(No Model.) 3 Sheets—Sheet 1.

C. LAMPITT.

GRADING MACHINE.

No. 483,225. Patented Sept. 27, 1892.

Fig 1

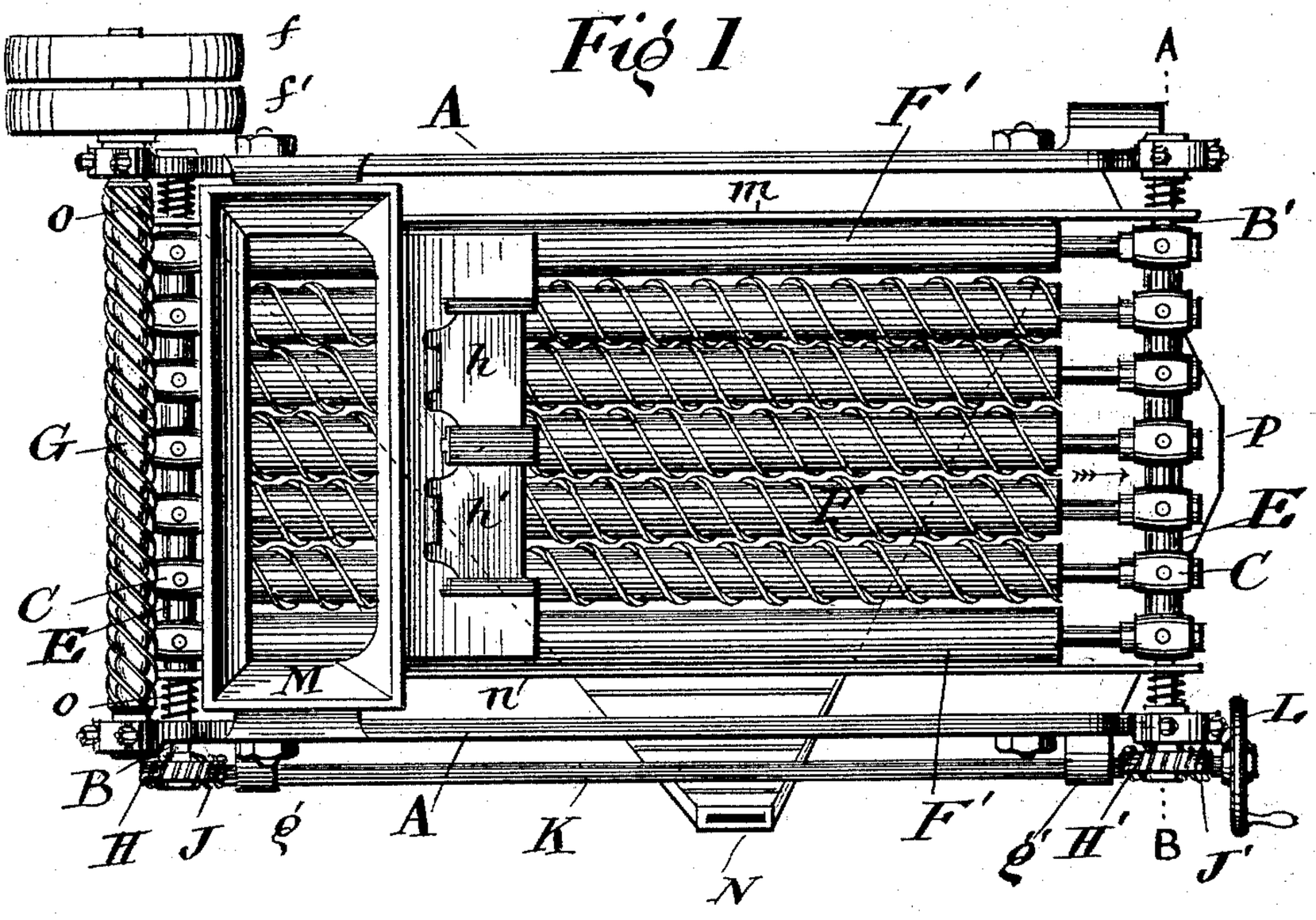
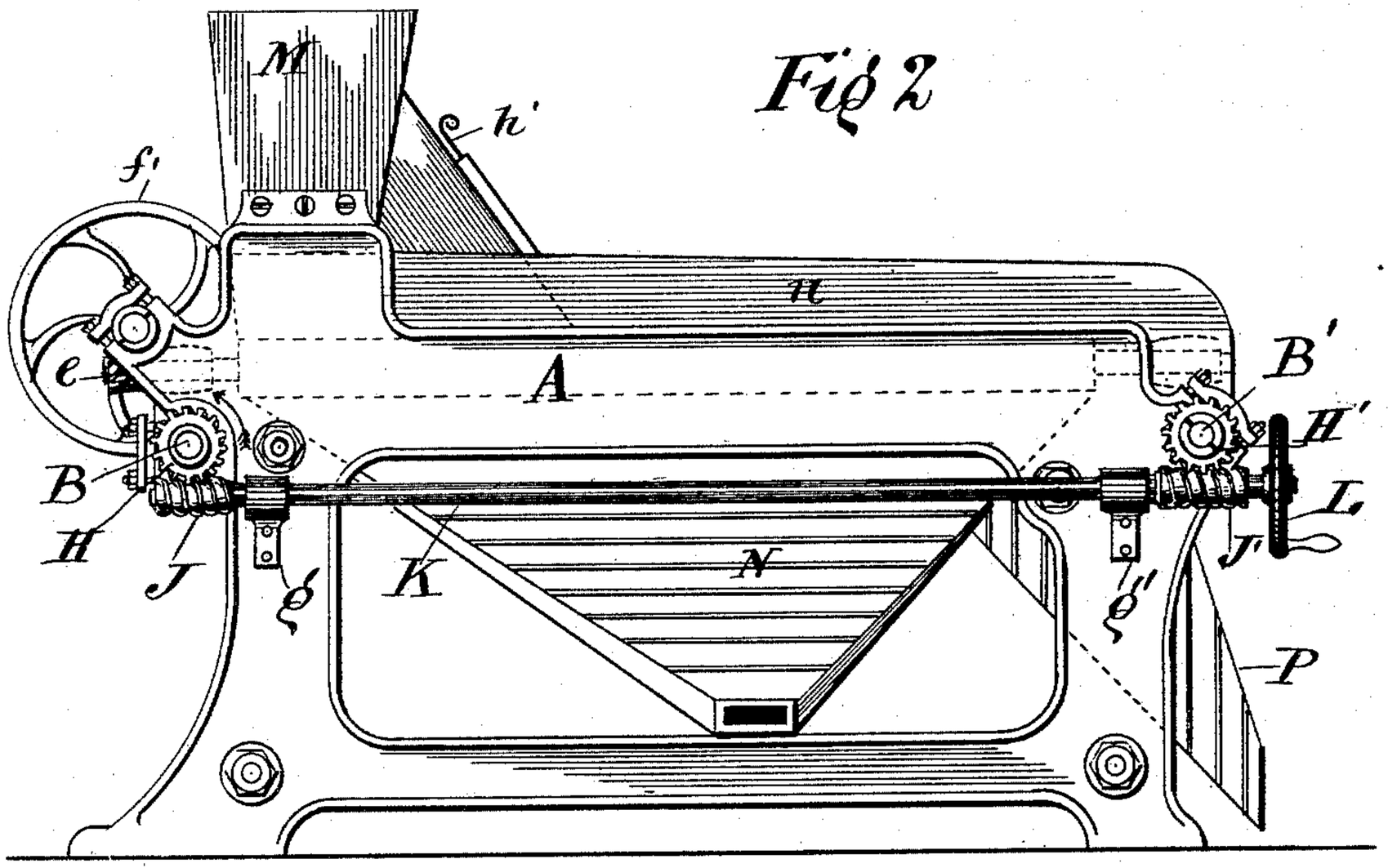


Fig 2



Witnesses
E B Bolton
H Palmer

Inventor
Charles Lampitt
by his Attorneys
Reinard & R

(No Model.) 3 Sheets—Sheet 2.

C. LAMPITT.

GRADING MACHINE.

No. 483,225. Patented Sept. 27, 1892.

Fig 1

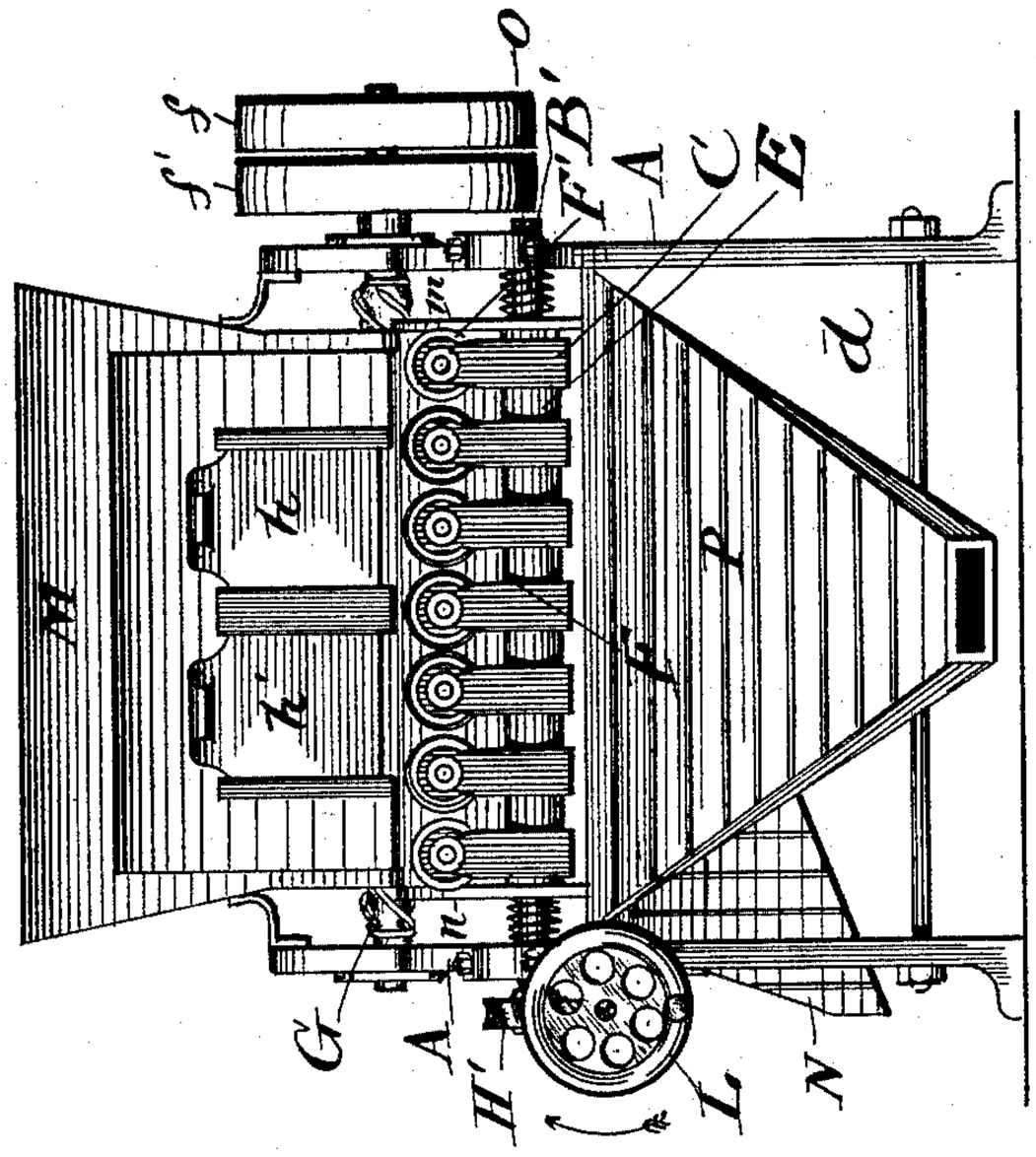


Fig 3

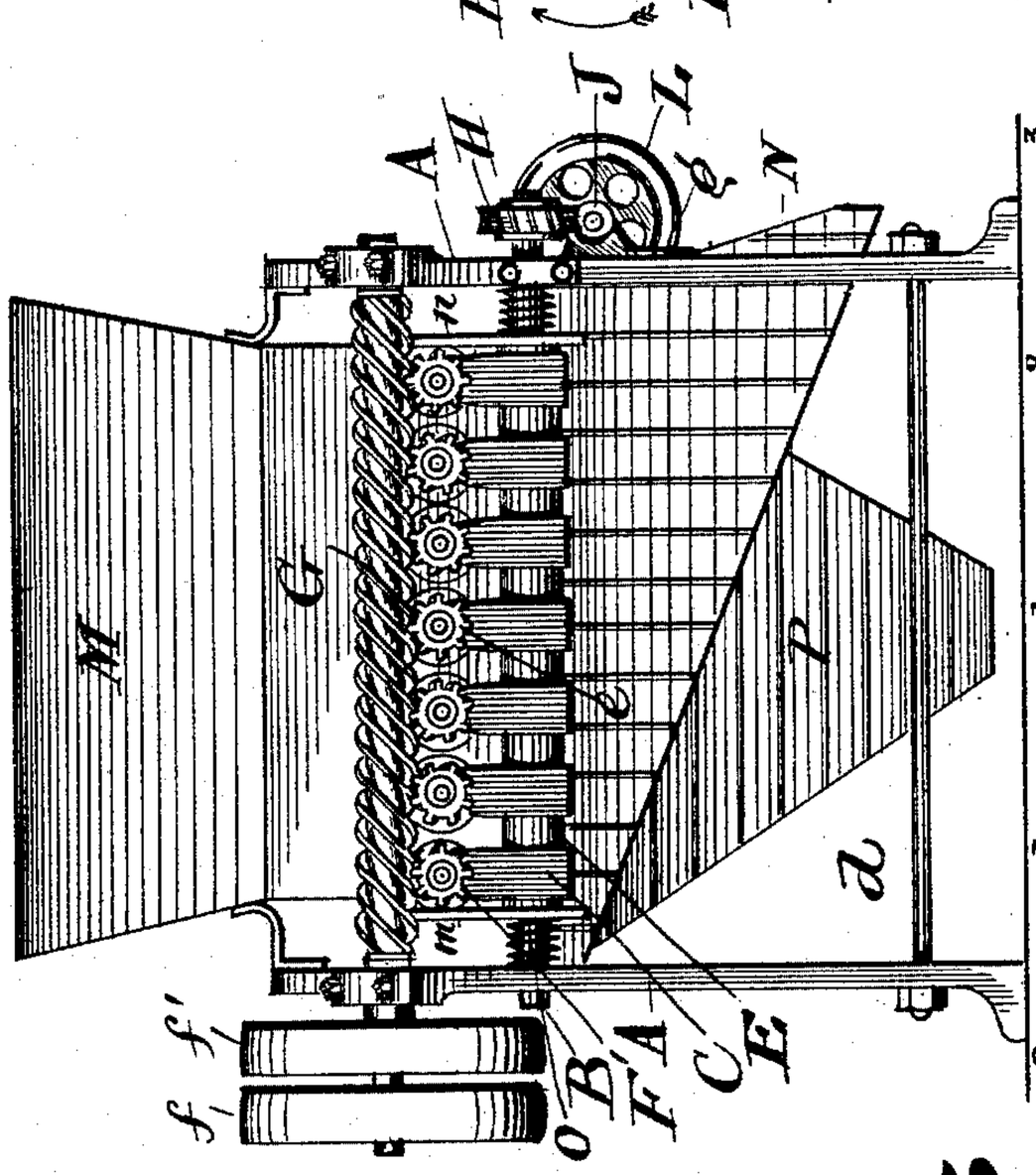


Fig 4

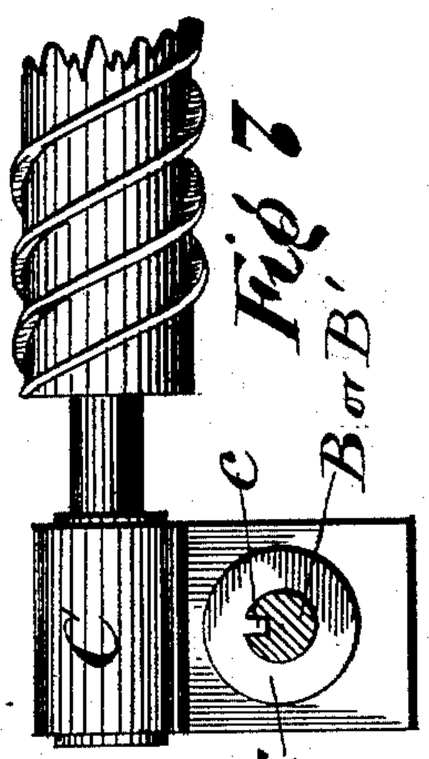


Fig 6

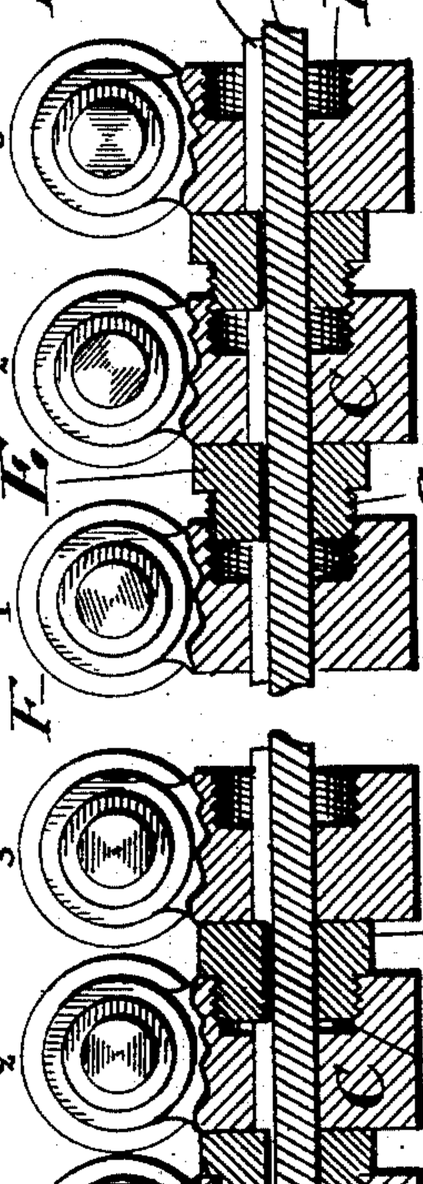
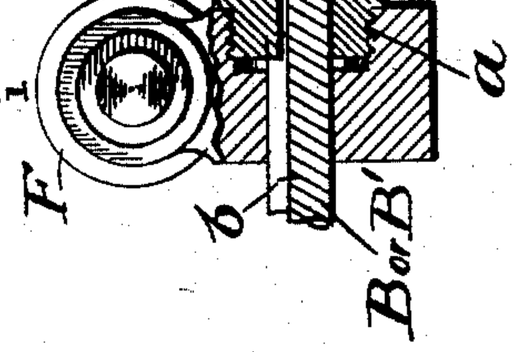


Fig 5



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(No Model.) 3 Sheets—Sheet 3.

C. LAMPITT.

GRADING MACHINE.

No. 483,225. Patented Sept. 27, 1892.

Fig 8

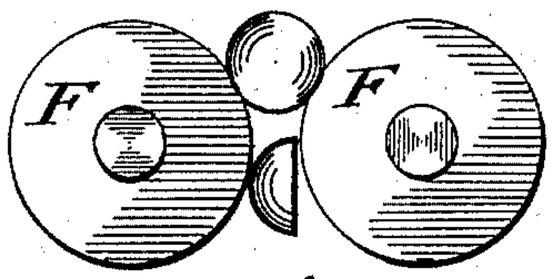


Fig 9

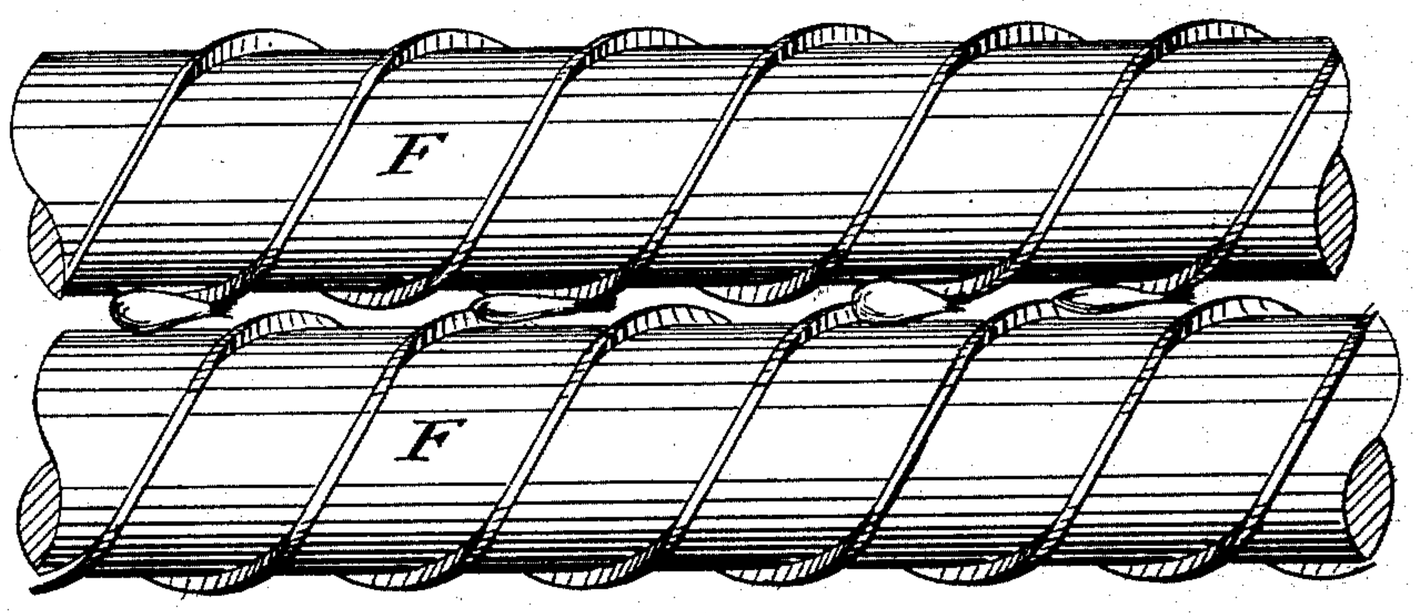
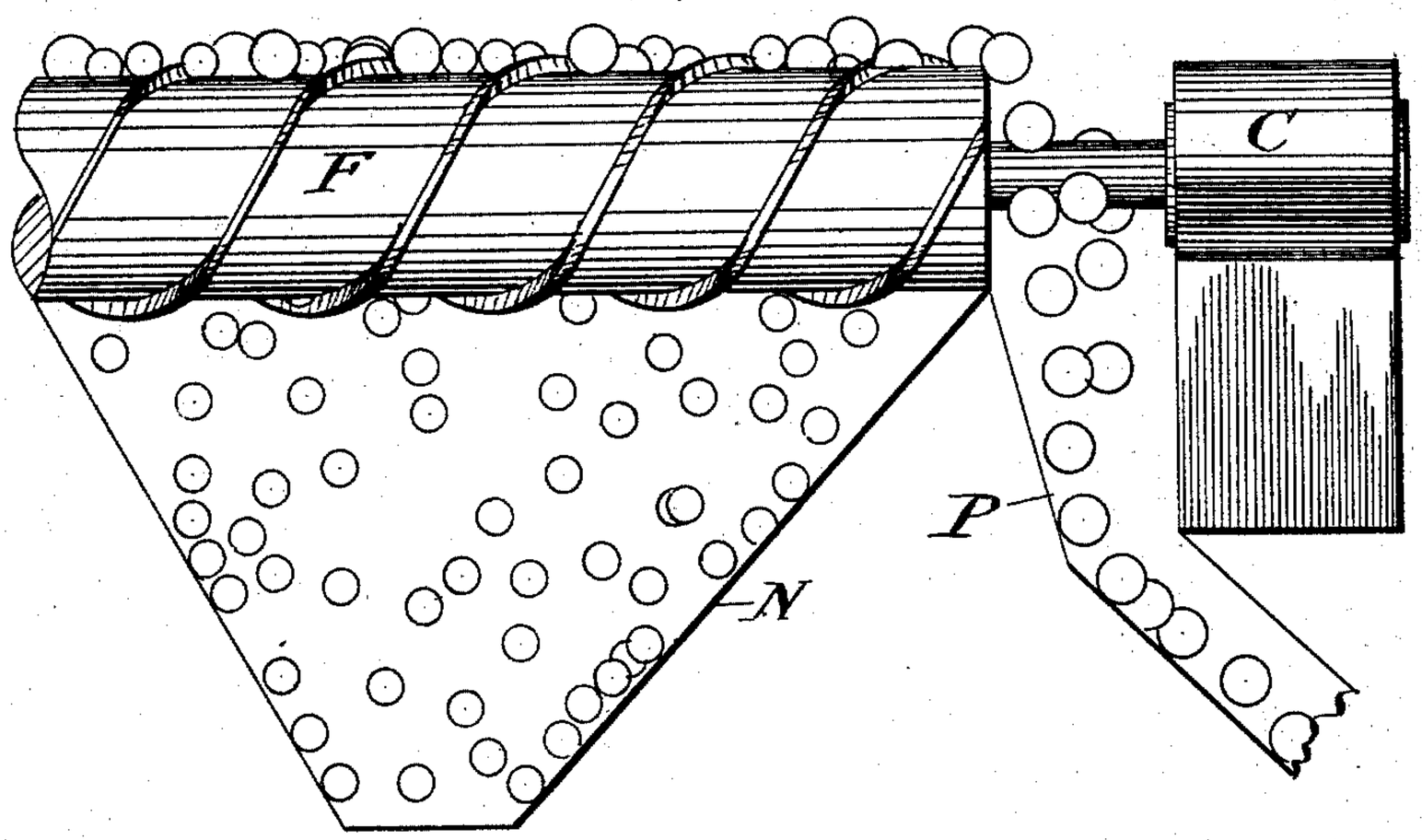


Fig 10



Witnesses
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UNITED STATES PATENT OFFICE.

CHARLES LAMPITT, OF SOUTHGATE, ENGLAND.

GRADING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 483,225, dated September 27, 1892.

Application filed March 14, 1892. Serial No. 424,869. (No model.) Patented in England April 9, 1891, No. 6,109; in Canada June 10, 1892, No. 60,363, and in Victoria June 30, 1892, No. 9,763.

To all whom it may concern:

Be it known that I, CHARLES LAMPITT, engineer and millwright, a subject of Her Majesty the Queen of Great Britain, residing at Nelson Villa, Bounds Green Road, in the parish of Southgate, England, have invented a new and useful Grading-Machine, (for which I have been granted Letters Patent in Great Britain, bearing date April 9, 1891, No. 6,109; in Victoria June 30, 1892, No. 9,763, and in Canada June 10, 1892, No. 60,363,) of which the following is a specification.

My invention relates to a new or improved manner of constructing a mechanical apparatus for sorting or grading barley, oats, wheat, rye, and other grain, peas, beans, rice, and similar vegetable productions, and for dividing and sorting the same or any substance or material consisting of large and small particles sought to be divided and separated from each other.

My invention may also be adapted for use in drying and conveying grains after leaving the mash-tub of breweries, distilleries, and the like, or may be employed for use as an elevator or conveyer of solid substances after the same has been sorted or cleansed, or both; and the object of my said invention when in use as a sorter and separator, and more especially in connection with cereal substances for separating therefrom all matter foreign thereto, is to prevent all possibility of choking or clogging during the process, as occurs in many methods hitherto adopted, and by the application of my invention any substance or combination of substances consisting of any number of degrees of size or varying dimensions or contour may be so separated that each may be divided and removed from the others by the same machine.

My invention when used as a grader or sorter of grain and the like consists of any number of solid or partly solid rollers arranged parallel to and equidistant from each other, the ends of which are reduced in diameter and carried or borne in suitable sliding adjustable bearings provided at each end of the frame of the machine and arranged to slide laterally with the rollers by the means of a novel mechanical movement, by which the distance or spaces between the said rollers must be, and always are, at all times equal to each other. The said adjusting mechanical movement is attained by the means of a transverse rod or spindle at each end of the machine, passing freely through each set or series of bearings, a hole being provided in each bearing for the reception thereof. The said spindles or shafts are each furnished with a longitudinal slot, groove, or keyway, and passes freely through and carries a number of metallic blocks in such a manner that the blocks occur thereon alternately with the before-mentioned bearings—that is to say, one block for each bearing. Upon the inner periphery of each block I form a projection, which serves as a key for engaging with the keyway in the shaft, and by this means the blocks and bearings are free to slide along the shaft; but the blocks only can be rotated by and with the rotation of the shaft. Upon one side of each block is a threaded projection, which screws into an internally-threaded recess in the companion bearing, and by the rotation of the shaft all the blocks are rotated, which according to the direction thereof are either screwed into or out from the said bearings and the distances or spaces therebetween extended or diminished thereby equally. In order that both the said shafts may rotate simultaneously and their respective bearings, and consequently both ends of said rollers may be spaced equally, I provide at one side of the machine a horizontal rod carrying a worm upon each end thereof, which engage with a worm-wheel keyed or otherwise rigidly fixed upon the proper end of the said shafts, so that the turning of said rod by means of a suitable handle rotates both shafts in the same direction simultaneously and equally. To the outer surface of each of the before-mentioned rollers or each alternate roller or every third roller or otherwise, as may be desired, is attached or formed integrally therewith a helicoidal or spiral projection, the pitch and direction of which are identical in all the rollers and so arranged that the helix of one roller occurs alternately with the helix upon that of its neighbor, supposing that each succeeding roller is so formed, or a helicoidal groove or grooves may in certain cases be employed in lieu of the said projections. I do not confine

myself to any particular method of rotating the said rollers; but prefer to drive them by means of worm-gearing in the manner to be hereinafter fully explained, although the same may be driven by any suitable means whereby they may all be rotated in the same direction and at the same speed.

I provide upon one end of the said machine and above the rollers a suitable hopper for the reception of the substances to be operated upon, furnished with sliding doors for regulating the feed, and as the grain or other substance when placed or shot into said hopper falls upon the rollers at the end from which the receding motion of the helix of each commences the same is carried thereby along the rollers and turned over and over in its passage, by which means the longest dimensions of the grain or other substances become in line with the rollers, so that such grains or the like whose smallest diameter is less than the space between the rollers must fall therethrough or therebetween into suitable chutes or receptacles, while the larger is conveyed to the ends of the rollers and falls through spaces left between the ends of the rollers and the bearings for that purpose into a separate chute or receptacle, and may then be conveyed to a second machine whose rollers have been adjusted to perform the next smallest gradation, or the same may be again passed over the first machine, when the rollers of this have been adjusted for the same purpose, or any number of machines may be employed arranged in like manner to continue the grading process after each other until the same is perfected.

By a slight modification of the foregoing the same may be employed at the pumping-station of sewage-works, in which case the rollers may be extended to any length and the sewage in its crude state allowed to flow thereonto, so that pieces of wood, bones, bagging, or other substances likely to choke the pumps may be conveyed by the revolving rollers where desired, while the fluid portion would fall between into suitable receptacles to be operated upon by the pumps, and by reason of the opposing surfaces of each pair of rollers passing each other in opposite directions choking or the accumulation of matter could not possibly occur; but, on the contrary, the rollers would by the constant passing friction be always perfectly bright and clean.

My invention may be adapted for a variety of purposes, such as equally distributing the feed to the rolls or sieves of purifiers and other machines, it being impossible to choke or clog the rollers constructed and operating as hereinafter described and shown, and I am enabled thereby to sort or grade the material acted upon and convey the residue at the same time a distance equal to the length of the rollers employed.

In order that my invention and the manner of its operation may be clearly understood, I have appended hereunto three sheets of drawings, in which—

Figures 1 and 2, Sheet 1, are plan and side elevations, respectively, of an entire machine according to my invention as it would appear when constructed as a grading medium for cereal and other like substances or materials of similar size and weight. Figs. 3 and 4, Sheet 2, are front and back elevations, respectively, of Figs. 1 and 2. Figs. 5 and 6 are enlarged sectional views of a short series of bearings taken through the center of the adjusting shaft or spindle, or upon so much of the line A B, Fig. 1, as refers to the bearing only. Fig. 7 is a side elevation of one of the bearings similar to Figs. 5 and 6, showing a section of the adjusting-shaft, illustrating the manner in which the same engages with the adjusting-blocks. Figs. 8, 9, and 10 are diagrammatic views to be hereinafter fully explained.

Similar letters of reference are used throughout the drawings when indicating the same or like parts.

In carrying my invention into effect I cast or otherwise construct of iron, wood, or other suitable material, and of any dimensions or contour, a frame A, upon the ends of which I mount within suitable journals transverse shafts or spindles B and B′ of sufficient strength to carry the number of bearings C required. The said bearings may be of any suitable metal, cast or made solid or otherwise, and of any desired shape at their upper ends, but preferably rectangular in cross-section at their lower ends. In one side of each of these I bore or otherwise form a circular opening or recess D, Figs. 5 and 6, Sheet 2, extending any desired distance thereinto, but preferably one-half or thereabout, and provided with an internal right-handed screw-thread. Each bearing C is accompanied by a circular or other shaped metallic block or disk E, with an extension *a* formed upon one face thereof, upon which is cut or otherwise provided an external screw-thread corresponding to the thread in D, into which *a* is loosely screwed until the disk or block E abuts against C, as shown. A circular hole is bored through C and E, or cast or otherwise formed therewith, centrally with the extension *a*, and of a size capable of permitting the shafts B or B′ to pass easily therethrough. A longitudinal groove or keyway *b* is formed in the shafts B and B′ for the whole of their lengths between the journals, and a projection *c*, formed upon the inner periphery of each of the disks or blocks E, engages with *b*, so that while C and E would be free to slide along B or B′, E only would be rotated if a rotatory motion be given to the shaft, or two keys and keyways may be used to engage E with B or B′, as desired.

Each bearing C is bored or otherwise formed with a circular opening at its upper end at right angles with the bore for the reception of the adjusting-shaft B or B′, which may be

provided with suitable brasses for receiving the journal ends of the rollers. The rollers F may be solid or otherwise, but preferably the former, and made of chilled iron or steel or faced with the finest steel, upon the outer surface of which is provided a single, double, or treble helical thread extending from end to end thereof, and either cut thereon from the solid or fixed thereto by any suitable means, or cast or otherwise formed therewith. Each roller is turned down at both ends to fit the brasses in the bearings C and sufficiently to extend therebeyond when pushed home thereinto, for purposes to be hereinafter explained.

The sides of the frame A may be held rigidly connected to each other by any suitable means, but preferably by that of tie-rods *d*, the length of these regulating the width of the frame, which would be variable, according to the number of rollers employed. In the accompanying drawings I have chosen to show a machine having seven rollers; but any number may be employed, according to the desired grading capacity of the machine, such number being preferably odd, in order that each machine may have a central roller. I may in certain cases alternate the helical rollers F with plain rollers F′, or any number of rollers F with a plain roller F′ outermost at each side, as in Fig. 1, Sheet 1.

The capacity of the machine and the number of rollers it is to carry being decided upon a like number of bearings C, each accompanied by a disk E, would be mounted upon the shaft B, so that C and E occur alternately thereon and B be placed in position upon the frame A. One end of the rollers F and F′ would then be placed within the bearings C and a duplicate number of bearings C and disks E placed in a like manner upon the shaft B′, and this also placed in position upon A. The distance between the first and second or front and back rows of bearings would be several inches in excess of the length of the helical or larger diameter of the rollers. I have before mentioned that the turned-down or spindle ends of the rollers are longer than the diameter of the bearings through which they pass, the purposes of which are that by pushing the rollers close up to the front bearings C upon the shaft B the spindle ends thereof would extend through and beyond the bearings sufficiently to receive upon each and keyed or otherwise fixed thereto a worm-wheel *e*. This arrangement provides a space of several inches between the ends of the rollers and the back bearings upon the shaft B′, as will be seen by reference to Fig. 1, Sheet 1, the purposes of which will be hereinafter made understood.

I have previously mentioned that the rollers F and F′ may be rotated by any suitable means and may be driven from either end; but in practice I find it preferable to rotate them by the means of a worm upon the front end of the machine, as I make it a *sine qua non* that the said rollers must all rotate in the same direction and at equal rates, and I regard the worm-and-wheel method the most reliable means of attaining and maintaining this, and as I intend the front end to be that end which carries the shaft B, I fix, as aforesaid, upon that end of the projecting spindles of the rollers the worm-wheels *e* and mount within suitable bearings a worm G, capable of engaging with and rotating equally all the wheels *e*. One end of the spindle of G extends beyond the frame A and carries thereon a fast and loose pulley *f f′*, or an equivalent therefor, by which the same may by suitable power be rotated.

The ends of the shafts B B′ extend beyond the frame A and carry worm-wheels H and H′, which gear with worms J J′ upon each end of a horizontal shaft K, carried within suitable bearings *g* and *g′*, fixed to the frame A, and upon one end of said shaft K is mounted a wheel or handle L, by which it may be rotated or partly rotated at will.

Upon the top of the frame A and above the rollers I provide a suitable hopper M, with adjustable slides *h h′*, or their equivalents, for regulating the feed of the grain or other substance or material to be graded.

Now, presuming that the disks E are each screwed as far as possible into their bearings C, the rollers F F′ would be as near to each other as it is possible to get them and the space between them reduced to its narrowest limits. In the accompanying drawings the disks E are abnormally thick to what they would be in actual practice, this being done to prevent the appearance that the helices of the rollers were in touch with each other, but actually the rollers would be so arranged before gearing the worm G with the wheels *e* that the projecting helix of one roller would occur alternately with the projecting helix of its neighbor, so that the disk E may be thin enough to permit the helix of one roller to all but touch the body of its neighboring roller or rollers. Therefore the depth of the projecting helix would represent the smallest grading capacity of the rollers, or approximately so; but as the said helical projections or helical grooves serve no purpose other than that of conveyers the height of the former or depth of the latter may be less than the diameter of the smallest oat grown, and as the disks E are used for adjusting the spaces between the bearings C, and consequently the rollers F and F′, the thickness of the largest diameter of said disks may be only sufficient to prevent actual touch between the helices of one roller and the body of its neighbor or neighbors.

The manner of operation is as follows: The pulleys *f f′* and the worm G being driven by suitable means would be caused to rotate in such a direction that by reason of the gearing of G and the worm-wheels *e* the rollers F and F′ would rotate, so that the helical feed thereof would be in the direction of the ar-

row, Fig. 1, and the grain or other substances to be graded would be shot into the hopper M, which, falling upon the revolving rollers, would be conveyed by the agency of the helices therealong, and by reason of the rollers all revolving in the same direction would be turned over and over thereby, and choking or clogging would not be possible, since the opposing surfaces of each pair of rollers pass each other in opposite directions. By this means the longest dimensions of the grain or other substance would be brought lengthwise with the rollers and the shortest dimensions with the space between them, so that the smallest grain or other substances would fall between the rollers into a suitable chute or receptacle N, while the larger would be conveyed to the ends of the rollers and fall between the turned-down ends thereof provided for that purpose into the chute or other receptacle P. Now having extracted by this means the smallest grains or other substances of the contents of M, to remove the next smallest particles from the contents of P the grading-spaces between the rollers must be slightly extended. I attain this as follows: By turning the wheel or handle L, and consequently the shaft K and worms J and J′ in the direction of the arrow, Fig. 4, Sheet 2, the worm-wheels H and H′ and the shafts B and B′, upon which they are mounted, would be rotated in the direction of the arrow, Fig. 2, Sheet 1, and as the disks E are only loosely keyed to B and B′ these would be rotated thereby in the same direction, which would have the effect of unscrewing each disk E a like distance from its bearing C at both ends of the machine simultaneously. Referring to Figs. 5 and 6, Sheet 2, in which the three sectional elevations shown are numbered 1 2 3 in Fig. 5, the bearings C and rollers F are as close together as possible without actually touching each other and the disks E screwed right home into their respective bearings C. Now if the disk E, No. 1, be rotated by the shaft until it has been unscrewed from its bearing—say one-sixteenth of an inch—it would push bearing No. 2 along the shaft a like distance, and as the disk E of No. 2 would also be simultaneously rotated a like distance by the shaft, it follows that that would also be unscrewed from No. 2 one-sixteenth of an inch and would push No. 3 bearing a like distance along the shaft, and so on for the whole of the series of bearings, irrespective of their number, as shown by Fig. 6, which represents Fig. 5 after the unscrewing described. I am thus enabled by this device to provide an equal adjustment of the space between each roller and its neighbors by the simple turning of the wheel or handle L, and as the movement of this may be by infinitesimal degrees it follows that the distance between the rollers may be extended or diminished to the breadth of a hair and remain in the position in which they have been placed for an indefinite period, or until L be again rotated in the direction desired. The contents of P may now be shot into M and the second degree of grading carried out, as before.

To prevent the substances being graded from passing over the outer rollers F′, I provide two horizontal vertical plates *m* and *n*, or their equivalents, arranged to slide upon the shafts B and B′, or by any other suitable means. The plates *m* and *n* may be kept in close contact with the rollers F by any approved means, but preferably by that of springs *o*, which also serve to press the bearings together when the space between them is being reduced.

It may sometimes occur that it is necessary that the bearings C, when the spaces between them are being enlarged, should not all slide along the shaft in the same direction. By making any one bearing a fixture the remaining bearings on each side thereof would recede therefrom in opposite directions by the rotating of L, as before described, compressing thereby the springs *o* at each side of the machine. The manner of adjusting the spaces between the rollers will now be fully understood.

The diagram Fig. 8, Sheet 3, in so far as regards the whole and split pea or bean, clearly illustrates how my apparatus would separate the one from the other, while Fig. 9 serves a like purpose with regard to the separating of oats from barley.

I have previously mentioned that my said invention may be adapted for the grading, sorting, and separating of any substances or materials consisting of large and small particles which it is necessary should be divided from each other, and in large establishments where a great quantity of materials have to be so treated the apparatus described could be employed in duplicate or triplicate, or more if needed, each adjusted so as to perform a grading operation following each other. In illustration of this let it be supposed that a large quantity of mixed grain—say oats—is lying in the top floor of a warehouse, and that the said oats are known or believed to consist of, say, five different grades or qualities that need separating. One of my apparatus could be placed on said floor and the rollers so adjusted that the smallest oats only could pass between them. A man could be continually employed to shoot the said mixed oats into the hopper M, the slides *h h′* having been properly adjusted that the feed may not be in excess of the grading capacity of the machine. The finest or smallest oats would pass out through the chute N, while the other four larger sizes would be carried along the rollers into the chute P, and this could be arranged to lead to the hopper M of a similar apparatus in the next lower floor, and so adjusted that the next larger oats would pass through the rollers thereof, while the remaining three grades of oats could be passed in a like manner to another apparatus gaged to perform the next degree of grading, and so on. Thus four ma-

chines would divide the five grades of oats, with the labor of one man only, as each of the chutes N could be arranged to lead to suitable bins or other receptacles. Reference to the diagram Fig. 10 will render this perfectly clear.

I wish it understood that I may construct the apparatus herein described of any suitable material or combination of materials and without limit of dimensions, and may rearrange the various parts relatively to each other in any suitable manner for the purposes stated, so long as no substantial alteration be made in the construction thereof, without departing from the principle of my invention.

Having now fully described my said invention and the manner of operating the same, what I claim, and desire to secure by Letters Patent of the United States of America, is—

1. In combination, the frame, the series of parallel grading-rollers, means for rotating the rollers, the bearing-blocks at the ends of the rollers, the means for supporting the rollers and bearing-blocks, consisting of the cross-shafts, and the means for adjusting the bearing-blocks, said means being supported directly by the cross-shafts and in operative connection therewith, substantially as described.

2. In combination, the frame, the series of parallel grading-rollers, means for rotating them, the bearing-blocks and adjusting-disks therefor, the means for supporting the said parallel rollers, the blocks, and adjusting means, and for operating the latter, consisting of the cross-shafts B B′, having a splined connection with the disks, and the means for operating both the said shafts in unison, including the operating connection from one shaft B to the other B′, substantially as described.

3. In combination, the series of parallel grading-rollers, with operating means therefor, the movable bearing-blocks for said rollers, the interposed disks between the bearing-blocks, screw-threaded to engage the same, and the means for supporting the blocks and operating the threaded disks, consisting of the shaft having a spline connection with the disks, substantially as described.

4. In combination, the series of parallel grading-rollers, the movable blocks therefor, the shafts for supporting the bearing-blocks, and the interposed screw-threaded disks E, having a spline connection with the shaft, the said blocks having screw-threaded recesses to receive the screw-threaded ends of the disks, substantially as described.

In witness whereof I have hereunto set my hand in presence of two witnesses.

CHARLES LAMPITT.

Witnesses:

GEO. THOS. HYDE,

SAMUEL J. EARL.