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H. SECK.

MACHINE FOR SEPARATING LIGHT AND HEAVY SUBSTANCES.

No. 306,648. Patented Oct. 14, 1884.

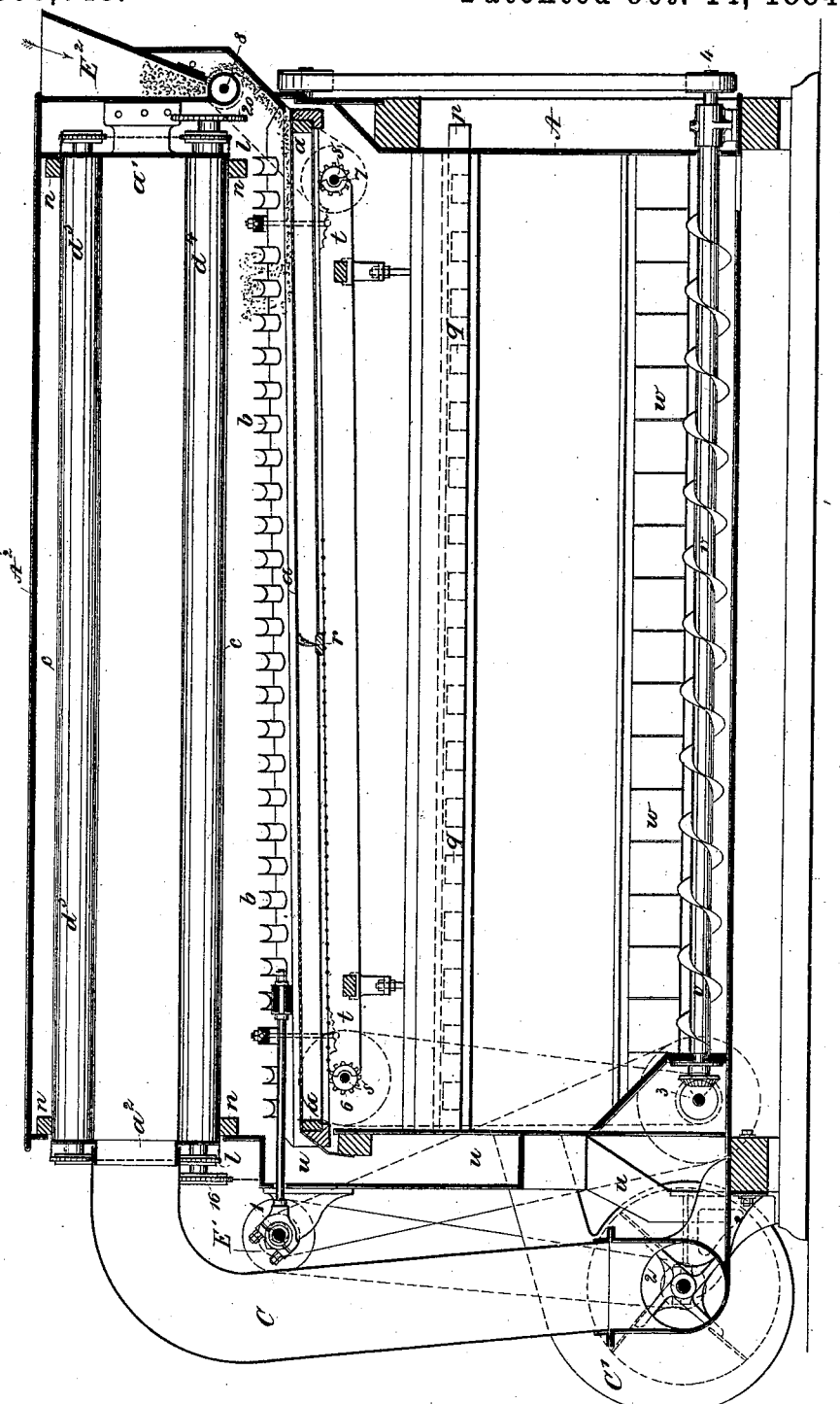

Fig 1.

Witnesses.
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By James L. Norris.
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(No Model.) 5 Sheets—Sheet 2.

H. SECK.

MACHINE FOR SEPARATING LIGHT AND HEAVY SUBSTANCES.

No. 306,648. Patented Oct. 14, 1884.

Fig. 1ª.

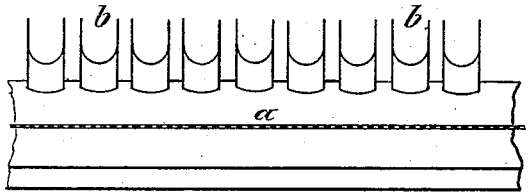
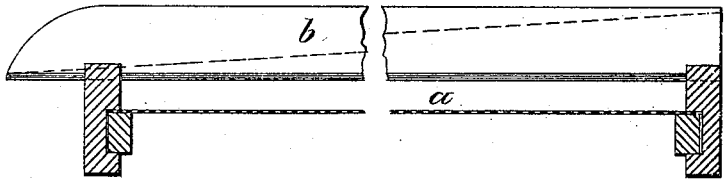


Fig. 2ª.



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(No Model.) 5 Sheets—Sheet 3.

H. SECK.

MACHINE FOR SEPARATING LIGHT AND HEAVY SUBSTANCES.

No. 306,648. Patented Oct. 14, 1884.

Fig. 2.

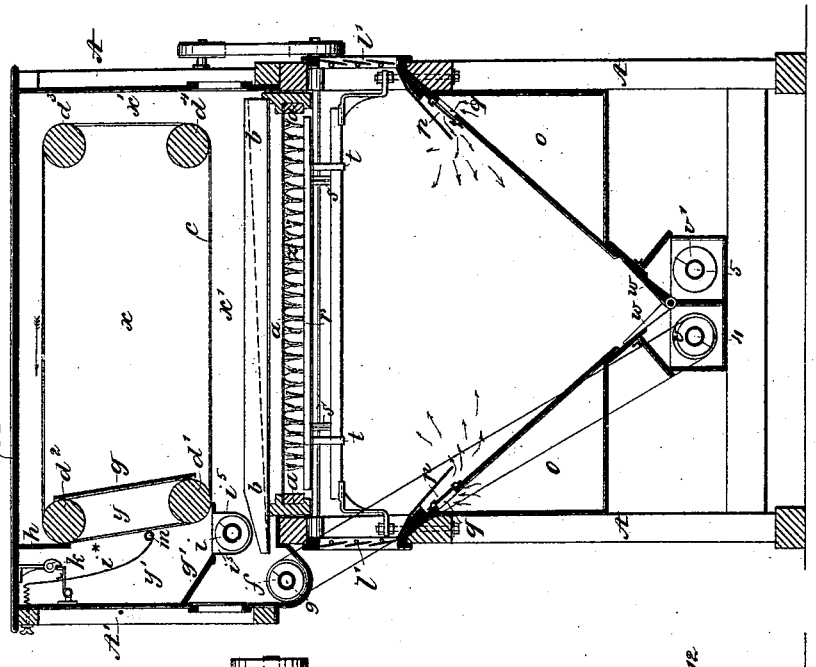
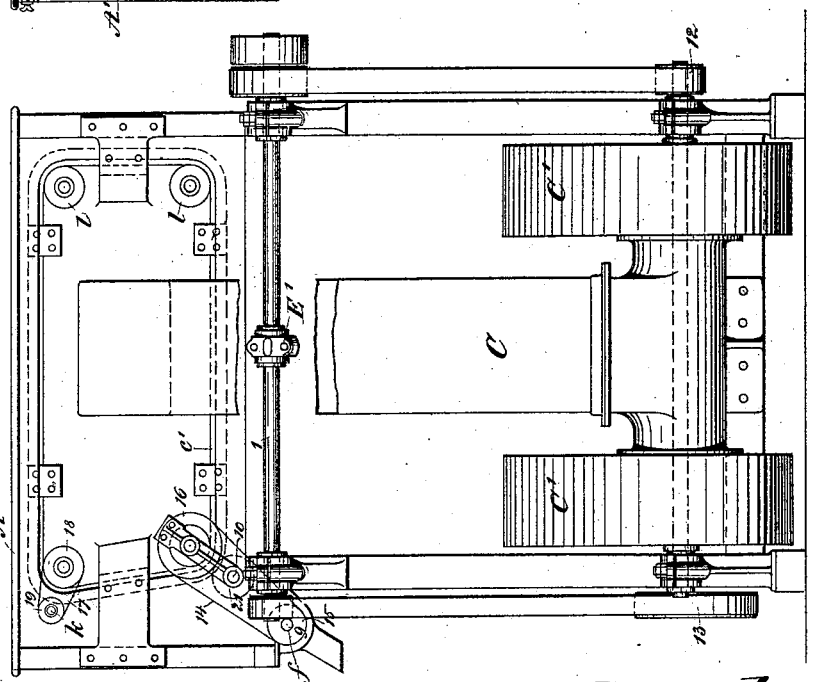


Fig. 3.



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(No Model.) 5 Sheets—Sheet 4.

H. SECK.

MACHINE FOR SEPARATING LIGHT AND HEAVY SUBSTANCES.

No. 306,648. Patented Oct. 14, 1884.

Fig. 4

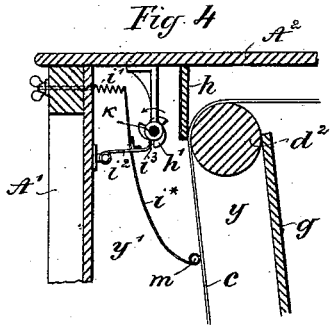


Fig. 5.

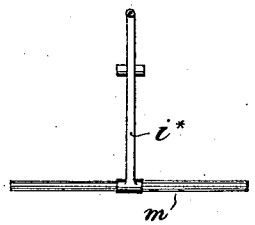


Fig. 7.

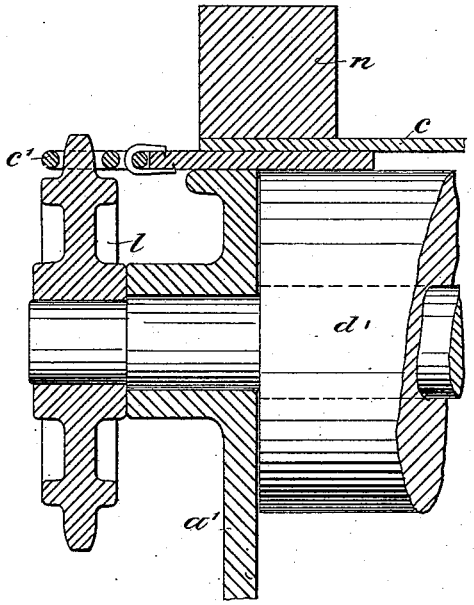


Fig. 6

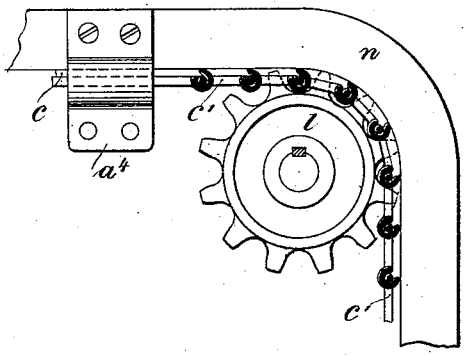
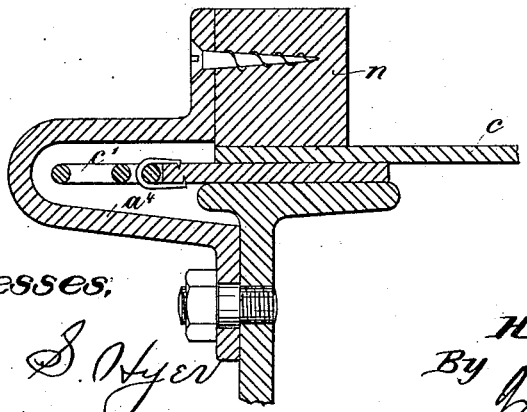


Fig. 8.



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(No Model.) 5 Sheets—Sheet 5.

H. SECK.

MACHINE FOR SEPARATING LIGHT AND HEAVY SUBSTANCES.

No. 306,648. Patented Oct. 14, 1884.

Fig. 9.

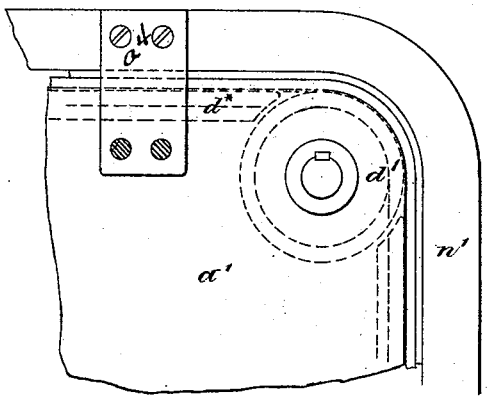


Fig. 10

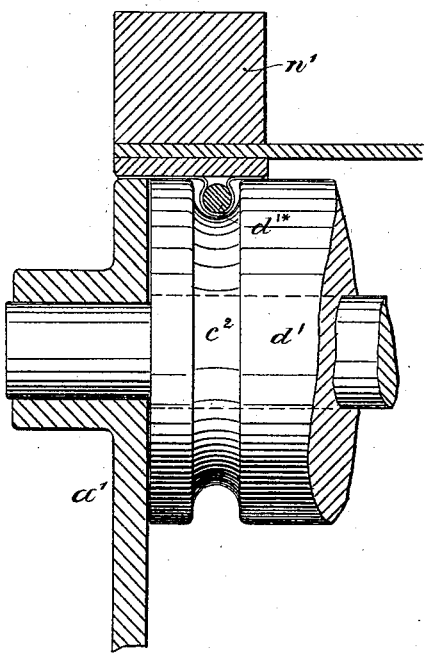
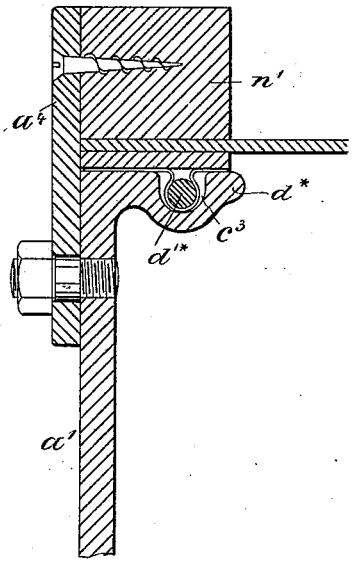


Fig. 11.



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UNITED STATES PATENT OFFICE.

HEINRICH SECK, OF DRESDEN, SAXONY, GERMANY.

MACHINE FOR SEPARATING LIGHT AND HEAVY SUBSTANCES.

SPECIFICATION forming part of Letters Patent No. 306,648, dated October 14, 1884.

Application filed April 12, 1884. (No model.) Patented in Belgium March 31, 1884, No. 64,567.

To all whom it may concern:

Be it known that I, HEINRICH SECK, of the city of Dresden, in the Kingdom of Saxony and German Empire, have invented a certain new and useful Improvement in Machines for Separating Light and Heavy Substances, of which the following is a specification, reference being had to the accompanying drawings, and to the letters of reference marked thereon.

This invention relates to apparatus for separating by means of air-suction light and heavy substances, and is more particularly intended for the purification of grits and middlings in the manufacture of flour, with a view to obviate the danger of fire and explosion arising from the deposition of the dust sucked from the said middlings, and heretofore generally collected in separate dust-collectors or dust-chambers.

The invention consists in the construction and the combination of parts hereinafter particularly described, and pointed out in the claims.

In the accompanying drawings, forming part of this specification, Figure 1 is a longitudinal vertical section of a machine constructed according to this invention. Fig. 2 is a transverse section of the same. Fig. 3 is an end view of the same. Figs. 1^a and 2^a show part of the rocking sieve constructed with the said grate drawn to an enlarged scale. Figs. 4 and 5 show the device for beating the filtering-cloth. Figs. 6, 7, and 8 illustrate the means for tightening and stretching the said cloth, and Figs. 9, 10, and 11 show a modification of the said means.

All the views of details above mentioned are drawn to enlarged scales.

A indicates the frame of the machine, having the upper end plates, a' a^2, in which are suitably journaled the four rollers d' d^2 d^3 d^4, arranged longitudinally of the frame.

c indicates the endless filtering-cloth passing over the said four rollers, and moving transversely of the machine when rotatory motion is imparted to the rollers. Upon each end of each of the four rollers is secured a sprocket-wheel, *l*. The four sprocket-wheels on each end of the machine are connected by an endless chain, c', the several links of which are firmly connected by means of suitable hooks or staples with the filtering-cloth *c*, so that the latter will be stretched in the direction of its length and partake of the motion of the chains c' when the latter run over the several sprocket-wheels *l*.

n n indicate wooden bars of convenient shape which are arranged around the flanges of the end plates, a' a^2, and held in position thereon by means of suitable connecting-plates a^4, secured to the end plates, a' a^2, and bars *n* by bolts or screws, the said bars *n* serving to hold the filtering-cloth in contact with the flanges of the end plates, a' a^2, so as to prevent the outside air from entering the interior of the machine. As shown in Figs. 6 and 8, the said connecting-plates a^4 have an angular form in order to allow the chain c' to pass between them and the plates a' a^2; but in cases where the chain is dispensed with as a means for imparting motion to the filtering-cloth the plates a^4 may be of the plain form shown in Figs. 9 and 11.

In the modified arrangement illustrated in the latter figures the tightening and stretching of the filtering-cloth is provided for as follows: The rollers d', &c., near each of their ends, are provided with circular grooves or channels c^2, and between the said rollers the end plates, a' a^2, of the frame are constructed with flanges d^*, projecting inwardly and having the grooves c^3. A strip of leather or other suitable material is fastened by stitching to the under side of the outer rims of the filtering-cloth *c*, and a similar strip of linen inclosing a rope, d'^*, is stitched to the under side of the leather. The rope d'^* is inserted into the said grooves c^2 and c^3, and is held in position therein by means of the bar n', fastened upon the end plate a' by the connecting-plate a^4, thus holding the filtering-cloth longitudinally in a stretched position, while at the same time the connection between the end plate and the filtering-cloth is tightened effectually, so that air cannot enter the interior of the machine from without. Of the end plates, a' a^2, the one, a', is closed, while the other, a^2, is provided with a suitable opening, which is connected to the conduit C of the ventilators C', so as to allow the latter to suck the air from the interior of the filtering-cloth *c* through the said end plate a^2.

g indicates a plate or board secured to the

inner sides of the end plates, a' a^2, and bearing with the least friction possible against the two rollers d' d^2, but at the same time tightening well upon the said rollers d' and d^2, so as to divide the interior of the filtering-cloth c into two spaces or compartments—that is to say, into a space, x, which is acted upon by the flow of air caused by the sucking action of the ventilators, and into a space, y, which is not disturbed by the said sucking action, and the flow of air thereby produced. Another plate or board, h, is arranged above the filtering-cloth c, and secured, in a similar manner to the board g, to the end plates, a' a^2, the said plate h also bearing with little friction, but with a tightening effect, against the outside surface of the filtering-cloth c, passing over the roller d^2 and against the head-plate A^2 of the machine in order to exclude the air-suction from the space or compartment y' on the left-hand side of the machine. This space y' is prevented from being acted upon by the said air-suction by the extension plate or board g' of the trough i^5 of the conveyer i bearing tightly against the left-hand side plate, A′, of the machine, and by the upper right-hand flange of the said trough i^5 bearing with a tightening effect against the outer surface of the filtering-cloth passing over the lower roller, d'. Arranged in the said space y', excluded, as described, from the air-suction prevailing in the other portion of the machine, is a shaft, k, which is suitably journaled in the end plates, a' a^2, and provided with five or any other convenient number of cams, h', the said cams being arranged rectangularly upon the shaft k, but pointing in different positions with relation to each other, as will best be seen from Fig. 4 of the drawings.

i^* indicates elastic beaters of steel or other suitable metal corresponding in number with the cams h' upon the shaft k, the said beaters being secured to the side plate, A′, of the frame A by means of draw-springs i', attached to their upper ends.

i^2 indicates plates pivoted to the side plate, A′, and secured near their outer ends to the beaters i^*, so as to project beyond the latter and form shoulders i^3, against which the respective cams h' will strike when the shaft k is rotated in the direction of the arrow. The lower end of each beater i^* is provided with an eye for the reception of a beating-rod, m, composed of elastic wood or metal.

a indicates the rocking sieve, arranged in an inclined position in the usual manner, and constructed with a grating consisting of a series of parallel bars or plates, b, of wood, metal, or other suitable material, having inclined grooves or channels, (more particularly shown in Figs. 1^a and 2^a of the drawings,) the said grooved bars or plates b being arranged immediately above the sifting-surface and partaking in the rocking movement of the rocking sieve a, of which they form a part. The said rocking sieve a, no matter whether it be constructed with the said grating or without the same, is arranged immediately below the lower suction-surface of the filtering-cloth c, so that all intermediate apparatus between the cloth c and the rocking sieve a is avoided. The grooved bars b may be so arranged that their channels will run either in a transverse or in a longitudinal direction upon the rocking sieve a, the former arrangement being illustrated in the drawings. The lower ends of all the grooves in the bars b deliver into a conveyer, f, which is arranged near one side of the machine, but would have to be placed near one of the ends of the latter if the longitudinal arrangement were to be chosen for the grooved bars b of the rocking sieve a. The required reciprocating motion is imparted to the latter in a well-known manner by means of the eccentric E′.

E^2 indicates a hopper for the reception of the substances to be separated upon the sieve a, and r is a brush applied to an endless band intended to cleanse the lower surface of the said sieve, but forming no part of my invention. Arranged below the rocking sieve a are two conveyers, v v', which serve for educting from the machine the purified heavy substances passed through the sifting-surface of the rocking sieve a. Either of the conveyers v v' may be covered entirely or partly by means of the hinged lids w, so as to allow of educting either the whole of the purified substances by one conveyer only, or one part of the said substances by the one, and another part by the other conveyer.

o o indicate air-chambers or return-conduits connected with the ventilators C′ C′, and provided for the purpose of continuously returning the air exhausted by the said ventilators through the conduit C into the machine below the rocking sieve a. The walls of the conduits o are provided with the valves q for regulating the entrance of air into the portion of the machine under the rocking sieve a, and plates p are arranged obliquely behind the valves q, so as to cause the air returned through the latter to break its force by striking against the said plates and to become quieted in order not to disturb or agitate the mass of substances upon the rocking sieve a.

l' l' indicate valves or shutters, which may be opened in cases where it is desired to introduce fresh outside air into the machine.

Motion is imparted to the several working parts of the machine as follows—that is to say: The main driving-shaft 1, provided with the eccentric E′ for reciprocating the rocking sieve a, is rotated by means of a pulley driven by any suitable motor, and through belts running over the pulleys 12 and 13, secured upon the shafts 2 and 3, imparts rotary motion to the latter, the former of which carries the fans of the ventilators C′, while the other shaft, 3, is provided with suitable bevel gear-wheels for revolving the shafts 4 and 5 of the conveyers v and v', and with a pulley and belt for

revolving the shaft 6. From the latter motion is imparted to the endless band carrying the brushes *r*, and through the said band to the shaft 7, which by means of a belt will rotate the shaft 8 of the feeding-roller arranged below the lower end of the hopper E^2. The conveyer *f* and its shaft 9 are rotated by the shaft 4 by means of a belt and pulley, and this rotation is transferred to the roller *d'* by means of the chain 14 and the sprocket-wheels 15 and 16. The rotation of the roller *d'* will cause the sprocket-wheels *l*, secured thereto at both ends, to rotate likewise, and by means of the endless chain *c'* to transmit this rotatory motion to the other sprocket-wheels *l*, secured upon each end of the rollers d^2 d^3 d^4, which will cause the latter to revolve in due relation to the speed of the filtering-cloth *c*, moved by the chain *c'*, to the links of which it is secured. The roller *d'* is provided with an extension upon which is secured the star-wheel 20, in gear with a similar pinion, 21, applied to the shaft 10 of the conveyer *i*, the latter being thus revolved. A sprocket-wheel, 18, is secured upon an extension of the roller d^2, and is connected, by means of an endless chain, 19, with a similar sprocket-wheel, 17, upon the end of the shaft *k* of the beating device, so that when the said roller d^2 is rotated rotatory motion will also be imparted to the shaft *k*.

The operation of the improved machine for separating light and heavy substances by means of air-suction is as follows—that is to say: The substances to be separated fall upon the sifting-surface of the rocking sieve *a* from the hopper E^2, and are moved forward on the said sieve by reason of its rocking movement, which causes the heavy portions of the substances to go to the bottom and to drop through the sifting-surface into the conveyer *v* or *v'* below. At the same time the ventilators C' will draw the air through the filtering-surface of the filtering-cloth *c*, arranged immediately above the rocking sieve *a*, the flow of air thus produced acting quite uniformly upon every point of the substances to be separated, so as to draw off the lighter portions of the same and carry them upward toward the surface of the filtering-cloth *c*.

It is well known that in purifying heavy substances—such as middlings, for instance—the air-suction, if properly regulated, does not possess sufficient power to carry the heavier portions of the light substances drawn off the rocking sieve sufficiently high to bring or hold them in contact with the filtering-cloth. According to my invention the said heavier portions of the light substances are prevented from falling back upon the rocking sieve and the substances thereon by the peculiar construction of the said sieve, which has the grating formed of the grooved bars *b*, and which allows the air to act with uniform suction upon every point of the substances to be separated or purified, and causes a high tension or compression of the air-current through the longitudinal openings between the bars *b*, so that the light substances which are dropped by the air before they reach the filtering-cloth *c* will be prevented, by the currents of compressed air rising between the bars *b*, from falling between the said bars upon the mass of heavy substances below, but will be driven sidewise by the said compressed currents, and thus caused to drop into the grooves or channels *b*, above which the air-currents are of a comparatively reduced intensity. The heavier portions of the light substances which are thus dropped into the channels *b* are delivered into the conveyer *f* by reason of the rocking movement of the rocking sieve, and educted from the machine by said conveyer into some suitable receptacle. The light substances carried upward against the filtering-cloth *c* will adhere to and be carried on by the latter in the direction of the arrows, Fig. 2, until they enter the space *y'*, which, as above stated, is not acted upon by the air-suction. On entering this space *y'*, and while passing through the same, they are beaten off the filtering-cloth *c* by means of the beating device composed of the beaters *i** and the beating-rods *m*, as follows: The cam-shaft *k* is rotated by the roller d^2 and the endless connecting-chain 19, as described, in the direction of the arrow, Fig. 4, which rotation causes the cams *h'* to strike alternately against the shoulders i^3 on the pivoted plates i^2 of each of the beaters *i**, so that the latter will be pressed away from the surface of the revolving filtering-cloth *c*. This movement of the beaters *i** will expand the draw-springs *i'*, attached to their upper ends. As the shoulders i^3 are released by the cams *h'* in quick and regular succession, the springs *i'* will alternately draw back the upper ends of the beaters *i** and throw their lower ends, provided with the transverse beating-rods *m*, with a sudden elastic blow, against that portion of the filtering-cloth *c* moving before the space *y*, which, as above stated, is excluded by the board *g* from the action of the sucking air. The elastic blows thus successively applied to the said portion of the moving filtering-cloth cause the light substances adhering to the latter to fall off and drop into the conveyer *i*.

By reason of the arrangement, in different positions, of the cams *h'* upon the shaft *k* the beaters *i** are pressed away successively from the cloth *c* and strike against the same one after the other, so that the several elastic beating-rods *m* will strike in regular alternation against the surface to be beaten without thereby disturbing the sucking surfaces of the filtering-cloth. The light substances beaten off are conducted by the conveyer *i* into some suitable receptacle. It will thus be seen from the above description that with the construction of the machine as herein described the heavy substances passed through the rocking sieve *a* will be conveyed away by the conveyers *v v'*, the heavier portion of the light substances by the conveyer *f*, and the light substances by the con-

veyer *i*, so that they may be collected in separate receptacles.

The beating device may be modified so that the beaters *i*[×] are rigidly secured to the shaft *k*. With this modification a rocking motion would have to be imparted to the said shaft by means of some suitable cam and eccentric, which would cause the beating-rods *m* to strike simultaneously, instead of alternately, against the inclosed portion of the filtering-cloth *c;* but such arrangement would not be as preferable as the one hereinbefore described, for the reason that the filtering-surfaces of the cloth *c* would be more likely to be disturbed by the combined than by the alternate blows of the rods *m*.

In some cases, and more particularly where the machine is used for purifying very light substances from dust and the like, I may construct the rocking sieve *a* without the grooved bars *b* and regulate the flow of air so that the dust and similar matter only are sucked off the mass of substances on the rocking sieve. The air which is sucked through the filtering-cloth *c* by the ventilators C′ is continually returned by the return-conduits *o* into the machine below the rocking sieve *a*, the object of this arrangement being to avoid the necessity of drawing fresh air into the machine from without.

Drawing in air from without the machine causes an unpleasant agitation of the air and a reduction of the temperature of the latter outside of the machine; but this difficulty is obviated by the combination of the ventilator C′ with the return-conduits *o*, which allow of dispensing with the introduction of outside air in the machine, since no air can escape from the machine, the same air being used over and over again for the purification of the substances, as will be readily understood.

I am aware of the fact that in a former machine for filtering grains and other substances by means of air-suction an endless filtering-cloth has been proposed, and therefore I make no claim for a revolving endless filtering-cloth *per se;* but in the former instance referred to the filtering-cloth was arranged so as to move in a longitudinal instead of transverse direction of the machine, and was not apt to give good results in practical use, partly for the reason of its said longitudinal arrangement and partly because of the difficulty in constructing the space not acted upon by the air-suction, but chiefly for the reason that intermediate apparatus was provided between the surface of the filtering-cloth and the rocking sieve, which would prevent the said surface, arranged at a comparatively great distance above the rocking sieve, from acting uniformly upon the entire surface of the substances to be purified, so that at some points part of the heavy substances would be carried off by the air-suction, while at other points, again, the light substances would not be sucked off at all and remain among the heavy substances after the purification. I obviate these difficulties with my improved machine, as herein described, by arranging the lower surface of the filtering-cloth immediately above the upper surface of the rocking sieve, and by moving the endless cloth in the transverse direction of the machine and providing for the space not acted upon by the air-suction in a simple and at the same time most effective manner.

I wish it to be understood that I do not confine myself to employing four rollers, *d*, for guiding the filtering-cloth *c*, as it will be seen that any suitable number of such rollers may be used for this purpose, and also that the roller d^3 may be dispensed with and the filtering-cloth conducted directly over the rollers d' and d^2 from the roller d^4, if desired.

Having thus fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a machine for separating light and heavy substances by means of air-suction, the combination of a traveling endless filtering-cloth arranged within a casing to move transversely to the length of the machine, and a rocking inclined sieve provided with a grating composed of a series of parallel channeled bars with spaces between arranged immediately below the traveling cloth, substantially as described.

2. In a machine for separating heavy and light substances by air-suction, the combination of a casing, a series of rollers arranged therein, a traveling endless filtering-cloth supported by said rollers, a plate within said endless cloth and bearing against two of the end rollers, a plate located outside of the endless cloth with one end next to the upper roll against which the inner plate rests, and the other end against the casing, a converging trough with a part thereof fitting close to the lower roller against which the inner plate bears, and a plate extending from said trough to the side of the casing, substantially as described.

3. In a machine for separating heavy and light substances by air-suction, the combination of a series of rollers, a traveling endless filtering-cloth supported thereby, partition-plates for separating the space above and below said endless cloth from a space at the end thereof, and a plate within the endless cloth with its ends fitting against the upper and lower rolls at one end of the cloth, substantially as described.

4. In a machine for separating light and heavy substances by air-suction, the combination of a traveling filtering-cloth, a series of yelding beaters, springs connecting said beaters with a fixed part of the machine, a series of pivoted arms or plates connected to the beaters and projecting beyond the same, and a rotating shaft provided with cams arranged to strike said arms and in succession operate said beaters, substantially as described.

5. In a machine for separating light and

heavy substances by air-suction, the combination of a traveling filtering-cloth, a series of rollers supporting the same and having sprocket-wheels at their ends, sprocket-chains connecting said wheels, and the hooks passed through the links of the sprocket-chains and piercing the filtering-cloth, substantially as described.

6. In a machine for separating light and heavy substances by air-suction, the combination of a traveling filtering-cloth, a casing having end plates, $a' a^2$, bars bearing against the filtering-cloth, and plates a^4, connecting said bars and plates $a' a^2$, substantially as described.

7. In a machine for separating light and heavy substances by air-suction, the combination of a traveling filtering-cloth, a rocking inclined sieve provided with a grating composed of a series of parallel channeled bars with spaces between and arranged immediately below the traveling cloth, the air-chambers *o o*, communicating with the space below the rocking sieve, and the air-conduit C and ventilators C′ C′, for returning air sucked through the filtering-cloth to chambers *o*, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

HEINRICH SECK.

Witnesses:—
BERNHARD RÜDIGER,
PAUL DINCKMÜLLER.