

1,294,740.

E. E. WINKLEY.
GRADING MACHINE.
APPLICATION FILED JUNE 22, 1916.

Patented Feb. 18, 1919.
5 SHEETS—SHEET 1.

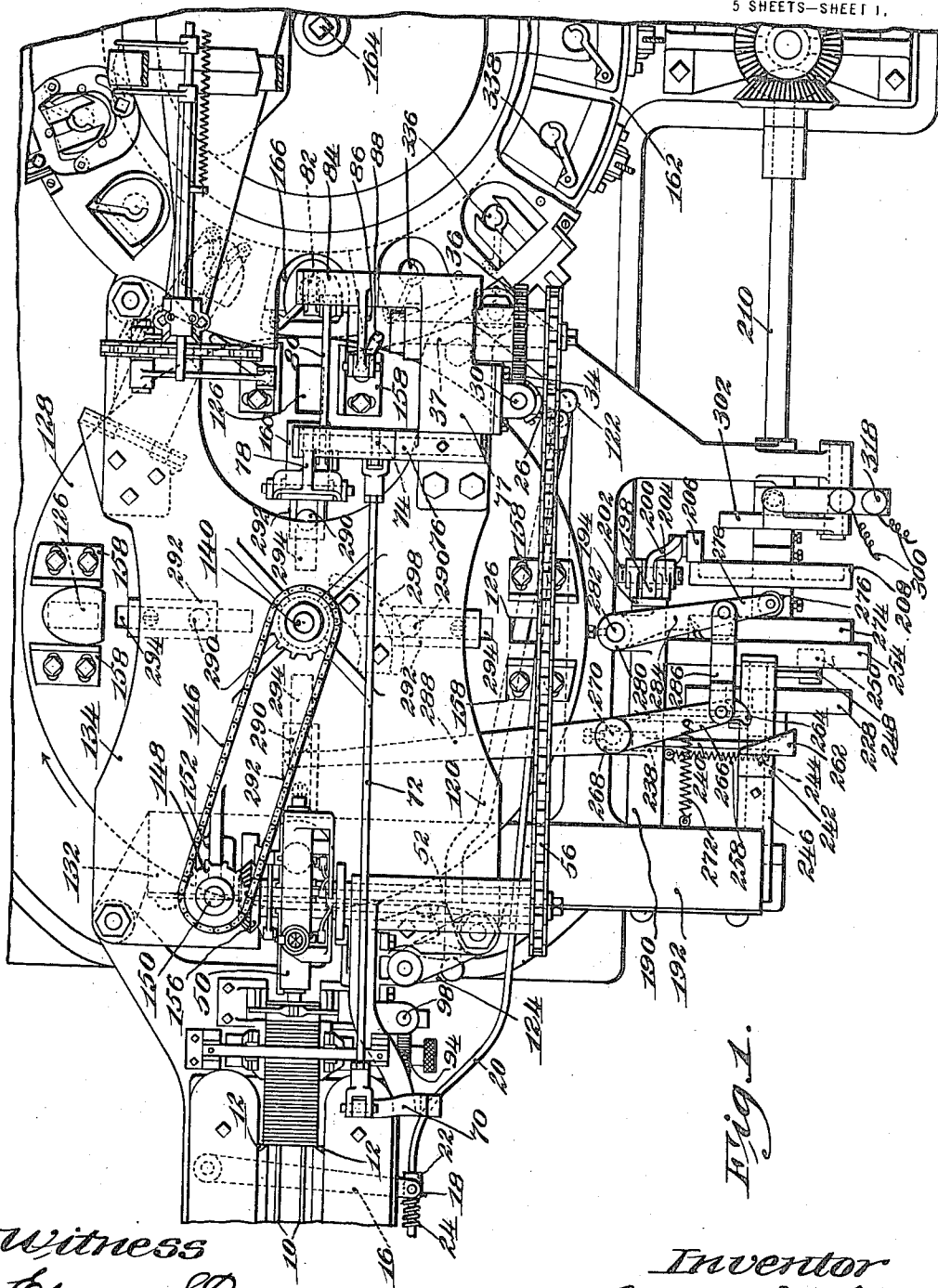


Fig. 1.

Witness
Edward S. Day

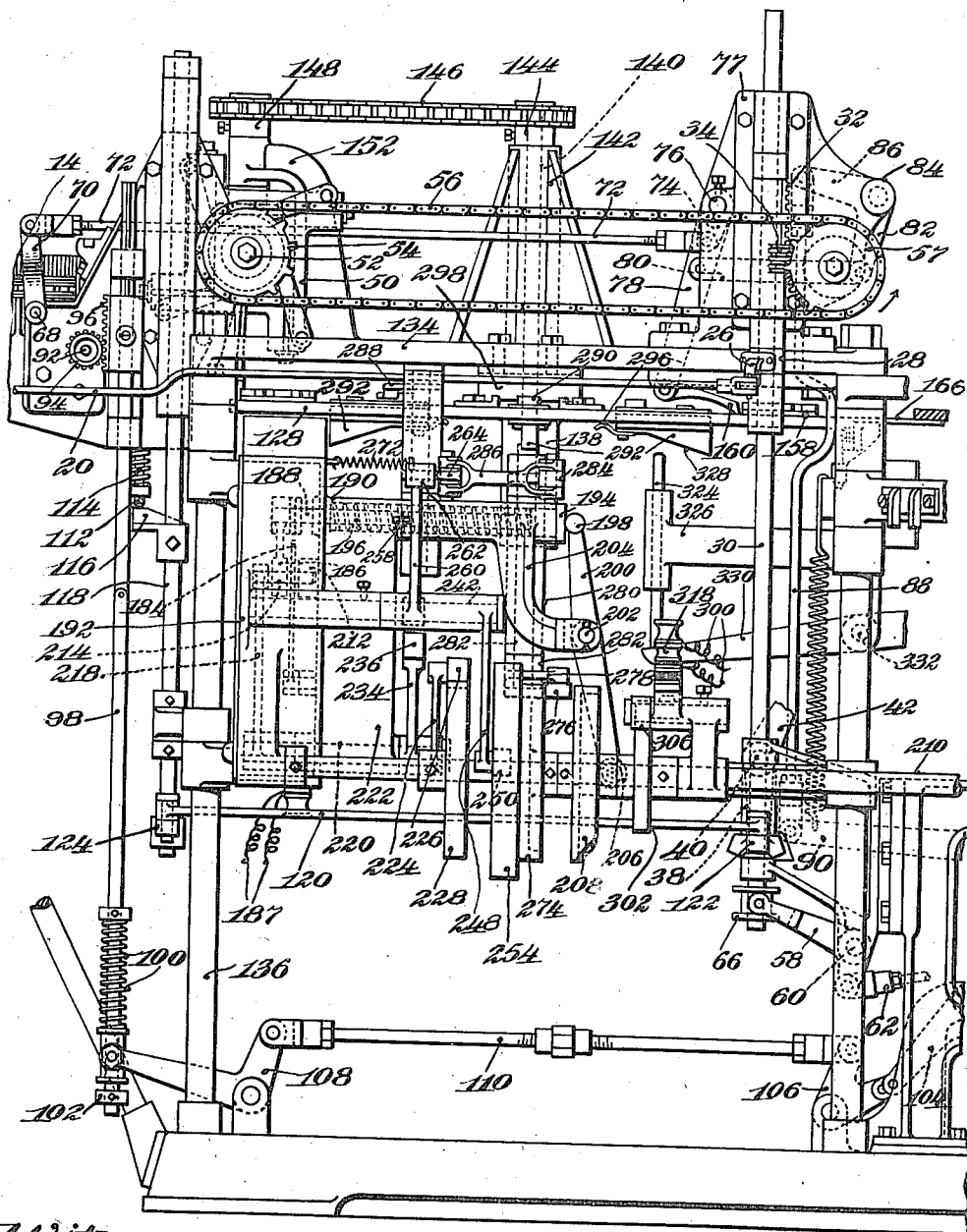
Inventor
Ernest C. Winkley
by his attorneys
Phillips Van Ceven & Fish

1,294,740.

E. E. WINKLEY.
GRADING MACHINE.
APPLICATION FILED JUNE 22, 1916.

Patented Feb. 18, 1919.

5 SHEETS—SHEET 2.



Witness
Edward S. Day

Fig. 2.

Inventor
Ernest E. Winkley
by his attorneys
Phillips, Hanover & Fish

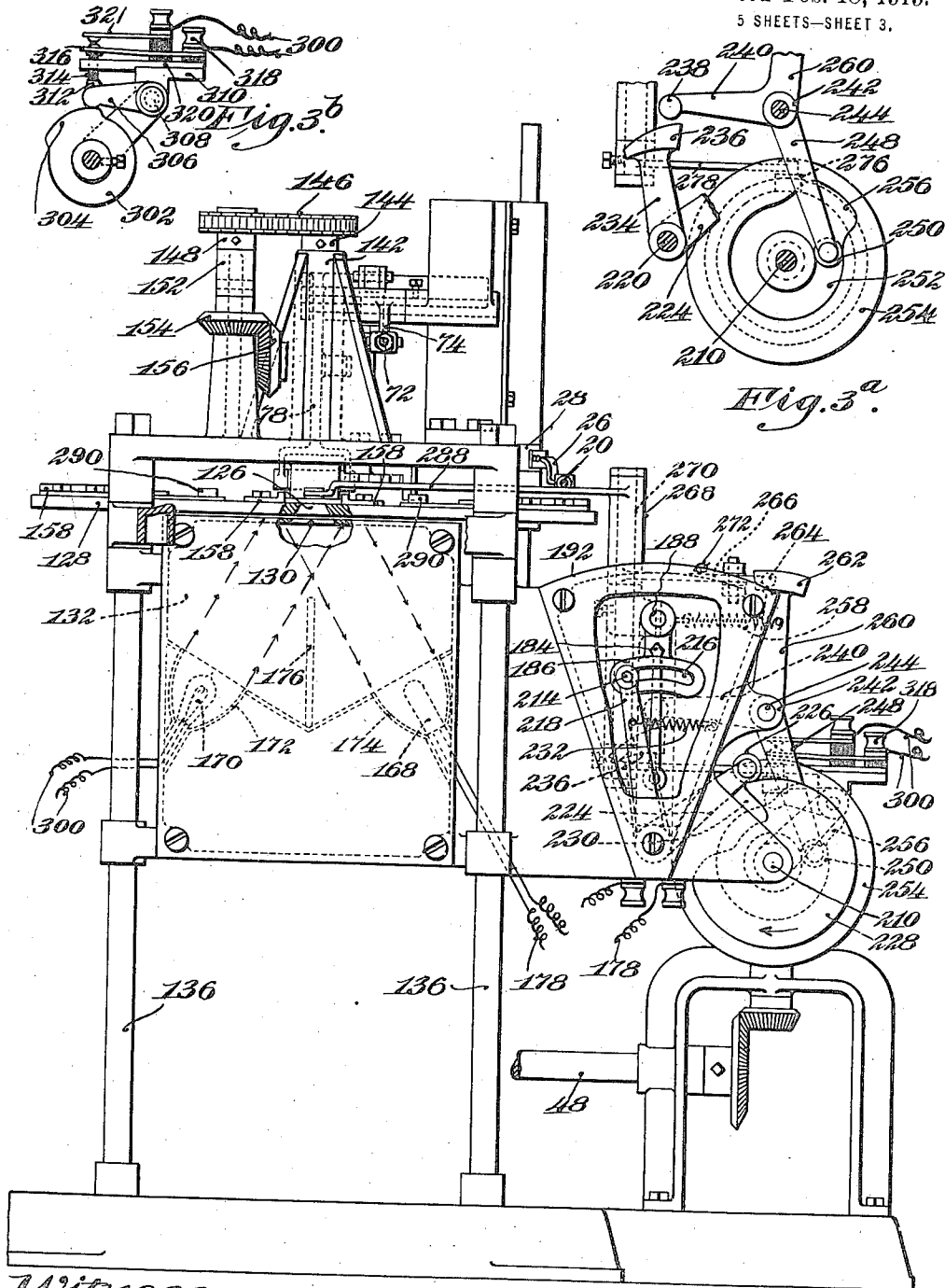
E. E. WINKLEY.
GRADING MACHINE.

APPLICATION FILED JUNE 22, 1916.

1,294,740.

Patented Feb. 18, 1919.

5 SHEETS—SHEET 3.



Witness
Edward S. Day

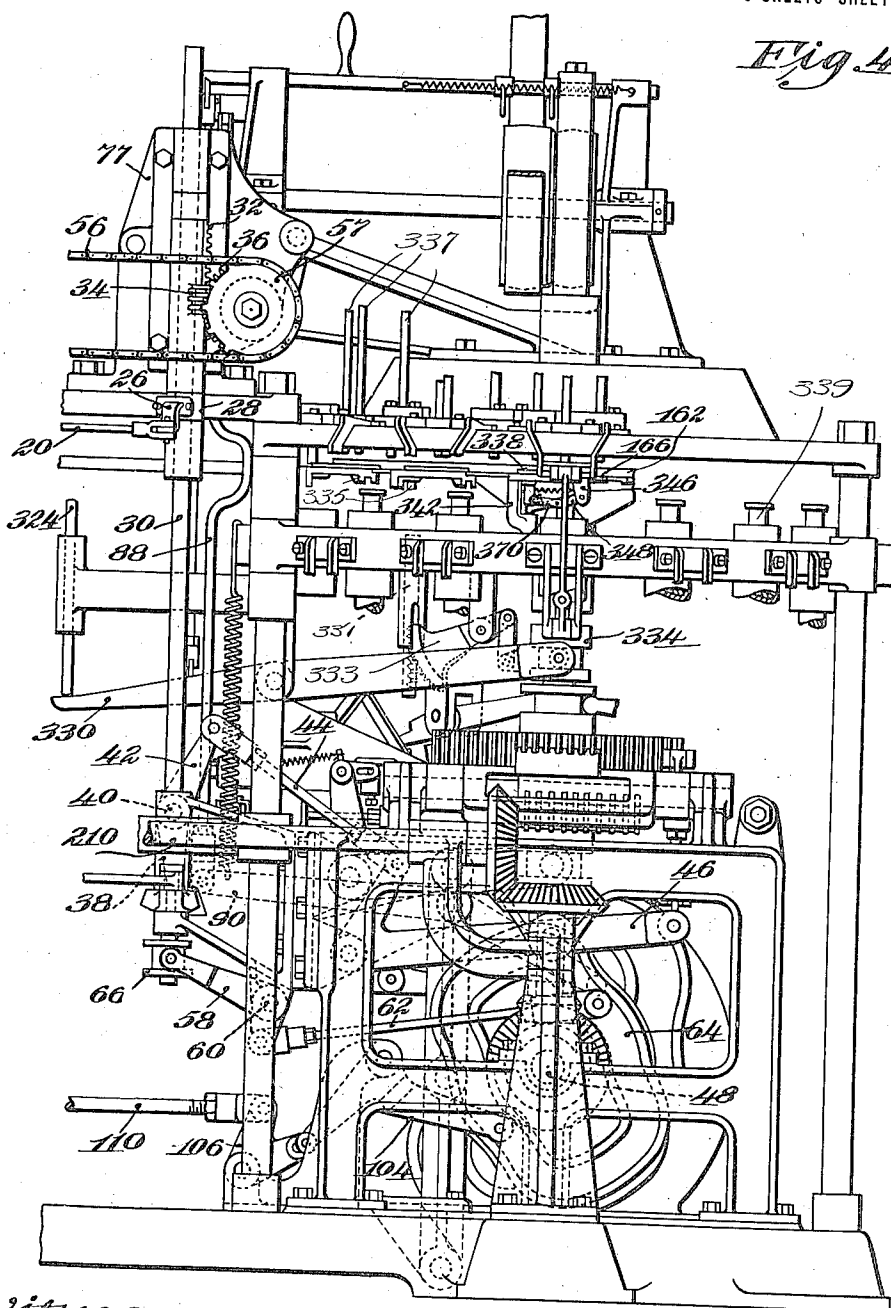
Fig. 3. Inventor:
E. E. Winkley
by his attorneys
Phillips Van Eosen & Finch

1,294,740.

E. E. WINKLEY.
GRADING MACHINE.
APPLICATION FILED JUNE 22, 1916.

Patented Feb. 18, 1919.
5 SHEETS—SHEET 4.

Fig. 4.



Witness
Edward S. Day

Inventor
Ernest C. Winkley
by his attorneys
Phillips Van Ceven & Fish

1,294,740.

E. E. WINKLEY.
GRADING MACHINE.
APPLICATION FILED JUNE 22, 1916.

Patented Feb. 18, 1919.
5 SHEETS—SHEET 5.

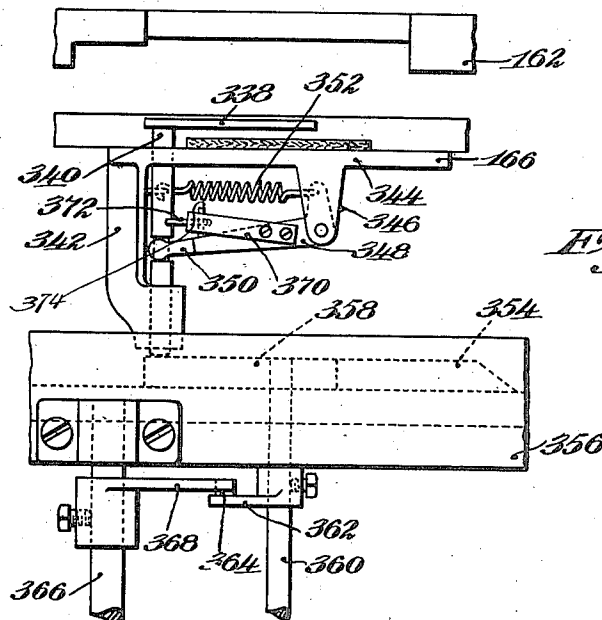


Fig. 5.

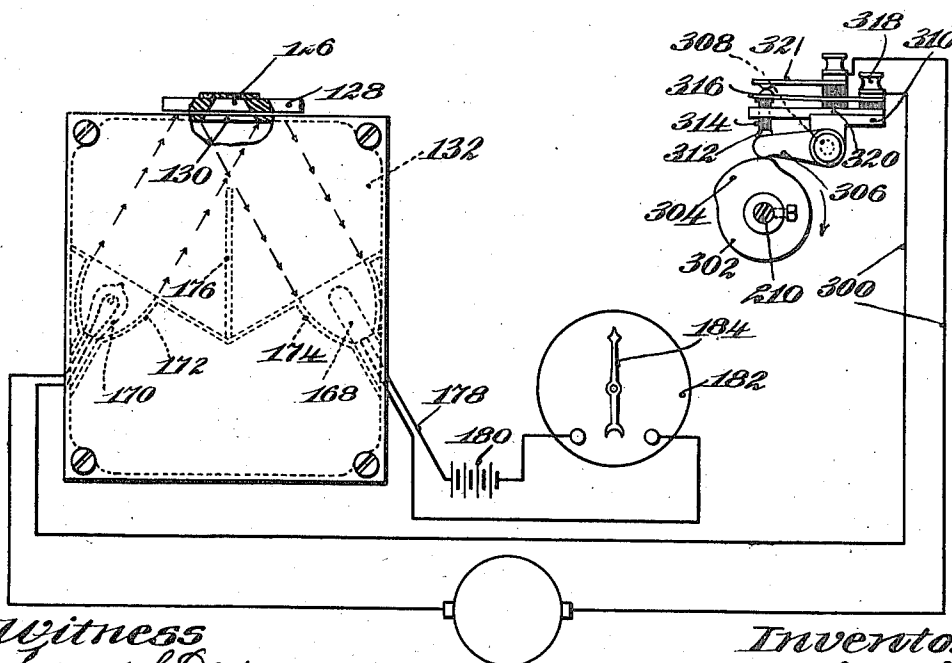


Fig. 6.

Witness
Edward S. Day

Inventor
Eugene E. Winkley
by his attorneys
Phillips Van Curen & Fish

UNITED STATES PATENT OFFICE.

ERASTUS E. WINKLEY, OF LYNN, MASSACHUSETTS, ASSIGNOR, BY MESNE ASSIGNMENTS, TO UNITED SHOE MACHINERY CORPORATION, OF PATERSON, NEW JERSEY, A CORPORATION OF NEW JERSEY.

GRADING-MACHINE.

1,294,740

Specification of Letters Patent.

Patented Feb. 18, 1919.

Application filed June 22, 1916. Serial No. 105,157.

To all whom it may concern:

Be it known that I, ERASTUS E. WINKLEY, a citizen of the United States, residing at Lynn, in the county of Essex and State of Massachusetts, have invented certain new and useful Improvements in Grading-Machines; 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 appertains to make and use the same.

This invention relates to a grading machine adapted first to determine the differences in color of a number of pieces of material, and thereafter grade and assemble together the pieces showing approximately the same gradation of color as ascertained by the color determining mechanism of the machine.

For convenience and a ready understanding of the principles of the invention, the specific embodiment of the invention is illustrated and described as operating upon shoe stock, and particularly upon blanks for heel lifts. As is well known, there is frequently a distinct difference in color between two "sides" of leather tanned by the same process, as for example, by the "Oak" or by the "Hemlock" process; sometimes also there is a variation of color between different portions of the same "side". In the making of boots and shoes it is desirable that like parts of two boots or shoes of a single pair, especially the soles and the top lifts, which may be left unstained in the finished shoe, be alike in color as well as in size and contour.

At the present time the sorting of soles and top lifts for variations in color is done by workmen, and the accuracy of this sorting is dependent entirely upon their judgment with the result that there is sometimes an undesirable variation in the color of such parts of shoes composing an order, or even in the color of such parts for a single pair. This is because the workmen's eyes become tired toward the latter part of the day's work, and they cannot, therefore, detect the variations in the shades of color as readily and accurately as when they began work in the morning. Moreover, leather sorting, by this method, for differences in color is expensive.

The chief object of the present invention

is to produce an automatically operating machine having provision whereby the variations in color of a plurality of pieces of material may be accurately and uniformly determined mechanically. Preferably further mechanism is provided so that pieces of approximately the same gradation of color will be assembled together in separate stacks.

In practically applying the principle of the invention, use is made of the peculiar electrical properties of selenium, the conductivity of which, as is well known, is greater when in the light than in the dark. Pieces of material to be graded according to their variations in color are successively exposed or subjected to a beam of light which is reflected from the pieces to a selenium cell placed in an electric circuit. The light reflecting properties of the pieces of material vary proportionately to their differences in color; the lighter in color the pieces are, the less light they absorb, and, consequently, the more they reflect; and conversely, the darker in color the pieces are, the more light they absorb and the less light they reflect. The selenium cell, therefore, receives more or less light according to the color or shade of the piece from which the light is reflected and proportionately to the amount of light the selenium cell receives, the amount of current permitted to flow in the circuit is indicated by the pointer or needle of a current measuring instrument. When a piece of material has been subjected to a beam of light and the reflected light has been directed into the selenium cell, thereby reducing to a greater or less extent the resistance of the cell so as to permit a greater or less amount of current to flow in the circuit, the needle indicates the amount of current flowing and is then firmly clamped in its indicating position. Thereupon, a feeler is moved into contact with the needle, and as the position of the needle varies according to the amount of current permitted to flow through the selenium cell, which in turn is directly dependent upon the color or shade of the piece operated upon, so in like wise the position of the feeler is governed by the position of the indicating needle. The feeler operates through appropriate mechanism to regulate the operative position of a controller which governs the

devices for assembling together and stacking the pieces showing approximately the same gradation of color as indicated by the sameness of their light reflecting properties. According to the operative position of the controller, which is positively governed by the position of the feeler, the pieces of material are placed in one or another of a series of receptacles or hoppers. The pieces assembled and stacked in any one receptacle are all of approximately the same gradation of color.

To the accomplishment of the chief object of the invention and such others as shall hereinafter be made to appear, the invention comprises the features and combinations of parts hereinafter described and particularly pointed out in the appended claims.

In the accompanying drawings illustrating the preferred form of the invention, Figure 1 is a plan of the color determining mechanism and of the transfer table showing their position relatively to the feeding devices and to the grading and assembling devices; Fig. 2 is a right side elevation of the color determining mechanism and associated devices; Fig. 3 is a front end elevation of the color determining mechanism, Figs. 3^a and 3^b being details of parts of the same; Fig. 4 is a right side elevation of the grading and assembling devices; Fig. 5 is a detail of the devices by which the pieces are clamped on the carrier and the releasing means therefor; and Fig. 6 is a diagrammatic view showing the arrangement of the light and selenium cell circuits and the means by which the light circuit is intermittently closed and broken.

In the embodiment of the invention illustrated in the drawings the color determining mechanism of the present invention is employed in coöperation with devices for automatically feeding the pieces of material to be graded into position to be operated upon by the color determining mechanism, and with means for transferring the blanks to another position where they are discharged to a carrier, by which they are conveyed into position to be acted upon by devices for assembling and stacking them according to their gradation of color. The automatic feeding devices and the carrier and assembling devices may be, and preferably are, of substantially the same construction and arrangement as shown and described in United States Letters Patent Nos. 1,234,433 and 1,270,476, granted respectively on July 24, 1917 and June 25, 1918, to the present applicant, except for some slight modifications in design in order to adapt them for coöperation with the color determining mechanism and with the means for transferring the blanks from the feeding devices to the carrier.

The devices for automatically feeding the

pieces of material to be graded into position to be operated upon by the color determining mechanism comprise means for supporting the pieces vertically in stack formation and for advancing them intermittently step by step to a position where they are engaged successively by pickers which deposit them one by one over an opening in an otherwise closed chamber, grain side down, if the pieces be leather blanks, so that a beam of light may be directed on them.

As illustrated in Figs. 1 and 2, the blank supporting means consists of a channel shaped support 10 upon which heel lifts are arranged with their breast edges downward. The lifts are fed forward by pawls 12 carried by conveyer chains 14 intermittently in timed relation with the other movements of the machine. The conveyer chains 14 are actuated by a lever 16 upon the free end of which is pivoted a block 18 which loosely embraces a rod 20 arranged to move forwardly and rearwardly. On its rearward movement the rod 20 imparts a positive backward or non-feeding movement to the lever 16 by means of a collar 22 fixed on the rod 20; and on its forward movement the rod 20 imparts a yielding feeding movement to the lever 16 by means of the spring 24, so that variations in the thicknesses of the lifts may be automatically compensated for. The forward end of the rod 20 is articulated with the free end of an arm 26 secured to a sleeve 28 provided with a recess for loosely receiving an inner sleeve which is fixed upon a vertically arranged rod 30. Secured to the inner sleeve is an actuating rack 32, and fixed on the sleeve 28 is a stop rack 34. Oscillations are intermittently imparted to the rod 30 so that the actuating rack 32 and the stop rack 34 may in turn engage with and be disengaged from a gear 36 secured to a shaft 37, for a purpose to be hereinafter described. The oscillatory movements of the rod 30 are imparted to it by a lever 38 pivoted at 40. The upper arm 42 of the lever 38 is connected by a link 44 with a lever 46 actuated by a cam mounted on the main driving shaft 48 of the machine. On the lower end of the lever 38 is a segmental gear which meshes with a segmental pinion fixed on the rod 30. The oscillations of the rod 30 are transmitted to the rod 20 so as to cause it to move forwardly and rearwardly, through the inner sleeve, the sleeve 28, and the arm 26.

The heel lifts are transferred one by one from the stack to the position in which they are operated upon by the color determining mechanism, by means of a series of lift pickers, four in number, indicated at 50, Figs. 1 and 2. The pickers are carried by a disk fixedly mounted on a shaft 52 journaled in a bracket on the frame of the machine. The arrangement and mode of op-

eration of the pickers are such that as one picker engages and takes a lift from the stack, the next preceding picker is depositing a lift on the transfer table over an opening therein which registers with an opening in the selenium cell chamber of the color determining mechanism. After each lift picking and depositing operation the pickers are swung counterclockwise, viewing Fig. 2, through a quadrant to present the next succeeding picker to the lifts and to position the picker which has just engaged a lift over the opening in the selenium cell chamber. The means for swinging the pickers consists of a sprocket wheel 54 which is mounted on the outer end of the shaft 52 and is connected by a chain 56 with another sprocket wheel 57, of the same diameter and number of teeth, fixed on the outer end of the shaft 37. When the actuating rack 32 has been brought into engagement with the gear 36 through the oscillation of the rod 30, the rod 30 is moved downward a distance such that the sprocket wheels 57 and 54, and consequently the shaft 52 and the pickers, are moved through a quadrant. Thereupon, the rod 30 describes a return oscillation, disengaging the actuating rack 32 from the gear 36 and meshing the stop rack 34 therewith. The rod 30 then rises into its normal position. The downward and upward movements are imparted to the rod 30 by a lever 58 pivoted at 60 on the machine frame and connected by a link 62 with a cam lever actuated by a cam 64. The free end of the lever 58 is bifurcated and embraces a grooved collar 66 fixed on the lower end of the rod 30.

In Letters Patent No. 1,270,476, hereinbefore referred to, the pickers are shown and described as being moved into engagement with the lifts and disengaged therefrom by a lever pivoted on a fixed stud, the lever being directly connected with and actuated by a vertically disposed rod. In the preferred embodiment of the present invention the feeding devices have been separated from the carrier and the assembling devices and the color determining mechanism and the transfer table have been interposed between them. It has been necessary, therefore, to alter very slightly the construction by which the pickers are brought into engagement with and are disengaged from the lifts. The lever of the present construction, which corresponds to the picker actuating lever of the patent, is fixedly mounted on a pivot pin 68 which is journaled in the machine frame. On the outer end of the pivot pin 68 is fixed an arm 70, (Fig. 1), pivotally connected at its free end with one end of a link 72, the other end of which is pivoted to a lever 74, (shown best in Fig. 2), fulcrumed on a stud 76 fixed in a bracket 77 on the machine frame. Extending down-

wardly from the hub of the lever 74 is another lever 78 in fixed relation with the lever 74. The lever 78 is connected by a link 80 with a vertically disposed arm 82 of a bellcrank 84 fulcrumed in the bracket 77. The horizontally disposed arm 86 of the bellcrank 84 is articulated at its free end with the upper end of a rod 88, which corresponds to and performs the same function of a similarly disposed rod in said patent. The up and down movements of the rod 88 are imparted to it by the cam actuated lever 90 in the same manner in which the up and down movements of the corresponding rod of the patent are imparted to it by its cam actuated lever. The movements of the rod 88 serve to rock the bellcrank lever 84, and rocking movements of the same extent as those of the bellcrank 84 are transmitted to the pivot pin 68 by the link 72, so that the lever of the present machine corresponding to the picker actuating lever of said patent is caused to perform the same function as that performed by said lever.

The devices of the present construction for holding the lifts clamped during the lift picking operation are constructed as in said Letters Patent No. 1,270,476 and are actuated in like manner. The actuating means for the clamping devices comprise a clamp operating shaft 92 (Fig. 2) upon the outer end of which is fixed a pinion 94 which meshes with a rack 96 secured to the upper end of a jointed rod 98 which is yieldingly actuated in one direction through the spring 100 and positively actuated in the opposite direction through the collar 102 by a cam actuated lever 104 which is connected with the rod 98 through the bellcrank levers 106 and 108 and the link 110.

The means for arresting the advancing movements of the feeding devices when the endmost lift is in position to be engaged by the pickers, are controlled by a vertically disposed rod 112 (Fig. 2) in the same manner in which the corresponding rod of said patent controls the lift arresting means therein disclosed. This rod 112 is yieldingly pressed downward by the spring 114 and is positively moved upward by a cam block 116 fixed on a rod 118 journaled in brackets on the machine frame. The cam block 116 is swung under and away from the rod 112, in order that the rod may be moved upwardly and downwardly, by the oscillations of the rod 118 which are imparted to it by the oscillations of the rod 30 through a link 120 which is connected with the rod 30 by the arm 122 and with the rod 118 by the arm 124.

A full description of the details of construction of the feeding devices, of the pickers, and of their actuating means and mode of operation, is contained in said Letters Patent No. 1,270,476.

Previous to the color determining operation the lifts are successively deposited by the pickers over an opening 126 cut in the transfer table 128, by which the lifts are transferred, after the color determining operation, into position to be discharged onto the carrier. The opening 126 in the transfer table registers with a similar opening 130 cut in the upper wall of the closed chamber 132, in which are housed the source of light and the selenium cell of the color determining mechanism. The construction and correlation of operation of the pickers and of the transfer table are such that each time the pickers are swung through a quadrant, the transfer table is simultaneously moved through a corresponding quadrant. The transfer table is circular in outline and is supported in operative position between the feeding devices and the assembling devices by a plate 134 (Fig. 1) resting on four standards or uprights 136 (Fig. 2). Depending from the center of the transfer table is a hub 138. Fixed in the hub 138 is a shaft 140 journaled in a vertically arranged bore in a webbed bearing 142 rising from the plate 134. Secured to the upper end of the shaft 140 and resting on the top of the bearing 142 is a sprocket wheel 144. The shaft 140 is thus permitted to rotate and is prevented from endwise movements. The sprocket wheel 144 is connected by a chain 146 with another sprocket wheel 148, of the same diameter and number of teeth, mounted on the upper end of a shaft 150 vertically journaled in a bracket 152 rising from the plate 134. On the lower end of the shaft 150 is fixed a bevel gear 154 (Fig. 3) which meshes with another bevel gear 156, of the same diameter and number of teeth, mounted on the inner end of the shaft 52, on the outer end of which the sprocket wheel 54 is mounted.

The openings 126 are formed in the peripheral edge of the transfer table and are four in number. On each side of the openings 126 are guide pieces 158 which may be adjusted laterally to compensate for different sizes of lifts. The guides prevent the lifts from being displaced laterally while permitting their longitudinal movement therethrough. The arrangement of the transfer table and the timing of its movements are such that while the picker which has just engaged a lift and is being swung with it into position over the opening 130 in the selenium cell chamber 132, the opening 126, corresponding to the lift carrying picker, is moving into registration with the opening 130.

After the color determining operation has been performed, the lifts are not in position to be discharged from the transfer table until it has been moved through two quadrants. The means for discharging the lifts

from the transfer table comprise a discharge finger 160 (Figs. 1 and 2) pivoted at the lower end of the lever 78. The lift discharging operation therefore takes place simultaneously with the lift engaging and depositing movements of the pickers. The free end of the discharge finger 160 rests on the transfer table, and when in normal inoperative position is retracted toward the center of the table out of the path of travel of the guide plates 158. In discharging a lift from the transfer table onto the lift sorting and assembling carrier 162, which is a revolving table pivoted at 164, the discharge finger 160 engages the breast edge of the lift and pushes it from between the guide plates 158 onto an oppositely disposed lift receiving support 166, on which it is held until it is conveyed by the carrier 162 into position to be introduced into its proper receptacle or hopper, as determined by the color determining mechanism. It will have been observed that by stacking the lifts breast edge down in the feeding devices, the pickers deposit the lifts on the transfer table with their breast edges directed toward the center of the table, and that owing to the fact the transfer table rotates through 180° before discharging the lifts, they are placed on the carrier with their curved or rear edges toward the center of the carrier, as in the Letters Patent No. 1,270,476.

The color determining mechanism comprises a closed chamber 132 in which are located a selenium cell 168, preferably of the Ruhmer type, and the source of light, which may conveniently be an electric bulb 170. The chamber is entirely closed except for the opening 130 at its top. The electric bulb is surrounded by a parabolic reflector 172 which is so situated that the rays of light from the bulb are reflected in a beam toward the opening 130, so that the beam may illumine the surface of a lift which has been placed, grain side down, over the opening 130 in the manner heretofore explained. The beam of light reflected from the lift is caught by an appropriately situated parabolic reflector 174 which surrounds the selenium cell, and which directs the rays of light reflected from the lift into the cell. Between the reflectors is a partition wall 176 which prevents diffused rays of light from reaching the cell. The source of light during the color determining operation is of a constant and uniform intensity; consequently the quantity of light directed into the selenium cell is directly proportionate to the intensity of the light reflected from the lifts. Therefore, as the light reflecting properties of the lifts are directly proportionate to their gradation of color, it is readily seen that the variations in the color of the lifts will have their corresponding light effects upon the selenium cell.

Since the conductivity of selenium is directly proportionate to the intensity of the light to which it is exposed, this fact is availed of to regulate the movements and positions of a train of mechanism by which the assembling devices are controlled.

The selenium cell 168 (Figs. 3 and 6) is placed in an electric circuit, indicated at 178, having a source of electric current at 180.

In the circuit is a galvanometer, or other current measuring instrument, 182 provided with an indicating pointer or needle 184. The indicating positions of the needle 184 vary proportionately to the conductivity of the selenium cell. After a lift has been placed in operative position over the openings 126 and 130 and subjected to a beam of light which is reflected into the selenium cell, as described, thereby affecting the resistance of the crystalline selenium in the cell to the passage of the electric current through it, the needle 184 of the current measuring instrument is firmly clamped in the position to which it has moved.

The needle clamping means consists of a clamp member 186 (Figs. 2 and 3) pinned on one end of a clamp rod 188 journaled in a casing 190 projecting rearwardly from the box 192 in which the galvanometer and associated parts are housed. The clamp rod 188 extends through the casing 190 and its rear end terminates in an enlarged head 194 of the same diameter as the outside diameter of the casing. Within the casing 190 and surrounding the rod 188 is a clamp closing spring 196, the forward end of which bears against the box 192 and the rear end of which presses against the inner side of the head 194. While the needle 184 is swinging into indicating position, the clamp member 186 is pressed forward into inoperative position out of engagement with the needle, against the action of the spring 196, by means of a boss 198 formed on the upper end of a needle clamping lever 200 pivoted at 202 on a bracket 204 which extends downwardly from beneath the casing 190. The lower end of the lever 200 carries a roll 206 (Figs. 1 and 2) which engages a cam surface formed on the side of a cam disk 208 mounted on the cam shaft 210, which is driven in timed relation with the other movements of the machine through geared connections with the main driving shaft 48. When the needle 184 has come to rest in position indicating the amount of current permitted to flow through the selenium cell in accordance with the quantity of light reflected from the lift being graded, the rotation of the cam disk 208 brings the idle part of the cam surface thereof opposite the cam roll 206, thereby permitting the spring 196 to move the rod 188 rearwardly to force the clamp member 186 into engagement with the needle 184 and press the needle

against a stationary clamp block 212. The tension of the spring 196 is sufficient to hold the needle immovable while the other parts of the color determining mechanism are moving into their respective positions as determined by the position of the needle. After the needle has been clamped sufficiently long to permit the other parts of the apparatus to operate, the further rotation of the cam disk brings the active part of its cam surface into engagement with the roll 206, thereby forcing the boss 198 against the head 194, so that the rod 188 is pressed forward against the action of the spring 196 and the clamp member 186 moved out of engagement with the needle to allow the needle to perform its next indicating operation.

The position of the indicating needle varies according to the quantity of current flowing in the selenium cell circuit; and the quantity of current varies proportionately to the intensity of the beam of light reflected from the lifts. According as the position of the indicating needle varies, so does the operative position of a series of controller wedges vary, with which the needle is operatively connected by appropriate mechanism, to be presently described. These controller wedges regulate the operative position of a controller, the elevation of which determines into what receptacle or hopper the lift being graded shall be introduced. When the needle 184 has been clamped in indicating position, a feeler 214 (Figs. 2 and 3) is moved into contact with it. The feeler 214 travels in arcuate slots 216 formed in the clamp 186 and the clamp block 212, and is supported on the upper end of a feeler lever 218 fixed on a pivot pin 220 fulcrumed in an extension 222 of the box 192. Mounted on the pivot pin 220 in fixed relation with the feeler lever 218 is an arm 224 carrying on its free end a cam roll 226 which engages the peripheral edge of a feeler cam 228 mounted on the cam shaft 210. When the rotation of the cam shaft 210 brings the idle part 230 of the cam 228 opposite the cam roll 226, a spring 232 connected with the box 192 and with the feeler lever 218, is permitted to move the feeler lever to bring the feeler 214 into contact with the indicating needle 184. The tension of the spring 232 is such that the feeler is held firmly against the needle while those parts of the color determining mechanism which operate subsequently are moving into position. Fixed on the pivot pin 220 is a second arm 234 which carries on its free end a wedge-shaped head having a cam surface 236 (Fig. 3^a). The clamped position of the indicating needle determines the operative position of the cam wedge 236, and when the feeler 214 has been moved into contact with the indicating needle and thereby operatively positioned the cam wedge 236, a

feeler boss 238 formed on the free end of an arm 240 of a lever 242 is moved into engagement with the cam wedge 236. The lever 242 is pivoted on a stud 244 secured in a rearward projection 246 (Fig. 1) of the box 192. The lever 242 is provided with a downwardly extending arm 248 carrying at its outer end a cam roll 250 which engages a groove 252 in a cam 254 mounted on the cam shaft 210. The cam groove 252 widens outwardly at 256 (Fig. 3^a) and when by the rotation of the cam 254 the part 256 of the groove 252 moves opposite the roll 250, the cam wedge 236 has been positioned under the boss 238; thereupon a spring 258 (Fig. 3) connected at one end with an arm 260 of the lever 242 and at the other end with the machine frame, acts to bring the feeler boss 238 into contact with the cam wedge 236. The lateral position of the wedge 236 determines the vertical position of the boss 238, which in turn determines the lateral position of a cam wedge 262 (Figs. 1 and 2) carried on the upper end of the vertically disposed arm 260. When the operative position of the cam wedge 262 has been thus determined, a feeler boss 264 comes into contact with it. This feeler boss 264 is formed on the end of an arm 266 of a controller wedge lever 268 fulcrumed on a vertical stud 270 rising from the casing 190. The feeler boss 264 is moved into engagement with the cam wedge 262 by a spring 272 (Fig. 1) connected at one end with the arm 266 and at the other end with the box 192, when the idle portion of a cam 274 mounted on the cam shaft 210 moves opposite a cam roll 276 carried on the outer end of the lower arm 278 of a bellcrank lever 280 fulcrumed on a vertical stud 282 rising from the casing 190. The upper arm 284 of the bellcrank 280 is positioned directly over the lower arm 278, and is connected at its outer end with the arm 266 of the lever 268 by a link 286. The position of the indicating needle determines with what portion of the surface of the cam wedge 236 the feeler boss 238 shall contact; the vertical position of the feeler boss 238 as thus regulated determines what portion of the cam wedge 262 the feeler boss 264 shall contact; and the lateral position of the feeler boss 264 as thus regulated determines into what position the controller wedges for operatively positioning the controller for the assembling devices shall be moved.

When the feeler boss 264 moves into contact with the cam wedge 262, the outer end of a second arm 288 of the controller lever 268 is pushed inwardly toward the center of the transfer table against a lug 290 (Fig. 3) rising from a controller wedge 292 (Figs. 1 and 2), and moves the controller wedge into operative position by which the position of the controller for the assembling devices is determined. The controller wedges

are four in number, one corresponding to and opposite each opening 126, and are loosely received in radially disposed slots 294 in the transfer table, so that they may slide toward and from the center of the table. They are supported on the table between upper and lower flanges which extend laterally beyond the edges of the slots 294, and are held in the various positions to which they are moved by the arm 288 of the controller lever, according to the color variations of the lifts, by means of springs 296 secured at one end to the inner edges of the under surfaces of the controller wedges, the free ends of the springs extending upwardly and pressing against the under surface of the transfer table. The outer end of the arm 288 of the controller lever extends between the lift being subjected to the color determining operation and the lug 290 of the controller wedge then adjacent the selenium cell chamber. Thus, when the gradation of color of the lift being operated on has been determined, the indicating needle clamped, and the devices connecting the needle with the arm 288 have moved into their respective positions as determined by the position of the needle, the arm 288 moves inwardly toward the center of the transfer table in engagement with the lug 290, and thereby sets in operative position the controller wedge corresponding to the lift being operated on. The controller wedge corresponding to this particular lift remains in the position to which it has been set by the arm 288 until after the lift has been discharged from the transfer table, before which time the controlling means of the assembling devices have been acted upon by the wedge.

The same mode of operation obtains for each successive lift: the wedge opposite the opening 126 which then registers with the opening 130 is set into operative position according to the amount of movement imparted to the arm 288 by its actuating means, which is proportionate to the amount of light reflected from the lift then over the selenium cell chamber.

After the controller for the assembling devices has been operated upon by the controller wedges 292 and the lifts discharged from the transfer table 128 onto the carrier 162 to be thereby conveyed to the assembling devices and distributed as determined by the setting of the controller wedges and their corresponding effect upon the controller, the continued rotation of the transfer table moves the lugs 290 into engagement with a controller wedge resetting device 298, secured to and depending from the underside of the plate 134. The resetting device is arcuate in form and serves to push the controller wedges outward into normal or inoperative position. It will be observed

from an inspection of Fig. 3 that the lugs 290 pass under the arm 288 and that the lug engaging outer end of the arm is bent toward the transfer table in order that it may

engage the lugs.

It is desirable, for the most accurate results, that the incandescent lamp 170 be extinguished after each color determining operation, so that the needle may be permitted to return to its normal position, which is the position it holds when the selenium cell is setting up its greatest resistance to the flow of the electric current, and this, of course, is when the lamp is extinguished. Accordingly, after a lift has been subjected to the beam of light for a sufficient length of time to permit the reflected beam to thoroughly permeate the selenium cell and thereby govern the flow of electric current through the cell so as to regulate the positioning of the indicating needle, the electric circuit 300 (Figs. 3 and 6) in which the lamp 170 is placed, is broken until the next lift is in position to be subjected to the color determining test. The means for intermittently making and breaking the lamp circuit 300 comprises a cam 302 (Figs. 3^b and 6) mounted on the cam shaft 210. When the active part 304 of the cam 302 engages the outer end of a lever 306 pivoted at 308 on a terminal bracket 310 fastened to the machine frame, a boss 312, formed on the outer end of the lever 306, is forced against a plug 314 composed of insulating material and which, in turn, is forced against the underside of a resilient terminal 316 (in the lamp circuit) secured to the bracket 310, properly insulated, by a thumb screw 318. The plug 314 is loosely received and guided in a hole in the outer end of a support 320, secured to the bracket 310. The forcing of the plug 314 against the outer end of the resilient terminal 316 serves to make an electric contact with a second terminal 321 in the lamp circuit, also secured to and properly insulated from the bracket 310. So long as the active part 304 of the cam 302 remains in engagement with the lever 306 the lamp circuit is closed, but immediately the active part 304 passes from under the lever 306, the tension under which the resilient terminal is placed acts to disconnect it from the second terminal 321, thereby breaking the circuit so that the lamp 170 will be extinguished during such time as is required to remove one lift from over the opening 130 and place the next lift thereover.

After the arm 288 has moved inwardly toward the center of the transfer table to set the controller wedge 292 corresponding to the lift being subjected to the color determining operation according to the color gradation of the lift, the transfer table is then moved through a quadrant in order to bring the next succeeding opening 126

over the opening 130 in the selenium cell chamber. Immediately the lug 290 of the controller wedge corresponding to the lift which has just been operated upon moves out of contact with the end of the arm 288, the indicating needle is unclamped, and the active parts of the cams controlling the movement of the arm 288 come into engagement with their respective cam rolls and operate to return the arm 288 to its normal position. After the lifts have been subjected to the color determining operation and have been received from the transfer table by the lift supports on the carrier, they are conveyed by the carrier into position to be introduced into receptacles or hoppers containing lifts of approximately the same gradation of color by the assembling devices. The operation of the assembling devices is governed by the elevation of a controller, which in turn is governed by the positions occupied by the controller wedges.

When the transfer table has been moved through two successive quadrants to transfer the lifts from their color determining position to their position of discharge from the transfer table, the controller wedges corresponding to the respective lifts are successively positioned over the lift sorting and assembling controller 324 (Figs. 2 and 4). The controller 324 is received in a bore in the outer end of an arm 326 secured in the machine frame, and is frictionally held therein, so that it may occupy any elevation within its range, as determined by the setting of the wedges 292. When a wedge 292 has been moved into position over the controller 324, the controller is moved upwardly into contact with the inclined surface 328 of the wedge. It will be observed from an inspection of Fig. 2 that according as the wedge has been set nearer or farther from the center of the transfer table by the arm 288 (and bearing in mind that the movements of the arm 288 toward the center of the table are inversely proportionate to the variations in the color of the lift blanks) the elevation of the controller is regulated and set either lower or higher. The greater the light reflecting properties of the lift subjected to the color determining operation, the more light is directed into the selenium cell, and consequently a greater amount of current is permitted to pass therethrough by the reduction of the resistance of the cell. The farther to the right, viewing Fig. 3, the indicating needle 184 swings, the farther to the right the cam wedge 236 is positioned, and consequently the lower the elevation of the boss 238 of the lever 242. The lower the elevation of the boss 238, the more to the left the cam wedge 262 swings, and consequently the less distance the boss 264 is permitted to travel before it contacts with the inclined surface of the cam wedge 262, and,

therefore, the less the movement which is imparted to the arm 288. It is thus seen that the lighter in color the lifts are, as shown by their light reflecting properties, the shorter the distance toward the center of the transfer table the wedges 292 are moved, and from an inspection of Fig. 2 it is seen that the greater the distance of the transfer wedges from the center of the table, the greater the elevation of the controller 324 must be when it is brought into contact with the inclined surface 328 of the controller wedges.

The lower end of the controller rests on one end of a lever 330 pivoted at 332 on the machine frame. The other end of the lever 330 is forked and embraces a grooved collar 334, by the up and down movements of which the lever is oscillated. When the collar 334 is moved yieldingly downward by the mechanism illustrated in Letters Patent No. 1,234,433 the controller 324 is moved into yielding engagement with the wedge face 328. At the same time a lever 331 (Fig. 4), connected to the lever 330, is oscillated to move the plunger 333 into engagement with a selector pin 335. A series of selector pins 335 are mounted in the carrier 162, one pin being located opposite each of the supports 166. It is apparent that the movement of the lever 330 to bring the controller into engagement with the measuring wedge 328 will correspondingly move a selector pin 335 and such setting will be in accordance with the measurement of the color variation. The selector pins are rotated with the carrier 162 beneath assembling receptacles or stackers which consist of a series of vertical guide rods 337 which have a stack retainer at their lower ends. At the time the selector pins come opposite a stack containing the color of lifts for which the pin has been set the pin operates a mechanism to raise a stacking plunger 339 to force the lift from the support 166 into the stack 337. This sorting and assembling mechanism has substantially the same construction and mode of operation as that of said patent. In said patent the amount of movement of said lever, corresponding to the lever 330, is determined by the mass characteristics of the lifts, whereas in the present construction the amount of movement of the lever 330 is determined by the light reflecting properties, and consequently by the color of the lifts. In said patent the less the mass characteristics of the lifts operated upon, the greater the upward movement of the lever. In the present invention, on the contrary, the greater the light reflecting properties of the lift operated upon, the greater the upward movement of the lever 330. The result of this difference is that the lifts are distributed, in the present construction, inversely to the

order in which they are distributed in said patent.

When the lifts have been received on the supports 166 secured to the carrier 162, to be thence introduced into the receptacles containing lifts of approximately the same color, they are firmly clamped on the supports until the moment of introduction into the receptacles. The lift supports consist of flat plates provided centrally with round holes 336 through which the plungers of the assembling devices operate in order to introduce the lifts into their respective receptacles, all as described in said Letters Patent No. 1,234,433. In the present invention the construction of the means for retaining the lifts on the supports until the assembling operation differs somewhat from that shown and described in said patent, because of the interposition of the transfer table between the feeding devices and the assembling devices. In the present construction the retaining means comprise lift holding fingers 338 (Fig. 5) by which the lifts are clamped frictionally on the supports. These fingers 338 are fixed on the upper end of a vertical stem 340 loosely received in a bracket 342 integral with a bracket base 344 fixed to the lift support 166. Depending from the bracket base 344 are lugs 346 between which is pivoted a bellcrank lever 348 having a forked end 350 which loosely engages a reduced portion of the stem 340. A contraction spring 352, one end of which is secured to an arm of the bellcrank lever 348 and the other end of which is secured to the bracket 342, tends to move the stem 340 and the clamping finger 338 toward the lift to hold it in position on the support 166. When during the rotation of the carrier 162 each lift support comes into position opposite the discharge finger 160 ready to receive a lift, the clamping finger 338 of the support in the lift receiving position is raised to permit the lift to be slid from the transfer table onto the support by the discharge finger 160. For this purpose a cam block 354 is fixed upon an annular frame 356, (which corresponds to a similar annular frame of said patents), situated below the rotary carrier 162. This cam block is in position to be engaged by the lower end of the stem 340 of each clamping finger as the lift support with which the finger is associated approaches the lift receiving position. Beyond the cam block 354 and constituting a continuation thereof, is an arm 358 which serves to retain the clamping finger 338 in raised position while the lift is being slid under it. When the lift has been received in position on the lift support, it is necessary that it be immediately clamped thereon. This is accomplished by securing the arm 358 to a rod 360, to which an arm 362 provided with a pin

364 is fastened. The rod 360 is actuated in order to move the arm 358 out from under the lower end of the stem 340, to permit the spring 352 to move the clamping finger 338 into clamping engagement with the lift on the lift support, by means of a vertically arranged shaft 366 provided with an arm 368 having lugs which engage in turn the pin 364. This vertically arranged shaft corresponds to the similarly situated rock shaft of said patent and operates in substantially the same manner as therein described. When the lift has been clamped on the lift support and the continued rotation of the carrier moves the stem 340 beyond the arm 358, thereupon a reverse movement of the shaft 366 returns the arm 358 into normal position. After the lifts have been introduced into their respective receptacles, as determined by the elevation of the controller 324 and its effect on the lever 330, (the operation of the assembling means, that is, of the means for introducing the lift into their proper hoppers 337 being substantially as described in said Letters Patent No. 1,234,433), the clamp fingers 338 are disengaged from the stacks by the continued rotation of the carrier 162. The fingers 338 are swung outwardly from their operative position over the middle of the supports in the manner and for the purpose described in said patent. Each finger is returned to normal position by a spring 370 secured at one end to an arm of the bellcrank 348 and pressing against a pin 372 fixed in the stem 340, thereby tending to push the finger inwardly until the pin 372 comes into engagement with a stop pin 374 rising from the bellcrank 348, by which the operative position of the finger is determined.

The lifts are deposited successively by the pickers over the opening 130 in the selenium cell chamber when an opening 126 in the transfer table registers therewith. Immediately a lift has been thus deposited, the light circuit 300 is closed and a beam of light is directed on the grain side of the lift. The beam of light reflected from the lift is directed into the selenium cell. The conductivity of the cell as affected by the intensity of the reflected beam is indicated by the position of the indicating needle 184, which is then clamped in its indicating position. Thereupon, the feeler 214 moves into contact with the needle, and according to the setting of the needle the feeler controls, through the consequent positioning of the cam wedges 236 and 262, the amount of movement imparted to the arm 288 as it operatively positions the controller wedges 292. When the controller wedge corresponding to the lift being subjected to the color determining operation has been set in operative position according to the light reflecting properties

of the lift, the transfer table 128 is moved through 180° to bring the lift into position to be discharged onto one of the lift supports 166. During the lift discharging operation the controller 324 is moved into contact with the inclined surface of the controller wedge, and its elevation, and consequently the operative position of the lever 330, are thereby determined. The lift is then conveyed by the carrier into position to be operated upon by the assembling devices which introduce it into the proper receptacle as determined by the setting of the lever 330.

Having thus described the invention, what is claimed as new, is:

1. A machine for sorting pieces of shoe stock having, in combination, means for successively feeding pieces of shoe stock, means for determining slight variations of shades of a color of the pieces of shoe stock, and means controlled by the color determining means for positively assembling together pieces having approximately the same gradation of shade.

2. A machine for sorting pieces of shoe stock having, in combination, means for determining slight variations in shades of a color of pieces of shoe stock, and means controlled by the color determining means for positively assembling together the pieces having the same gradation of shade.

3. A machine for sorting pieces of shoe stock having, in combination, means for determining variations of shades of a color of flat pieces of shoe stock, and means for feeding the pieces successively to a position for their flat faces to be operated on by the color determining means.

4. A machine having, in combination, means for positively feeding pieces of shoe stock into a position to be subjected to a beam of light, means for directing a beam of light on the pieces of material, a selenium cell, means for directing the light reflected from the pieces into said selenium cell, and means controlled by the conductivity of the selenium cell as affected by the reflected light for positively grading the pieces of shoe stock.

5. An automatic machine for operating on pieces of shoe stock having, in combination, means for directing a beam of light on the pieces of shoe stock successively, a selenium cell in an electric circuit, means for directing the light reflected from the pieces into said selenium cell, means for measuring the quantity of current flowing through the circuit as controlled by the selenium cell, and means governed by the current indicating means for positively grading the pieces according to their light reflecting properties.

6. A machine for determining the color variations of a plurality of pieces of mate-

rial having, in combination, means for feeding the pieces successively into position to be acted upon; color detecting means comprising a source of light and a selenium cell in an electric circuit; color indicating means comprising a current measuring instrument in said circuit having an indicating needle, means for clamping the needle in indicating position, a feeler, means for moving the feeler into contact with the needle while the latter is clamped in position, a movable controller wedge, the operative position of which is determined by the position of the feeler, and a movable controller the position of which depends upon the position of the wedge; and assembling mechanism for assembling together the pieces having a like color indication governed by the position of the controller.

7. A machine for determining variations in shades of a color of flat pieces of shoe stock having, in combination, means for feeding pieces of shoe stock successively into position for their flat faces to be operated upon, means for subjecting the pieces to a beam of light, means for detecting the intensity of the light reflected from the pieces, and means controlled by the variations in the intensity of the reflected light for positively assembling the pieces according to their light reflecting properties.

8. An automatic machine having, in combination, means for determining the variations in color of a plurality of pieces of material heterogeneous as to color, feeding devices for depositing the pieces successively into position to be subjected to the action of said means, mechanism for assembling together pieces having approximately the same color determination, a carrier for conveying the pieces into position to be acted upon by the assembling mechanism, and a transfer table for transferring the pieces from the color determining position to the carrier.

9. An automatic machine having, in combination, means for determining the variations in color of a plurality of pieces of material, a holder supporting pieces in stack formation, devices for feeding the pieces successively from said stack to said means, a receiver for pieces and transfer devices cooperating with the feeding devices for removing the pieces from said means after they have been subjected to the color determining operation and placing them in said receiver in stack formation.

10. An automatic machine having, in combination, means for determining the gradation of color of a plurality of pieces of shoe stock, devices for feeding the pieces one by one into position to be acted upon by said means, devices for positively assembling together in stack formation the pieces having approximately the same color determination,

and means for transferring the pieces from the color determining position to the assembling devices.

11. A machine for determining the variations in color of pieces of shoe stock having, in combination, means for directing a beam of light of uniform intensity on the flat faces of the pieces successively, a selenium cell, means for directing the beams reflected from the pieces into said selenium cell, means for measuring the differences in intensity of the beams reflected from the different pieces by their effect upon the selenium cell, and means for indicating the differences in the light reflecting properties of the pieces to sort positively the pieces of stock in accordance with their gradations in shade.

12. A machine for determining the color variations of pieces of material having, in combination, devices for automatically feeding the pieces one by one into position to be operated upon; a color detecting mechanism comprising means for subjecting the pieces successively to a beam of light of uniform intensity; means for indicating the differences in intensity of the beams reflected from the pieces; a series of movable controller wedges, the operative positions of which are governed by the indicating means; a movable controller, the position of which is determined by the positions of the wedges; and devices governed by the controller for stacking together the pieces having approximately the same light reflecting properties.

13. A machine for grading pieces of shoe stock in accordance with color having, in combination; means for detecting slight variations in shades of a color of the pieces successively; means for indicating the degree of the color thus detected; and means for utilizing said indications to positively assemble together all pieces for which the color indication is the same.

14. A machine for grading pieces of shoe stock in accordance with color having, in combination; means for detecting variations in color of the pieces; means for depositing the pieces successively with a flat face in position to have their color detected by said means; means for successively indicating the degree of color of each piece; and assembling mechanism controlled by said indicating means for positively assembling at a plurality of separate stations pieces having like gradations of shade.

15. A machine for grading pieces of material in accordance with color having, in combination; color detecting means comprising a light tight compartment having an opening to be closed by a piece to be graded and containing a source of light, a selenium cell in an electric circuit, and means for directing a beam of light on the piece at said opening and gathering the re-

5 deflection from the piece into said selenium cell; color indicating means in said electric circuit operated by the conductivity of the selenium cell as affected by the reflected light; and means for assembling together

10 16. A machine for grading heel lifts heterogeneous as to color having, in combination, means for determining a multiplicity of gradations in shades of color of a series of heel lifts, and means for indicating the color gradations thus determined.

15 17. A machine for grading pieces of shoe stock having, in combination, means for determining gradations in shades of a color of a series of pieces of shoe stock, a carrier to support pieces for the operation of said color determining means, means to automatically feed pieces of stock to said support, 20 measuring mechanism on said support, means controlled by the color determining means for adjusting said measuring mechanism in accordance with the color gradation of the piece of shoe stock on the support, 25 shoe stock assembling means, a controller on the assembling means for sorting pieces of shoe stock, means to move the measuring mechanism into engagement with the controller to thereby determine the position of 30 assembling of a piece of shoe stock, and devices to advance a piece of measured shoe stock from the support into the control of the assembling means.

18. A machine for grading pieces of shoe stock having, in combination, means for determining gradations of shades of a color 35 of a series of pieces of stock, a carrier, a series of stock supports on the carrier, measuring mechanism on the carrier adjacent each of the supports, devices controlled by 40 the color determining means to position said mechanism in accordance with the color gradations of a piece of stock on the support, an assembling and sorting means, a controller on the assembling means to deter- 45 mine the position of a measured piece of stock, means to bring the controller into engagement with the measuring mechanism, and means to transfer the piece of measured stock from a support into the control of the 50 assembling and sorting means.

19. A machine for grading pieces of shoe stock having, in combination, means for supporting pieces of stock in stack formation, means for determining color gradations of 55 a series of pieces of stock, means to feed pieces from the stack to the color determining means, an assembling mechanism to transfer pieces of stock from the color determining means to the assembling means, 60 and devices controlled by the color determining means to place pieces of stock in the assembling means in different stacks in accordance with gradations of color.

ERASTUS E. WINKLEY.