(No Model.) 4 Sheets—Sheet 1.

P. VAN GELDER.

GRAIN SEPARATOR AND GRADER.

No. 281,808. Patented July 24, 1883.

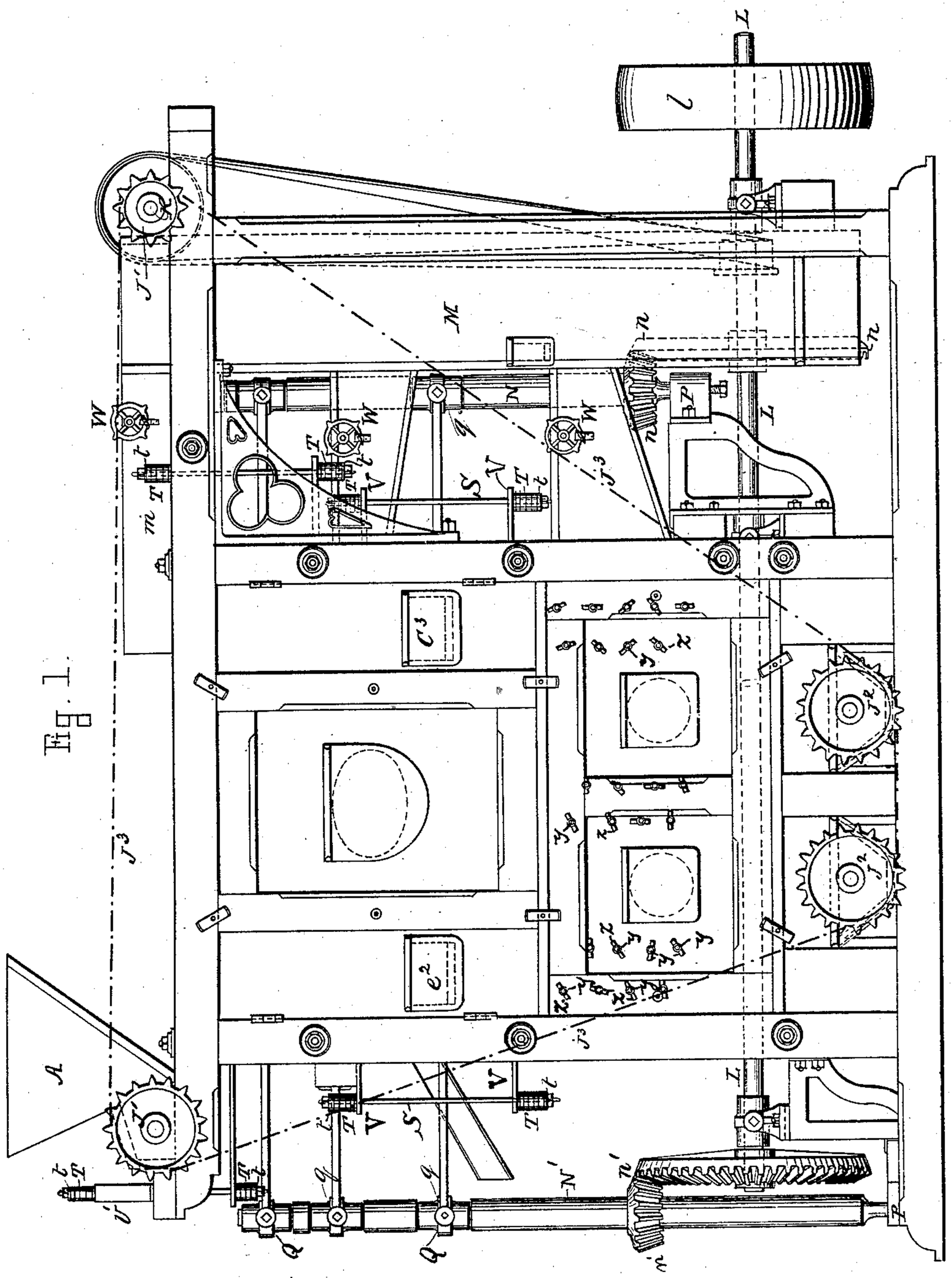

Fig. 1.

Witnesses.

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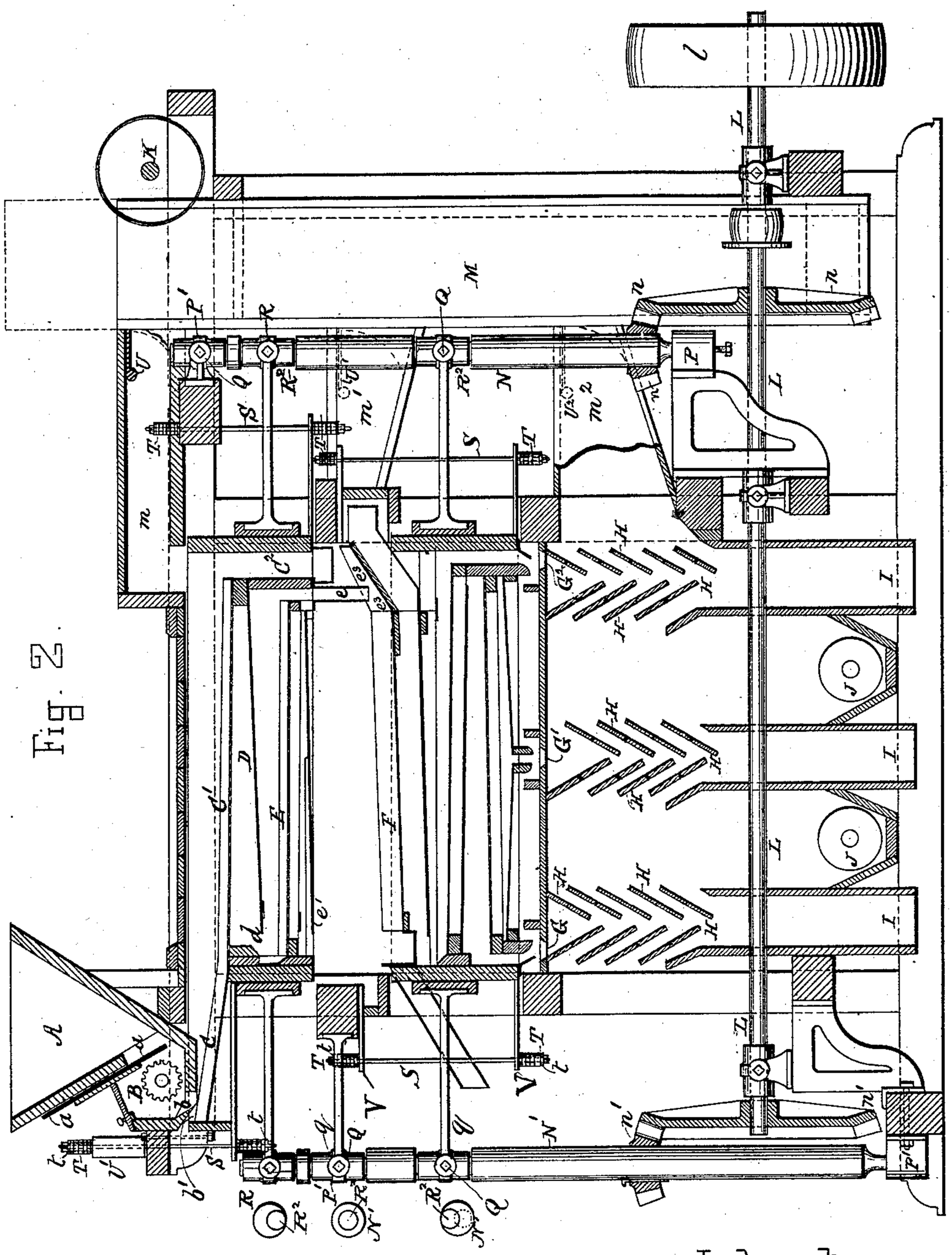

Fig. 2.

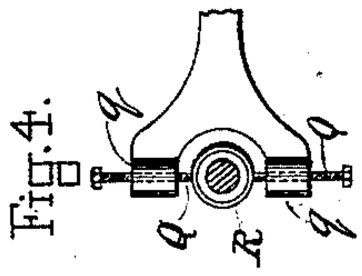

Fig. 4.

Witnesses.

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(No Model.) 4 Sheets—Sheet 3.

P. VAN GELDER.

GRAIN SEPARATOR AND GRADER.

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Fig. 3.

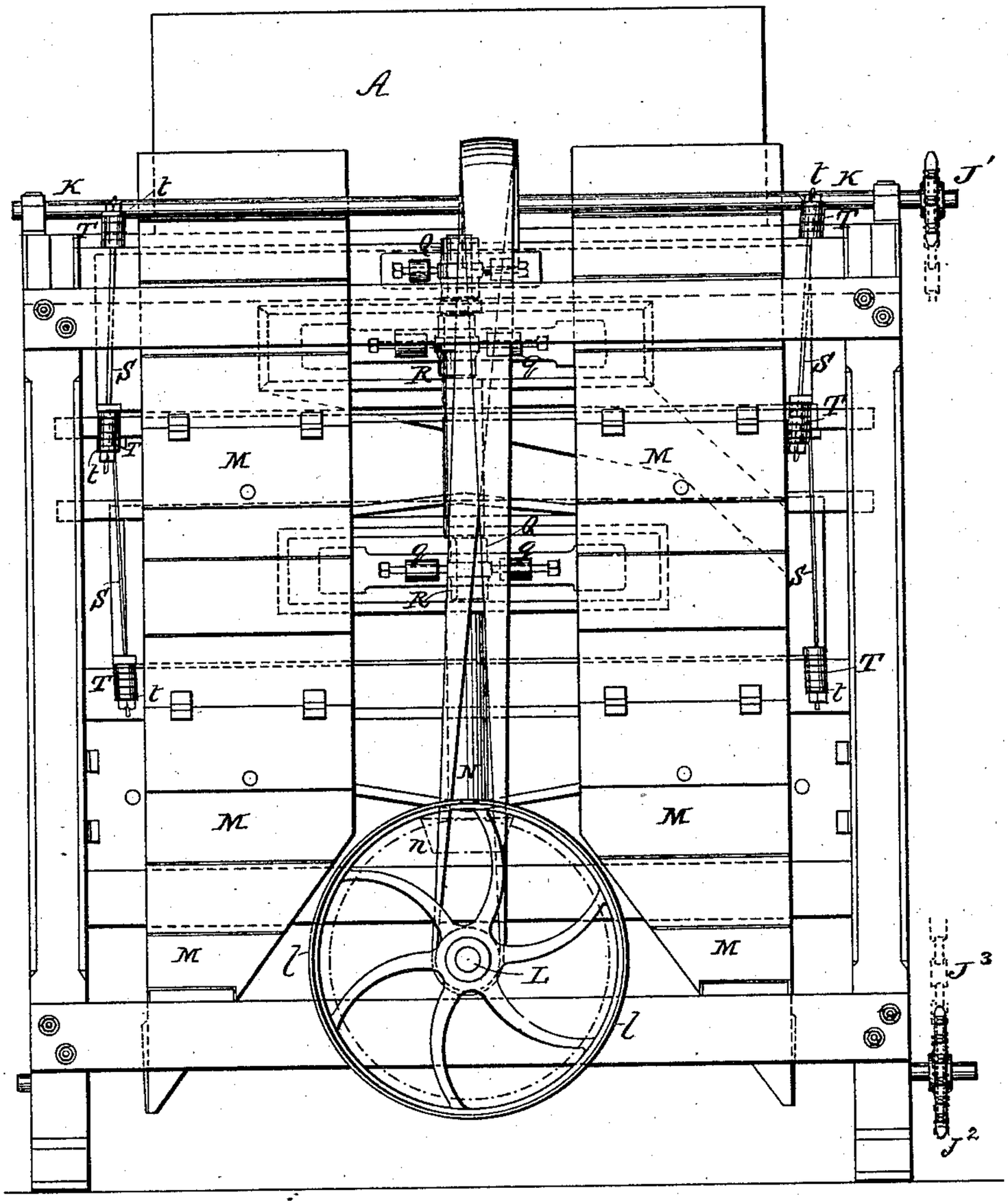

Fig. 5

Witnesses.

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GRAIN SEPARATOR AND GRADER.

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Fig. 6.

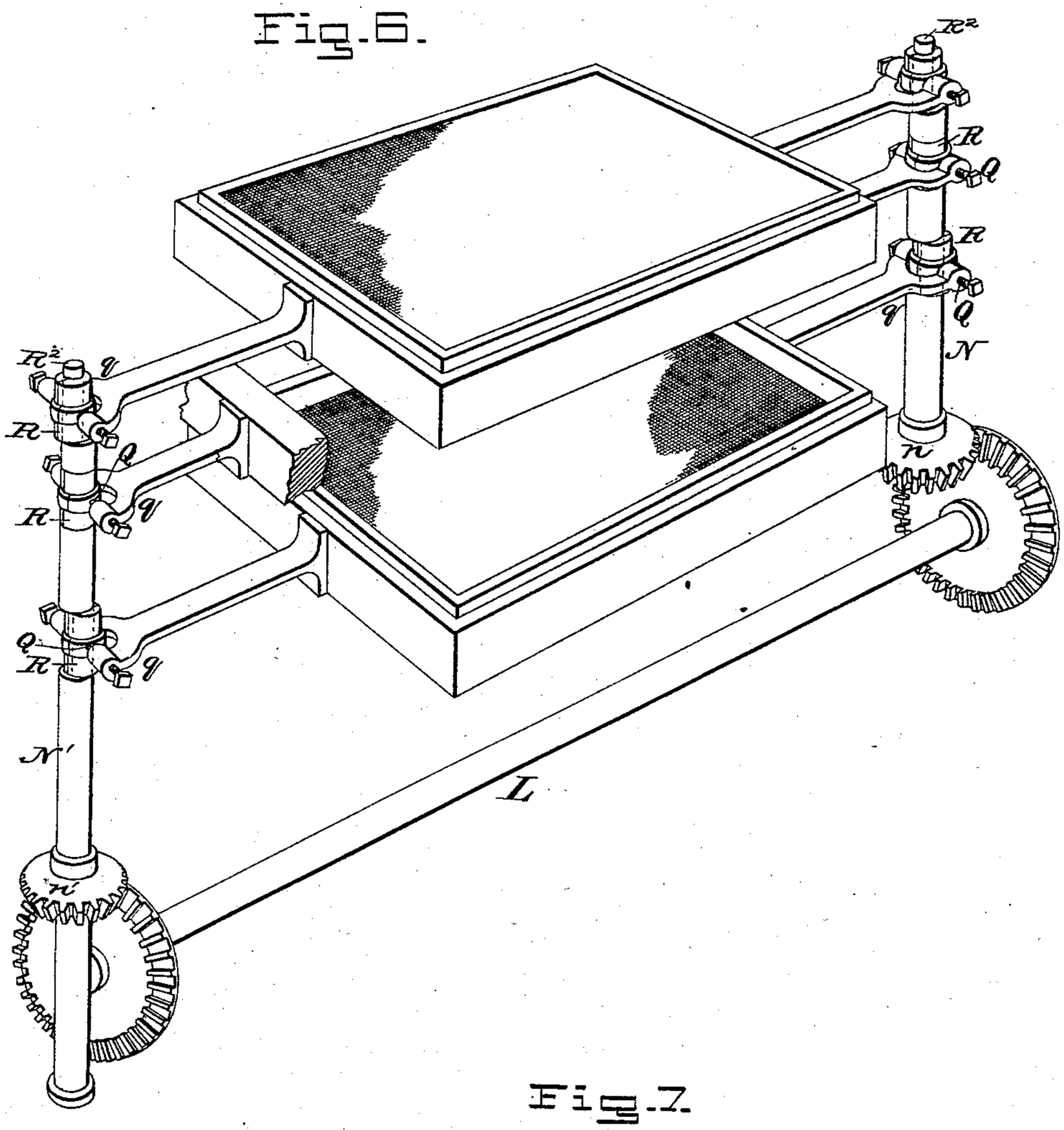
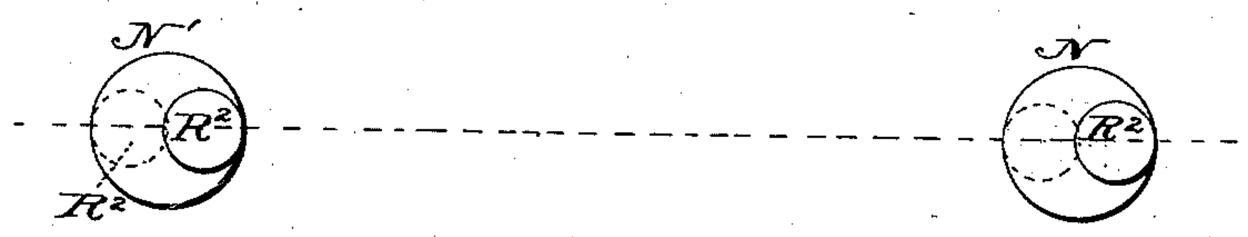


Fig. 7.



WITNESSES:

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Walter S. Dodge

INVENTOR:

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UNITED STATES PATENT OFFICE.

PIETER VAN GELDER, OF SOWERBY BRIDGE, COUNTY OF YORK, ENGLAND.

GRAIN SEPARATOR AND GRADER.

SPECIFICATION forming part of Letters Patent No. 281,808, dated July 24, 1883.

Application filed September 25, 1882. (No model.) Patented in England June 21, 1878, No. 2,470.

To all whom it may concern:

Be it known that I, PIETER VAN GELDER, a subject of the King of the Netherlands, residing at Sowerby Bridge, in the county of York, in the Kingdom of England, have invented certain new and useful Improvements in Grain Separators and Graders, (for which I have received Letters Patent in Great Britain, No. 2,470, bearing date June 21, 1878,) of which the following is a specification.

My invention relates to machinery for separating and grading grain; and it consists, mainly, in a novel means of supporting and operating a sieve or sieves, as hereinafter pointed out and claimed.

In the accompanying drawings, Figure 1 represents a side elevation of the improved machine; Fig. 2, a longitudinal section; Fig. 3, a front or end elevation; Fig. 4, a plan view of one of the bearings and attachments by which the sieve-frames are carried; Fig. 5, a face view of a section of one of the sieves; Fig. 6, a perspective view of the mechanism for supporting and operating a pair of sieves, and Fig. 7 is a diagram showing the manner of imparting motion to the sieves.

It is a fact well known that hand-sieves are much less apt to clog or choke than sieves worked by machinery, and the circumstance is due to the fact that hand-sieves are given a circular motion, instead of the simple reciprocating motion commonly imparted to sieves when operated by machinery.

The purpose of the present invention is to secure in mechanically-operated sieves and screens this same freedom from choking or clogging, and to so mount the sieves or their carrying-frames that each sieve shall be perfectly counterbalanced by another or others at every part of its movement, said movement being a circular one, closely corresponding to the motion given by hand to an ordinary hand-sieve. Various attempts have hitherto been made to secure this motion in machines of the class here referred to, but, so far as I am aware, without success, for although the sieves have in some cases been carried by a crank at each end, and two sieves have been arranged one above another, and carried by double cranks set at an angle with one another, it has been found necessary to set the cranks at unequal angular distances about the shafts to cause the two shafts to rotate in unison. Such arrangement causes a pounding, jolting, or jarring action, which is highly injurious to the action of the machine and causes it to be speedily racked to pieces. Experience shows it to be essential that the sieves be operated by cranks or eccentrics at opposite ends or sides of the sieves, that the cranks of each driving-shaft be set at equal angular distances about the shaft, so that the sieves shall perfectly counterbalance each other, and that means be provided to insure the synchronous and equal rotation of the shafts at opposite ends of the sieves.

In speaking of the cranks or eccentrics as being at equal angular distances about the shafts, I mean that the two crank-shafts are duplicates or counterparts of each other, and that each shaft is formed or furnished with two or more such cranks or eccentrics. If but two cranks or eccentrics be used for each shaft, they will project from the same in diametrically opposite directions, and will be at an angular distance around the shaft of one hundred and eighty degrees from each other. If three be used, they will be at angular distances of one hundred and twenty degrees from each other about the shaft, and so on. Each sieve will be carried by those cranks of the two shafts which exactly correspond in position, both as to elevation and angular distance or position around the shaft.

I do not broadly claim the operation of a single sieve or screen by means of crank-shafts at opposite sides thereof, geared to rotate synchronously, as that has before been done; but, so far as I am aware, no one has ever heretofore provided two shafts thus geared together, with two or more cranks each, at equal angular distances about the shafts, and hung or mounted a separate sieve upon each set or tier of cranks, as herein set forth, whereby the sieves are caused to balance one another in every part of their movement.

If the cranks or eccentrics be placed both at the same side or same end of the sieve, as has been proposed, the centrifugal force causes a strong and constant tendency on the part of the sieve to tear away, acting with a leverage proportionate to the distance from the cranks

or eccentrics to the opposite side or end of the sieve; but if the cranks or eccentrics be set at opposite sides or ends of the sieve, it is perfectly balanced and the motion is easy and light. Again, if two or more sieves be attached to and moved by cranks or eccentrics set at equal angular distances about the shafts, at opposite sides or ends of said sieves, the sieves will at all times perfectly balance each other, and any tendency of one sieve to move in a given direction will be counteracted by another tending to move or exert a centrifugal force in the opposite direction.

Referring now to the drawings, A is the feed-hopper, provided with a regulating-slide, *a*, and feed-roller B. Into this hopper the grain to be cleaned is fed, and it passes into the machine through opening *b*, onto incline C, to sieve C′. The part above B is boxed in, so that no air can enter the machine through *b* except through the opening *b*′.

C′ is the sieve, along which stones, sticks, beans, maize, and other materials too large to pass through the wheat-sieve travel until they fall into the spout C^2, whence they are carried away through door C^3. The wheat and finer material passing through the sieve C′ fall on shelf D, and from the end *d* of D fall onto the second and finer sieve, E. The good grain, unable to pass through this sieve, falls through spout *e* onto an inclined plane, e^3, and thence onto another sieve, F. This sieve F is formed with meshes of a peculiar shape, as shown in Fig. 5, which being approximately the same shape and size as the grain to be sieved, confine the material passing through them to a very narrow limit.

All the sieves, except in some cases the top one, are made to slide in and out from the side, like drawers, so that they can be taken out, cleaned, and, if desirable, others substituted for them, each being slid into a permanent main frame carried by the eccentrics presently referred to—a construction common in sifting-machines—and the side of the machine being provided with doors or removable sections to permit their withdrawal, as in Fig. 1. By this substitution the machine can be used for cleaning oats, beans, barley, maize, or any other grain or seed. The small stuff falling through sieve E passes out at *e*′, and finally through door e^2.

It will be seen from the above that the function of the upper sieve is to separate from the wheat materials larger in any one or more dimensions than any grain of wheat, while the function of the lower of the two sieves is to separate the dust and fine seeds or dirt smaller in every dimension than the length of the smallest grains of wheat.

The wheat itself is graded into different sizes, and further purified in the lower set of sieves. These lower sieves, with their shelves, (or, if desirable, two or more sets of sieves and shelves,) are placed below, and the separated or graded final products pass out through openings G G′ G^2, whence they pass between a series of adjustable louver-boards, H H H, exposed to an exhaust of air to carry off dust and stive, and finally drop into receptacles or outlets I.

The louver-boards are supported and adjusted by thumb-screwed axes *y* and thumb-nuts *z* at their ends, said axes passing through the sides of the machine. By turning the screw-axes and tightening the nuts the louver-boards can be set at any angle.

The stive and dust are removed by Archimedean screws J, driven by chain-wheels J^2 J^2 and chain J^3, which chain also drives the feed-roller B, and is driven from the counter-shaft K, which is in turn driven from driving-shaft L.

M is an air duct or trunk, through which air is drawn by a fan placed in any convenient position and worked independently of the machine. This air duct or trunk connects with passages *m m*′ m^2, and the fan therefore exhausts from the various parts of the machine, carrying off the stive, the force of the wind being regulated as required by valves U U′ U^2, worked by hand-wheels W. These hand-wheels are controlled by thumb-screws, as shown.

L is the driving-shaft, carrying driving-pulley *l*, and driving vertical shafts N N′ by bevel-gearing *n n n*′ *n*′.

N N′ are vertical shafts carried by steps P and bearings P′. These bearings P′ and the bearings of the sieves, hereinafter described, are formed in a peculiar manner. Cast on, fitted or screwed into, or simply bearing on two brasses or straps, R R, forming the bearing, are two pivots, Q Q, preferably exactly in the center (both ways) of the brasses. A stirrup, *q*, fastened to the support or to the sieve, as the case may be, carries in its bearings or sockets these two pins, the plan view of these being shown in Fig. 4, and in this plan will be noticed the way the two brasses are fitted into each other, instead of having a straight division between them. This prevents any chance of longitudinal movement the one on the other.

The small figures to one side of the bearings P′ and R on shaft N are sections through the crank-shafts at the points opposite them.

R R are sleeves or brasses attached to the frames carrying the sieves. They encircle shafts N N′, which are formed with eccentric portions R^2 at equal angles to each other round the shaft. Thus, if there be two sets of sieves, as in the drawings, there are two of the eccentric portions or journals at an angle of one hundred and eighty degrees with each other. If there be three, then they would be at one hundred and twenty degrees with each other. By this means they cause the sieves to counterbalance each other.

It will be noticed that the two shafts N N′, being driven by similar gearing from the same shaft, work in exact unison with each other, and consequently, notwithstanding that I can run my sieves at the rate of eight hundred revolutions a minute, they are run with less noise, wear, and tear than running the same sieves at

one hundred revolutions a minute would entail if not geared in unison, but simply connected by the sieve, and if the sieves were only at ninety degrees with each other.

The actual speed for running differs with differing materials and stroke of crank. For half-inch stroke (one inch diameter circle) and wheat cleaning, I prefer a speed of from three hundred to six hundred revolutions per minute, the lowest speed being for Egyptian and the highest for American spring wheat.

The peculiar manner of attaching the sieves to their bearings is also of great value in this case, as it permits any wear and tear in the bearings to be taken up without in any degree altering the distance apart of the pivots on the bearings of the two shafts.

S S are suspension-rods supporting the sieves.

T indicates rubber washers, or the same with iron washers, *t*, outside.

V V are supports with holes for the suspension-rods S, the holes being sufficiently wide for the rods to easily oscillate in them. Now, these suspension-rods overcome a very serious difficulty—namely, that of suspending a sieve so that it shall have a circular motion, yet not support it on the cranks—a mode of suspension which would entail great wear and tear. No other form of suspension mechanism known to me will suffice, as it must have considerable elasticity and not cause jerks or noise. The rubber, being compressible, just gives the required amount for the bars or rods S to gyrate, while no matter what position they take they have a firm bearing on both the frame-work and the sieve-frame, the rubber accommodating itself to the altered angle without sensible wear or tear.

I am aware that a shaking-shoe carrying sieves or screens has been suspended by rods which permitted a gyratory motion, but I am not aware that the rubber washers were ever before employed in connection therewith; and in practice I find them of the utmost importance in preventing noise and wear and insuring a proper support of the sieves otherwise than upon the cranks or eccentrics, the rubber yielding sufficiently to insure a proper movement of the sieve without binding or resting upon the cranks.

Having thus described my invention, what I claim is—

1. In a sifting-machine, the combination of independent sieves, parallel shafts at opposite sides of said sieves, each provided with a crank for each sieve, said cranks being arranged at equal angular distances about the shafts, and connections, substantially such as shown and described, connecting the sieves with the cranks, whereby the sieves are caused to balance one another in all positions.

2. The combination of the two frames carrying sieves rotated by cranks or eccentrics at their two ends, and the two crank-shafts connected by gearing, as described, whereby said sieves are caused to have in every part a circular motion, and the motions of the two sieves are caused to be at an angle of one hundred and eighty degrees with each other, though in parallel planes, so that they shall counterbalance each other throughout their whole movement.

3. In combination with a sieve, a crank at each end connected therewith, and suspension-rods S, freely suspended and armed with washers T at both ends, for the purposes described.

4. In combination with the upright shafts N N′, provided with eccentrics R^2, straps encircling said eccentrics and provided with radial studs or pins, and a sieve provided at its ends with stirrups, said stirrups being attached to and carried by the studs or pins, as shown.

5. In combination with a sieve, a crank at each end connected therewith, and suspension-rods S, all arranged substantially as shown and described.

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