5 Sheets—Sheet 1.

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ORE SEPARATOR.

No. 189,734. Patented April 17, 1877.

Fig. 1.

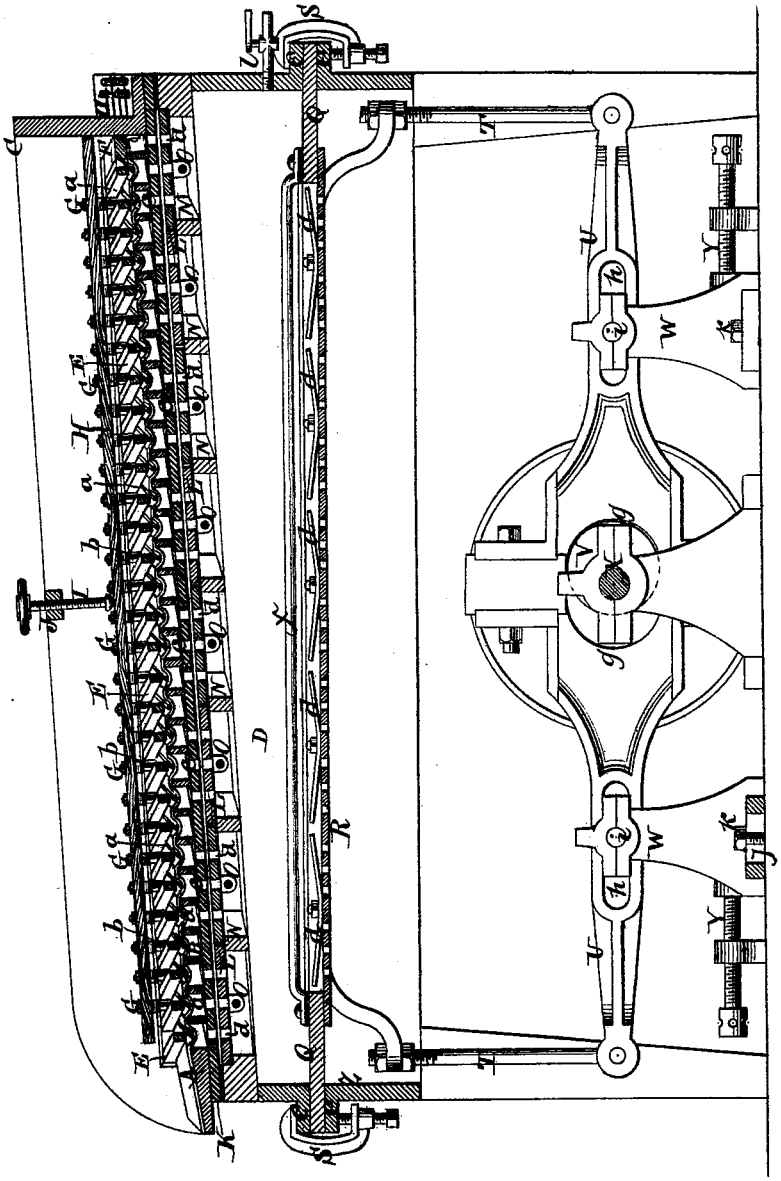

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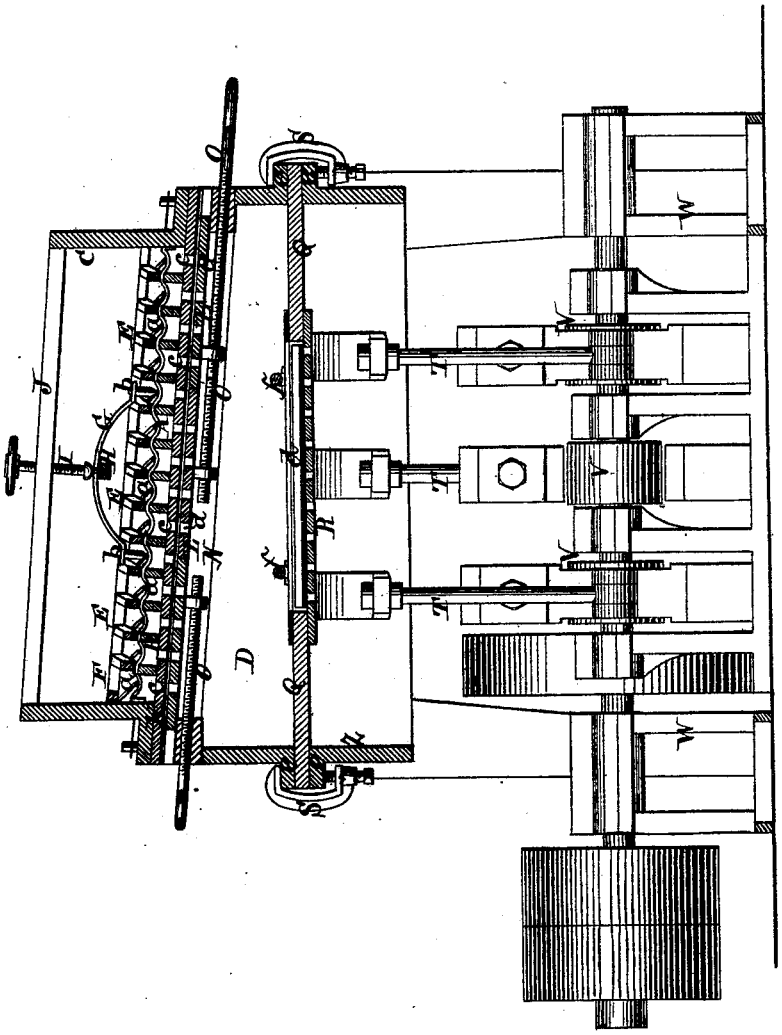
Fig. 2.



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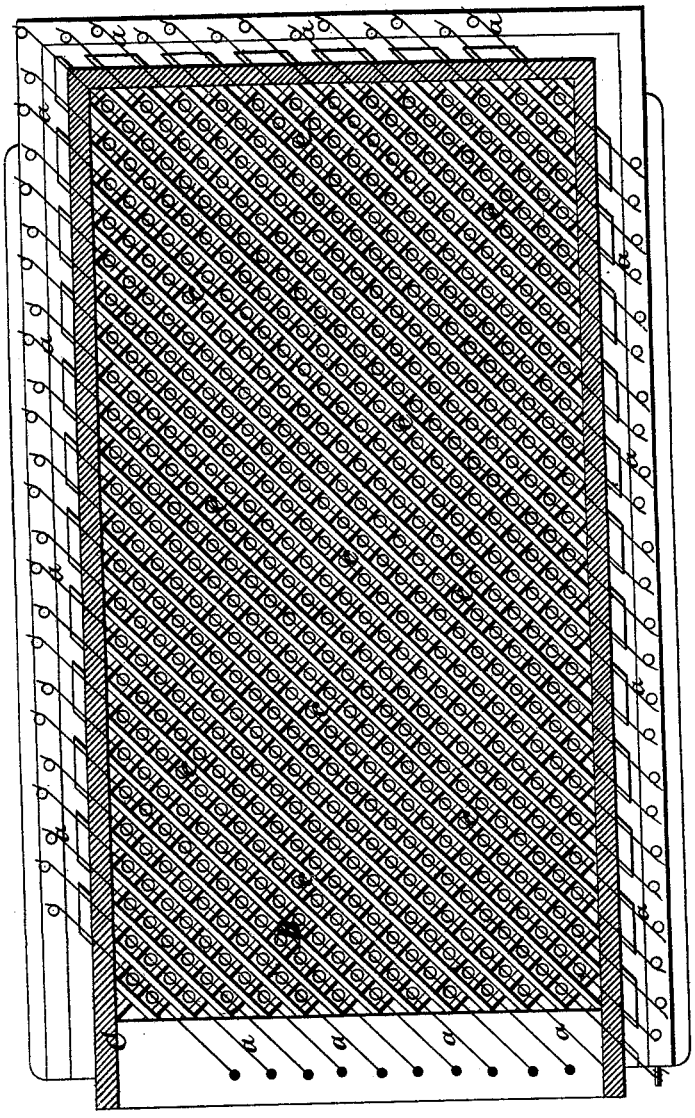

Fig. 3.

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Fig. 4.

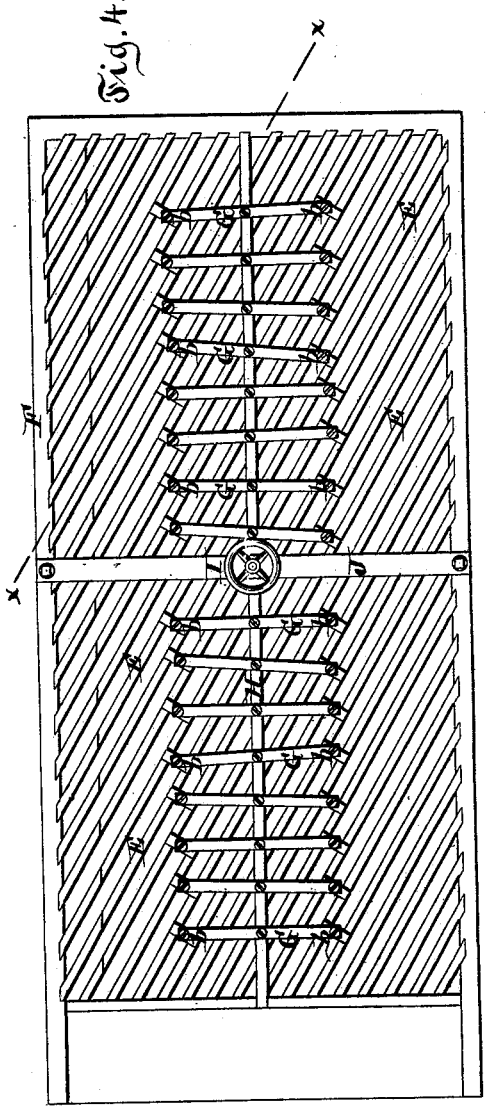
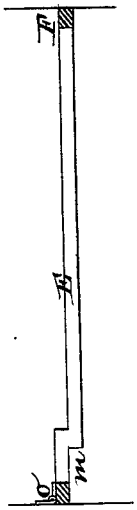


Fig. 5.



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5 Sheets—Sheet 5.

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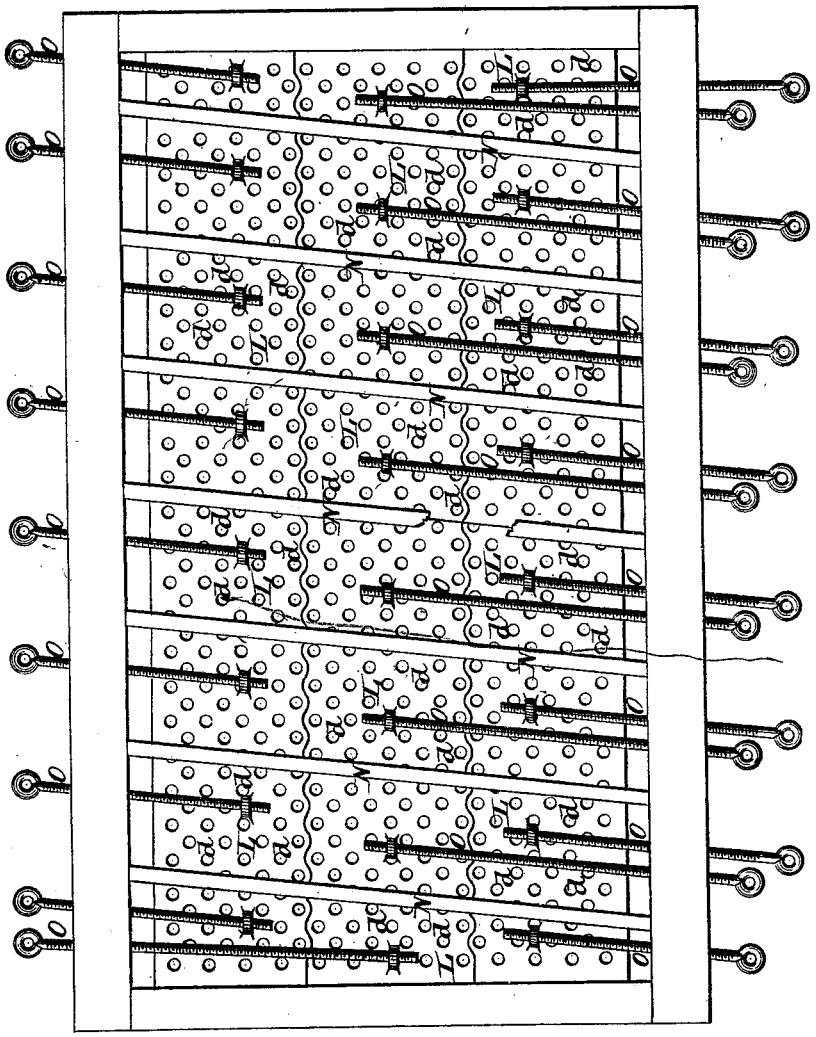

Fig. 6.

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UNITED STATES PATENT OFFICE.

WILLIAM HOOPER, OF TICONDEROGA, NEW YORK.

IMPROVEMENT IN ORE-SEPARATORS.

Specification forming part of Letters Patent No. **189,734**, dated April 17, 1877; application filed September 2, 1876.

To all whom it may concern:

Be it known that I, WILLIAM HOOPER, of Ticonderoga, county of Essex, and State of New York, have invented a new and useful Improvement in Dry-Ore Separators, which improvement is fully set forth in the following specification, reference being had to the accompanying drawing, in which—

Figure 1 represents a vertical longitudinal section of my machine. Fig. 2 is a vertical cross-section thereof. Fig. 3 is a plan or top view of the grate for supporting the ore-bed and of the tension-wires. Fig. 4 is a like view of the skimmers. Fig. 5 is a cross-section thereof in the plane *x x*, Fig. 4. Fig. 6 is an inverted plan view of adjustable plates for regulating the air-blast.

Similar letters indicate corresponding parts.

My improvement relates especially to that class of ore-separators for which Letters Patent of the United States were granted to me March 22, 1870, No. 101,132. It consists in constructing the ore-bed or sieve of cloth, or other material which is pervious to air and impervious to dust, or nearly so, with such ore-bed being combined a grate, for the purpose of affording a support thereto, and the whole being situated in a box which is arranged over the air-chamber of the apparatus, and which is open at the tail end, the ore-bed as well as the grate being inclined both in a lateral as well as a longitudinal direction, so that a tendency is given to the ore to work its way toward one or the lower side of the ore-box, and thence along such side of the box to the tail end thereof, where it discharges. The bars of the said supporting-grate are arranged diagonally across the ore-box, while the ore-bed is depressed between the said bars, and held in this position by means of tension-wires, the ends of which are fastened to the box or to the grate in such a manner that by said depressions diagonal channels are formed in the ore-bed for the reception of separated ore.

Immediately above the said supporting-grate and ore-bed are placed a series of "skimmers," consisting of bars which are arranged diagonally across the ore-box, the direction of such bars or skimmers being contrary to that of the diagonal channels in the ore-bed, and their object being to conduct the tailings or lighter particles of ore toward the upper side of the ore-box, whence such ore works its way to the open end thereof through a passage which is formed at that end of the skimmers which is contiguous to the upper side of the ore-box. Above the said supporting-grate and ore-bed is placed also a longitudinal bar, which is depressed by means of a set-screw, and to which are attached a series of springs carrying pins or blocks, which are made to press on the wires running through the diagonal channels in the ore-bed, for the purpose of holding the wire down. Beneath the said supporting-grate and ore-bed is arranged a stationary plate, having perforations formed in it for the passage of air, and beneath this stationary plate are arranged movable or adjustable plates, also having perforations formed therein corresponding to those in the stationary plate, the said movable plates being situated immediately next above the air-chamber of the apparatus, so that, by a proper adjustment of either of the movable plates, the perforations therein can be made to coincide with a corresponding number of perforations in the stationary plate; or the perforations can be brought out of line, and by this means the blasts of air passing up through the plates from the air-chamber may be increased or lessened, as the case may be, with a corresponding effect on the ore-bed.

My improvement consists, also, in fastening the rubber diaphragm of the bellows or blowing device between the sides of the air-chamber and its supporting-frame by means of clamps in lieu of screws or rivets, so as to preserve the integrity of the rubber; also, in the arrangement of one or more bars above the flap-valves of the bellows, for the purpose of limiting the upward motion of the valves; further, in connecting the bellows to rods, which, in turn, are connected to one end of levers, which, at the other end, are subjected to the action of cams or eccentrics, so that when the latter are revolved an oscillating motion is imparted to the levers, and the bellows is moved backward and forward.

The levers for operating the bellows are provided with slots, and they are mounted on pins passing through these slots, and having their bearings in sliding boxes or pillow-blocks, which are connected to adjusting-

screws, so that by means of these screws the boxes can be set toward either end of the levers, and by this means the stroke of the bellows can be regulated.

It consists, also, in connecting an air-cock to the air-chamber of the apparatus, so as to permit of letting off surplus air from said chamber.

In the drawing, the letter A designates the ore-bed or sieve of my machine, and B is the grate for supporting the bed. The grate B may be made of metal or wood, or any other suitable material, and it is preferably constructed of two rows of bars arranged at right angles to each other, or nearly so, so that the grate is composed of a series of square spaces or chambers, as clearly shown in Fig. 3, the said bars, moreover, being arranged diagonally to the sides of the grate, and to the box C, in which it is placed. The object of dividing the grate B into a series of chambers or spaces, as just stated, will be hereinafter pointed out. The ore-bed or sieve A is made of some material which possesses the qualities of being pervious to air, but impervious to dust, or nearly so, and I have found broadcloth the most advantageous for this purpose.

The letter C designates the box containing the grate B, the ore-bed, and their adjacent parts, which will be presently referred to, this box being open at one or the tail end, and being placed above the air chamber marked D. The grate B and the ore-bed are inclined in two directions—that is to say, longitudinally, as seen in Fig. 1, and laterally, as seen in Fig. 2; or, in other words, they are inclined toward one corner of the ore-box C.

The cloth composing the ore-bed A is stretched over the grate B, and depressed between one row of the bars thereof, (when it is made of two rows of bars,) by strands of wire *a*, or cords, which are made to pass through the sides of the ore-box C, and the ends of which are fastened to pins outside of it. These wire strands or cords *a* are tightened by means of screws or other similar devices located outside the box C, and I have found piano-screws the best for this purpose. I prefer to use piano-wire for the purpose of depressing the ore-bed. The wire strands *a* are drawn through between those bars of the grate B which are in line to the direction of the inclination of the grate B, and by means thereof channels are formed in the ore-bed A, in which the separated ore will readily accumulate. By the inclination of the ore-bed a tendency is given to such separated ore to work its way toward and against the lower side of the box C, and thence along this side of the box to the tail end thereof, where it discharges.

In order to permit of depressing the ore-bed between the bars of the grate B, (when two rows of bars are used,) the intersecting bars are cut out accordingly, as in the example shown.

The letter E designates a series of bars or "skimmers" situated above the ore-bed A. These skimmers are inclosed in a frame, F, and they are arranged diagonally to the ore-box C, but extend in an opposite direction to the wire strands *a*, or the channels formed thereby in the ore-bed, as seen in Fig. 1. That end of each of the bars or skimmers E which is contiguous to the upper side of the ore-box C when the skimmers are put in place is either bent up, as shown at *m* in Fig. 5, or cut away, so as to form a passage at that point. The tailings or lighter particles of ore contained on the ore-bed are conducted by the skimmers E in the direction of the upper side of the ore-box C, and to the passage *m* under the skimmers, whence they find their way to the tail end of the said box, and are there discharged. The skimmers E may be made of wood or metal, or any other suitable material.

Inasmuch as, by the action of the ore or from other causes, the wire strands or cords *a* might become displaced in the channels formed thereby in the ore-bed A, they are held down by means of pins *b*, affixed to the opposite ends of springs G, which are fastened to a bar, H, placed above the skimmers E. It will be noticed that the bar H is held above the skimmers by the springs G. The said bar is depressed by an adjusting-screw, I, which is passed through a cross-piece, J, of the ore-box, as shown, and thereby the tension of the springs G can be regulated, and the pins *b* made to press on the wire strands or cords *a* with more or less force.

The letter K designates a plate, which is provided with a series of perforations, *c*, and which is firmly secured to the machine-frame under the grate B, so that it occupies a stationary position. The perforations of this plate K are so arranged as to correspond in number and position to the spaces or chambers of the grate B, which I have hereinbefore mentioned, and hence, when air is driven up through the said perforations, each of the said spaces or chambers receives the air from one of them. Under the stationary plate K are arranged a series of movable plates, L, which are each provided with perforations *d*, corresponding to a like number of perforations in the said stationary plate. These movable plates L are supported on cross-pieces N, and they are connected to set-screws O, (best seen in Fig. 6,) whereby they can be adjusted to different positions. The movable plates L are situated immediately next above the air-chamber of the apparatus, from which chamber blasts of air are directed upward at regular intervals by the action of a bellows or air-forcing device situated therein, and which I will presently describe. The amount of air which is permitted to escape upward from the air-chamber D is regulated by the position of the movable plates L, the maximum amount being allowed to escape when the perforations of such movable plates and the stationary plate K are made to coincide. It is obvious

that a corresponding effect is produced on the ore-bed A as the blasts of air are lessened or increased, and by using a series of movable plates, the said effect can be produced on any part of the ore-bed, as may be found expedient.

In the air-chamber D is arranged a bellows or air-forcing device, consisting of a diaphragm, Q, of india-rubber or other suitable material, and of a series of flap-valves, *d*, which are secured to a perforated plate, R, fastened in an opening formed in the diaphragm Q for this purpose. The rubber diaphragm Q is fastened between the sides of the air-chamber D and a supporting-frame, Z, placed beneath it, by means of screw-clamps S, both the said sides of the air-chamber P and the supporting-frame Z being provided with flanges *e*, between which the edges of the said rubber diaphragm are inserted, and which the clamps S are made to grasp, so as to tightly compress the rubber. The advantage of fastening the said rubber diaphragm through the clamps S, instead of by screws or rivets, is that the integrity of the rubber is thus preserved, and the diaphragm is rendered more durable. Over the flap-valves *d* are arranged one, two, or more bars, *f*, the ends of which are fastened to the diaphragm Q, and which serve to prevent the said valves from moving upward farther than is just necessary to produce the result thereby to be attained.

To the opposite ends of the bellows are connected rods T, which, in turn, are connected to one end of levers U, which at the other end are each provided with a semicircular recess, *g*, containing a cam or eccentric, V. The levers U are provided with slots *h*, and have their fulcrum in pins *i*, passing through such slots, and which have their bearings in boxes or pillow-blocks W.

In the example shown, three levers, U, are used, two being placed side by side, and being connected to one end of the bellows, and the other extending in an opposite direction thereto, and being connected to the other end of the bellows. The cams or eccentrics V of the several levers U are mounted on a common shaft, X, and when a revolving motion is imparted to this shaft the levers are oscillated, while a reciprocating motion is imparted to the bellows.

The boxes W, which form the bearings for the fulcrum-pins *i* of the levers U, are arranged to slide in the direction of the length of the levers, being, in the present example, provided with slots *j*, and moving on guide-pins *k*, as seen in Fig. 1. The said boxes, moreover, are connected to set-screws Y. By means of these screws Y I am enabled to adjust the boxes W, and with them the fulcrum-pins *i*, toward either end of the levers U, and thereby a longer or shorter stroke can be given to the bellows.

In the side of the air-chamber D is secured an air-cock, *l*, as seen in Fig. 1, so that in case such chamber contains a greater amount of air than is required, a portion thereof can readily be allowed to escape.

In some cases the skimmers E are hinged, as shown at *o* in Fig. 5, so that they can be adjusted relatively to the ore-bed for ores of different kinds and richness.

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

1. In a dry-ore separator, the combination of an ore-bed or sieve, A, composed of cloth or other material which is pervious to air and impervious to dust, or nearly so, a grate, B, for supporting the ore-bed, said grate and ore-bed or sieve being inclined both in a lateral and in a longitudinal direction, and a box, C, to inclose the whole, substantially as described.

2. The combination of a supporting-grate, B, having diagonal bars, an ore-bed or sieve, A, which is depressed between the said bars by means of tension wires or cords *a*, so as to form diagonal channels therein, and an ore-box, C, substantially as and for the purpose described.

3. The combination of a series of diagonal skimmers or bars, E, having a passage formed at one end thereof, with the ore-bed or sieve A, its diagonal channels, the supporting-grate B, and ore-box, the said diagonal skimmers extending in a direction contrary to that of the said diagonal channels, substantially as described.

4. The combination, with the ore-bed or sieve A and tension wires or cords *a*, of a bar, H, situated above the said ore-bed, and an adjusting-screw, I, to the said bar being attached a series of springs, G, carrying pins or blocks *b*, to hold the said tension-wires in position, substantially as described.

5. The combination, with the ore-bed or sieve A, supporting-grate B, and ore-box C, of a stationary perforated plate, K, and of movable or adjustable plates L, arranged beneath the said ore-bed and supporting-grate, substantially as described.

6. The combination of the clamp S, rubber diaphragm Q, its supporting-frame, the perforated plate R, flap-valves *d*, and longitudinal bars *f*, arranged above said valves, substantially as and for the purpose described.

7. The combination of sliding boxes W and adjusting-screws Y with the levers U, their slots *h*, and fulcrum-pins *i*, substantially as described.

8. The combination of an air-cock, *l*, with the air-chamber P, bellows Q, and ore-bed A, substantially as and for the purpose described.

In testimony that I claim the foregoing I have hereunto set my hand and seal this 10th day of August, A. D. 1876

WILLIAM HOOPER. [L. S.]

Witnesses:
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ROBT. E. MILLER.