

(No Model.)

H. P. FAIRFIELD & L. A. SHEAD.

ORE SEPARATOR.

No. 295,993.

Patented Apr. 1, 1884.

Fig: 2.

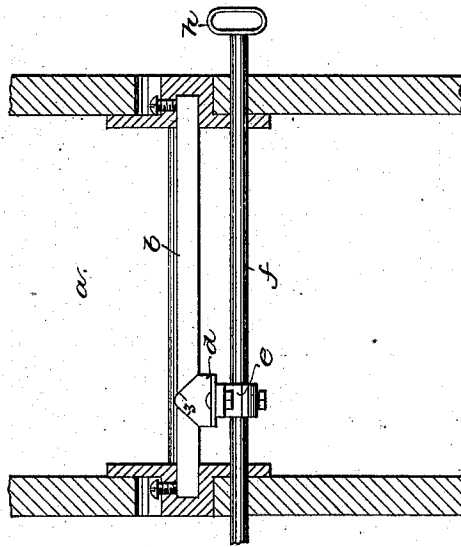
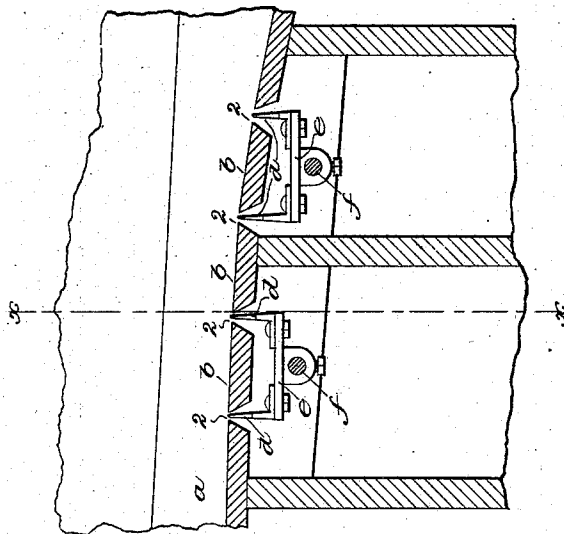


Fig: 1



Witnesses.
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UNITED STATES PATENT OFFICE.

HADLEY P. FAIRFIELD, OF WEST MEDFORD, MASS., AND LOUIS A. SHEAD,
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ORE-SEPARATOR.

SPECIFICATION forming part of Letters Patent No. 295,993, dated April 1, 1884.

Application filed December 17, 1883. (No model.)

To all whom it may concern:

Be it known that we, HADLEY P. FAIRFIELD, of West Medford, county of Middlesex, State of Massachusetts, and LOUIS A. SHEAD, of Alameda, county of Alameda, State of California, have invented an Improvement in Ore-Separators, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

Our invention relates to that class of ore-separators in which materials of different specific gravities are acted upon by a running stream flowing through a sluice or conduit.

The invention herein shown and forming the subject-matter of this case is the broad form of the invention of which specific instances are claimed in the applications numbered 94,521, filed May 10, 1883, and 95,771, filed May 22, 1883, to which reference may be had for particulars. Sluices have been made having their bottoms provided with a narrow transverse slit, through which a portion of the valuable material of high specific gravity fell into a receptacle placed beneath the sluice to receive it, the said portion of valuable material being thus separated from the lighter worthless material, which was carried on over the slit with the stream; but in no such apparatus heretofore invented, so far as we are aware, was it possible to separate all, or even a large proportion, of the valuable from the worthless material.

Our invention consists in a sluice the bottom of which is provided with narrow transverse slits of different widths, varying (as hereinafter described) from perhaps about one one-hundredth to one-sixteenth of an inch or more, by means of which almost the whole of the valuable material may be saved in a highly-concentrated state, the finer particles passing through the narrower slits and the coarser particles through the wider slits. In our invention the material is caused to pass along the bottom of the sluice in a layer so thin as to be practically without ripples, the separation thus being much more readily accomplished. In order to permit the finest particles of heavy material to drop through the narrowest slits, instead of being swept over them, the stream is caused to pass very slowly over the said slits, the velocity, however, being sufficient to sweep the equally fine but lighter worthless

particles over the said slits; and in order to have the larger particles of different specific gravity properly separated at the wider slits, the stream has imparted to it a greater velocity, causing it to operate in a similar manner on the said larger particles—namely, sweeping the lighter ones over the slit and permitting the heavy ones to pass through. This variable velocity may be produced, as shown in the drawings, by making the bottom of the sluice of variable inclination, and we purpose to so proportion the velocity of the stream to the width of the slits that each width shall be washed by that velocity of stream which shall most effectually operate to separate the heavier from the lighter particles of a given size, and to provide for every given velocity of current a sufficient number of slits of a width adapted to said velocity to save all of the heavy valuable material of that size. Means are provided for preventing the slits from becoming clogged by grains of such form as may enter but not pass through, they operating to push back such grains from beneath—that is, in the direction from which they entered. The operation of clearing the slits is performed by mechanism wholly outside of the stream flowing through the sluice, and consequently not disturbing the said stream, and itself not being exposed to the wearing effects of the said stream, or endangered by the heavy masses of rock carried by it.

Figure 1 is a longitudinal section of a portion of an ore-separating sluice embodying this invention, and Fig. 2 a transverse section thereof on line *x x*, Fig. 1.

The sluice *a*, through which a stream containing valuable and worthless material in suspension passes, has a portion of its bottom composed of a series of transverse pieces or plates, *b*, having small slits 2 between the edges of the adjacent plates. The said slits at the higher end or farther up the stream are narrower, and those lower down of increasing width, the actual width varying in accordance with the nature of the material being treated, but usually being from about one one-hundredth of an inch to perhaps one-sixteenth of an inch, more or less.

Transverse slits have been used in ore-separators previous to this invention, and are not in themselves claimed as a part of this invention, and in considering any one of the said

slits it is possible that its operation upon certain portions of the material passing over it is substantially the same as in apparatus before employed, permitting heavier valuable particles to pass through the said slits, while the lighter worthless particles are swept over them by the stream. In the apparatus heretofore constructed upon this principle, however, the slits are all of the same width, and it is possible, consequently, with such apparatus, to separate only particles of one particular size, larger particles not being permitted to pass through the slits, which have to be made narrow in order to prevent worthless materials from passing through, while the smaller particles of valuable material are swept over the said slits, owing to the high velocity of the stream, and, so far as we are aware, up to the present time it has been considered impossible to separate such extremely fine particles by any single process.

In practicing our invention the sluice is made of such width and inclination as it approaches the portion provided with the slits that the stream sweeps the material over the said slits with a comparatively small velocity, and the materials carried by the stream are so distributed as to pass along the bottom in a thin layer without tumbling one over the other, and upon arriving at the uppermost narrowest slits the finest material of comparatively high specific gravity will pass through the said slits, while the equally fine material of lower specific gravity, being carried along more nearly with the same speed as the water, will be swept over the said slits, which thus operate to separate the heavy from the light material, while the coarse materials are too large to pass through the said narrow slits.

As the stream passes on toward the lower and wider slits, it has a greater velocity by making the inclination of the bottom steeper, as shown in Fig. 1, and in this manner the larger particles, which are of too great size to pass through the upper narrow slits, are acted upon in a similar manner at the wider slits—viz., the heavier materials dropping through the said slits—while the lighter materials of the same size and smaller are swept over the said slits by the force of the stream, and thus at each slit a portion of the material the particles of which are of a size proportional to the said slit is acted upon, the heavy particles of that size passing through, while the lighter particles pass over. The actual variation in pitch or inclination of the bottom of the sluice is quite small, so that it is hardly perceptible to the eye, and it is shown somewhat exaggerated in Fig. 1.

In order to prevent the slits from being clogged by particles too large to pass through becoming wedged therein, the apparatus is provided with clearing devices *d*, placed beneath the bottom *b* of the sluice and extending up into the said slits 2, the sides of the said clearing device *d* being inclined, as shown at 3, Fig. 2, so that when they are moved longi-

tudinally along the slits the said edges 3, engaging the under side of particles lodged in the said slits, will raise the said particles up from the said slits, thereby detaching them and forcing them back in the direction from which they entered without producing any pressure or abrasive action between the particles and the side of the slit. The clearing devices *d* are mounted on cross-heads *e*, themselves carried by rods *f*, shown in this instance as provided with handles *h*, by means of which they may be moved back and forth across the sluice, the said clearing devices thus moving longitudinally through the slits. If desired, the said clearing devices may be operated automatically by any suitable mechanism actuated by a wheel turned by the current passing through the sluice, or by any other suitable motor. By placing the said clearing devices and their actuating mechanism below the bottom *b* of the sluice, it will be seen that they do not obstruct the flow of the stream in the said sluice, and do not interfere with the process of separation going on at the slits, as would be the case if they passed down into the slits from above the bottom of the sluice, and the said devices, furthermore, are themselves protected from the action of the stream and the rocks and other material carried by it.

We claim—

1. In an ore-separating apparatus, a sluice having a portion of its bottom provided with narrow transverse slits of different widths, whereby particles of heavy material of various sizes may be separated from particles of lighter materials of various sizes, substantially as described.

2. A sluice having a transverse slit through its bottom, combined with a clearing device below the said slit, and supporting and operating mechanism for the said clearing device, outside of and removed from the action of the stream passing through the sluice, the said clearing device acting on substantially the whole length of the slit, substantially as described.

3. The combination of the sluice having a transverse slit through its bottom with a clearing device, and means to move the said clearing device longitudinally in the said slit, the said clearing device having inclined edges, whereby the particles are lifted out of the said slits, substantially as and for the purpose described.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

HADLEY P. FAIRFIELD.
LOUIS A. SHEAD.

Witnesses as to signature of H. P. Fairfield:
JOS. P. LIVERMORE,
GEO. W. GREGORY.

Witnesses as to signature of Louis A. Shead:
KATE M. SMITH,
N. W. PALMER.