

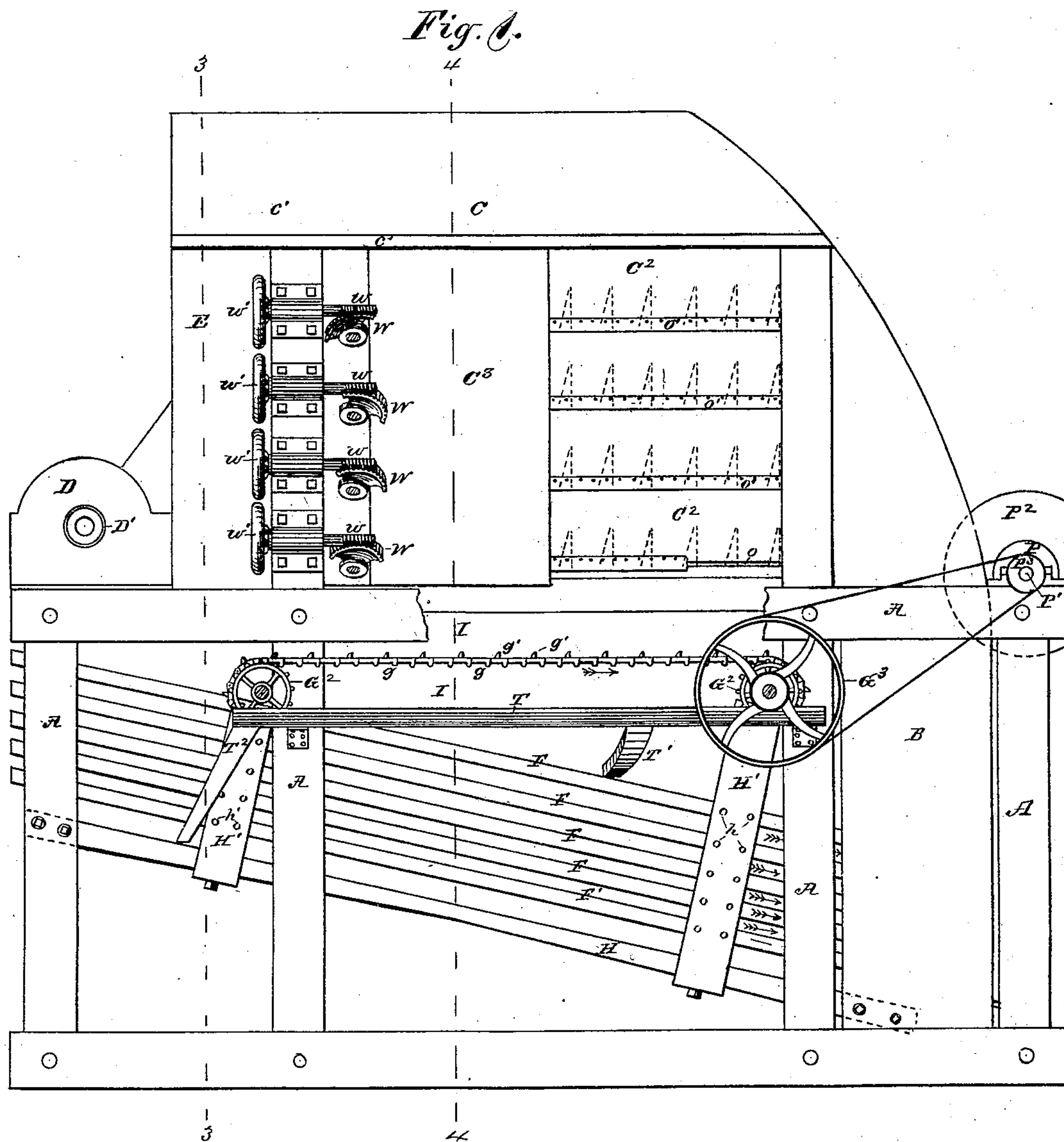
(No Model.)

3 Sheets—Sheet 1.

A. P. GRANGER.
Atmospheric Mineral Concentrator or Dry Ore
Separator.

No. 243,549.

Patented June 28, 1881.



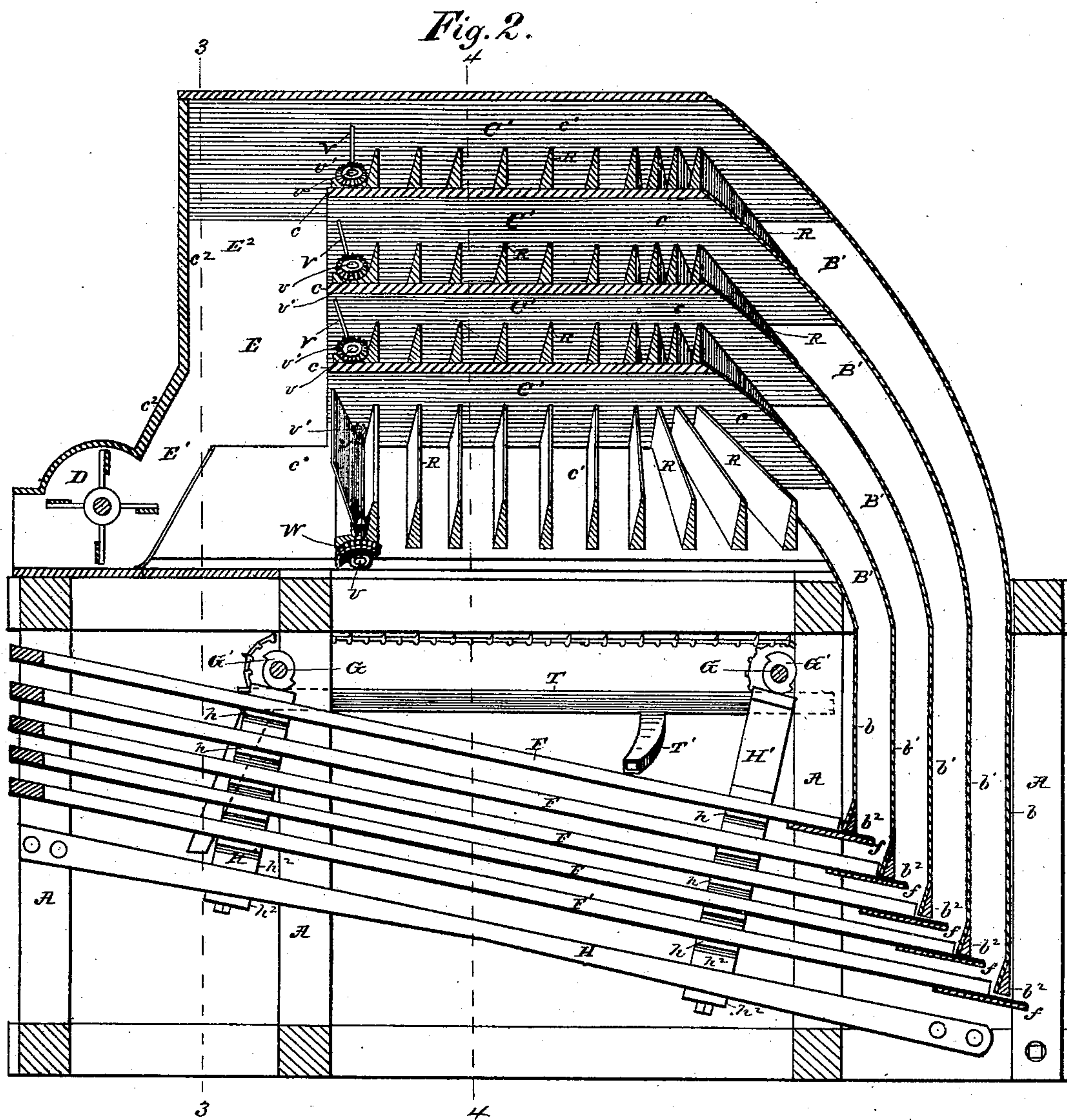
Witnesses.
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A. H. Frost

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Attorney.

(No Model.)

3 Sheets—Sheet 2.

A. P. GRANGER.
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No. 243,549. Patented June 28, 1881.



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(No Model.)

3 Sheets—Sheet 3.

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Fig. 3.

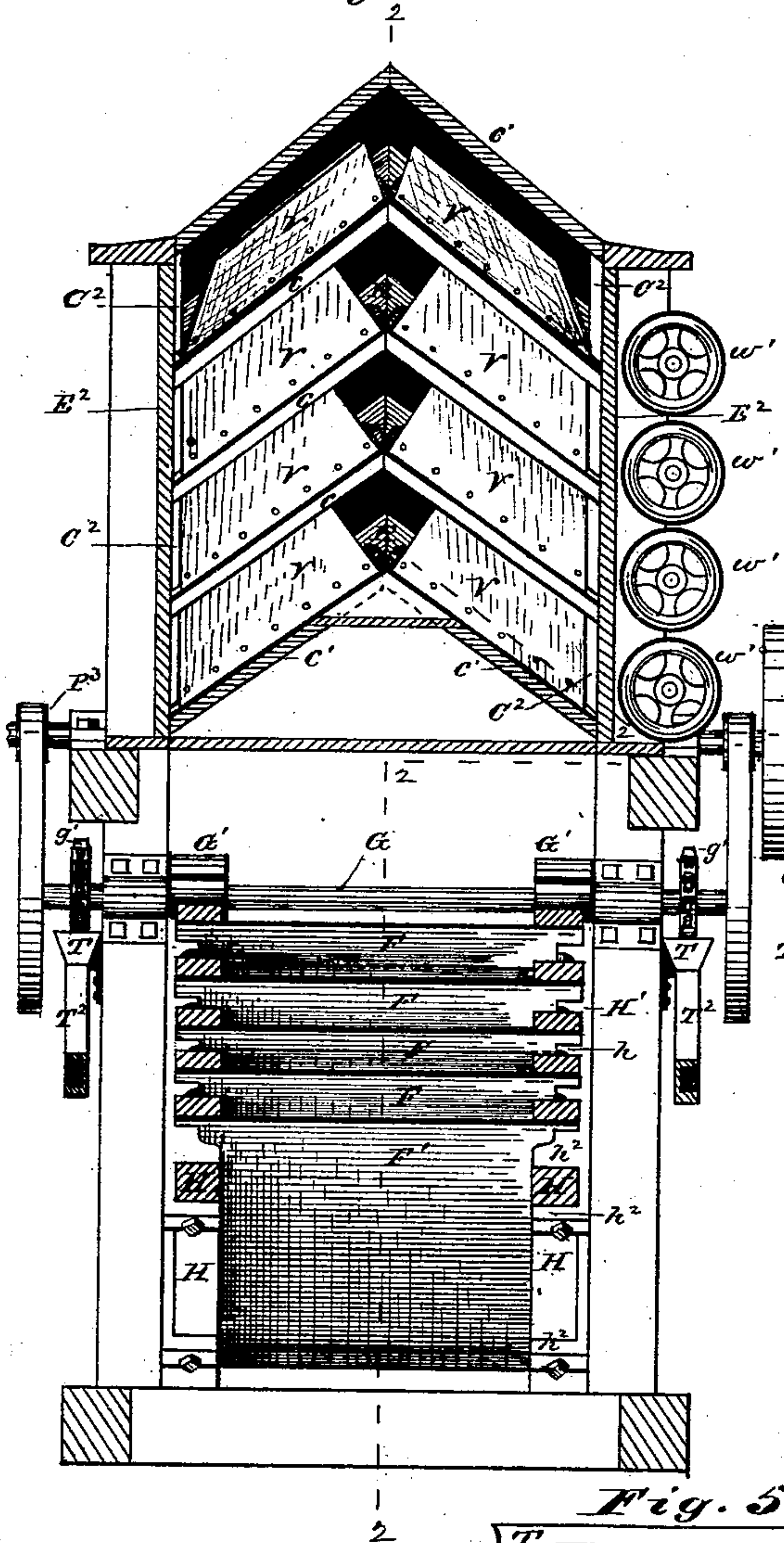


Fig. 4.

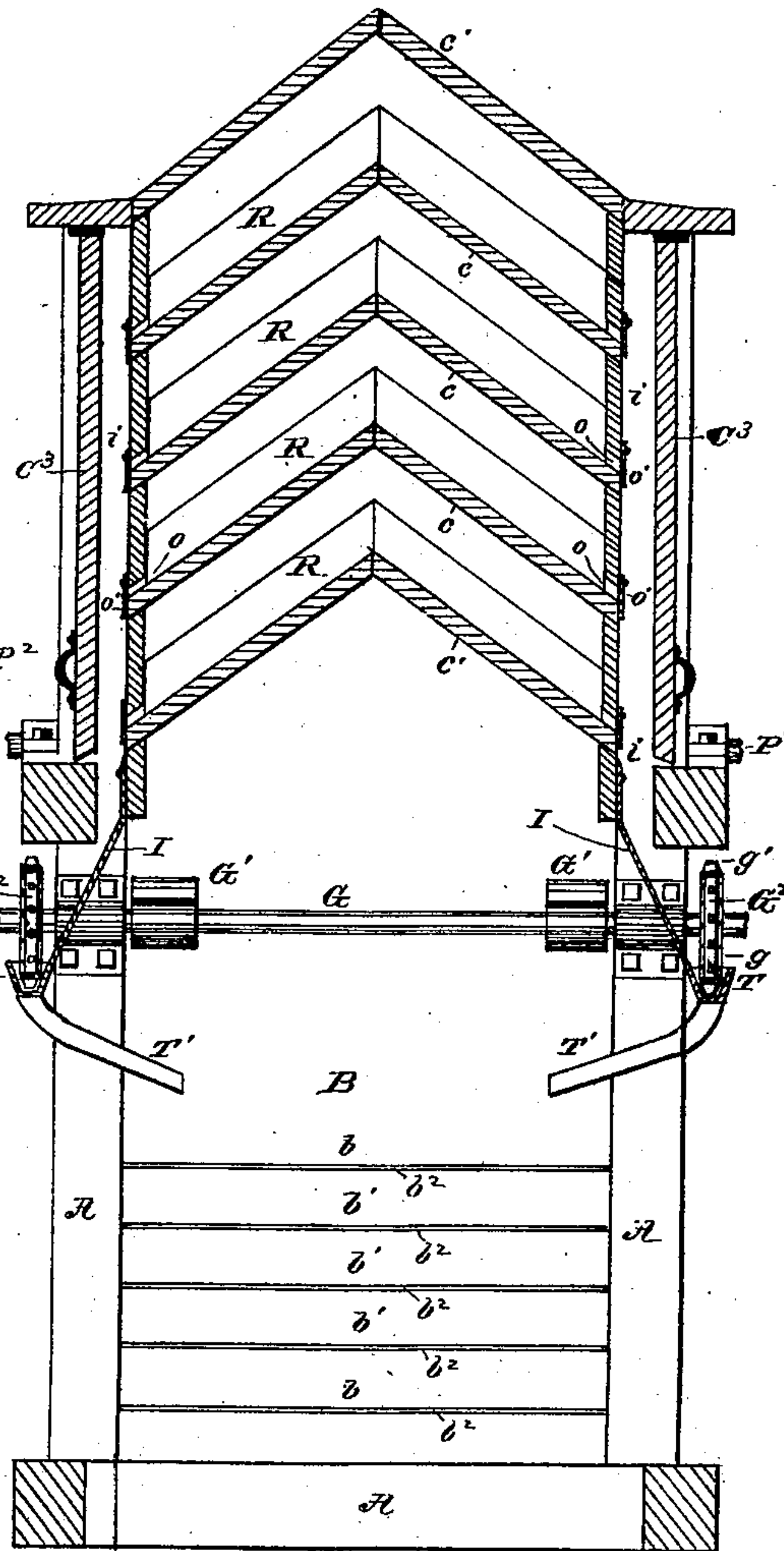
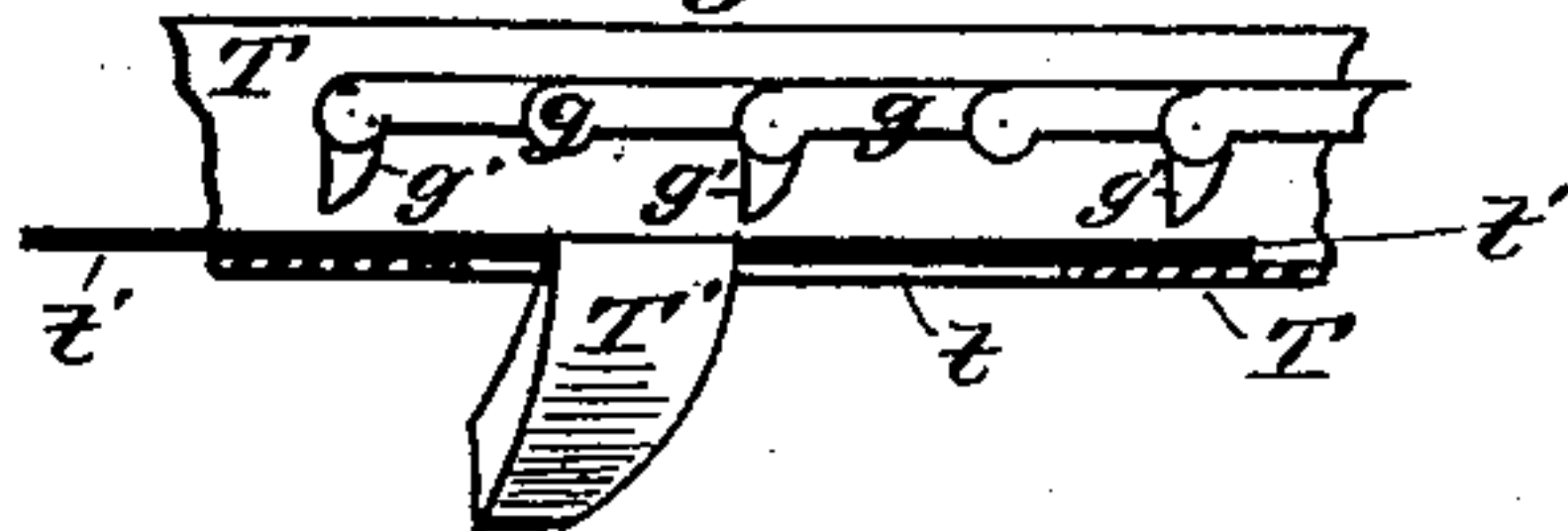


Fig. 5.



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UNITED STATES PATENT OFFICE.

ALVAN P. GRANGER, OF WA KEENEY, KANSAS.

ATMOSPHERIC MINERAL CONCENTRATOR OR DRY-ORE SEPARATOR.

SPECIFICATION forming part of Letters Patent No. 243,549, dated June 28, 1881.

Application filed December 31, 1880. (No model.)

To all whom it may concern:

Be it known that I, ALVAN P. GRANGER, of Wa Keeney, in the county of Trego and State of Kansas, have invented certain new and useful Improvements in Atmospheric Mineral Concentrators or Dry-Ore Separators; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention belongs to the class of pneumatic concentrators or dry-ore separators; and it consists, primarily, in the combination, in one machine, of two or more ducts with mechanism for feeding material of different dimensions to the several ducts, and mechanism for producing air-currents of different force in the several ducts, by which said currents are adapted to separate the material fed severally thereto.

It also consists in other features of construction and operation, which, together with the foregoing, will be hereinafter more fully set forth, and indicated in the claims.

In the drawings, Figure 1 is a side elevation of the machine with a part of the outer side casing removed. Fig. 2 is a vertical longitudinal section thereof through the indirect line 2 2 of Fig. 3. Fig. 3 is a transverse vertical section through 3 3 of Figs. 1 and 2; and Fig. 4 is a transverse vertical section through 4 4 of Figs. 1 and 2, the screens being omitted.

Like letters indicate like parts in all figures of the drawings.

A is a suitable supporting-frame.

B is the vertical wind-trunk, divided interiorly by transverse vertical partitions *b'* into several interior ducts, *B'*; and C is a horizontal continuation of the trunk B, divided by partitions *c* into a corresponding number of horizontal ducts or passages, *C'*, which serve as settling-chambers for the gangue. Each of said settling-chambers *C'* is continuous with one of the vertical ducts *B'*.

D is a suction-fan, connected with a chamber, E, in which all of the several inclosed air-ducts terminate.

F F are a series of graduated screens, the coarser being uppermost, each leading to one of the several ducts *B'*. In each of said ducts

an upward air-current is produced by the suction-fan D, adjusted in force to material of the size fed into it by the screen or chute leading thereto, as will be further explained.

G G are shafts, bearing eccentrics *G'*, which co-operate with the springs H to duly shake the screens F, and thereby facilitate their action both as separators and as feeding-chutes to convey the material to be separated into the several air ducts or passages *B'*.

F' is an imperforate chute discharging into the outer air-passage, *B'*, or beyond it, as here shown. The screens F and chute F' are located in an inclined position beneath the upper or horizontal trunk, C, and between the uprights of the frame A, thereby adding nothing to the size of the machine, and being perfectly protected and quite out of the way. Said screens F and bottom closed chute, F', are supported by the spring side bars, H, through the medium of the metal connecting-plates H', provided with the lugs or flanges *h*, on which the screens severally rest. Bolts *h'*, inserted through the plates H' into the screen-rails, hold the latter permanently in place. The plates H' are also provided with flanges *h''*, which embrace the spring side bars, H, and are fitted, by a suitably broad head or top, to receive the thrust of the double cams or eccentrics *G'*. By means of the connecting-plates H' thus secured to the screens, the latter are all simultaneously and equally shaken.

It will be observed that the movement of the screens under the action of the eccentrics *G'* and the spring side bars, H, is in a direction at right angles with the planes of the screens, whereby the screens are first suddenly thrown obliquely downward away from the material resting thereon, and next suddenly upward against the material as it is falling in a vertical direction. The result is not only to perfectly clean the meshes of the screens at each downward movement thereof and to force the material through the screens at each upward movement thereof, but also to catch the falling substance at points nearer the lower ends of the screens, and thus to insure its advance toward the points of discharge into the ducts *B'*. This effect is enhanced by the obliquely upward thrust of the screens through the agency of the spring-bars H, for, said screens

being arrested in their upward movement by the eccentrics G' or other stops, the material is thrown obliquely upward or forward off the screens, so as to fall back on them farther down, or nearer the air-ducts B' .

The screens F extend unequally at their lower ends, as shown, in order to deliver each such material as will not pass through the meshes thereof into its appropriate duct or passage B' , and the chute F' may be arranged to deliver either into a duct or outside, as preferred. It is here shown as delivering outside or beyond the outer duct. The walls b and partitions b' , preferably of sheet-iron, also extend unequally to meet or proximate the screens, and terminate at the bottom in the triangular fixed cross-bars b^2 , beneath the broad under faces of which the material upon the screens passes downward, and against which the ends of the several screens strike as they rise at each upward impulse of the spring H . The side rails of the screens are seen to be above the screen-cloth. The latter is supported where it extends beyond the frames beneath the bars b^2 by imperforate stout metal plates f .

The horizontal wind-trunk C is divided by partitions c , which, together with the roof and bottom c' , incline laterally both ways from the center, as better seen in Figs. 3 and 4. The parts b and b' sweep over in a free curve to unite with the parts c and c' , as shown in Fig. 2, and thereby obviate serious retardation of the air-currents in their change from a vertical to a horizontal direction. The roof and bottom boards, c' , of the horizontal wind-trunk C extend forward beyond the partitions c , and are connected by the head-piece c^2 to form with the side walls, E^2 , the terminal chamber E , which receives the air from all of the several passages C' . At the bottom of the chamber E the passage E' leads to the suction-fan D . The passages C' are inclosed at the sides by the vertical boards C^2 , which are supported about three-eighths of an inch above the inclined bottom boards and partitions, c' and c , affording outlets o for the escape of the gangue deposited in said passages C' . Over these outlets are tacked strips of leather or other flexible material, o' , which are drawn down closely by the suction induced by the fan, but which yield to the pressure of accumulated dust on the inclined bottom boards, c' and c , and allow the same to escape.

At a little distance from the side boards, C^2 , are hinged the external vertical doors, C^3 , which inclose a space, i , through which the escaping gangue falls from the outlets o . An inclined cant-board, I , conducts said gangue as it falls to the troughs T .

On the eccentric or shaker shafts G G are fixed sprocket-wheels G^2 , and the two such wheels at each side of the machine are connected by the sprocket-chain g , preferably provided with the wings g' . The lower part of this chain runs in the trough T and operates to carry the gangue forward in said troughs, whence it escapes by a suitable spout or spouts.

Two spouts, T' and T^2 , are here shown leading from the bottom of the trough T , the former discharging into the upper screen, F , and the latter on the ground or into any vessel or conduit arranged to receive its contents.

Within the passages or ducts C' , and upon the inclined bottom boards, c c' , are fixed the transverse ribs R , rising about one-half the depth of the passages. These ribs are intended to form eddies in the air-currents, arresting their rapid sweep, and thereby facilitating the settling and deposit of the gangue borne by said currents, the air in the spaces between said ribs being obviously comparatively still.

At the mouth of the several passages C' are located valves V , operated from the exterior of the machine, by which valves the force of the currents in the several passages may be independently regulated at will. These valves are here shown as being fixed to the rocking shafts v , resting pivotally on or near the bottom boards, c c' . The two shafts v in each passage are connected by the beveled-gear wheels v' , so that both are operated simultaneously and to an equal extent. The passage is therefore opened or closed uniformly throughout its entire width. One of each pair of shafts v protrudes, and is provided with the external segmental worm-wheel, W , operated by the worm w , provided with the hand-wheels w' . The upper ends of the valves V are cut off, as shown in Figs. 3 and 4, to allow of their swinging simultaneously forward without interfering with each other, it being unnecessary to provide for perfectly closing the passages.

To more specifically detail the operation of the machine it is premised that placer-dust or crushed ores are the material treated, and the same is fed upon the upper one of the screens F by a suitable spout or spouts. Said screens being graduated with the coarser at the top, as stated, under the shaking action of the screws, the larger particles of gangue and mineral are tailed over from the topmost screen into the first vertical duct B' , connected with the lowermost horizontal duct, C' . In like manner smaller particles are discharged by the second screen into the second duct B' , and so on to the last screen, which is the finest of all. It is understood that the machine operates to lift the gangue or non-mineral-bearing particles through the ducts B' by the force of the air-currents, and to deposit said gangue or particles in the horizontal ducts C' , the mineral falling, by reason of its greater specific gravity, to the bottom of the vertical duct, into which, with the gangue, it is fed by the screens F . The material fed to the several ducts being of different dimensions, as explained, the air-currents must be made to correspondingly differ in strength. The force of the current in each passage C' will, in general, be determined by the position given the valves V in such passages; but it will also in part depend upon the relation of the passage to the fan; wherefore the fan is preferably located at the bottom of the chamber E , or more directly in line with the lower

passage, C', through which the stronger currents are required. Thus a certain degree of adjustment of the draft is effected independently of the valves V.

5 Generally stated, it is the intention to so adjust the air-currents as to obtain gangue or non-mineral-bearing substance only in the discharge from the openings o; but to insure more perfect separation of the gangue from the mineral, and at the same time to avoid loss of mineral, it is deemed best to make the several currents of such strength as to carry up some small amount of mineral in each duct. This will, of course, by reason of its greater specific gravity, be first deposited in the horizontal passages C', and will be found emerging at that end of the openings o nearest the vertical ducts. By careful observation this effect may be limited to any degree, and to prevent any loss of the mineral so raised and deposited the first spout, T', is provided, which carries all mineral-bearing material discharged into the trough T back again to the screens. The remaining or non-mineral-bearing gangue is carried off by the spout T².

The chute F' is not perforated, and may discharge in the last of the ducts B'; or, one more screen being added for this duct, said chute F', receiving the mineral discharge of all the screens, may deliver said mineral outside the machine, as shown clearly in Fig. 2. Being without perforation and operating merely to convey the mineral, F' may obviously be an endless belt or other form of carrier.

35 It will be observed that the air is directed into the ducts or passages B' by the screens F, and therefore enters said passages beneath the ends of the screens in a practically horizontal direction. The material, being operated upon as it passes over the ends of the screens, falls therefore directly across the current, and such portions of the gangue as are not taken up by the weaker part of the air-draft (probably first encountered) meet the stronger parts of the current in their further fall. No part of the gangue from either screen escapes the full or a sufficient force in the current to carry the same upward, therefore, provided the air-currents be properly adjusted by the appropriate valves V.

The spout T' may, if desired, be constructed to slide backward and forward in the manner shown in Fig. 5. The trough is here shown as having a long aperture, t, in its bottom, and the spout T' as having horizontal wings or extensions t', either of which will cover the aperture and form the bottom of the trough when the spout is placed at the end of the aperture t. The spout may obviously be supported by arranging the wings t' to slide beneath the bottom of the trough T. As a result of this construction, the trough T' may be readily moved, so that only that portion of the gangue found by examination to contain mineral need be returned to the screens and again operated upon.

While it is preferable that the ducts B' be vertical, they may be inclined somewhat from

the vertical without materially modifying the operation of the machine. They are herein spoken of as vertical in contradistinction to the horizontal ducts C', which also may obviously be inclined in some degree from the horizontal.

The machine is here shown as being driven through the central pulley, P, on the shaft P'. Side belts run from pulleys P² to the pulleys D' on opposite ends of the fan-shaft, and also from pulleys P³ to the pulleys G³ on shafts G. The relative sizes of these pulleys will be determined by the speeds required in the several parts; or a wholly different arrangement of driving mechanism may be employed, if preferred.

The spring supporting-bars H may be secured to the frame by adjusting-plates, where by they may be elevated bodily, or by which they may be sprung upward centrally, to increase their force in case they sag or fail to give sufficient upward thrust.

I claim as my invention—

1. In a pneumatic ore concentrator or separator, two or more air-ducts, combined with mechanism for producing air-currents of different degrees of force in the different ducts, and mechanism for feeding material of different dimensions severally to the different ducts, whereby the larger particles of material so fed to the machine are acted upon by the stronger currents, substantially as described.

2. In a pneumatic ore-concentrator, the combination of two or more air-ducts, each provided with a regulating-valve, a corresponding number of screens of different degrees of fineness arranged to feed into the several ducts, and a suction-fan, substantially as and for the purposes set forth.

3. The combination, in a pneumatic ore-concentrator, of the vertical air-ducts B', the horizontal extensions of said ducts, C', the regulating-valves V, the terminal air-chamber E, and the suction-fan D with the screens or chutes F, arranged to feed into the several ducts B', substantially as and for the purposes set forth.

4. In a pneumatic separator, the combination of the unequally-extended screens or chutes F and the parts b b', also unequally extended to meet or proximate the screens F, whereby the air-currents are directed into the passages B' at their lower extremities and between the screens, substantially as shown.

5. In a pneumatic ore-concentrator, an air-passage having its settling portion inclosed between parallel laterally-inclined top and bottom walls, and provided with ribs R, resting on the lower inclosing-wall and directed transversely to the direction of the air-current, substantially as described.

6. In combination with the wind-trunk C, containing one or more settling-chambers C', having lateral openings o, the exterior part, C³, arranged to give the passage i, substantially as described.

7. In combination with the screen F, the

wind-trunk B, and the settling-chamber C, the latter having the discharge-opening *o*, the trough T, arranged to catch the material discharged from said opening and to deliver the same back to the screen, substantially as described.

8. In combination with the wind-trunk provided with the discharge-opening *o*, the exterior trough, T, arranged to receive the material from said openings, and provided with a spout and a traveling belt, *g*, substantially as described, and for the purposes set forth.

9. In combination with the separator, the trough T, provided with a movable spout, T', substantially as and for the purpose set forth.

10. In combination with the vertical trunk B and the elevated horizontal trunk C, the

screens or chutes F F', arranged within the frame A and beneath the trunk C, to discharge into the trunk B, substantially as described.

11. The inclined screens or chutes F, combined with the spring supporting-bars H, arranged parallel with the screens, the connecting-plates H', and cams G', together arranged and operating substantially as described, and for the purposes set forth.

In testimony that I claim the foregoing as my invention I affix my signature in presence of two witnesses.

ALVAN P. GRANGER.

Witnesses:

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