S. R. KROM.

Apparatus for Separating Metal from Ores.

No. 59,510. Patented Nov. 6, 1866.

Fig. 1.

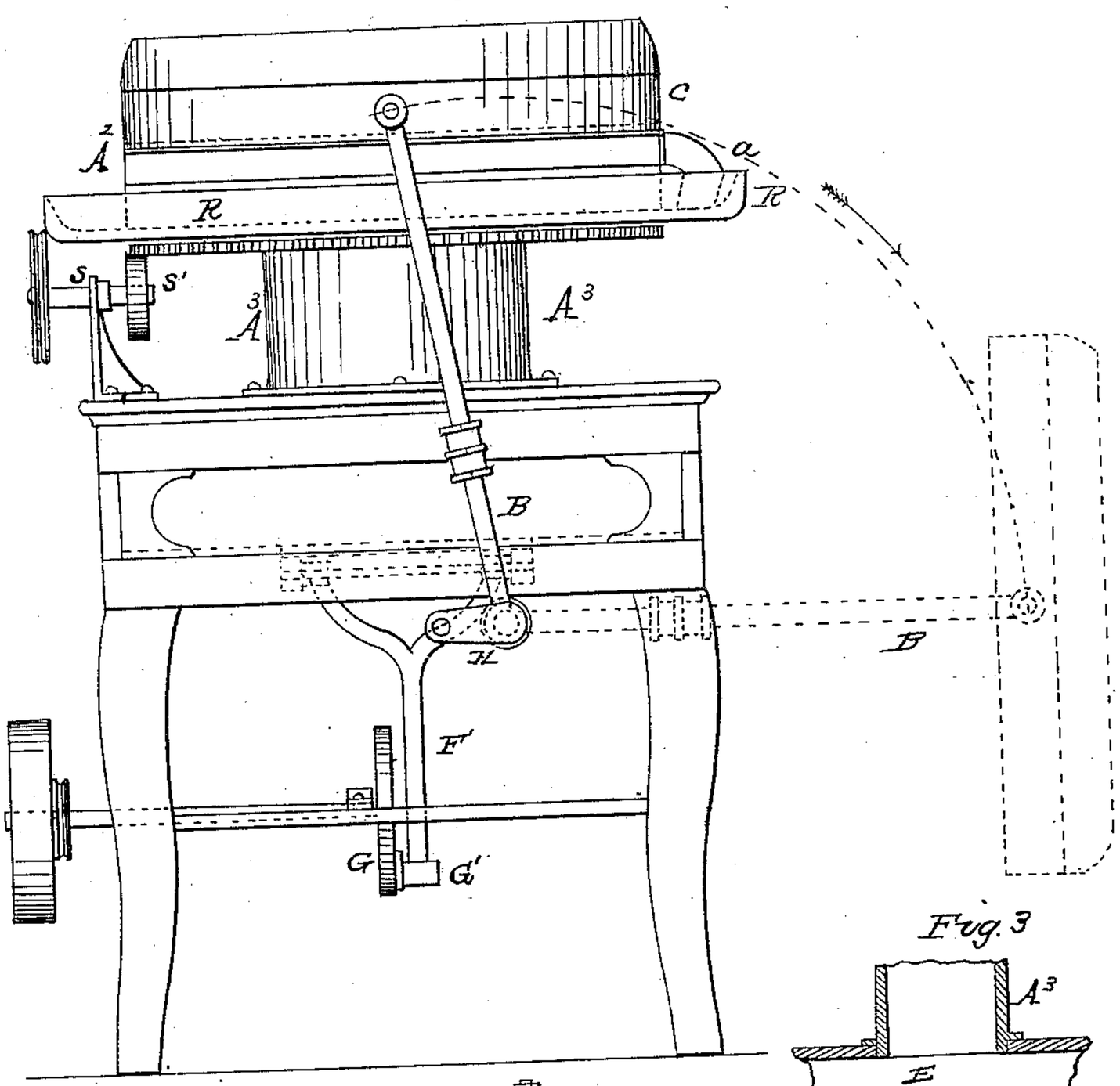


Fig. 3

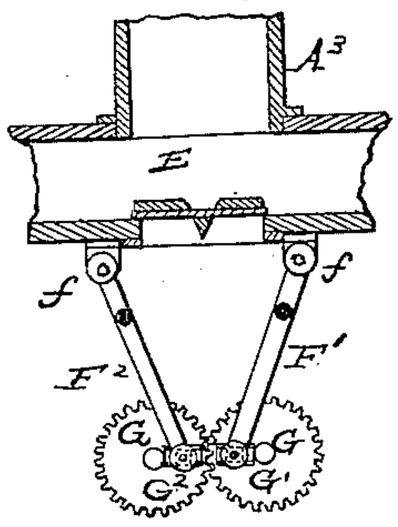
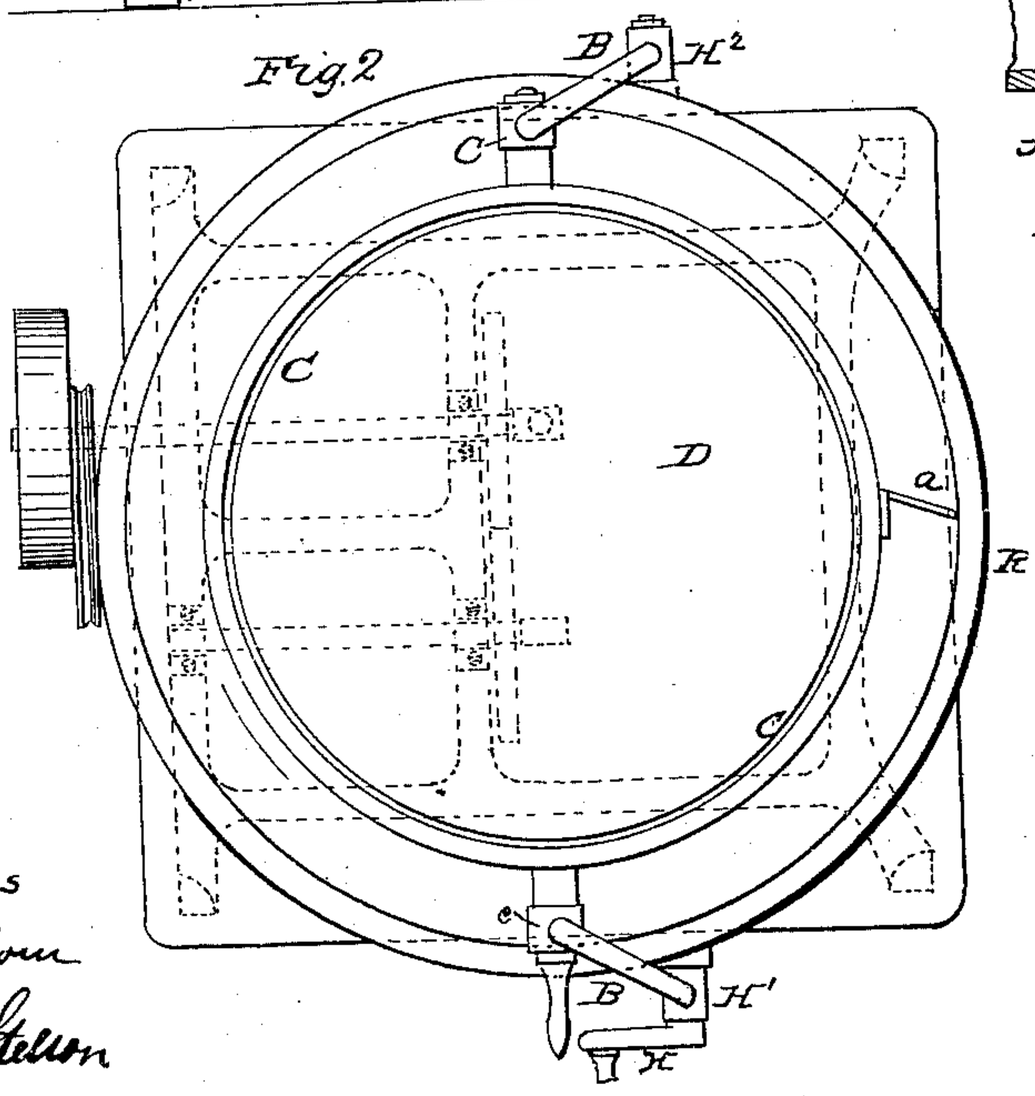


Fig. 2



WITNESSES

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STEPHEN R. KROM, OF NEW YORK, N. Y., ASSIGNOR TO LOUIS F. THERASSON, JOHN A. BRYAN, JAMES M. BLACKWELL, AND APOLLOS R. WETMORE, OF SAME PLACE.

IMPROVED APPARATUS FOR SEPARATING METALS FROM ORES.

Specification forming part of Letters Patent No. **59,510,** dated November 6, 1866.

To all whom it may concern:

Be it known that I, STEPHEN R. KROM, of the city of New York, in the county and State of New York, have invented certain new and useful Improvements in Machines for Concentrating or Separating Ores and other material in a pulverized or granular condition; and I do hereby declare that the following is a full and exact description thereof.

This invention (as also another, for which I ask a separate patent) relates to that class of machines in which currents of air or other fluid are passed upward through the material in opposition to gravity, and caused to agitate it at intervals. The particles or grains so situated tend to arrange themselves according to their specific gravities, the more dense, or those in which the material is heaviest, lying in a stratum at the bottom and the lighter lying above.

I will first proceed to describe minutely what I consider the best means of working out this invention, and afterward to point out the features which I claim as new. The accompanying drawings form a part of this specification, and my description will be confined to the treatment of ores, except where other substances are particularly specified.

Figure 1 is a side elevation of my machine. The finished drawing shows the parts in the condition for working, and the faint outline in red indicates the parts in the position in which they are placed for discharging the concentrated material at intervals. Fig. 2 is a plan view. Fig. 3 represents, on a smaller scale, the arrangement of some of the parts viewed in a plane at right angles to the view in Fig. 1.

Similar letters of reference indicate like parts in all the figures. The tints are employed to distinguish parts and not to indicate materials.

A is a fixed frame-work. B B are adjustable arms or links, connected at their lower ends to a small crank, and at their upper ends to the trunnions *c* of a ring, C. A fine sieve, D, of brass wire or other suitable material is mounted within the ring C, and sustained by a grated support. (Not represented.) The depth of the sieve D below the upper edge of the ring C corresponds to the depth of the stratum of material which is to be worked. The upper portion of the frame-work is made air-tight. Directly below the ring C it is of equal size, as indicated by A^2. Below this it is greatly contracted, as indicated at A^3; but the size of A^3 is sufficient to afford a free passage for the air from the bellows below up to the sieve.

E is the bellows, which may be cylindrical, and is provided with valves for inhaling at the base and discharging at the top.

F^1 F^2 are V rods or links which operate the bellows. They are connected at their upper extremities to the lower bed of the bellows by joints *f*, and at their lower ends to cranks G^1 G^2 on two separate shafts, which carry the interlocking wheels G G and a suitable driving-pulley or other means of receiving motion from a steam-engine or other motor. (Not represented.) The motion thus received is transferred through the cog-wheels G, so that both the cranks G^1 G^2 shall turn simultaneously in opposite directions, and the links F^1 F^2 be raised and lowered in exactly equal times and to equal extents, and be inclined to equal extents, but in opposite directions, at any given period. This completes the description of the blowing mechanism, the wind from which is discharged upward in vigorous puffs through the perforated bed D.

Each of the blasts of air produced by the rising of the lower board of the bellows acts with such force as to agitate the material on the bed D and lift it slightly. The heavier particles retain their place, or rather gradually sink to the immediate vicinity of the bed D, while the lighter particles are more lifted by the puffs of air, and soon find their way to the top. The material is deposited on the center of the bed D by an overhanging spout or other convenient means (not represented,) and gradually distributes itself over the surface, becoming separated in the act, so that by the time it reaches the periphery the lighter particles alone are at the top. Each lifting of the material by the air throws over a quantity of the light material.

R is an annular pan, adapted to be turned on the casing A by means of the small shaft S, which acts through bevel-gear S′, as repre-

sented, and receives motion through one of the shafts below, by means of a round belt. (Not represented.) A scraper, *a*, is bolted to the side of the fixed casing, as represented, so as to scrape nearly to the bottom of the annular pan, and throw overboard the material with which it becomes loaded. Each puff of the bellows throws a small quantity of the light material over the top of the ring C and deposits it in the annular pan R. This would soon fill the pan R uniformly full of material, but the rotation of R continuously clears it by the aid of the scraper, discharging the material opposite the scraper upon the earth or into any suitable vessel or spout. (Not represented.) This completes the description of the mechanism for removing the light material.

To remove the dense material the ring C is lifted with its contents and moved to one side. In the under side of the ring C is inserted a rubber ring. The upper edge of the casing A is made V shape. The V-shaped edge coming in contact with the rubber makes an air-tight joint by turning the cranks H^1 H^2. This contact is produced and broken at will, the turning of the cranks H^1 H^2 being simultaneously effected by turning the larger crank H, which is fixed on the same shaft. When it is found that a sufficient quantity of dense material has accumulated on the bed D, so that little else is found within the ring C, the hand-crank H is turned a half-revolution, which has the effect to lift the small cranks H^1 H^2, and thereby to lift the ring C and its contents clear of the ring A. The ring C is now forced to one side, as indicated by the arrow in Fig. 1. The links B now turn on the small cranks H^1 H^2 as a center, and support the ring C and its contents while it is being moved to one side and turned or tilted, as shown in red outline. The first part of its movement to the right lifts it, because the cranks are not directly under the trunnions *c*, but are on the right-hand side. This elevation aids to clear the ring C still more from the fixed ring or casing A.

After the dense material has been discharged in this manner, the reverse movement brings back the ring C to its original position over the fixed ring A. Now, a half-revolution of the hand-crank H again lowers the links B, and consequently the ring C and its contents, to a fair bearing on the ring A, and fresh material may be deposited on the center of the sieve D, and the operations continued as before.

It may naturally be presumed that the blast of wind, if impelled with great force through the sieve D at the commencement of the operation, where there is little material in the sieve, may blow out and discharge as tailings some of the valuable material, and that, on the other hand, if the blast is not increased in force after a considerable stratum of dense material has accumulated, it will not have sufficient force to throw out the light material rapidly.

My machine provides for graduating the strength of the blast without affecting the motion of the bellows E. I make the bellows E of such a size as to blow with sufficient force when the sieve D is loaded, and allow a portion of the wind to escape during the period while the sieve is not much loaded. I provide for this escape by simply turning the small cranks up in a little too high position during the first part of the operation of separating, and afterward turning them down to their lowest position. When they are elevated they support the ring C, so that there is a considerable leakage between the beveled surfaces where the rings C and A meet. This leakage regulates the force of the blast. When the blast requires to be stronger the leakage is reduced until it becomes nothing, and the full force of the blast is driven up through the sieve D.

Some of the advantages due to certain features of my invention may be separately enumerated as follows: First, by reason of the fact that the joints between the rings C and A may be set open or closed to the extent required, as represented, I am able to vary the force of the blast through the sieve D without the necessity for varying the action of the bellows E; second, by reason of the fact that the neck A^3 in the casing above the bellows is constructed as represented, I am able, without crowding the parts too compactly together, to reduce the cubical capacity of the space between the bellows E and the sieve D, and thereby to insure a more vigorous and sharply-intermittent action in the blast than would otherwise be practicable; third, by reason of the fact that the bellows is impelled by links F^1 F^2 and connecting-gear G, as represented, I am able to insure that the obliquity of the one connection shall balance the obliquity of the other, and the bellows be operated with a parallel motion with little labor and little friction; fourth, by reason of the fact that the supporting-links B B turn on points not under the trunnions *c* of the ring C, but considerably to one side thereof, I insure that the early portion of the sidewise movement of the bed D shall elevate it, and the return movement shall depress it, substantially as and for the purpose herein specified; fifth, by reason of the fact that the annular pan R, receiving the ore or analogous material, as represented, is rotated so as to present all parts in succession to the scraper *a*, I insure that the annular pan R shall be kept empty, or sufficiently so for the purposes of my invention, with very simple mechanism.

Another advantage due to the contracted neck A^3, in addition to that named above, is that it induces a blowing with more force at the center of the sieve than at the periphery, and thus more rapidly distributes the material, which is inclined to pile in the center when deposited from hopper above.

A part of the benefit of my invention may be realized by using only a part of the novel features herein described. For example, the

sieve D and its connections may be adjusted and removed by other means than those represented, as by racks and gear-wheels, levers, &c. The air may be allowed to escape by making a hole or holes of adjustable size at any other convenient point or points between the bellows and the sieve, instead of quite around between the rings A^2 and C. But I prefer the use of all of the novel features together, as represented.

Having now fully described my invention, what I claim as new therein, and desire to secure by Letters Patent, is as follows:

1. Producing a variable aperture through which the blast produced by the bellows may be discharged so as to reduce the action through the sieve D, as required, substantially in the manner and for the purpose herein set forth.

2. Contracting a portion, A^3, of the casing between the bed D and the bellows E, substantially as and for the purpose herein specified.

3. The inclined rods F^1 F^2, cranks G^1 G^2, and connecting-gear G, in combination with a bellows, and adapted to be used for separating ores and analogous uses, substantially as herein specified.

4. Mounting the supporting-links B B on centers one side and not under the trunnions *c* of the ring C, substantially as and for the purpose herein specified.

5. The rotating pan or vessel R, arranged to operate in combination with the scraper *a* and the bed D and ring C, substantially in the manner and for the purpose herein set forth.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

STEPHEN R. KROM.

Witnesses:
D. W. STETSON,
D. L. FREEBORN.