

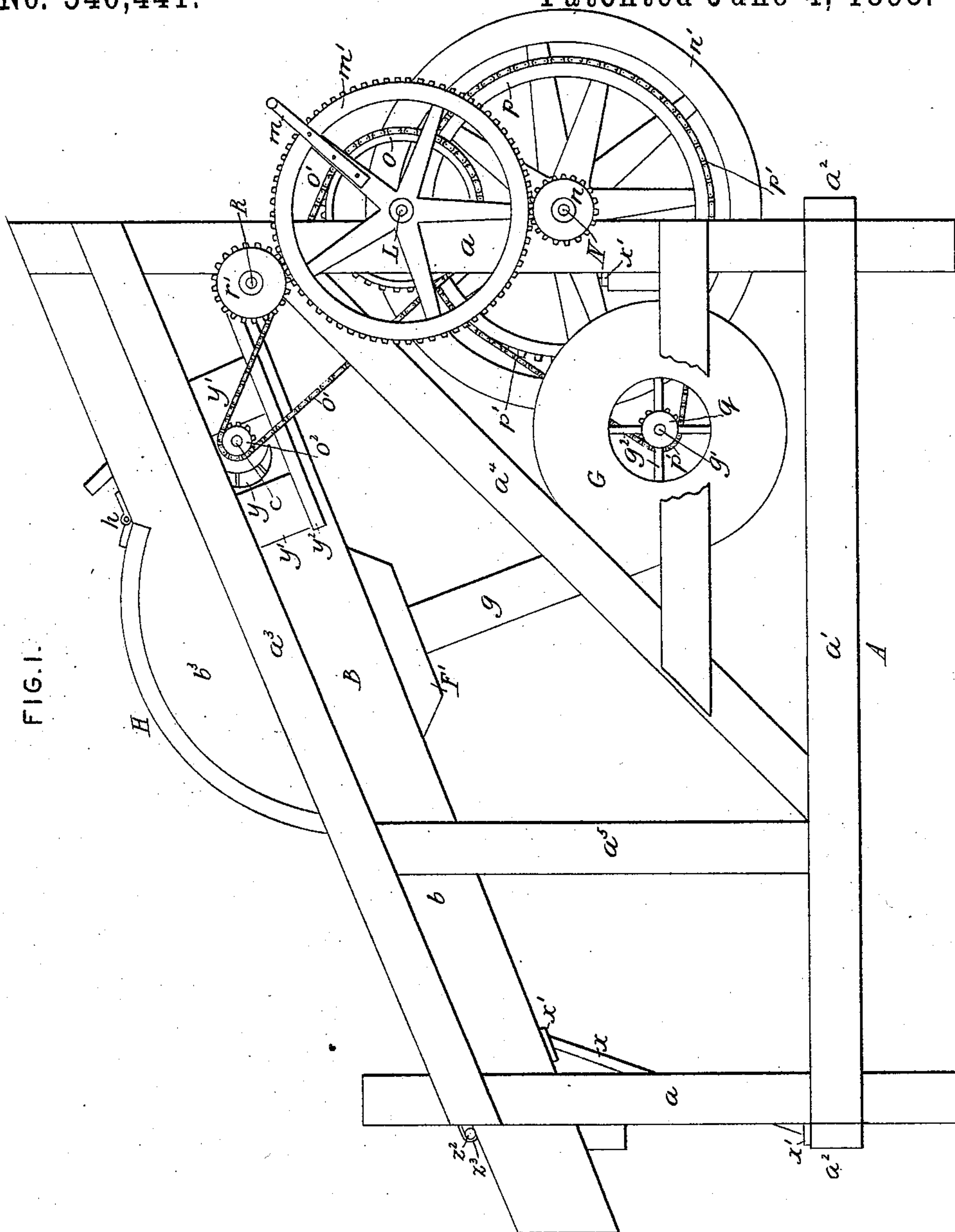
(No Model.)

3 Sheets—Sheet 1.

E. A. HEWITT.  
DRY SEPARATOR.

No. 540,441.

Patented June 4, 1895.



Witnesses

W. J. Norton  
R. H. Wood

Inventor

Elisha A. Hewitt

By *W. M. Audley & Co.*  
his Attorneys.

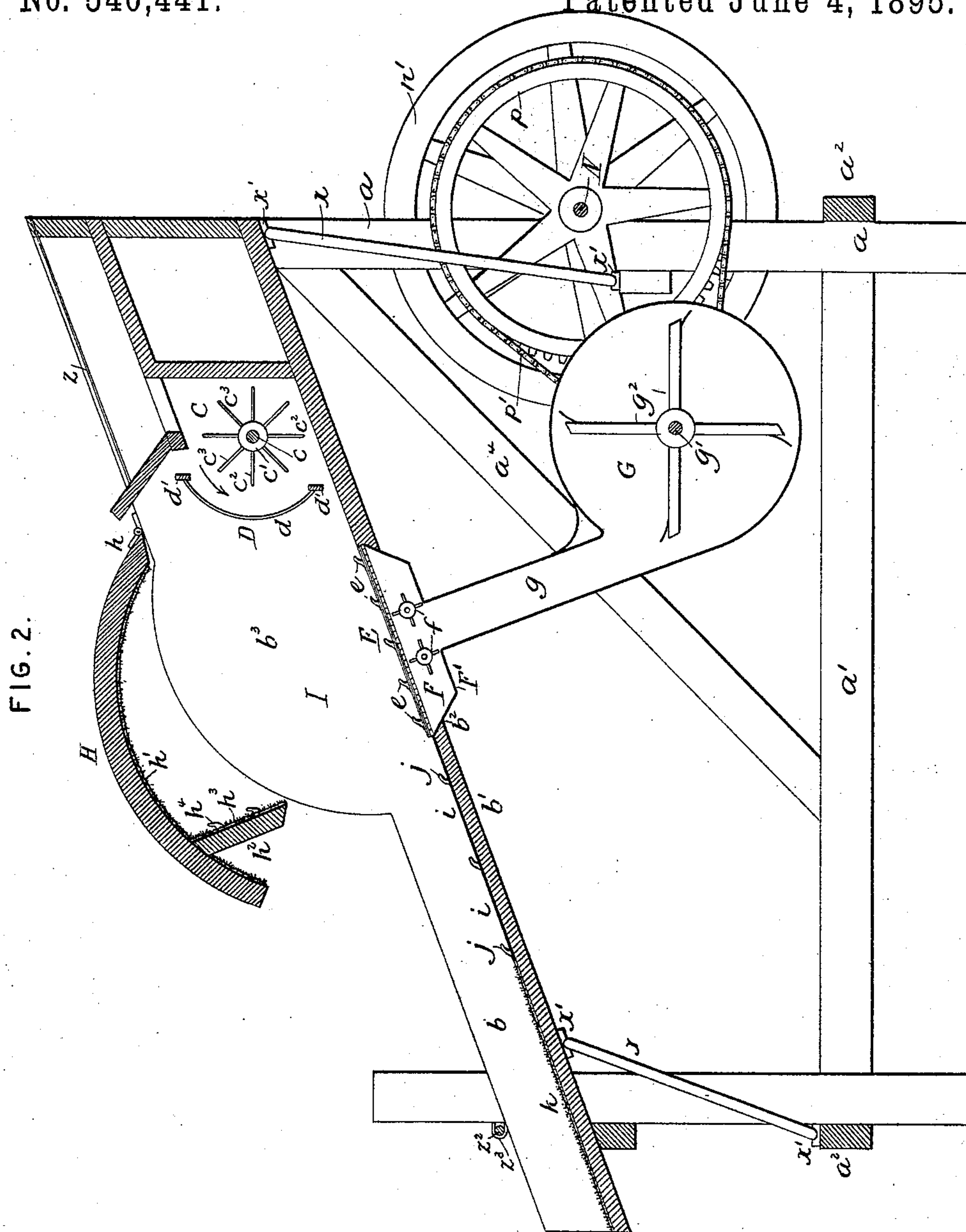
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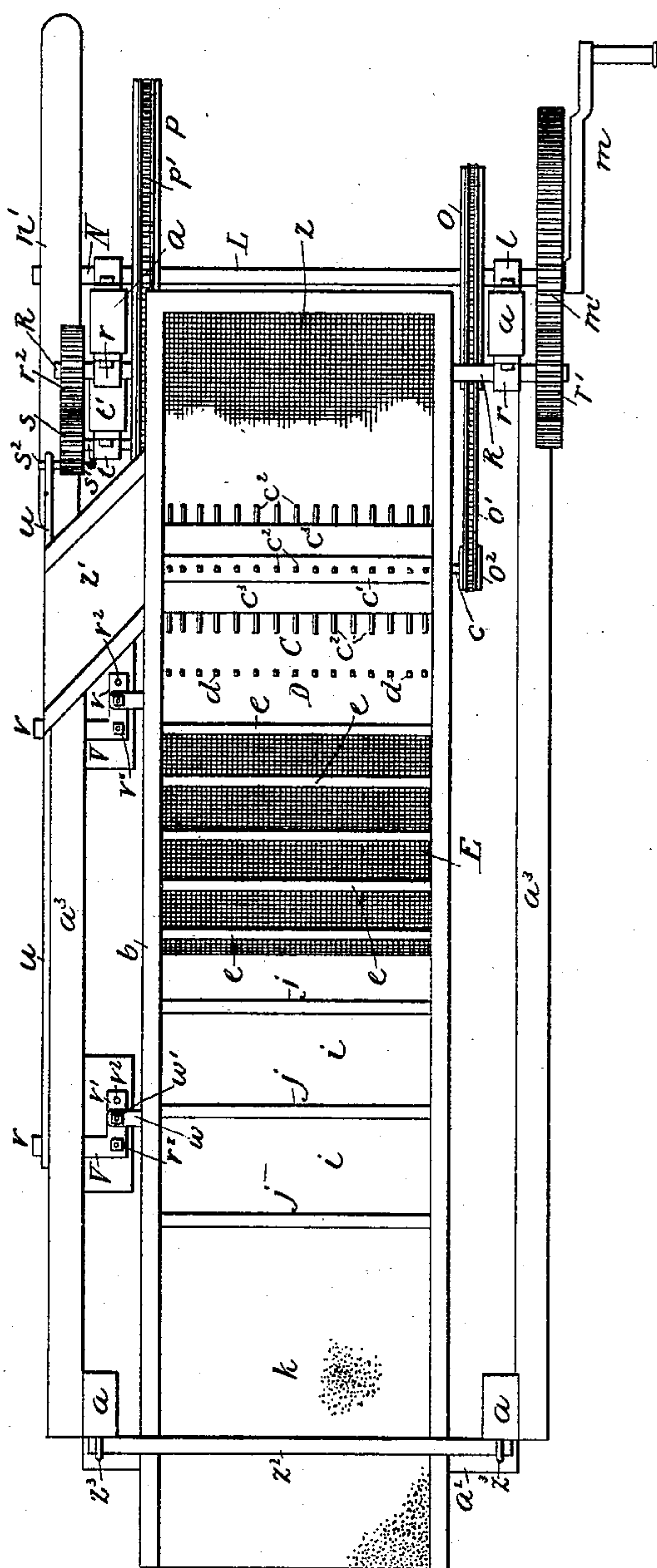
3 Sheets—Sheet 3.

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# UNITED STATES PATENT OFFICE.

ELISHA A. HEWITT, OF DENVER, COLORADO.

## DRY SEPARATOR.

SPECIFICATION forming part of Letters Patent No. 540,441, dated June 4, 1895.

Application filed May 24, 1894. Serial No. 512,289. (No model.)

*To all whom it may concern:*

Be it known that I, ELISHA A. HEWITT, a citizen of the United States, residing at Denver, in the county of Arapahoe and State of Colorado, have invented certain new and useful Improvements in Dry Separators; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to machines adapted for application to the operations of dry placer mining, and particularly to machines for separating the ore by what is known as the dry process, or in other words that process employing a blast of atmospheric air.

The invention has for its object the provision of a comparatively simply constructed but efficient machine of this character, by the operation of which the maximum quantity of ore is obtained by reason of facilities for breaking, pulverizing and disintegrating the dirt while in suspension; by the use of counter currents of air, and by the use of improved means for retaining the separated ore.

The invention consists in certain features of novelty, and in certain details of construction and operation which will fully and clearly appear from a reading of the subjoined description, taken in connection with the accompanying drawings, which form a part of this specification, and in which—

Figure 1 is a side elevation of my improved separator. Fig. 2 is a vertical longitudinal central section, and Fig. 3 is a top plan view thereof.

Referring to the said drawings, in which like letters denote like parts in all the figures, A denotes the frame of the machine which consists of four uprights  $a$   $a$   $a$   $a$  to which are bolted near their lower ends side bars  $a'$   $a'$  and end bars  $a^2$   $a^2$ , and near the tops of the uprights are bolted side bars  $a^3$   $a^3$ . This frame is strengthened by brace bars  $a^4$   $a^4$  and  $a^5$   $a^5$  arranged as shown. In the upper part of the frame is placed at any desired angle a box or sluice B having the sides  $b$   $b$ , and the bottom  $b'$  and at the upper end of

said box is a hopper into which the dirt is placed, and from the lower end of which the dirt is automatically dropped or fed upon a revoluble breaking or pulverizing wheel C mounted on a shaft  $c$  journaled in suitable bearings arranged in the sides  $b$ . This wheel is constructed with a hub  $c'$  to which are secured the pins  $c^2$   $c^2$  radially arranged, and between the pins are secured radially and longitudinal of the hub, blades  $c^3$   $c^3$ , by which arrangement the wheel performs the double function of a pulverizer for breaking up or disintegrating the dirt, and of a fan for creating a blast of air in the direction of the movement of the débris or dirt. Adjacent to this wheel is a stationary grate D which may be constructed in the manner of the ordinary screen, but which is preferably formed of concave or other shaped bars  $d$  secured at the requisite distance apart and at each end, to rods  $d'$  arranged transversely to the box or sluice. The dirt leaving the wheel is thrown rapidly by the blast of air against and through the grate, and from thence it falls or drops in a pulverized or disintegrated condition upon a triple screen E which is arranged across an opening  $b^2$  formed in the bottom of the box or sluice as shown. This triple screen consists of three screens of fine mesh placed one above the other and separated slightly, and operating to permit the passage through the same of the air currents, but to prevent the dirt and débris even when finely divided from falling through the opening  $b^2$ . The uppermost of these screens supports a series of riffles  $e$  the operation of which together with that of the screen will be hereinafter set forth. Below the triple screen is an air chamber F formed by a casing  $F'$  secured to the bottom of the box or sluice around the opening  $b^2$  and which receives a blast of air driven from a blower G arranged in the lower part of the frame. This blower is connected to said air chamber by an air duct or pipe  $g$ , and is preferably of the rotary type, the shaft being at  $g'$  and the blades at  $g^2$ . Located in said air chamber are two deflectors  $f$   $f$  which are fan shaped and continuously revolved during the operation of the machine by suitable connections with the driving mechanism; and these deflectors operate to distribute the air equally in its passage through the triple screen, inasmuch as the blast of air as



it enters the chamber from the blower is divided by the blades of the deflectors in such a manner as to insure an even distribution of air through the entire screen. This blast or current of air coming from the blower passes through the triple screen to which the riffles are attached, and combined with a lateral movement of the box or sluice hereinafter fully described, separates the gold or other ore from the débris or dirt and causes the gold or other ore to settle and to be retained in the riffles. The débris or dirt being raised above said riffles, and coming in contact with the upper blast or current of air induced by the wheel C, is rapidly driven thereby down through the box or sluice.

At  $b^3$ , the sides of the box are enlarged or raised and the top thereof is curved preferably in the arc of a circle, and at  $h$  is hinged a hood or cover H which is curved to conform to the top of the enlargement  $b^3$  of the sides of the box or sluice on which it normally rests. This hood or cover together with the sides and bottom of the box inclose an air chamber I of comparatively large area which is located directly over the triple screen and in line with the fans  $f$ , chamber F and air duct or pipe from the blower. On the under side of this hood or cover and on the sides of the enlargements  $b^3$  is a lining  $h'$  of fur, skin, blanket, carpet or any other suitable material for the purpose of catching and retaining the dust which is disengaged from the débris or dirt by the blasts or currents of air, and which contains large quantities of microscopic gold or other ore. Secured near the outer or free end of the hood or cover is a depending partition board  $h^2$  which is provided with a lining  $h^3$  similar to the lining on the under side of the hood or cover, and with riffles  $h^4$ . This board, together with its lining and riffles, operates to return or deflect backward the débris, dirt and dust, and to retain the latter with its ore as will be understood.

Secured to the bottom of the box or sluice adjacent to the triple screen are amalgamated plates  $i$ , riffles  $j$  and carpet  $k$  or other suitable material which catch and retain the débris and dirt in its passage through the remainder of the box or sluice.

The operating parts of my improved machine are driven by any suitable arrangement of wheels, gears and chains but I prefer the arrangement shown and which I will now describe. The driving shaft L is journaled in suitable boxes  $l$ ,  $l$ , secured to the forward uprights  $a$ ,  $a$ , and on one end thereof is secured a crank  $m$  by which the same is rotated.  $m'$  is a gear wheel of comparatively large diameter mounted on said shaft which meshes with a pinion  $n$  mounted on the end of a second shaft N which carries at its other end a fly or balance wheel  $n'$ . Mounted on the shaft L is a sprocket wheel  $o$  around which is passed a sprocket chain  $o'$  which latter in turn passes around a sprocket pinion  $o^2$  secured to one end of the shaft  $c$  which carries the wheel C.

On the shaft N is mounted a large sprocket wheel  $p$ , and  $p'$  is a sprocket chain which is passed around said wheel  $p$  and a sprocket pinion  $q$  secured to one end of the shaft  $g'$  of the blower G. The driving shaft being rotated by hand or any other suitable power, the wheel C is rapidly revolved through the action of the sprocket wheels  $o$ ,  $o^2$  and the sprocket chain  $o'$ . The rotation of the shaft N is very rapid being multiplied by the differential gearing  $m' n$ , and this speed is still further multiplied by the sprocket wheels  $p$ ,  $q$  and the sprocket chain  $p'$  which operate the fan of the blower.

I will now describe the means employed for imparting a lateral, reciprocating motion to the box or sluice.

R is a shaft journaled in boxes  $r$ ,  $r$  secured to the inner side of the forward uprights  $a$ ,  $a$ , and  $r'$  is a pinion on one end of said shaft which meshes with the gear  $m'$  on the driving shaft and through which latter the shaft R is rotated. On the other end of the shaft R is mounted a gear  $r^2$  which meshes with a crank pinion  $s$  on a short shaft  $s'$  journaled in a box  $t$  fixed to a portion of the frame  $t'$ . This crank pinion  $s$  has a crank pin  $s^2$ , and  $u$  is a connecting rod connected at one end to said pin and to the arms  $v$ ,  $v$  of two bell crank levers V, V pivotally secured to the frame at  $v^*$ ,  $v^*$ . The other arms  $v'$ ,  $v'$  of these bell crank levers are provided with apertures  $v^2$ ,  $v^2$  by which are secured adjustably by means of bolts or pivots  $w'$ , two lugs  $w$ ,  $w$ , arranged on the side of the box or sluice. This feature of adjustability regulates the lateral movements of the box or sluice, it being evident that the farther the connection of the lugs and arms  $v'$  from the pivotal point of the bell crank lever, the greater will be the movement of the box or sluice. In order to permit of the lateral movement of the box or sluice, as well as a longitudinal movement to allow of the adjustability of its connection with the actuating devices, the box or sluice is supported by rods  $x$ ,  $x$ , which engage at each end disks  $x'$ ,  $x'$  formed with depressions and secured to the underside of the box or sluice and to the frame as shown. Aside from the advantages given for the employment of said rods, the friction incidental to the movement of the box or sluice is reduced to the minimum. The lateral movement of the box or sluice is very rapid owing to the multiplied speed which is imparted through the gearing interposed between it and the source of power; and owing to the shortness of the arms  $v'$  of the bell crank lever, as compared with the arms  $v$  the power required to agitate the box or sluice is small.

For the purpose of regulating the supply of air to the wheel C, I provide an opening  $y$  in the side of the box or casing adjacent to said wheel, and the width of said opening and consequently the entrance of air, is controlled by slide doors  $y'$ ,  $y'$  which move in a guide  $y^2$ .

I prefer to arrange in the hopper a screen  $z$  which extends over its entire surface and



through which the débris and dirt must pass before it can be fed to the machine. As an outlet for the screen I provide a spout  $z'$  which leads from the hopper above the screen to a point outside of the machine.  $z^2$  is a rod secured to the rear uprights  $a$  and which serves to hold the box or sluice in place, and if desired this rod may be secured by staples  $z^3$  as shown.

The operation of my improved machine is as follows: Power being applied to the driving shaft, the operating parts are set in motion through the intermediate mechanisms heretofore described. The débris or dirt is deposited on the screen arranged in the hopper and the lateral agitation of the box or sluice causes the finer particles of the débris or dirt to pass through the meshes of the screen and fall on the bottom of the hopper, and by reason of the inclination of the latter aided by the movement of the box or sluice, the débris or dirt moves downward to the lower or inner end of the hopper where is located the outlet. Leaving said hopper the débris or dirt falls on the pulverizing wheel and fan and from thence is thrown rapidly by the blast of air from the latter against and through the breaker. By this time the débris or dirt is reduced by said operations to comparatively finely divided particles and dust which leaving the breaker falls on the triple screen and riffles and meets the blast or current of air from the blower. The movement of the box or sluice agitates the débris or dirt, and the air from the blower separates the dust from the body of material and carries the same upward until it is caught and retained by the lining of the hood or cover, and such particles as are too large or heavy to be retained are carried by the two currents or blasts of air against the partition board on the hood or cover where it is there caught and retained by the lining and riffles. The agitation of the box or sluice and its inclination, aided by the blast of air from the wheel causes such of the particles of the débris or dirt as have not been retained by the riffles on the triple screen to move downward through the box or sluice and to be caught and retained by the amalgamated plates, riffles and carpet.

From the foregoing it will be seen that the débris or dirt is broken up, disintegrated and pulverized while in suspension, inasmuch as the blasts or currents of air are of sufficient power to keep the particles in suspension, until they are caught and retained in the manner hereinbefore stated. Again, the counter currents induced by the blasts of air from the wheel and the blower, together with the facilities connected with the hood or cover render it possible to save the major portion of the microscopic gold or other ore mixed with the dust of the débris or dirt, which heretofore has been recovered only to a very small extent. The arrangement of the fans in the air chamber and in the path of the air from the

blow, operates to diffuse the blast of air in such a manner as to separate almost entirely from the body of the débris or dirt the dust containing this fine gold, inasmuch as the air is thereby caused to pass through every portion of the body of material, and not through the central portion as would be the case if the fans were dispensed with.

By the arrangement of the combined pulverizing wheel and fan which performs the double function of reducing the débris or dust and of inducing a blast of air to convey the same, the power to operate the machine is less than would be required to run a pulverizing wheel and a fan separately. The breaker is so arranged as to receive the impact of the débris or dirt while at its greatest velocity and operates to reduce such of the particles as have escaped the action of the wheel, and to still further reduce the particles which have been once divided.

The general construction of my improved machine is simple, and consequently the liability to disorder is small. The operation is attended with very effective results, and the débris or dirt and the ore contained therein being rapidly disposed of, the capacity of the machine is at the maximum.

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

1. In a machine of the class described, a wheel adjacent to the outlet of the hopper carrying breaking pins and fan blades, and a stationary grate adjacent to said wheel, the combination operating to reduce the débris or dirt while in suspension.

2. In a machine of the class described, the combination of the hopper, the wheel arranged below the outlet of said hopper having breaking pins and fan blades alternately arranged on its periphery, and a concave grate adjacent to said wheel, substantially as and for the purposes set forth.

3. In a machine of the class described, the combination of the wheel carrying breaking pins and fan blades, the stationary grate adjacent to said wheel, the triple screen arranged in the path of the débris or dirt, and a blower arranged to deliver air across said path, substantially as and for the purposes set forth.

4. In a machine of the class described, the combination of the wheel carrying breaking pins and fan blades, the concave grate adjacent to said wheel, the triple screen arranged in the path of the débris or dirt, and carrying riffles, an air chamber below said screen, a blower arranged to deliver air through said chamber and screen across said path, and deflectors in said chamber, all substantially as and for the purposes set forth.

5. In a machine of the class described the combination of the hopper, the wheel carrying alternately arranged breaking pins and fan blades and arranged below the outlet of said hopper, a concave grate adjacent to said



wheel, a triple screen arranged in the path of the débris or dirt and carrying riffles, a chamber below said screen, deflectors in said chamber, and a blower arranged to deliver air through said chamber and screen and across said path, substantially as and for the purposes set forth.

6. In a machine of the class described, the combination of the wheel carrying breaking pins and fan blades, the concave grate adjacent to said wheel, the triple screen in the path of the débris or dirt and carrying riffles an air chamber below said screen, a blower arranged to deliver air through said chamber and screen and across said path, a chamber above said screen, and a removable hood or cover for said chamber, substantially as and for the purposes set forth.

7. In a machine of the class described, the combination of the wheel carrying breaking pins and fan blades and arranged below the outlet of the hopper, the concave grate adjacent to said wheel, the triple screen carrying riffles and arranged in the path of the débris or dirt, a chamber above the screen having a removable hood or cover, an air chamber below the screen, deflectors in said air chamber, a blower and an air duct leading from said blower to the air chamber, whereby air is delivered through said chamber and screen across said path, substantially as and for the purposes set forth.

8. In a machine of the class described, the combination of the box or sluice having an opening in its bottom, a triple screen across said opening and carrying riffles, a chamber below said screen having deflectors therein, a blower connected to said chamber for delivering air through said chamber and screen across the path of the débris or dirt, a chamber above the screen having a removable hood or cover, a hopper, a breaking wheel carrying fan blades, and a concave grate between said wheel and screen, all substantially as and for the purposes described.

9. In a machine of the class described, the combination with the triple screen and a blower arranged to deliver air through said screen and across the path of the débris or dirt, an air chamber above the screen, and a hood or cover for said chamber having a lin-

ing of fibrous material for catching and retaining the dust separated by said air current.

10. In a machine of the class described the combination of a fan or blower arranged to deliver air in the path of the débris or dirt, a fan or blower arranged to deliver air across said path, the triple screen through which air from the latter blower passes, a chamber above the screen a hood or cover therefor having a lining of fibrous material, and a partition board depending from said hood or cover having a lining and riffles, substantially as and for the purposes set forth.

11. In a machine of the class described, the combination with the box or sluice, of a hopper, a wheel arranged below the outlet of said hopper and carrying breaking pins and fan blades, a concave grate adjacent to said wheel, amalgamated plates carrying riffles in the bottom of said box in the path of the débris or dirt, and the carpet arranged also in said bottom and adjacent to the plates, substantially as and for the purposes set forth.

12. In a machine of the class described, the combination of the combined breaking wheel and fan, the stationary breaker, the triple screen carrying the riffles, the air chamber above said screen, the hood or cover for said chamber the partition board having the riffles, the lining for the sides of the chamber, hood or cover and board, the air chamber below the screen, the fans in said chamber, the fan or blower leading to said chamber, and the amalgamated plates, riffles and carpet, all substantially as and for the purposes set forth.

13. In a machine of the class described, the combination with a box or sluice having openings in its sides, doors for controlling said openings, the inclined hopper having an opening in its bottom, and a screen across its mouth, a wheel adjacent to the outlet of the hopper and the openings in the box or sluice, said wheel carrying breaking pins and fan blades, and a concave grate adjacent to said wheel, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

ELISHA A. HEWITT.

Witnesses:

GEORGE J. HUMBERT,  
EARL HEWITT.