(No Model.) 2 Sheets—Sheet 1.

A. AYER.

ORANGE GRADER.

No. 401,241. Patented Apr. 9, 1889.

Fig. 1.

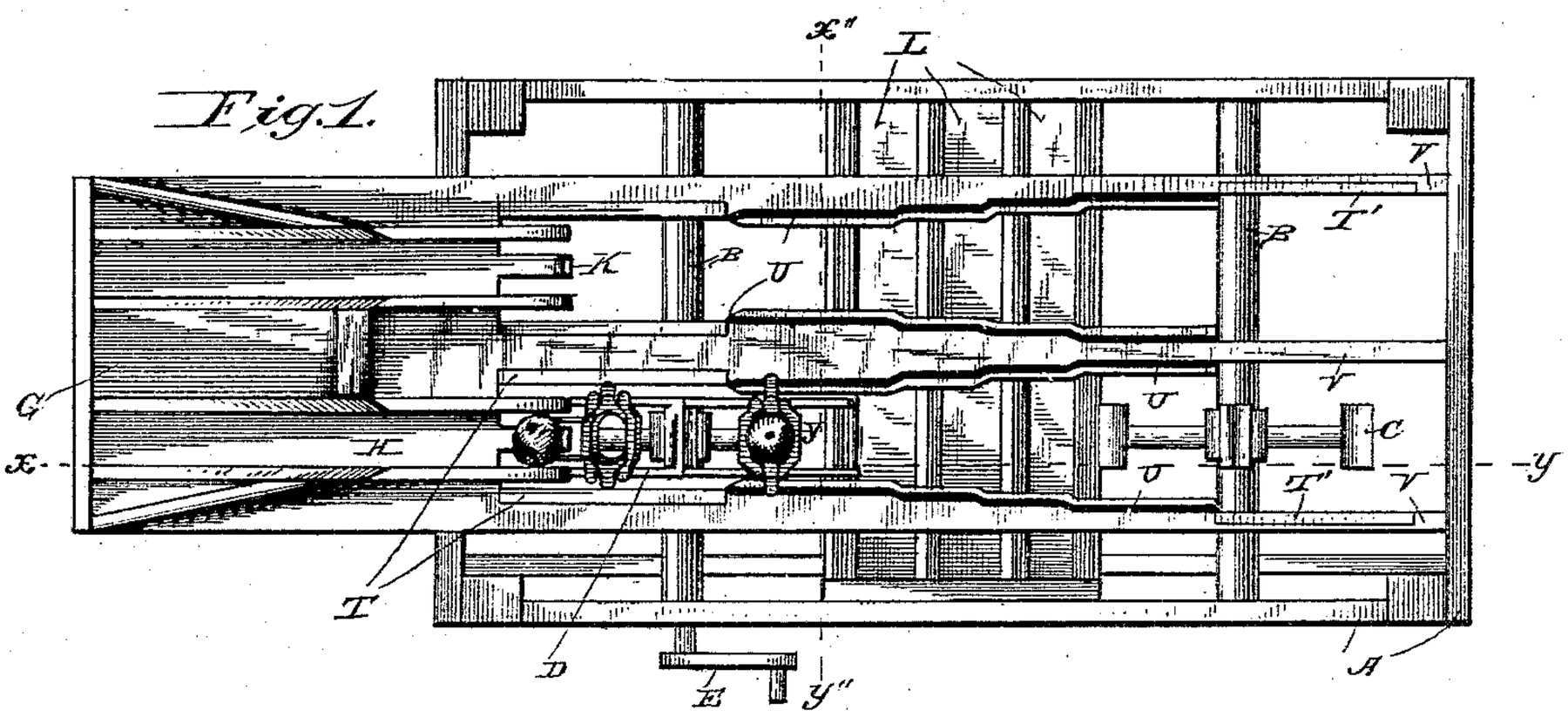


Fig. 2.

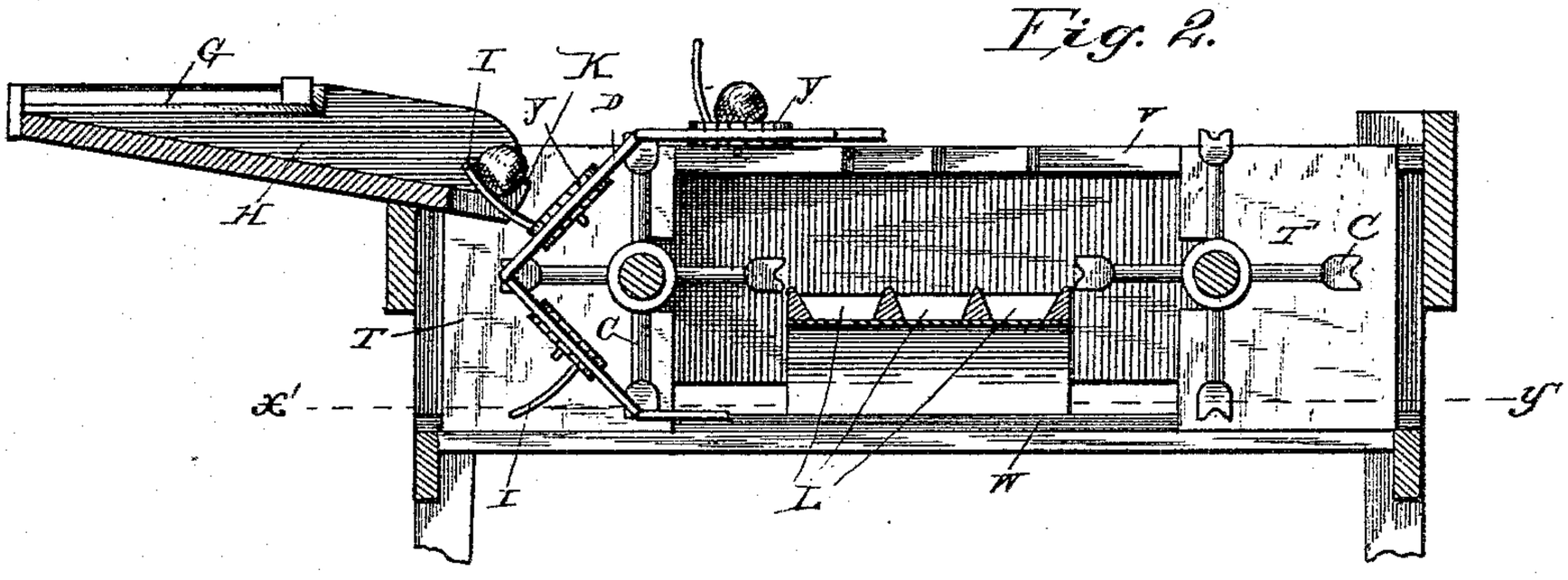
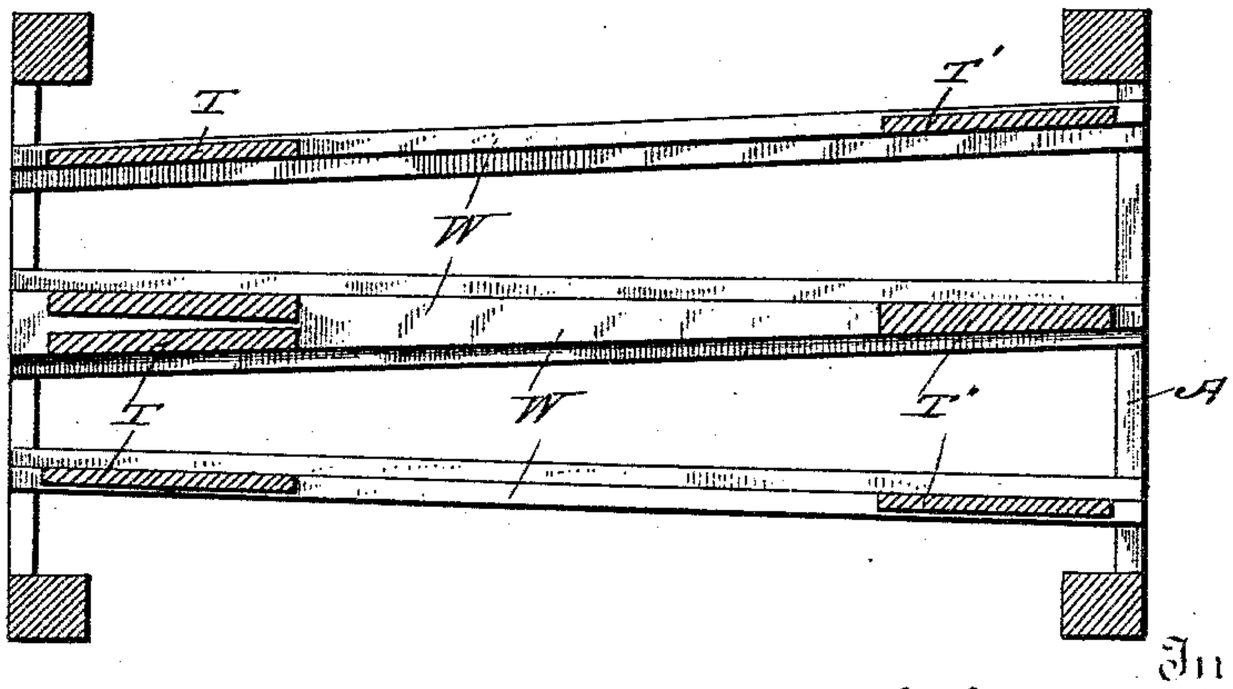


Fig. 3.



Witnesses,
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Geo. H. Lamar.

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By
Lamar Ellis & Lamar
Attorney.

(No Model.) 2 Sheets—Sheet 2.

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Fig. 4.

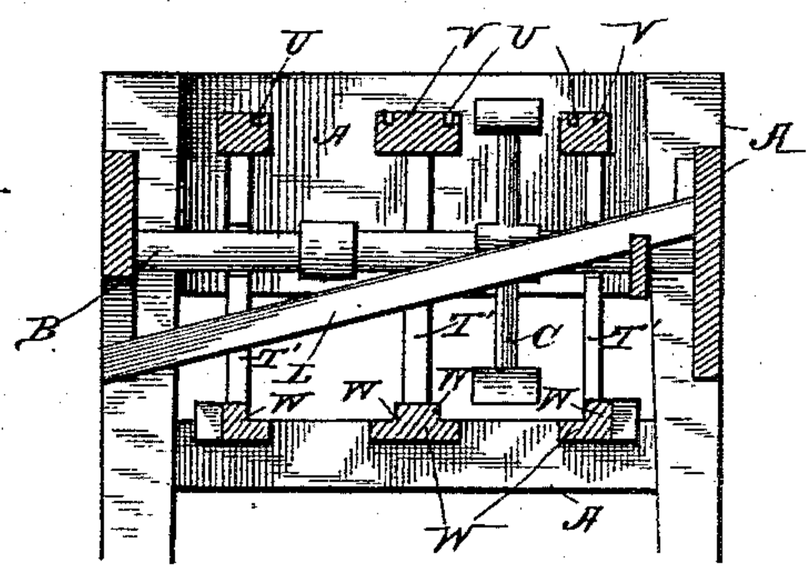


Fig. 5.

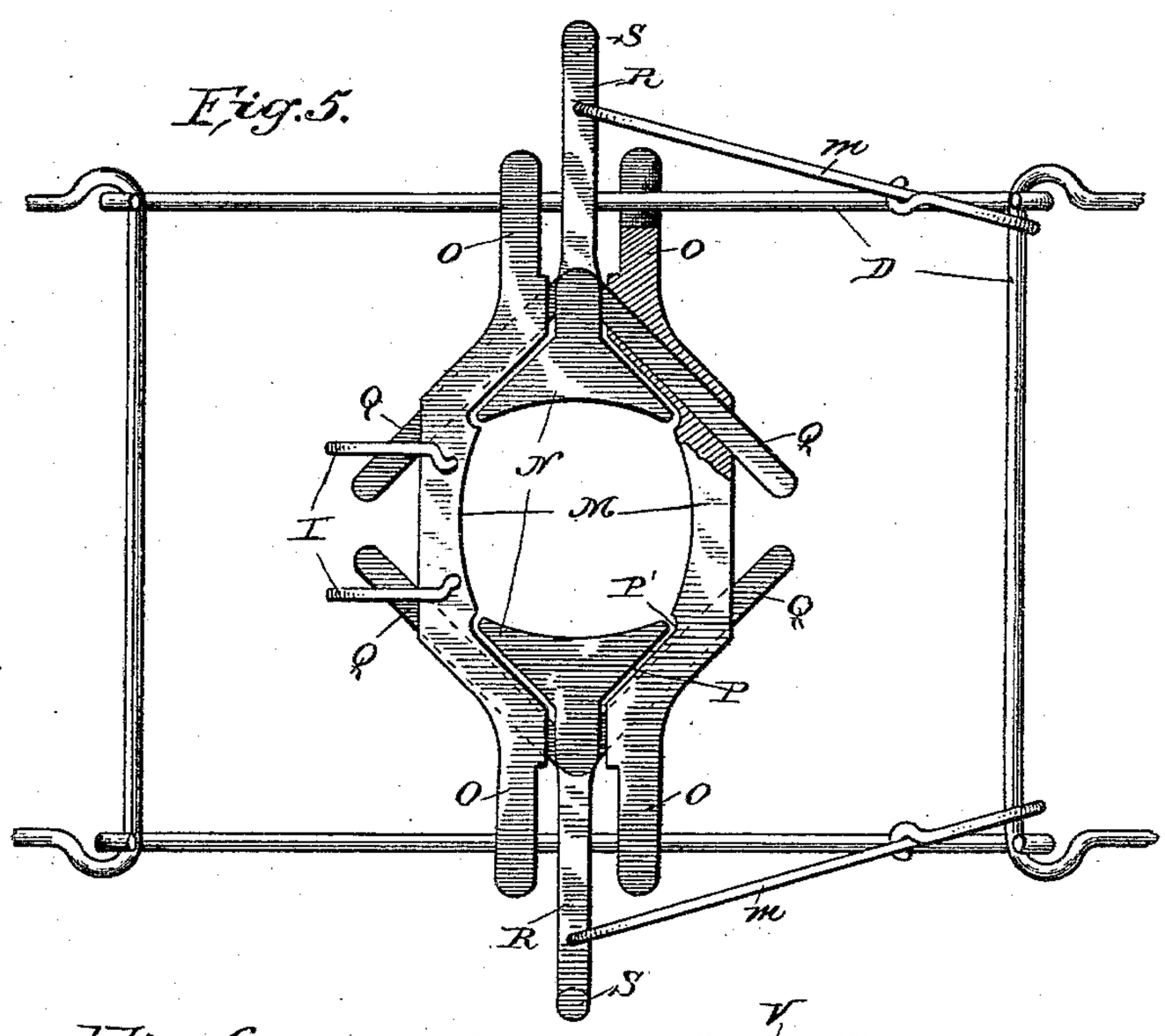
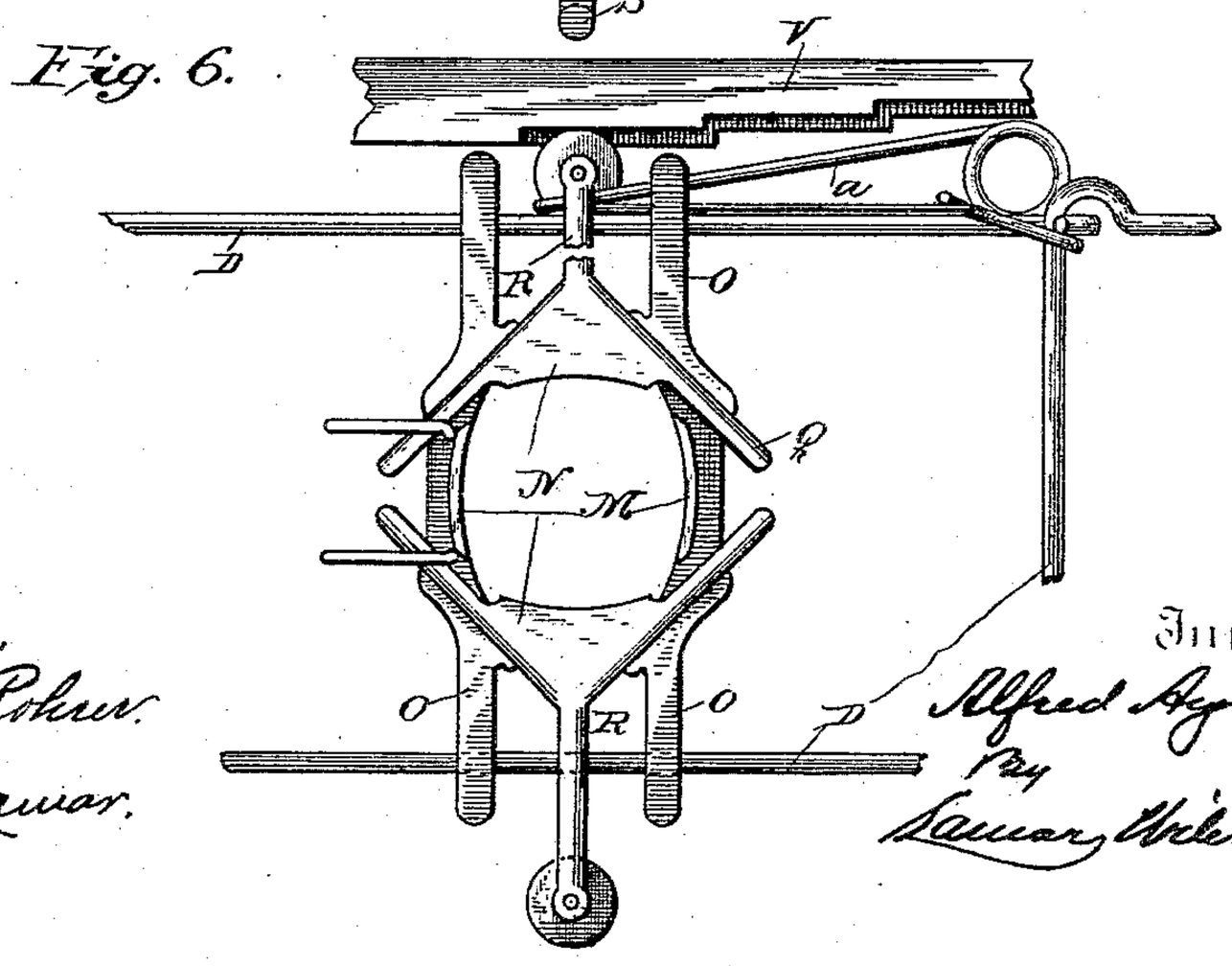


Fig. 6.



Witnesses,
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UNITED STATES PATENT OFFICE.

ALFRED AYER, OF LAKE WEIR, FLORIDA.

ORANGE-GRADER.

SPECIFICATION forming part of Letters Patent No. 401,241, dated April 9, 1889.

Application filed April 30, 1888. Serial No. 272,339. (No model.)

To all whom it may concern:

Be it known that I, ALFRED AYER, a resident of Lake Weir, in the county of Marion and State of Florida, have invented certain new and useful Improvements in Orange-Graders; and I do hereby 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 pertains to make and use the same.

My invention is especially intended for grading oranges, but is equally applicable to the grading of non-spherical articles of other kinds, provided that the length and width of each individual article are approximately equal.

In the drawings accompanying this specification, Figure 1 shows my apparatus in plan views, parts being broken away. Fig. 2 is a longitudinal vertical section on the line $x\ y$. Fig. 3 is a longitudinal horizontal section on the line $x'\ y'$, Fig. 2. Fig. 4 is a vertical transverse section on the line $x''\ y''$, Fig. 1. Figs. 5 and 6 are details, on an enlarged scale, of parts hereinafter described.

In the figures, A is a frame supporting all other parts of the machine, and B B are transverse shafts mounted in this frame and bearing sprocket-wheels C. The two sprocket-wheels are connected by a chain, D, having large square links, upon each of which is mounted a grading-ring, Y. One of the shafts is provided with a hand-crank, E, by which the apparatus is actuated. At one end of the frame is a hopper, G, for the fruit to be graded, and this is provided with a depression or inclined chute, H, down which may pass a single line of oranges. A stop, K, prevents the oranges from automatically passing out of the end of the chute, from which they are lifted in succession by mechanism to be described. Each grading-ring fixed upon the chain is provided with a curved fork, I, whose tines pass through suitable slots in the bottom of the chute as the chain passes upward around the adjacent sprocket and lift an orange out of the end of the chute. As the link in its continued motion changes its position from vertical to horizontal, the orange rolls gently from the fork upon the ring which is to discharge it in one or another place, according to its size. The ring, which is at first a minimum and too small to permit the passage of the smallest orange, is automatically expanded as it passes from left to right above and between the sprockets until it becomes a maximum and large enough to allow any ordinary orange to drop through. This expansion is not gradual, but occurs at intervals, the ring each time becoming larger than before, and the fruit dropped through the ring at either stage falls into one of a series of cloth-bottomed inclined chutes, L, by which it is deposited in a suitable receptacle at one side of the machine. Should any of the fruit be too large to pass through the ring at its largest, it is carried on, and as the chain descends over the right sprocket is dropped into a receptacle (not shown) at the end of the frame A.

The rings, as shown, Fig. 5, are made up of four segments, M M N N, arranged in pairs to form a quadrilateral with curved sides. The segments M are each provided with slotted arms O, adapted to slide upon the side bars of the link. The segments N have at their outer edges straight converging faces P, which at all times impinge upon correspondingly-inclined surfaces P′ upon the segments M, and are also provided with similarly-inclined arms, Q, which slide in closely-fitting passages in the segments M. Arms R also project from the segments N beyond the side bars of the links and bear upon their under sides, near the ends, studs or small rollers S.

It is plain from the construction that if the segments N be forced outward simultaneously their separation will force the segments M apart by the action of the inclined impinging surfaces, and that thus the ring will be enlarged in both directions; and, further, that if the segments N be forced inward the inclined arms Q will draw the segments M together, diminishing the size of the ring. Now when the links are passing upward around the left sprocket the ends of the arms R are in contact with the surfaces of two rigid vertical partitions, T, and the ring is thus kept at its minimum, and before these ends are entirely free from the partitions the studs S enter grooves U in guide-bars V, rigidly secured to the top of the frame A, and these maintain

the relative positions of the segments until the link is quite free from the sprocket. As the chain passes forward, the studs pass simultaneously outward by offsets in the grooves and the ring is enlarged, allowing a small orange to drop through. An instant later the constant advance of the chain causes in the same manner a second enlargement, and so on through any desired number of expansions at any desired intervals, according to the construction of the particular machine. As the studs finally pass from the grooves, the ends of the bars R pass between two vertical walls, T′, which prevent further expansion.

The bars or arms R are returned to their innermost position in passing from right to left along the lower part of their path by impinging against the surfaces of two converging bars, W, Fig. 3, which are continuous with the inner faces of the partitions T T′ at the opposite ends of the frame.

Rotary motion of each ring Y in its own plane is prevented by links *m*, connecting the outer portion of each bar R to the end bar of the link D. The links *m* are loosely attached at each end, so that they may swing as the bar R moves longitudinally.

In operation the crank may be turned with the right hand, while the left corrects any imperfection in the advancing line of oranges in the chute leading from the hopper.

The operation of the machine is extremely rapid, as each link carries forward an orange, and as the grading device, being but a few inches in width, may be duplicated or multiplied by providing the same hopper with two or more chutes, as shown, and by mounting other chains upon the same shafts.

I do not wish to limit myself to the exact construction described, for it is evident that many changes may be made without changing the principle of my machine.

Fig. 6 illustrates a modification that I have used practically and that works well, although the power required is somewhat increased. In this form the structure of the segments M N is slightly modified, and the arms R are thrown outward by springs *a*, attached to the side bars of the links, instead of being operated by the studs and grooves of the former case. In this form the successive enlargements of the ring are produced by offsets in the surfaces, against which the springs *a* press the ends of the arms R.

It is not essential in any case that the ring be divided into just four segments, nor that it be circular.

What I claim is—

1. In an orange-grader, the combination, with a suitable frame, a hopper, G, mounted thereon, and an inclined chute, H, of an endless chain belt mounted in the vertical plane of said chute, the expanding rings mounted upon the links of said belt and each provided with a fork adapted to pass through slots in said chute and lift fruit therefrom, and guiding-surfaces adapted to act upon two opposite sides of said rings fully expanding and contracting each ring while it is making each complete circuit.

2. In an orange-grader, the combination of an endless open-link belt, expansible segmental rings mounted, respectively, in the links of said belt, arms projecting from two opposite segments of each ring, and guides adapted to carry said arms outward as the link passes along one horizontal portion of the chain's path and to press them inward as it passes along the other horizontal portion of said path, substantially as and for the purpose set forth.

3. In an orange-grader, the combination of the revoluble sprocket-wheels C, carrying the chain D, the expansible sizing-rings Y, mounted upon the respective links of said chain, the ring-arms moving in guides adapted to force them alternately outward and inward, and the transverse chutes lying below one fold of said chain, substantially as set forth.

4. In an orange-grader, an expansible grading-ring composed of radially-movable segments, the alternate segments being each provided with ways oblique to the segments' line of motion, and each intermediate segment being provided upon its opposite sides with rigid sliding arms lying, respectively, in the ways of the two adjacent segments, all combined with mechanism for operating two opposite segments, substantially as and for the purpose set forth.

5. In an orange-grader, an endless traveling belt provided with openings larger than the fruit to be graded, expansible rings mounted in said openings, a chute adapted to convey fruit to said belt, a series of forks carried by said belt and adapted to transfer fruit from said chute to each passing ring, and means for expanding said rings from their smallest to their largest limit, substantially as set forth.

6. In an orange-grader, the combination, with two radially-moving segments, N, forming opposite sides of an expansible grading-ring and each provided with rigid arms Q, oppositely inclined to the segments' line of motion, of the opposite segments, M, forming the other two sides of the ring and each provided with ways to receive an arm, Q, from each of the segments N, substantially as set forth, whereby radial motion of the segments N causes a corresponding motion of the segments M and expands the ring symmetrically.

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

ALFRED AYER.

Witnesses:
J. C. PORTER,
L. M. AYER.