaining them in the vertical position in one direction of their reciprocation and for turning 45
and holding them in an inclined or angular position at and during the return, substantially as described and shown.

4. The combination of the bellows-bottom 1, the cross-heads 7 7, pitman-bars 6 6, the crank-shaft, and the slats 10 10, connecting the cross- 50
heads together.

5. The combination of the bellows-bottom 1, having the valve-boards 4 4, with shafts 12, hand-wheels 14, and eccentrics 13, fixed in the centers of the shafts beneath the valves, sub- 55
stantially as set forth.

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Witnesses:

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