No. 686,741. Patented Nov. 19, 1901.

S. R. KROM.

MACHINE FOR SEPARATING ORES.

(Application filed Jan. 15, 1898.)

(No Model.) 3 Sheets—Sheet 1.

Fig. 1.

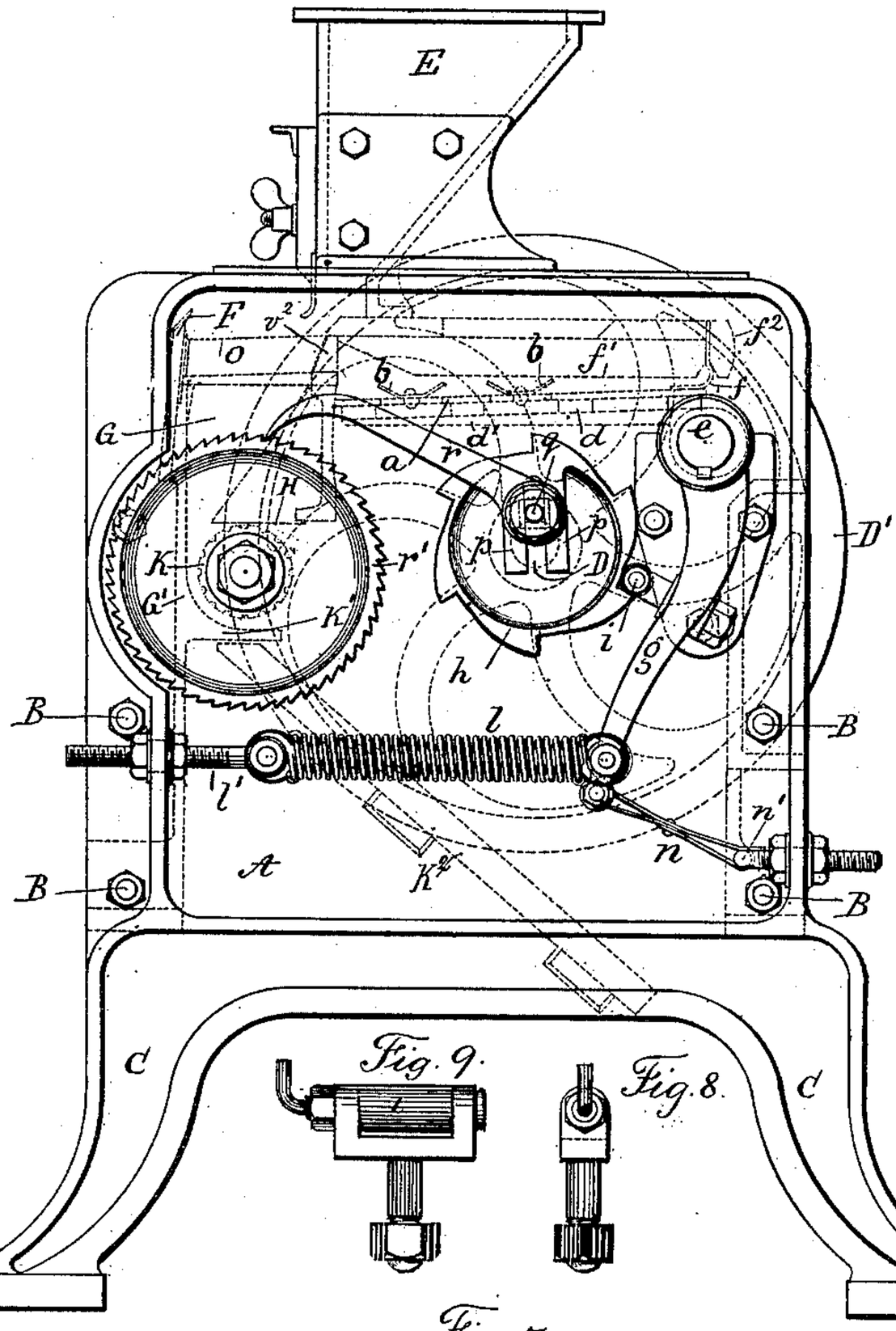


Fig. 10.

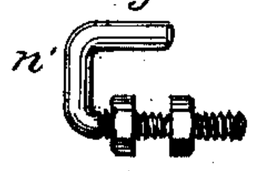


Fig. 9.

Fig. 8.

Fig. 6.

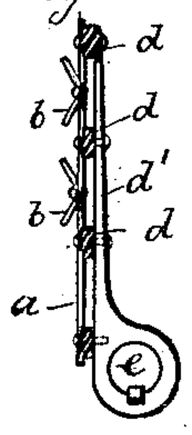
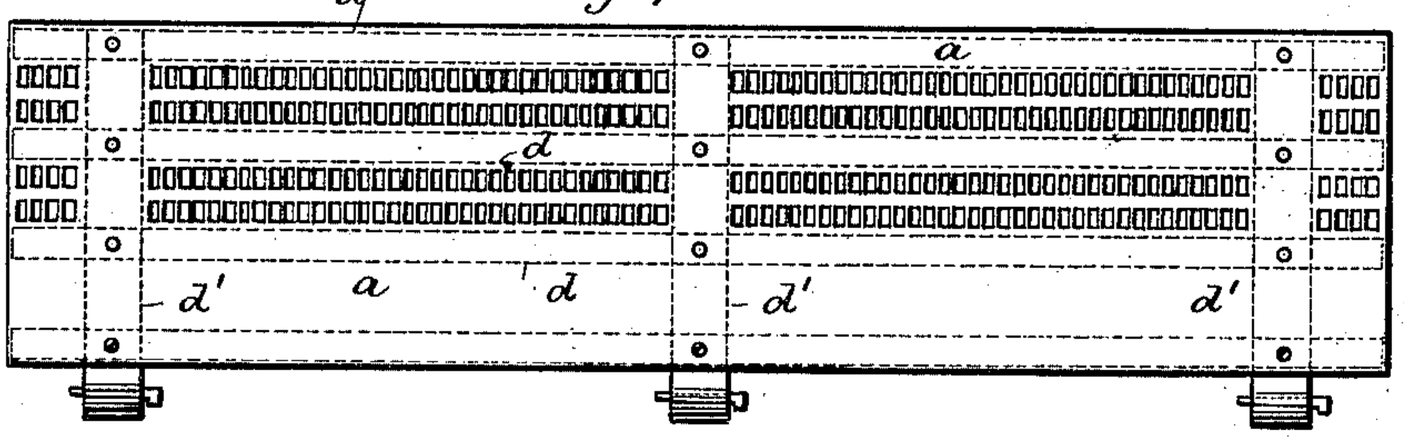


Fig. 7.



Witnesses.
Chas. H. Smith
J. Staib.

Inventor.
S. R. Krom
by L. W. Serrell & Son
attys

No. 686,741. Patented Nov. 19, 1901.

S. R. KROM.

MACHINE FOR SEPARATING ORES.

(Application filed Jan. 15, 1898.)

(No Model.) 3 Sheets—Sheet 2.

Fig. 2.

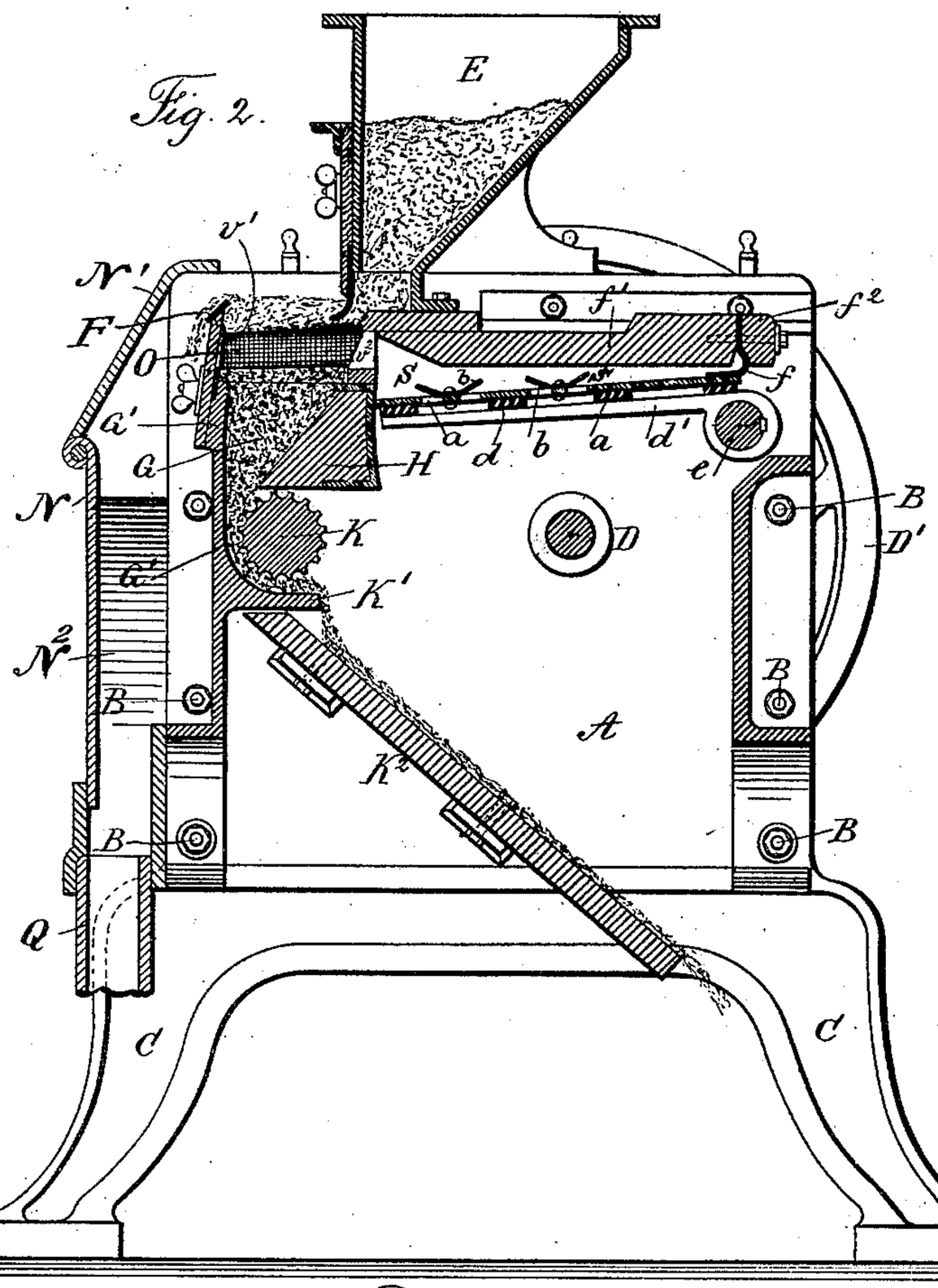


Fig. 3.

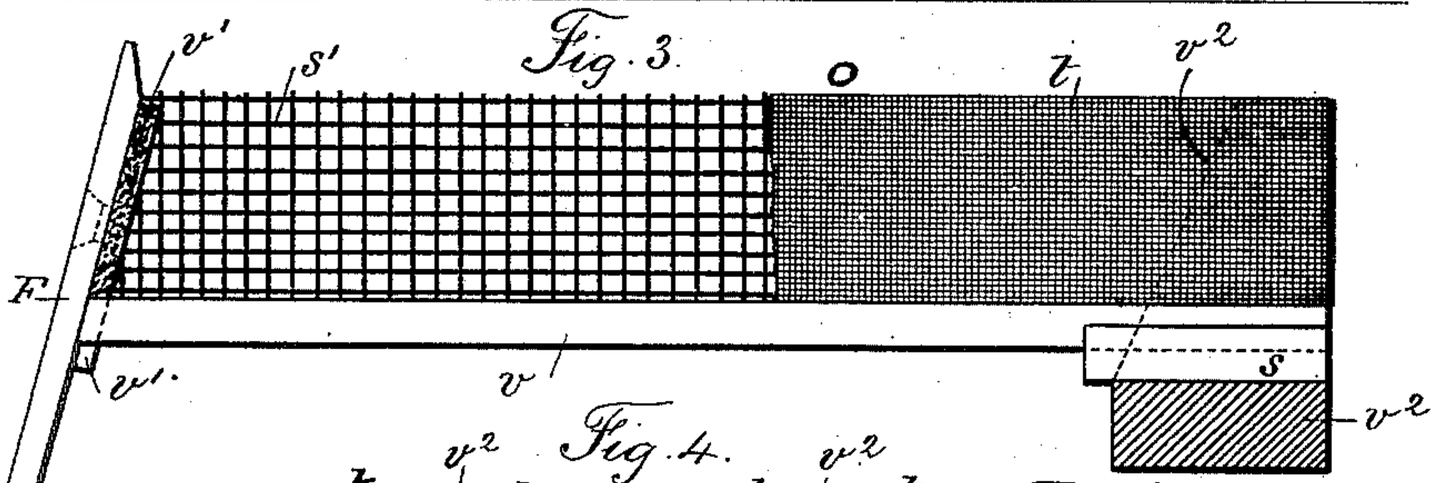


Fig. 4.

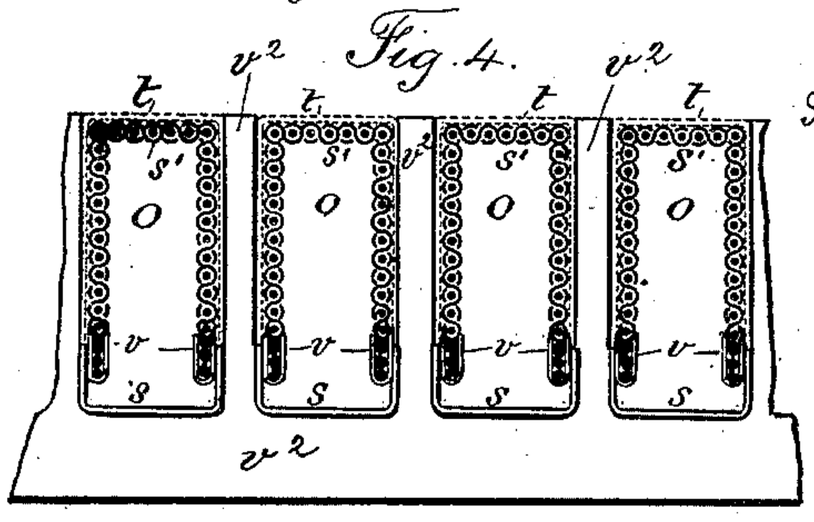
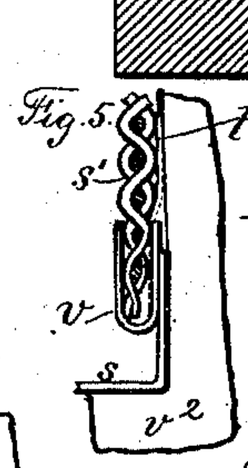


Fig. 5.



Witnesses.
Chas. H. Smith
J. Stair.

Inventor.
S. R. Krom
by
L. W. Serrell & Son
attys.

No. 686,741. Patented Nov. 19, 1901.

S. R. KROM.

MACHINE FOR SEPARATING ORES.

(Application filed Jan. 15, 1898.)

(No Model.) 3 Sheets—Sheet 3.

Fig 11

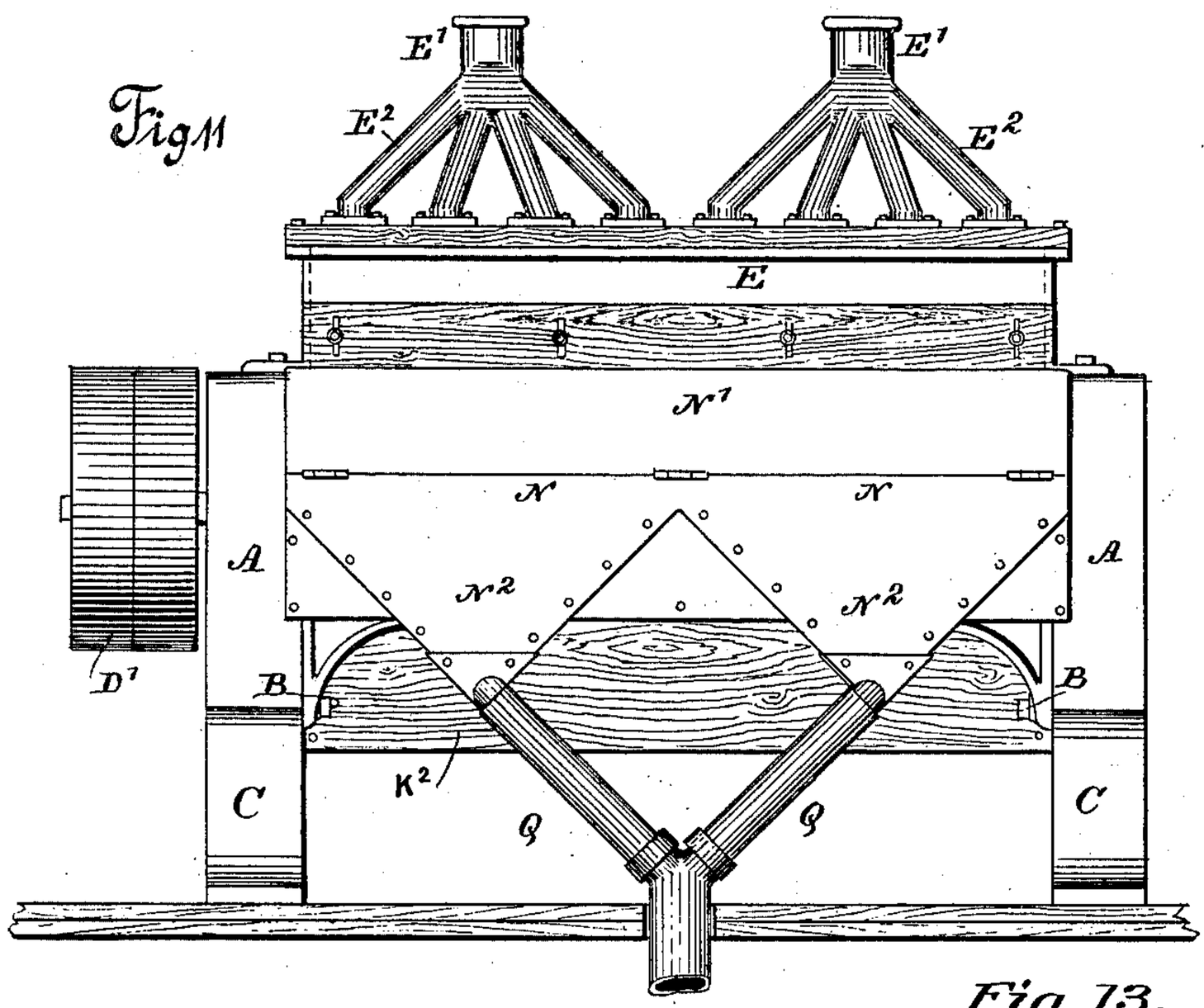


Fig. 13.

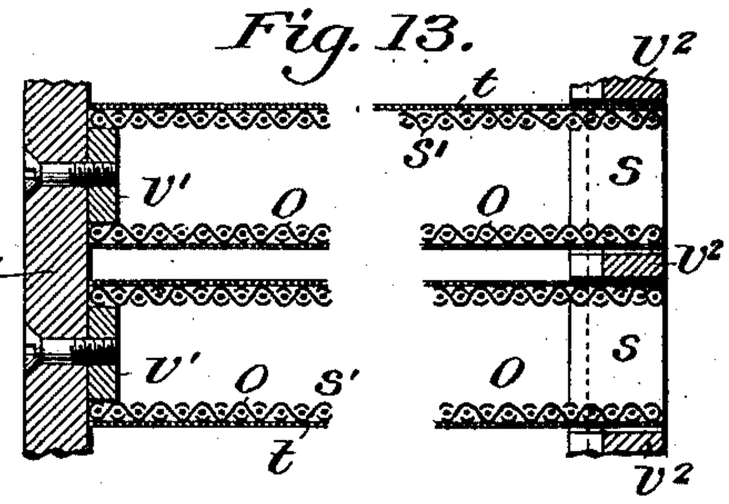
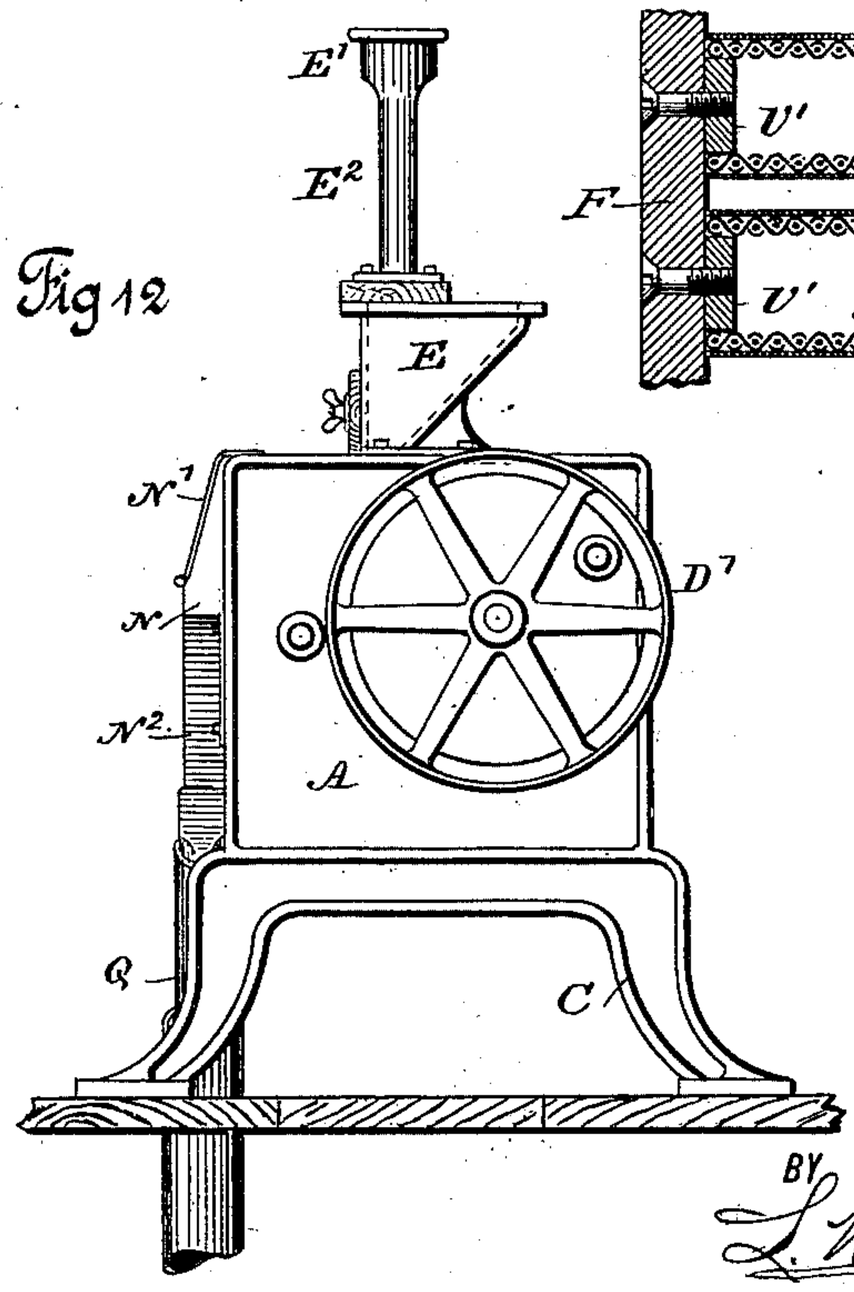


Fig 12



WITNESSES:
Chas. A. Smith
J. Stair

INVENTOR
S. R. Krom
BY
L. W. Serrell & Son
ATTORNEYS

UNITED STATES PATENT OFFICE.

STEPHEN R. KROM, OF PLAINFIELD, NEW JERSEY.

MACHINE FOR SEPARATING ORES.

SPECIFICATION forming part of Letters Patent No. 686,741, dated November 19, 1901.

Application filed January 15, 1898. Serial No. 666,769. (No model.)

To all whom it may concern:

Be it known that I, STEPHEN R. KROM, a citizen of the United States, residing at Plainfield, in the county of Union and State of New Jersey, have invented an Improvement in Machines for Separating Ores and other Granular Substances, of which the following is a specification.

This invention relates to improvements upon separating-machines such as shown in my Patents Nos. 80,747, 81,794, and 121,526.

My present invention is made for rendering the machine more perfect in its construction and more durable and economical in its operation.

In the drawings, Figure 1 is an end elevation. Fig. 2 is a vertical section without the delivery hopper and tube. Fig. 3 represents one of the ore-bed tubes with part of the exterior covering removed. Fig. 4 is a cross-section of four of such tubes. Fig. 5 is an enlarged view of the binding-strip and base-plate. Fig. 6 is an end view, and Fig. 7 is a plan view, of the vibrating bellows-bottom. Figs. 8 and 9 show end and side views of the roller for the trip-wheel, and Fig. 10 is a separate view of the adjustable loop or strap. Fig. 11 is a rear elevation showing the supply and delivery hoppers, and Fig. 12 is an end elevation. These two figures are on a smaller scale than Figs. 1 and 2. Fig. 13 is a horizontal section through two of the tubes of the ore-bed corresponding in size to the parts shown in Fig. 4.

The side frames A A are tied together by the bolts B B and intervening parts, and the machine will usually stand upon legs C. The power to drive the machine is derived from the shaft D, which may be actuated by suitable power, and usually it is provided with the fly-wheel or pulley D'.

The ore or other granular substance is placed in the hopper E, from the lower end of which it passes upon the ore-bed tubes O, and the lighter materials are carried over the dam F, and the heavier materials go down between the tubes O into the hopper G, formed between the plate G' and the bellows-segment H. The pulverulent ore is to be supplied into the hopper E in whatever manner will insure regularity of feed, so that it will pass out upon the ore-bed tubes with uniformity. I prefer and use supply-pipes E' and diverging tubes E^2, leading the material equally into the different portions of the hopper E. This arrangement of supply-pipes is of special advantage where the supply-hopper E is of considerable length. The ore or heavy material is carried away gradually by the grooved roller K, which is revolved progressively and delivers the material from the curved cheek-piece K' upon an incline or chute K^2, that is placed between the frames A. The bellows S gives motion to the fluid made use of in separating the granular materials according to gravity. Said bellows may be made to operate upon air or water. My apparatus is specially intended for a pneumatic ore-separator; but it is not limited in that particular.

The bellows S is provided with a bottom plate *a*, perforated with ranges of holes, as seen in Fig. 7, and between these rows of holes the central portions of the valve-strips *b* are secured, so that said strips cover the rows of holes when resting on the plate or open and admit the atmosphere uniformly when the bellows-bottom is being depressed. Beneath the plate *a* there are the longitudinal supporting-bars *d d*, and these rest upon and are attached to the arms *d'*, that extend out from and are keyed to the bellows rock-shaft *e*. The face of the bellows-segment H is a segment of a cylinder described from the center of the rock-shaft *e*, so that the edge of the bottom plate *a* moves close to the same. To the bottom plate *a* over the rock-shaft *e* is attached the flexible back *f* of the bellows. This is clamped above between the edge of the top bellows-plate *j'* and the clamping-strip f^2. This prevents leakage at the back of the bellows.

In order to move the rock-shaft *e* of the bellows, I employ the lever-arm *g* and trip-wheel *h*, the latter being formed of a circular range of cam-teeth, that act against a roller *i*, attached to the bellows-lever *g*. This roller is in a jaw, (seen in Figs. 8 and 9,) such jaw being bolted to the bellows-lever or otherwise connected thereto. The helical spring *l* is attached at one end to the bellows-lever *g* and at the other end to the screw *l'*, the nuts of which are used to adjust the screw and vary the tension of the spring, so as to give

the same more or less power to move the bellows. As each trip-wheel tooth passes off from contact with the roller *i* the bellows is suddenly actuated by the spring *l* to give a puff of air or other fluid through the ore-bed, as hereinafter more fully set forth, and to prevent the roller *i* striking at the base of the teeth I employ the strap *n*, extending from a loop at the end of the bellows-lever to the adjustable loop *n'*, (seen separately in Fig. 10,) by means of which the bellows-lever is limited in its movement to vary the amount of air ejected through the ore-bed and to prevent concussion. Upon the trip-wheel there are radial jaws *p*, into which is introduced a movable crank-pin *q*, which may be adjusted and clamped at any desired distance from the center of the driving-shaft D, so as to give more or less motion to the pawl *r*, which acts upon the ratchet-wheel *r'* of the delivery-roller K, so as to cause the material to be delivered more or less rapidly, according to the material that is being separated.

The ore-bed O is made of a range of tubes or inverted troughs, each being oblong by preference in cross-section. The sides and top are perforated, and the base of each tube next to the bellows is strengthened by a U-shaped plate *s*, that is preferably soldered at its ends to the perforated tube or trough. The perforated portions of the ore-bed tubes are made of two thicknesses, the inner or foundation being strong netting with large openings, the outer portion being thin wire-netting and having fine openings. By this means I secure the necessary strength and at the same time obtain great uniformity in the distribution of the air. The lower edges of the foundation and covering are secured together by the clamping-strips *v*, and these may be pressed on, soldered, or otherwise secured in place. At the ends of the tubes next to the dam F the ore-bed tubes are closed by a metal end *v'*, soldered into place, and these are fastened to the plate F by screws, and the lower edge of this plate *v'* passes between the plate G' and the dam F, and said dam is fastened to the plate G' by screws. At the back ends the ore-bed tubes open into the bellows S, and there is a notched receiving bar or frame v^2 below the base of the hopper, into which the said ore-bed tubes are received and through which they open into the bellows.

It is now to be understood that the ore or other material to be separated passes down from the hopper upon the ore-bed tubes and that the puffs of fluid from the bellows pass through the said tubes and raise the lighter particles and pass them toward the delivery-dam F; but the heavier particles remain nearest to and rest upon the bed-tubes and gradually pass down between said tubes into the hopper G and are finally delivered by the roller K and according to the rapidity of delivery, so the material will pass more or less rapidly down between the ore-bed tubes. If the delivery by the roller K is slow, the refuse or lighter material passed over the dam F will be greater in proportion than with a more rapid delivery by the roller K. The lighter materials that pass by the action of the air over the dam F fall down into the trunk N, Figs. 11 and 12, that extends across behind and below the dam, and the hinged flap N' has a lip extending at a sufficient distance above the dam to form a long narrow mouth for the lighter materials to pass through as they escape over the dam and fall down into the trunk N and thence to the hoppers N^2 and discharge tubes or spouts Q Q; but the trunk N may be used without the flap N', if desired.

In consequence of using arms *d'*, extending out from the rock-shaft *e*, and having upon these arms crossing-bars *a*, the bottom of the bellows can be made very light and of a sheet of metal or similar thin material, with the air-holes through the same in one or more rows and a strip of leather fastened so as to close upon the row of holes or open for the admission of air, and by extending the flexible strip *f* upward and clamping it by the bar f^2 there are no parts in the way of access to the shaft *e* and the arms connected thereupon. Hence the moving bellows-bottom is easy of access, so as to be kept in order. By making the ore-bed of hollow tubes, with open-work at the sides and top covered with a fine wire-cloth in the manner shown, the lower edges of the sides are protected by the folded strips *v* and the ends of the tubes next to the bellows are strengthened and supported by the trough-shaped pieces of metal *s*, that rest upon the cross-bar v^2, so as to make a very firm and reliable connection near the bellows, and the plates *v'* come within the open-work tubes adjacent to the dam and are firmly connected to the open-work, and these plates *v'* are fastened to the plate F', Fig. 3, and prevent the possibility of any separation of the parts at the dam end of the tubes of the ore-bed.

The flap N' when turned down gives access to the hoppers N^2 and permits of a rod being introduced and passed into either of the spouts Q to force the material out of the spout into the main discharge-pipe in case a spout should become obstructed by the lighter material in the same.

I claim as my invention—

1. In an apparatus for separating ore and similar granular substances, a bed upon which the ore is received formed of tubes of open-work material covered with fine wire-netting and having strips at the bottom edges of the sides for holding the materials together, a cross-bar and trough-shaped plates for supporting the ore-bed tubes at their ends adjacent to the bellows, and plates *v'* firmly secured within the open-work tubes and adjacent to the dam, substantially as set forth.

2. In an apparatus for separating ore and similar granular substances, a bed upon which the ore is received formed of tubes of open-

work material covered with fine wire-netting and having strips at the bottom edges of the sides for holding the materials together, a cross-bar and trough-shaped plates for supporting the ore-bed tubes at their ends adjacent to the bellows, plates v' firmly secured within the open-work tubes at one side of the ore-receiving bed, a dam adjacent to and parallel with said plates v', hoppers along one side of and below said ore-bed and discharge-pipes therefrom, a flap hinged to and extending upward from said hoppers, a receiving-hopper upon the opposite side of the ore-receiving bed, and an adjustable device at the mouth of the hopper for regulating the supply of material upon the ore-receiving bed, substantially as set forth.

3. In an apparatus for separating ore and similar granular substances, a bed upon which the ore is received formed of tubes of open-work material covered with fine wire-netting and having strips at the bottom edges of the sides for holding the materials together, a cross-bar and trough-shaped plates for supporting the ore-bed tubes at their ends adjacent to the bellows, plates v' firmly secured within the open-work tubes at one side of the ore-receiving bed, a dam adjacent to and parallel with said plates v', hoppers along one side of said ore-bed and discharge-pipes therefrom, a receiving-hopper upon the opposite side of the ore-receiving bed, and an adjustable device at the mouth of the hopper for regulating the supply of material upon the ore-receiving bed, substantially as set forth.

4. In an ore-separator and in combination, a rock-shaft and means for actuating the same, arms d' carried by said rock-shaft, bars d resting upon and secured to the arms d' and at right angles thereto, a plate a of sheet metal perforated with a series of parallel rows of holes and secured to the bars d which bars are situated between the series of holes, flexible valve-strips secured to the said perforated plates between the rows of holes of each series parallel with and intermediate to the said bars d a stationary top plate over the said perforated plate, a flexible connecting-strip attached respectively to the plate a and the top plate f' and forming with the adjacent parts a substantially bellows structure, substantially as and for the purposes set forth.

5. In an ore-separator, the combination with the ore-receiving bed formed of tubes of open-work material covered with fine wire-netting and having strips at the bottom edges of the sides for holding the materials together, a cross-bar and trough-shaped plates for supporting the ore-bed tubes at their ends adjacent to the bellows, of the hoppers N^2 for the lighter materials to pass through, discharge-pipes therefrom, a hinged flap N′ connected to the said hoppers, said flap having a lip at right angles thereto extending horizontally above the dam to form a mouth for the lighter materials to pass into the hopper, the said pipes extending from the bottom of the hoppers to convey away the lighter materials, substantially as set forth.

Signed by me this 11th day of January, 1898.

STEPHEN R. KROM.

Witnesses:
GEO. T. PINCKNEY,
E. E. POHLÉ.