No. 626,539. Patented June 6, 1899.

G. H. HATHORN.

GAGING MACHINE FOR SPHERICAL BODIES.

(Application filed Dec. 15, 1897.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

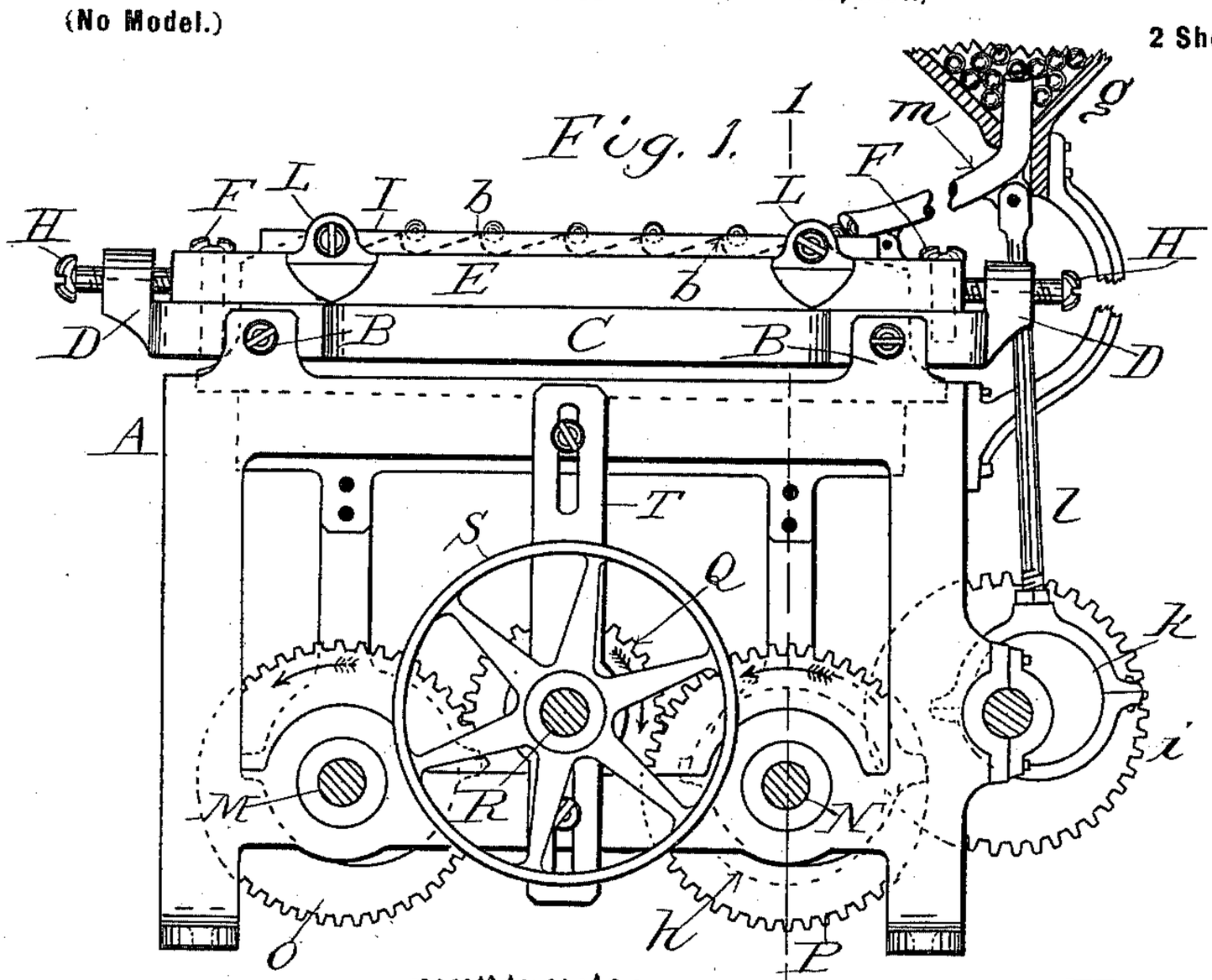

Fig. 2.

Fig. 3.

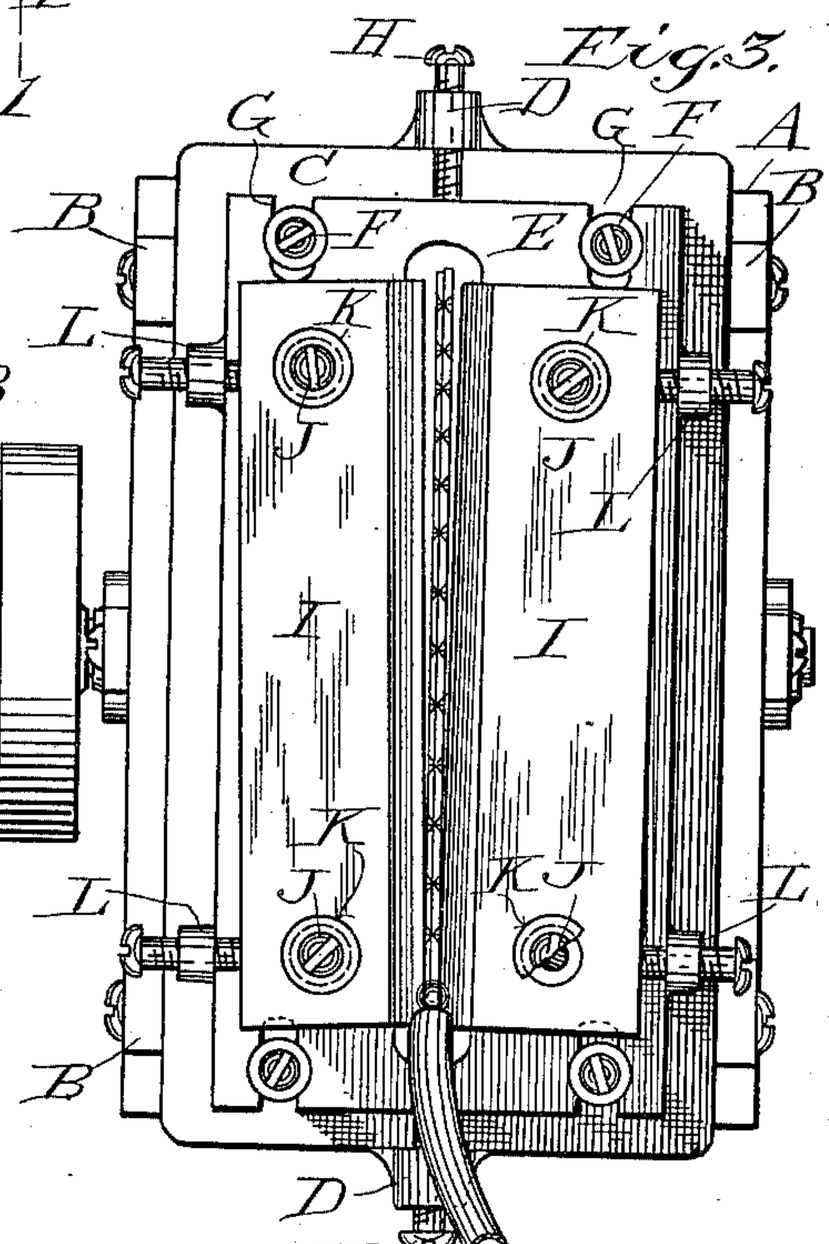

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Fig. 4.

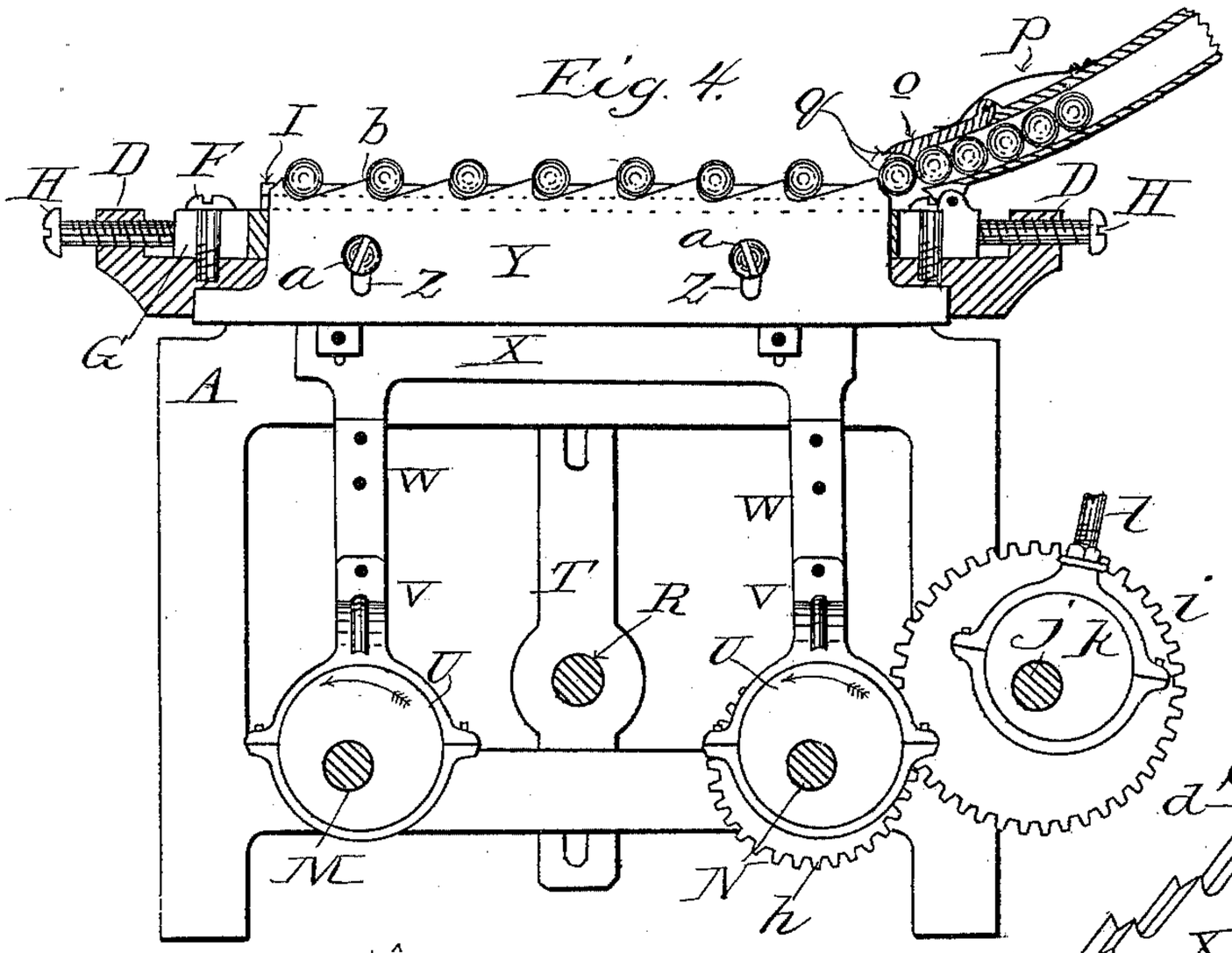


Fig. 5.

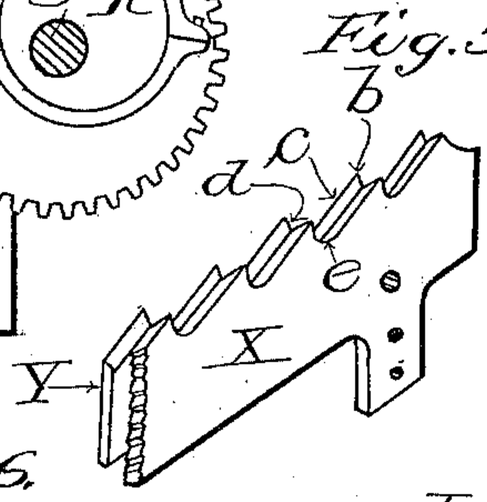


Fig. 7.

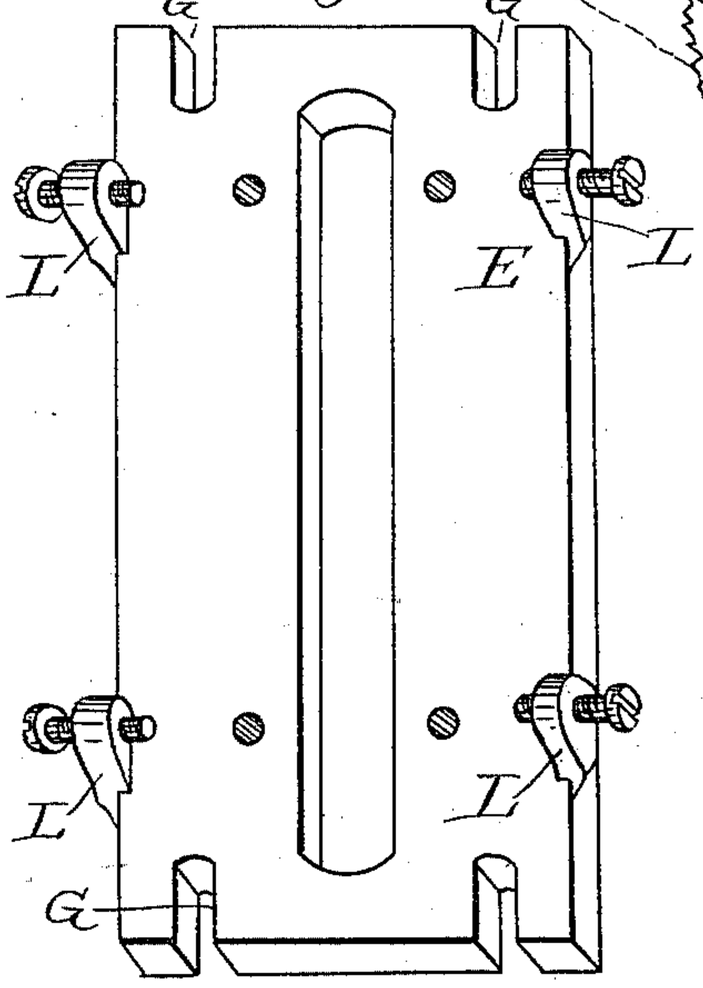


Fig. 8.

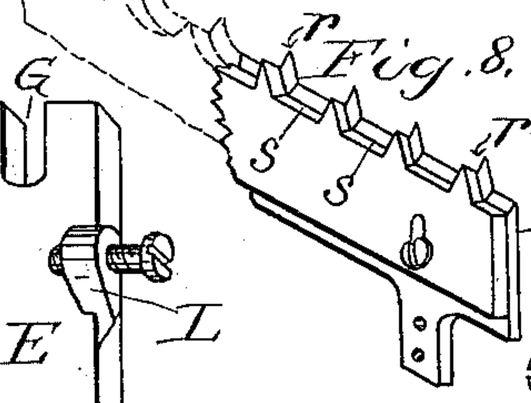
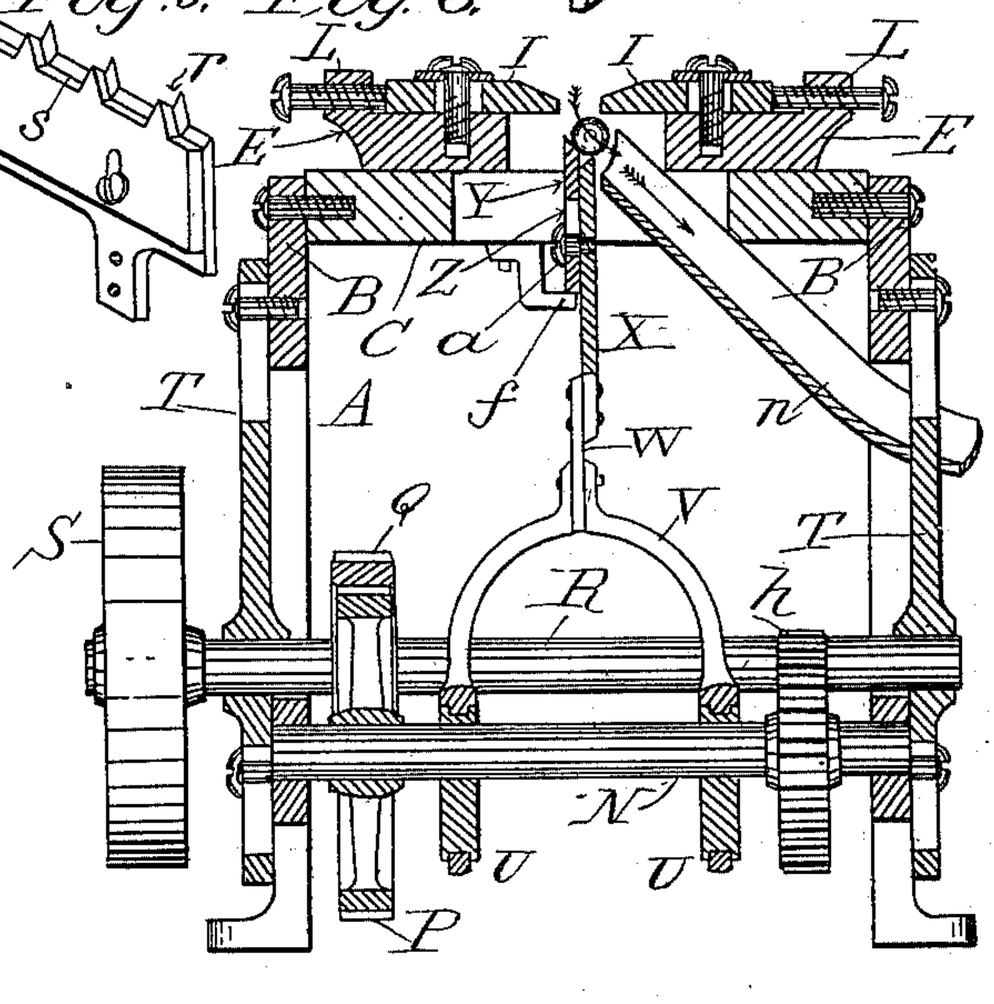


Fig. 6.



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UNITED STATES PATENT OFFICE.

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GAGING-MACHINE FOR SPHERICAL BODIES.

SPECIFICATION forming part of Letters Patent No. 626,539, dated June 6, 1899.

Application filed December 15, 1897. Serial No. 662,052. (No model.)

To all whom it may concern:

Be it known that I, GEORGE H. HATHORN, a citizen of the United States, residing at Bangor, in the county of Penobscot and State of Maine, have invented certain new and useful Improvements in Gaging-Machines for Spherical Bodies, of which the following is a specification.

My present invention pertains to machines for gaging spherical bodies, and its construction and advantages will be hereinafter pointed out, reference being had to the annexed drawings, wherein—

Figure 1 is a side elevation of the machine, the feed-hopper being shown in section; Fig. 2, an end elevation thereof; Fig. 3, a top plan view, the feed-hopper being omitted; Fig. 4, a longitudinal sectional view, the hopper being omitted and a modified form of the feeding or delivery tube being shown; Fig. 5, a perspective view of a portion of the lifting-bar; Fig. 6, a cross-sectional view taken on the line 1 1, Fig. 1; Fig. 7, a perspective view looking down upon the top of the gage-plate holder or frame, and Fig. 8 a perspective view of a portion of a modified form of the lifting-bar.

The object of my present invention is to provide a simple and efficient machine for gaging spherical bodies and for assorting the same according to their varying sizes.

A further object is to provide means whereby the bodies so gaged shall enter the machine at the same speed, and also to provide means for moving said bodies along the gage-plates an equal distance each time they are moved, so that bodies of the same size pass through the straight edges at the same point. By so constructing the machine I am enabled to more accurately gage the spherical bodies or balls than can be done where the balls come into the machine with varying momentum and do not pass through the same opening or point between the gage-plates. I am also enabled to use gage-plates which are not so accurately ground as those used in the class of machines just referred to, thereby saving a great amount of expense and liability of not having the balls properly gaged.

Various adjustments are provided whereby the life of the gage-plates is prolonged and the accuracy of the machine maintained.

Referring to the accompanying drawings, A indicates the main frame of the machine, provided at each side with two upwardly-extending lugs or arms B. Between these arms and secured thereto by suitable bolts or screws is a table or bed C, having formed at each end thereof upwardly-extending lugs D, which are provided with internal threaded openings. Upon this table or bed is mounted a frame E. (Shown in detail in Fig. 7.) Said frame is secured to the table C by bolts or screws F, which pass down through slots or recesses G in the ends of said frame E into suitable threaded openings formed in the bed C. Screws or bolts H, mounted in the lugs D, bear against the opposite ends of the frame E, and when the screws F are loosened the frame may be adjusted to any desired position lengthwise upon the table C by means of the screws H. When the frame E is brought to its desired position, the screws F are of course tightened and the frame securely held in place.

I I indicate the gage-plates secured upon the frame E Each is provided at or near its ends with enlarged openings, (dotted line, Fig. 3,) through which are inserted screws J, washers K being placed between the heads of said screws over the openings in order to form a bearing for the heads of said screws. By making the openings in the gage-plates I of a diameter larger than that of the screws the plates may be given an adjustment lengthwise of the frame E and may be also adjusted toward and from each other. To secure the necessary delicate adjustment of the gage-plates toward and from each other, the frame E is provided with upstanding ears or lugs L, through which screws are passed, the ends of which screws bear directly against the outer edges of the gage-plates I. The screws J must of course be loosened when the plates are to be moved toward or from each other or adjusted lengthwise of the frame E. They are tightened when the plates are brought to the desired point.

From the foregoing it will be seen that when the gage-plates are brought to the desired adjustment upon the bed E they may be maintained in such position and the frame and the gage-plates shifted bodily lengthwise of the machine through the agency of the

screws carried by the lugs D. The object of thus shifting the gage-plates lengthwise of the machine will presently appear.

Two shafts M and N are secured to the frame and extend crosswise thereof, as shown in Figs. 1, 2, and 4. Each shaft is provided with a gear-wheel, (indicated by the reference-letters O and P,) said gears being of the same diameter and meshing with an intermediate gear Q, carried upon a shaft R, to the outer end of which is attached a band-pulley S.

Motion is imparted to the band-pulley from any suitable source. The shaft R, as will be seen upon reference more particularly to Figs. 1, 4, and 6, has its bearings in bars or plates T, which are adjustably secured to each side of the frame A through the elongated slots and screws, as shown in all of said figures. By this means the intermediate gear Q may be brought to mesh exactly with the larger gears O and P.

Upon each of the shafts M and N are secured two cams or eccentrics U U, the relation of the cams to each other upon the shaft being shown in Fig. 6. Each pair of cams is connected through a yoke V, from which extends upwardly an arm W, and to said arm W is connected one member of the lifting-bar. Said lifting-bar, as will be seen upon reference to Figs. 4, 5, and 6, comprises two separate members X and Y, the member X being directly connected to the bars or arms W, so that as the yokes are lifted said member of the lifting-bar is also elevated. The second member of the lifting-bar Y is provided with slots or openings Z, through which extend screws *a*, the screws entering the member X and holding the parts together, while at the same time they may be moved one upon the other in a vertical line.

The upper face of each of the members X and Y is provided with a series of teeth *b*, the faces of the teeth being inclined downwardly toward the opposite member, so as to form grooves or channels within which the balls or spherical bodies may rest. In the form shown in Fig. 5 the teeth are formed by the long inclined surface *c* and the abrupt or vertical surface *d*, connected by an intermediate curved portion *e*, the inclination of all of said surfaces from the vertical being in the same direction or, as above stated, toward the opposite member.

A stop *f* is secured to the under part of the table or bed C in line with the under face of the movable member Y of the lifting-bar. When the parts are in the position indicated in Fig. 6, in which position the cams U are down and the yoke V in its lower position, said member Y will come into contact with the stop *f* and be arrested in its movement. When, however, the cams elevate the yoke, and through the arms W the member X of the lifting-bar, the screws *a* will carry the member Y up with the member X, so that when the lifting-bar as a whole passes in between the gage-plates or straight edges the upper faces of the members X and Y will be in the same plane or in the position indicated in Fig. 5. In this position they will engage the balls and lift them from the gage-plates, as indicated in Fig. 4.

Referring to Fig. 1, *g* indicates the feed-hopper, which for the purpose of illustration is shown connected to the main frame by a bracket, although it is immaterial how said feed-hopper is supported.

Secured upon the shaft N is a small gear *h*, which meshes with a somewhat larger gear *i*, mounted upon a shaft *j*, carried in suitable bearings at the forward or head end of the machine. Upon said shaft *j* there is mounted a cam *k*, about which is passed a strap, and to said strap is connected a rod or pitman *l*. Said pitman is connected at its upper end to a feed-pipe *m*, the upper end of which extends up into the hopper *g*, while its lower end is pivoted to the frame E in line with the upper or forward end of the gage-plates I. Through the agency of the connections just described the upper end of the feed or discharge pipe is reciprocated in the lower end of the feed-hopper *g* and insures the passage of the balls into said pipe, from whence they are discharged onto the gage-plates.

When the machine is in motion, the lifting-bar is moved up between the gage-plates, as indicated in Fig. 4, and then withdrawn from between the same down into the position shown in Fig. 6. When the bar is elevated, it is also carried forward slightly toward the head of the machine, and the teeth *b* will pass up beneath the balls upon the gage-plates, and as the bar comes to its highest position the balls will run down from the apex of said teeth along the inclined surface *c* up against the abrupt face *d*. As the lifting-bar begins to recede it moves toward the rear of the machine, and consequently the balls are carried along by said bar and again deposited upon the gage-plates at a point slightly farther along toward the discharge end of the machine. At each elevation of the lifting-bar one ball is taken out from the tube, and it will therefore be seen that each ball must come onto the gage-plates with the same momentum, irrespective of its size and weight. By thus regulating the speed of the balls as they enter the machine any overthrow thereof is prevented, which overthrow would result in the ball passing that point at which it should leave the gage-plates, and thus it is that the balls are all correctly gaged.

The bodily lifting of the balls by the lifter-bar and the carrying of them along by successive steps always insures the balls of a certain or fixed diameter passing through the gage-plates at one particular point. This being so, the gage-plates are worn simply at a number of points equal to the number of teeth in the lifter-bar, and when the edges of the gage-plates become worn they may, as above described, be shifted bodily from or toward the head of the machine, and thus a new surface

be presented to be used in connection with the teeth of the lifter-bar for gaging the balls. This not only enables me to use a straight edge or gage-plate for a much longer time than could otherwise be done; but it also enables me to use a gage-plate which is not accurately ground throughout its full length.

Upon reference to Fig. 6 it will be seen that as the cams and yoke reach their lowermost position member Y of the lifting-bar is arrested by the stop *f* and that the member X of said lifting-bar has reached such a position that the inclined surfaces *b*, *c*, and *d* thereof no longer form a support for the ball and that the ball will roll down off of the inclined face of the member Y into the runways or channels *n*.

In Fig. 4 I have shown a modified form of delivery-tube which instead of being provided with a simple outlet has upon its upper side at its discharge end a pivoted gate *o*, held down by a spring *p*. The gate is formed with an inwardly-projecting spur or lip *q*, which restricts the opening of the pipe to such an extent that the balls cannot pass therefrom without the gate being elevated. As the lifter-bar is elevated the forwardmost tooth thereof comes into contact with the ball previously released and through it forces the gate upward, allowing another ball to be fed forward, the spur or lip again coming down between the ball just released and the one immediately behind it as the lifter-bar moves toward the discharge end of the machine and recedes beneath the gage-plates. This operation is repeated each time the lifter-bar comes up, so that a positive feed is insured without the liability of more than one ball passing from the feed-tube at one time.

In Fig. 8 I have illustrated a modified form of the lifting-bar. It comprises two members, one designed to be directly connected to the arms W and the second one slidably mounted upon the first member, as in the construction above described. In the present instance instead of forming the teeth as shown in Fig. 5 I form them by making a series of separate and independent pointed teeth *r*, the edges of which incline toward the opposite member of the lifting-bar, while the connecting-faces *s* between the teeth *r* are straight and incline in the same direction as the edges of the teeth, or, as shown in dotted lines in said figure, the connecting-faces may be curved. The construction first described is, however, the preferred form.

It is manifest that instead of using two eccentrics and connecting them by yokes a single eccentric and arm could be used directly connected to the lifter-bar; but with such construction a guide would have to be provided.

Having thus described my invention, what I claim is—

1. In a machine for gaging spherical bodies, the combination of a suitable support or frame; gage-plates mounted thereon and adapted to receive and measure the spherical bodies; and means for bodily lifting the spherical bodies from one position on said plates and depositing them at a different point thereon.

2. In a machine for gaging spherical bodies, the combination of a suitable support or frame; gage-plates mounted thereon with their working edges gradually receding from each other; and means for bodily lifting the spherical bodies from one position on said plates and depositing them thereon at a point farther along.

3. In a machine for gaging spherical bodies, the combination of a suitable support or frame; gage-plates mounted thereon with their working edges gradually receding; and a lifting-bar designed to pass up and down between said plates and to lift the spherical bodies therefrom and redeposit them at a point farther along on the plates.

4. In a machine for gaging spherical bodies, the combination of a suitable frame or support; gage-plates mounted thereon with their working edges gradually receding from each other; and a lifting-bar designed to work between said plates, said bar being movable in a circular path, whereby the spherical bodies are raised clear of the plates, carried forward and redeposited at a point farther along upon the plates, substantially as described.

5. In a machine for gaging spherical bodies, the combination of a suitable frame or support; gage-plates mounted thereon; and a lifter-bar designed to move up and down between said plates and to move lengthwise thereof when above the plates, substantially as described.

6. In a machine for gaging spherical bodies, the combination of a suitable frame or support; gage-plates mounted thereon with their working edges gradually receding from each other; and a lifter-bar designed to pass up between said plates, the bar having teeth upon its upper surface.

7. In a machine for gaging spherical bodies, the combination of a suitable frame or support; gage-plates mounted thereon; and a lifter-bar designed to pass up between said plates being provided with a series of teeth, the teeth inclining downwardly from the delivery to the discharge end of the machine.

8. In a machine for gaging spherical bodies, the combination of a suitable frame or support; gage-plates mounted thereon; and a lifter-bar designed to be passed up between said plates, said bar comprising two members lying side by side, and movable one in relation to the other substantially as described.

9. In a machine for gaging spherical bodies, the combination of a suitable frame or support; gage-plates mounted thereon; and a two-part lifter-bar having the upper faces of the two parts beveled and inclining toward each other.

10. In a machine for gaging spherical bodies, the combination of a suitable frame or support; gage-plates mounted thereon; and a two-part lifter-bar, each part being provided with teeth, the edges thereof inclining into the opposite member.

11. In a machine for gaging spherical bodies, the combination of a suitable frame or support; gage-plates mounted thereon; a lifter-bar designed to pass up between said plates, said bar comprising two members, one slidably mounted upon the other; means for raising and lowering said bar; and a stop for arresting the downward movement of the slidable member of said bar.

12. In a machine for gaging spherical bodies, the combination of a suitable frame; gaging means carried thereby; a feed-hopper; a feed-tube pivoted to the frame and having its upper end extending loosely into the hopper; and means for raising and lowering the free end of said tube.

13. In a machine for gaging spherical bodies, the combination of a suitable frame; gaging devices carried thereby; a feed-tube provided on the upper side of its discharge end with a pivoted gate, said gate having an inwardly-projecting spur or stud; and a lifting-bar designed to act in conjunction with said gate.

14. In a machine for gaging spherical bodies, the combination of a suitable frame or support; gage-plates mounted thereon; a feed-hopper; a feed pipe or tube pivoted to the frame and having its upper end extending freely into said hopper; means for raising and lowering said tube; a gate pivoted upon the upper side of said tube at its discharge end, said gate having an inwardly-projecting spur or stud; and a lifter-bar designed to be raised and lowered between said gage-plates and to act in conjunction with said gate, substantially as described.

15. In a machine for gaging spherical bodies, the combination of a suitable frame or support; a bed mounted thereon and capable of adjustment bodily in the direction of the length of the machine; gage-plates secured upon said bed; and a lifter-bar working between said plates and moving lengthwise thereof, said bar being provided with means for engaging the spherical bodies as it passes up between the plates, substantially as and for the purpose described.

16. In combination with the gage-plates of a gaging-machine; a lifter-bar designed to be raised and lowered between said plates, said bar comprising two members one slidably mounted upon the other; means for raising and lowering said bar; means for arresting the downward movement of the slidable member; and channels or ways located to one side of the bar beneath the gage-plates.

17. In a machine for gaging spherical bodies, the combination of a suitable frame or support; a frame E mounted thereon; means for adjusting said frame bodily lengthwise of the machine; gage-plates adjustably mounted upon said frame; and a lifter-bar provided with teeth upon its upper face adapted to pass up and down between the gage-plates.

18. In a machine for gaging spherical bodies, the combination of a suitable frame or support; gage-plates mounted thereon; shafts M and N journaled in the frame below said plates; cams U, U, mounted upon said shafts; yokes V connected to said cams; a lifter-bar comprising two members, one slidably mounted upon the other; connections between one of said members and the yokes; and means for arresting the descent of the slidable member as the cams near their limit of downward movement.

19. In a machine for gaging spherical bodies, the combination of a suitable support or frame; gage-plates mounted thereon; shafts M and N journaled in the frame below said plates; gears O, P, mounted respectively upon said shafts; cams U, U, also carried by said shafts; an intermediate gear Q meshing with said gears O and P; means for imparting motion to said gear Q; yokes V connected to said cams; and a lifter-bar carried by said yokes.

20. In a machine for gaging spherical bodies, the combination of a suitable support or frame; shafts M and N journaled in said frame and provided with cams U, U; yokes V connected to said cams and carrying at their upper ends a lifter-bar; gears O, P, carried respectively by the shafts M and N; an intermediate gear Q meshing with said gears O, P; means for imparting motion to said gear Q; a small gear *h* mounted upon the shaft N and meshing with a larger gear *i* mounted upon a shaft *j*; a cam *k* carried by said shaft *j*; a pitman *l* connected to said cam at its lower end and connected at its upper end with a pivoted feed-spout; a feed-hopper G into which the upper end of the feed-spout extends; and gage-plates mounted upon the frame, substantially as described.

21. In a machine for gaging spherical bodies, the combination of a suitable frame or support having upwardly-extending lugs or ears B; a table or bed C secured within the frame between said lugs or ears; lugs D extending up from the ends of said table; a frame E carried upon said table C and adjustable between said lugs D, substantially as described; and laterally-adjustable gage-plates mounted upon said frame E, whereby the gage-plates may be moved bodily lengthwise of the machine without varying their lateral adjustment, or may be adjusted laterally without moving them in a longitudinal direction.

22. In a machine for gaging spherical bodies, the combination of suitable gage-plates designed to receive and gage the bodies as they are passed thereover from one end to the other; and a lifter-bar adapted to pass up

between the gage-plates and provided with means for moving the bodies along the gage-plates, step by step.

23. In a machine for gaging spherical bodies, the combination of suitable gage-plates adapted to receive and gage the bodies as they are passed thereover; a source of supply from which the bodies may pass to said plates; and a lifter-bar adapted to pass up between the plates, said bar serving to regulate the feed of the machine, substantially as described.

24. In a machine for gaging spherical bodies, the combination of suitable gage-plates adapted to receive and gage the bodies as they are passed thereover; a source of supply from which the bodies may pass to said plates; and a lifter-bar adapted to pass up between the gage-plates, said bar being provided with means for feeding the bodies, one by one, to the plates and moving them therealong, step by step.

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

GEORGE H. HATHORN.

Witnesses:
GEO. W. E. BARROWS,
WM. E. BROWN.