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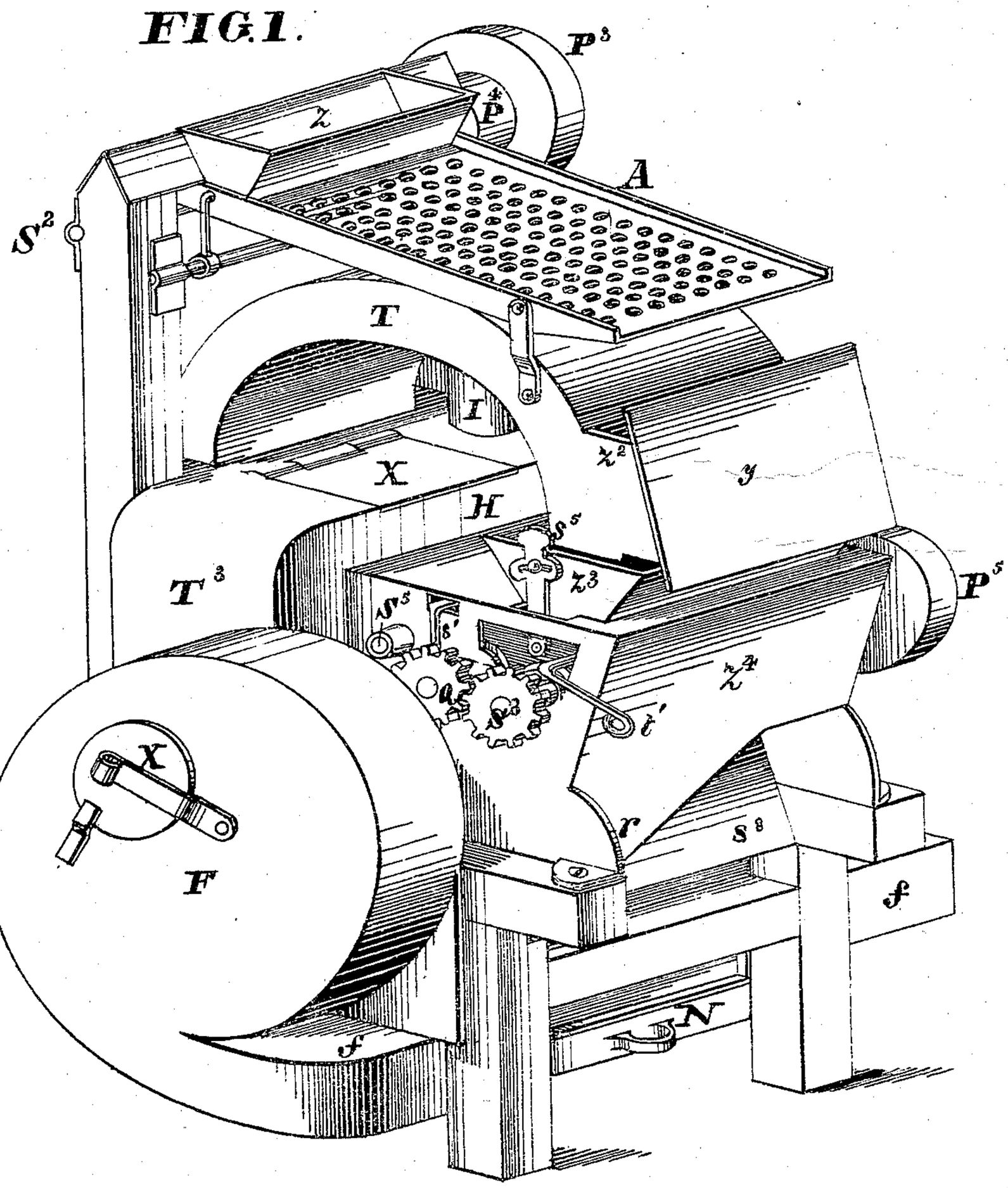
S. W. ANDREWS & L. GODFREY.

Grain Separators and Scourers.

No. 144,180. Patented Nov. 4, 1873.

FIG. 1.



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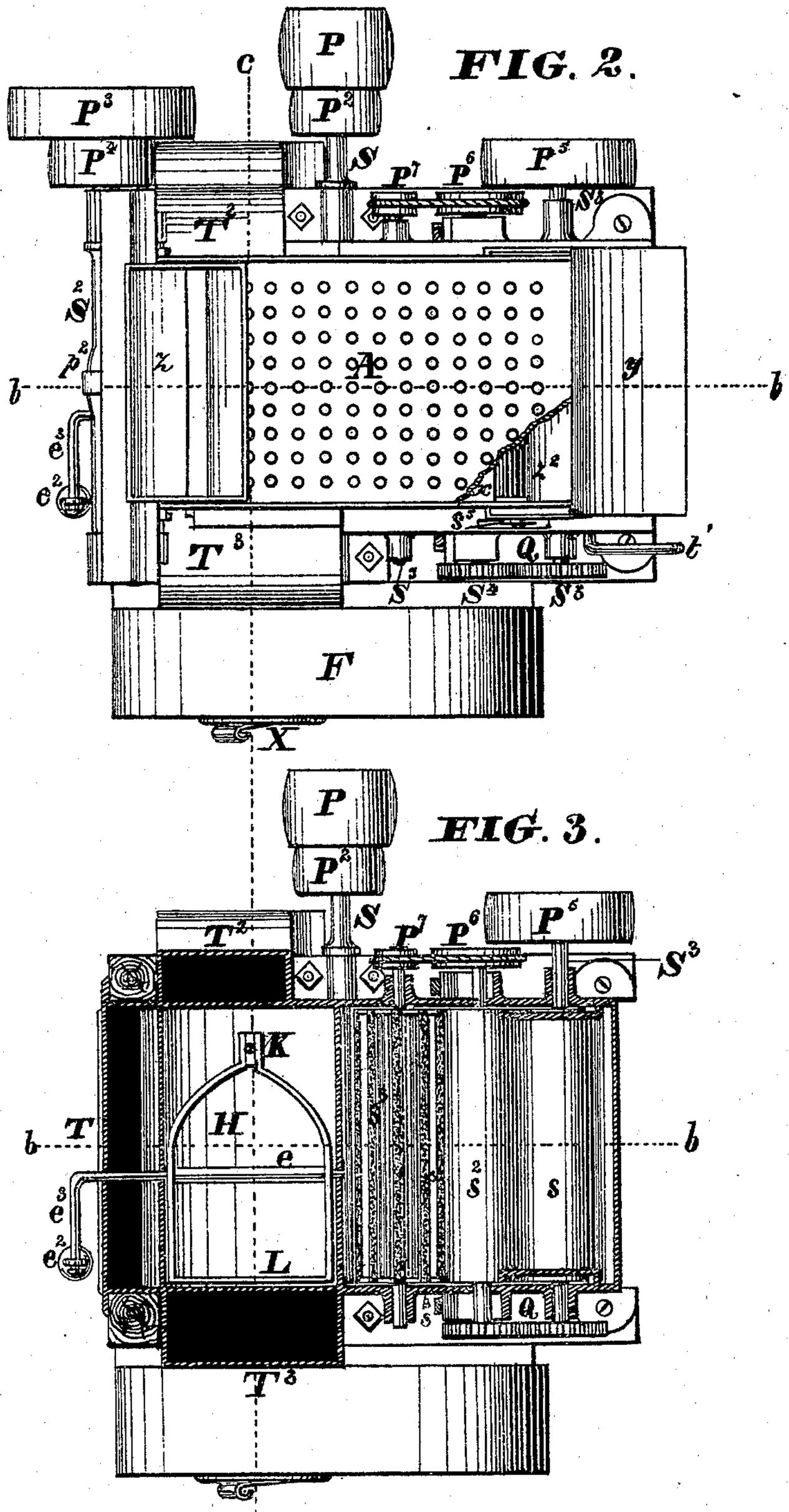

FIG. 2.

FIG. 7.

FIG. 3.

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FIG. 5.

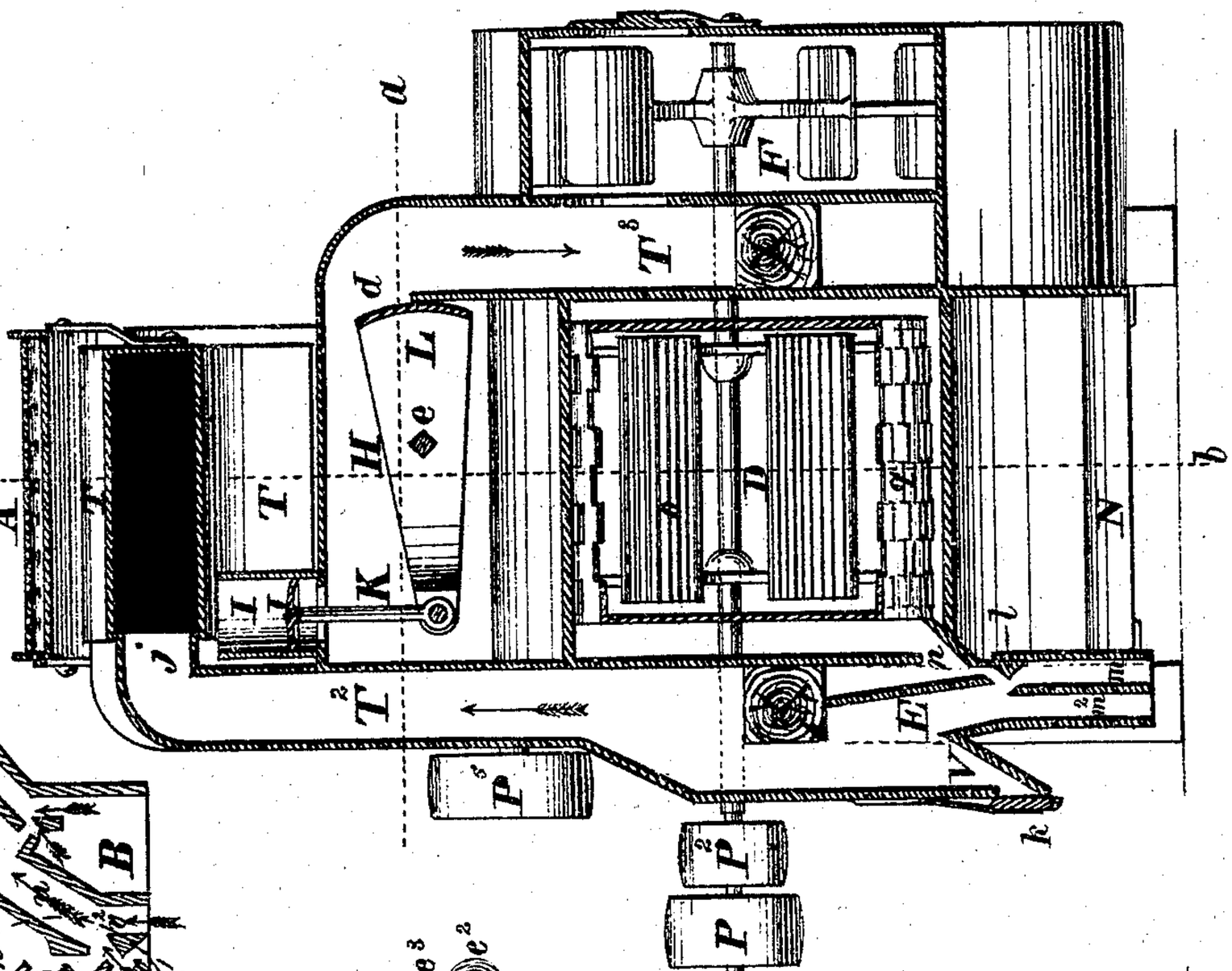
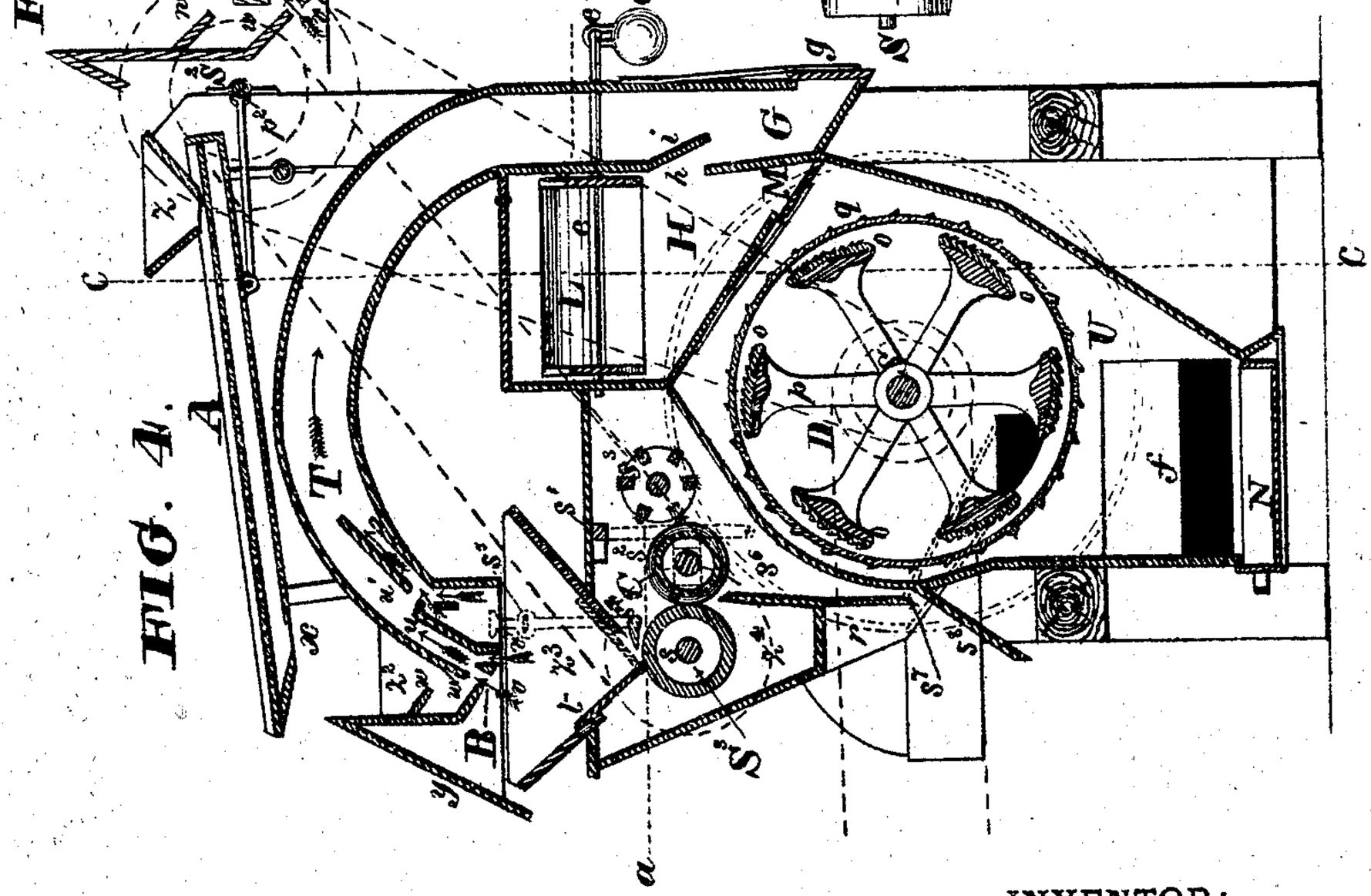


FIG. 6.

FIG. 4.



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UNITED STATES PATENT OFFICE.

SAMUEL W. ANDREWS AND LEWIS GODFREY, OF GREENVILLE, ASSIGNORS OF ONE-HALF THEIR RIGHT TO O. G. VANDERHOOF, OF KNOXVILLE, TENNESSEE.

IMPROVEMENT IN GRAIN SEPARATORS AND SCOURERS.

Specification forming part of Letters Patent No. **144,180**, dated November 4, 1873; application filed September 19, 1873.

To all whom it may concern:

Be it known that we, SAMUEL W. ANDREWS and LEWIS GODFREY, both of Greenville, in the county of Greene, Tennessee, have invented an Improved Grain-Cleaner, of which the following is a specification:

The apparatus herein described is designed for screening, winnowing, scouring, and separating grain. The general objects of the invention are to free grain more perfectly from all impurities, including smut, chess, cockle, and light grains, and to free the screenings from dust, chaff, and other refuse, in one and the same apparatus; and to accomplish this by means of a simple, compact, durable, and easily-operated machine. The first part of this invention consists in a horizontal scouring-cylinder, having scourers and a scouring-case of improved construction. The second part of the invention consists in a suction-fan and a peculiar combination and arrangement of wind-trunks, in connection with a wind-chamber, blast-separators, and dust, screenings, and grading chambers. The third part of the invention consists in blast-separators of peculiar construction for the wind-trunks. The fourth part of the invention consists in a cockle-separator of any approved construction, in combination with a preliminary blast-separator, through which it receives the grain and cockle, and a scouring apparatus, into which it discharges the grain; also, in a cut-off, by means of which the grain may be conducted directly to the scourer when no cockle is mixed therewith. The fifth part of the invention consists in a peculiar automatic governor for equalizing the blast. The sixth part of the invention consists in means for freeing the apparatus from any heavy particles which may settle in the dust-chambers. The seventh part of the invention consists in a peculiar combination of parallel shafts and pulleys for driving the several parts of the apparatus in unison.

Figure 1 is a perspective view of a grain-cleaner illustrating this invention. Fig. 2 is a plan view of the same, partly in section. Fig. 3 is a horizontal section of the same. Fig. 4 and Fig. 5 are vertical sections in planes at right angles each to the other. Fig. 6 is an enlarged vertical section in the same plane as Fig. 4, representing more clearly the details of the preliminary blast-separator. Fig. 7 is a like view of one of the scourers, and a section of the scouring-case.

The line *a*, Figs. 4 and 5, represents the plane of Fig. 2. The lines *b b*, Figs. 2, 3, and 5, represent the plane of Fig. 4. The lines *c c*, Figs. 2, 3, and 4, represent the plane of Figs. 5, 6, and 7.

The general appearance of the improved machine in a preferred form is represented in Fig. 1.

The construction of the frame and casing of the machine and other details may be of any preferred practical character.

The grain, as taken from a thrashing-machine, is fed into the hopper *z* of a screening-shoe A at the top of the improved cleaning apparatus. This shoe is vibrated, and is so inclined as to discharge the straw and other coarse refuse therefrom at its rear end, where it falls over a shed, *y*, away from the machine. The grain, with such other matter as passes through the screen, is discharged, through an orifice, *x*, in the bottom of the shoe A, into a second hopper, z^2, which is that of a blast-separator, B. Here the grain is loosened by deflectors *w*, and is discharged, through a strong suction-blast, into a third hopper, z^3. The primary discharge-orifices *v* v^2 of the blast-separator are arranged as shown most clearly in Fig. 6. The main orifice, v^2, is vertical. The smaller orifice, *v*, which is chiefly for the entrance of air, intersects the first at an angle more or less acute. The passage *u* into the wind-trunk is formed on a line equidistant between the outer ends of the two orifices, and is equal in capacity to both. It is thus adapted to carry off all the light impurities and light grains, while the arrangement of the orifices insures the contact of every particle with the blast.

To save any good grains which may be drawn in by the blast, a supplemental pair of discharge-orifices, with their appurtenances, as described above, are arranged beneath an enlargement, *u'*, of the passage *u*, as clearly illustrated in Fig. 4. These discharge into the

same hopper z^3 as the former, and complete the separation of solid grains from the chaff and other light impurities. This third hopper z^3 is provided at bottom with a pivoted cut-off or valve, t, shiftable by an arm, t', at one side of the machine. (See Fig. 1.) In the normal position of this cut-off, represented in full lines, the grain is conducted onto the hard roll s of a cockle-separator, C, the other parts of which are a rubber roll, s^2, an equalizing-spring, s^1, applied to the journals thereof, a brush-cylinder, s^3, a valve, s^4, having a handle, s^5, outside of the machine, to distribute the grain along the rolls, and to regulate its entrance, a cockle-chamber, s^6, tapering to a discharge-orifice, s^7, at bottom, and a shed, s^8, over which the cockle is discharged. This form of cockle-separator is employed by preference, being made under patent No. 92,559, dated July 13, 1869, which is owned by the proprietors of the present invention. Any other approved form of cockle-separator may be employed. A fourth hopper or funnel, z^4, receives the grain from the cockle-separator, and a spout, r, conducts the same into the case q of a scourer, D; or this hopper z^4 may receive the grain directly from the third hopper, z^3, if it is not necessary to pass it through the cockle-separator. To effect this change in the operation the cut-off t is shifted to the position represented by dotted lines in Fig. 4. The scourer consists of a horizontal scouring-cylinder, p, carrying a sufficient number of scourers, o, on its periphery, in combination with the concentric scouring-case q. The latter is constructed of perforated sheet-steel, the perforations being longitudinal slots or slits; and in forming them the metal at one edge of each perforation is forced either outward or inward, so as to roughen the inner surface of the case, and, at the same time, facilitate the escape of dust. The scourers o are constructed with longitudinal rasping ridges with square shoulders, opposed to those of the case, as clearly illustrated in Figs. 4, 5, and 7. The rear edges of the scourers are made a little eccentric, and the front edges increasingly so, in order to cause them to approach the surface of the case more closely for rubbing the grains on the same, and against each other, and to cause them to act as fan-blades to expel the dust. The scouring-case is inclosed in a dust-chamber, U, into which the major part of the dust separated by scouring is discharged. The grain is discharged, through a spout, n, at the opposite end of the scourer to that at which it entered, into a final blast-separator or grader, E, from which the first grade of grain is discharged into the bin or bag through drop-spouts m m^2. The first and smaller of these discharges is furnished with a deflector, l, to scatter the grain, and opens into the main discharge opposite this deflector at an acute angle. Here all except the very heaviest grains are scattered upward in the main discharge-spout m^2 by the blast, and the second grade of grain is deposited into a chamber, V, from which it is automatically discharged through a door, k, as hereinafter described. The blast for the several purposes above stated, and for the final discharge of the dust and other light refuse from the machine, is produced by a rotary suction-fan, F, which may be of any approved construction. The main wind-trunk T is of arc-shape, and extends from the first blast-separator, B, at rear, to a screenings-chamber, G, at the front of the machine. A second wind-trunk, T^2, extends from the grader E into the main trunk through an orifice, j, as illustrated in Fig. 5. The screenings, chaff, and dust carried through these trunks are carried against and past a deflecting shelf, i, in the screenings-chamber, where the blast is reversed, an opening, h, into a central wind or dust chamber, H, being formed behind this deflector, as illustrated in Fig. 4. This causes the screenings to be deposited in its chamber, and the light refuse to be separated therefrom by the blast. The screenings-chamber has a door, g, through which it is emptied. A third wind-trunk, T^3, leads from the central wind-chamber to the eye of the fan. The outer wall of the fan-case is tight, and its discharge-spout f opens into the dust-chamber U surrounding the fan, at one side, and is continued outward on the opposite side of the machine, as illustrated in Figs. 1 and 4. A partial vacuum is thus maintained around the scouring-case, and the dust is most efficiently carried off.

To provide for equalizing the blast as required, a simple automatic governor is formed in the wind-chamber H, as follows: A short vertical cylinder, I, is mounted on the top of this chamber, and provided with an opening into the chamber, around which is a small ledge. The outer end of the cylinder is open to the surrounding atmosphere. In this cylinder a free-working light piston, J, is arranged, the stem K thereof extending downward into the wind-chamber. Within the wind-chamber a valve, L, is mounted on a central horizontal pivot, e, and adapted to close, or nearly close, in one position the aperture d between the wind-chamber and the last wind-trunk. The construction of this valve is not essential, but it is preferably of the skeleton form represented. Its effective end is caused to preponderate more or less by means of an adjustable weight, e^2, on an external arm, e^3, of the valve-pivot. The other end of the valve is connected to the piston-stem K. When the machine is started the entire area of the gage-aperture d is exposed, the governor-piston being supported at the upper end of its cylinder by the preponderance of the effective end of the valve. As the speed increases the force of the blast acting on the piston depresses the same, and through the described connection elevates the effective end of the valve, and closes the gage-aperture more or less, as required, to reduce the effective force in the trunks to the fixed standard. Should the speed, and consequently the force of blast in the wind-chamber, be reduced, the gage-aperture is opened wider, to a greater or less

extent, by the reverse of the action above described, so as to maintain the required force in the trunks.

To provide for freeing the machine from any heavy particles which may settle in the wind or dust chambers, a door or valve, M, is arranged in the bottom of the wind-chamber H, and by means thereof this chamber is emptied into the dust-chamber U; and a drawer, N, is provided in the bottom of the latter chamber to receive all such matter; this drawer to be removed at intervals and emptied.

The mechanism for transmitting motion to the several parts of the machine is as follows: A main driving-shaft, S, extending transversely through the lower part of the machine, and mounted in suitable bearings, carries the scouring-cylinder *p* and the suction-fan F, receiving its motion by means of a pulley, P, and transmitting it by means of a pulley, P^2, to a second shaft, S^2, which receives the motion through a pulley, P^3, and transmits it again to a third shaft, S^3, by pulleys P^4 P^5. The second shaft S^2 is mounted in the upper part of the machine, and carries a crank or eccentric, p^2, by means of which the preliminary screening-shoe A is vibrated. The third shaft S^3 is that of the hard roll *s* of the cockle-separator. A fourth shaft, S^4, carries the rubber roll s^2, and is connected with the third shaft S^3 by gearing Q. A fifth shaft, S^5, is that of the brush-cylinder s^3 of the cockle-separator, and is driven by means of pulleys P^6 P^7 from the fourth shaft S^4. The arrangement of belts is illustrated by dotted lines in Fig. 4. The direction of the blast in the several wind trunks and chambers is illustrated by arrows in Figs. 4 and 5.

Motion being imparted to the several parts of the machine and a supply of grain directed into the first hopper *z*, as above described, a strong blast throughout the wind trunks and chambers is created by the suction-fan F, and equalized by the governor I J K L. The grain is fed by its gravity. By the operation of the screening-shoe A the grain is freed from sticks, straw, and similar impurities, which are discharged at the rear end of the shoe over the shed *y*. By the operation of the first blast-separator B the grain is relieved from smut-balls, chaff, dust, chess, and light grains, which are carried through the main wind-trunk T into the chess or screenings chamber G, where the chess and wheat grains are deposited. The smut-balls, chaff, and dust are carried into the wind-chamber H, and the major portion is carried by the blast out of the machine through the discharge-pipe *f*. The heavier particles, falling to the bottom of the wind-chamber H, are discharged into the drawer N. By the operation of the cockle-separator C the grain is freed from any cockle which may be mixed therewith, and this is discharged behind the machine over the shed s^8. By the operation of the scourer D fuzz, smut, and other adherent matters are detached from the kernels and the grain is polished. The improved scourer and polisher operates by rubbing the grains together between the rasping surfaces in contradistinction to whipping it around in the case, as in ordinary machines. The matter separated by the scourer escapes through the perforations in the scouring-case into the dust-chamber U, where the heavier particles settle in the drawer N, and the lighter matter is carried off through the discharge-pipe *f*. By the operation of the final blast separator or grader E dust or other light material, which may remain in the grain, is taken off through the wind-trunk T^2 into the main wind-trunk T, and by this deposited with the other screenings and refuse, as above described, and the second grade of grain is deposited in the grading-chamber V, and is discharged through the door *k*. The first-grade grain is finally discharged through the drop-spouts *m* m^2. The screenings are automatically discharged through the door *g*, and the heavy impurities may be taken from the machine at will by removing and emptying the drawer N. The doors or valves *k*, *g*, and M, for automatically emptying the grade, screenings, and dust chambers, are adapted to be held closed by atmospheric pressure when the suction-fan is in operation. When the machine is stopped, or a sufficiently large quantity has accumulated in the chambers, the doors or valves yield and the contents are discharged. Access may be had to the interior of the fan-case and other parts of the machine by means of suitably-arranged openings furnished with tight doors or caps X.

The following is claimed as new:

1. The horizontal scouring-cylinder *p*, having scourers *o*, constructed with longitudinal rasping ridges and arranged eccentrically, as described, in combination with the peculiarly-perforated scouring-case *q*, as specified, for the purpose set forth.

2. The suction-fan F, central wind-chamber H, and wind-trunks T T^2 T^3, arranged and operating as described, in combination with the blast-separators B E, dust-chambers U, screenings-chamber G, and grading-chamber V, for the purposes shown.

3. The combination and arrangement, in the blast-separator B, of the intersecting vertical and inclined grain-discharge and blast orifices *v* v^2 and the passage *u*, into the wind-trunk formed on a line equidistant between the outer ends of the two orifices and equal in capacity to both, as described, for the purposes stated.

4. The enlargement *u'*, in the blast-separator B, and the second set of orifices and passages beneath the same, substantially as and for the purpose specified.

5. The combined arrangement, in a grain-cleaner, of a prelimary blast-separator, B, a cockle-separator, C, receiving the grain and cockle from the former, and a scourer, D, receiving the grain from the cockle-separator, substantially as herein described.

6. The cut-off *t*, arranged as described, in combination with the hoppers z^3 z^4, for con-

ducting the grain from the blast-separator B through the cockle-separator C or directly to the scourer D, as set forth.

7. The automatic governor or blast-equalizer consisting of the valve L within the wind-chamber H, the valve-pivot *e* with external arm e^3 and adjustable weight e^2 thereon, and the piston J K within a cylinder, I, in combination with the gage-aperture *d*, arranged and operating substantially as specified.

8. The automatic door or valve M in the bottom of the wind-chamber H, constructed and arranged to be held closed by the force of the blast and to open under the weight of accumulations in the chamber, in combination with the drawer N beneath the same in the dust-chamber U, by which the heavy particles which settle in both chambers may be taken from the machine, as set forth.

9. The combination and arrangement of the parallel shafts S S^2 S^3 and pulleys P P^2 P^3 P^4 P^5, for driving the several parts of the apparatus in unison by simple band-and-pulley connections, as described.

10. The combination, in a grain-cleaner, of a screening-shoe, A, a preliminary blast-separator, B, a cockle-separator, C, a scourer and polisher, D, and a final blast separator or grader, E, arranged and operating substantially as herein described, for the purposes set forth.

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