(No Model.) 3 Sheets—Sheet 1.

R. H. GRANT.

MEASURING MACHINE.

No. 504,107. Patented Aug. 29, 1893.

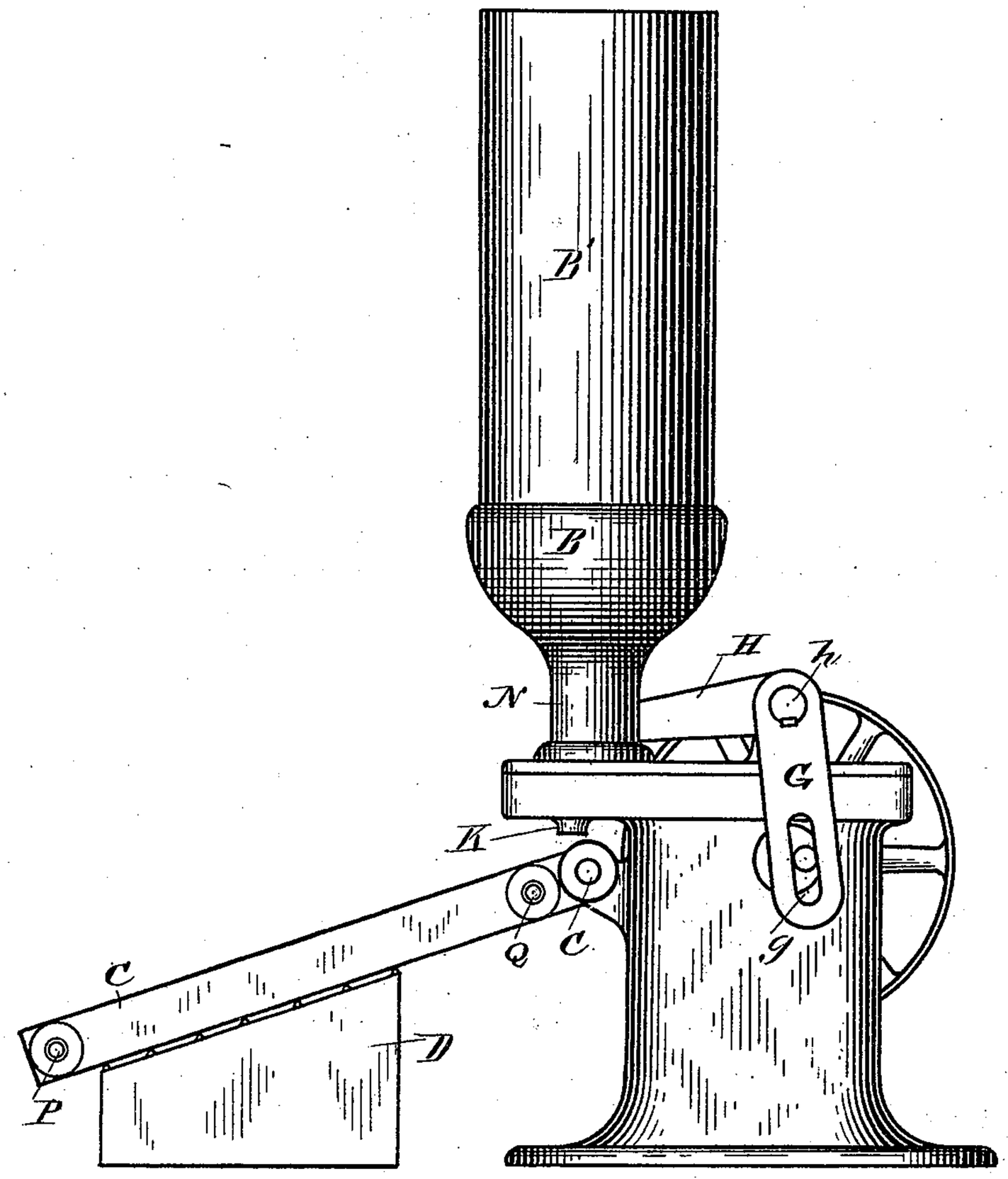

Fig. 1.

WITNESSES.
Geo. A. Holmes
L. H. Fawcette

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(No Model.) 3 Sheets—Sheet 2.

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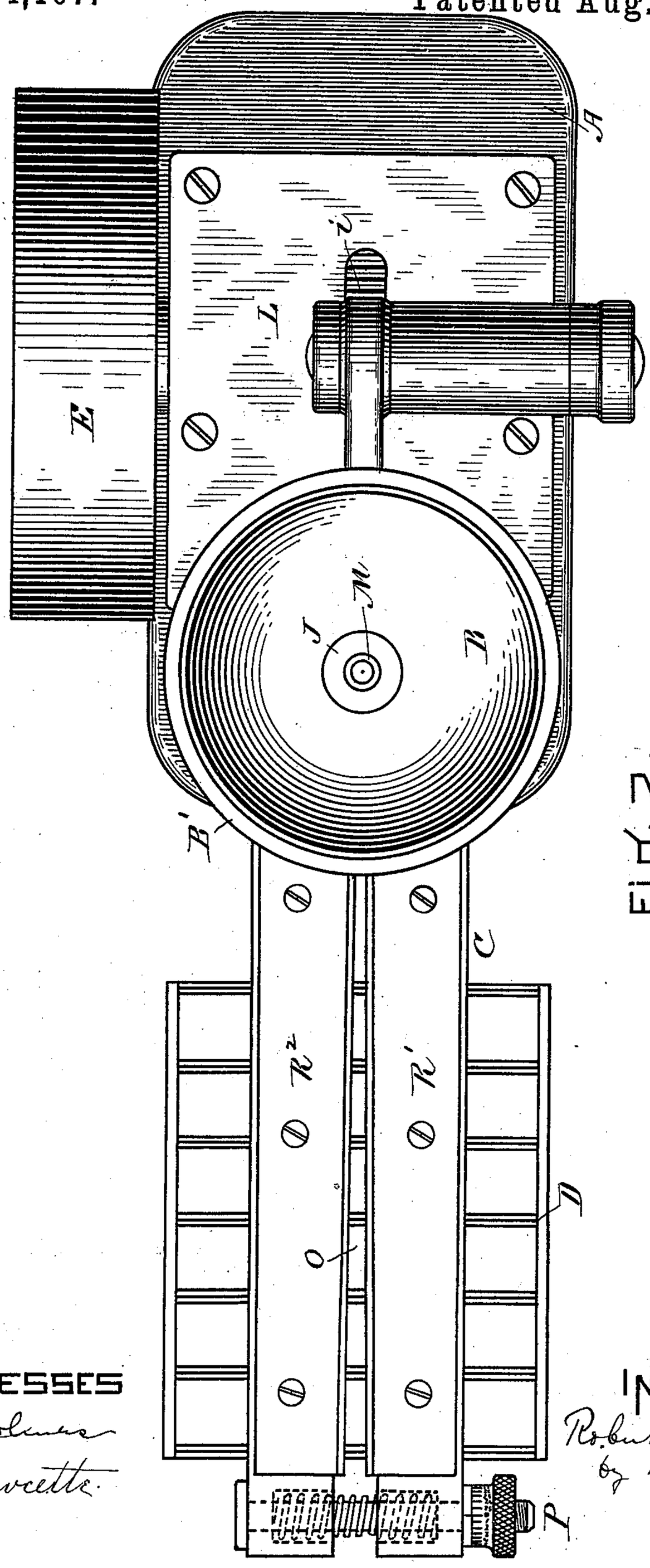

Fig. 2.

WITNESSES

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(No Model.)

3 Sheets—Sheet 3.

R. H. GRANT.

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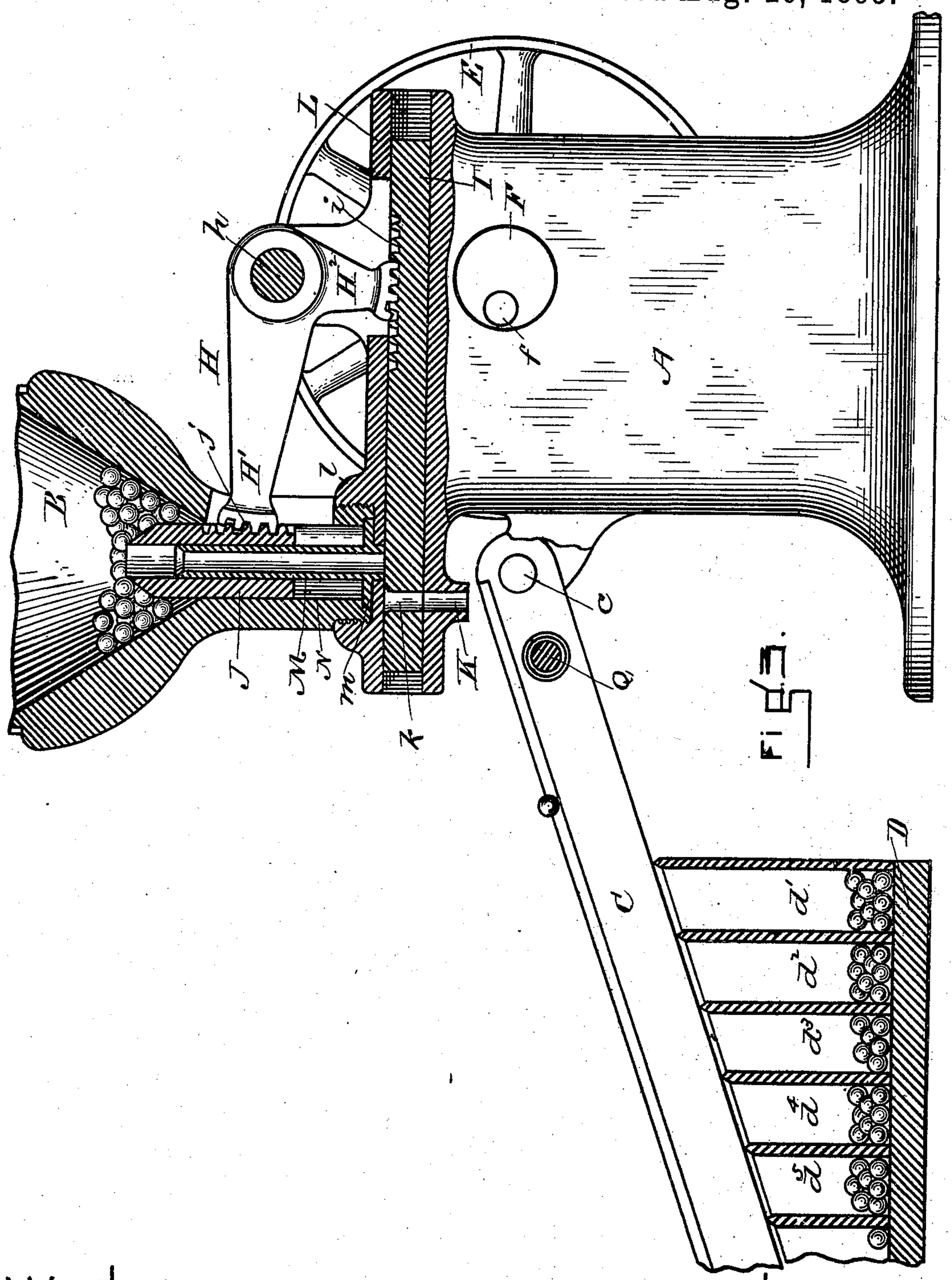

WITNESSES
Geo. Holmes
L. L. Hawcette.

INVENTOR.
Robert Howard Grant,
by W. H. Howe
Atty.

UNITED STATES PATENT OFFICE.

ROBERT HOWARD GRANT, OF FITCHBURG, MASSACHUSETTS, ASSIGNOR TO THE GRANT ANTI FRICTION BALL COMPANY, OF SAME PLACE.

MEASURING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 504,107, dated August 29, 1893.

Application filed November 30, 1892. Serial No. 453,618. (No model.)

To all whom it may concern:

Be it known that I, ROBERT HOWARD GRANT, a citizen of the United States, residing at Fitchburg, in the county of Worcester and State of Massachusetts, have invented certain new and useful Improvements in Measuring-Machines, of which the following is a full specification.

My invention relates to that class of machines designed to sort rapidly and accurately according to size, metallic balls which have been previously turned and ground to true spheres. In my machine this sorting is accomplished by automatically allowing the balls, one at a time, to roll down an inclined plane over a longitudinal slot whose edges diverge gradually from the top to the bottom; the design being to have the balls drop through a slot as soon as they reach a place where their width corresponds to their diameter. Beneath the inclined slot is placed a box provided with transverse bins into which balls of different diameters drop.

Referring to the accompanying drawings wherein like letters represent like parts: Figure 1 is a side elevation of my improved measuring machine. Fig. 2 is a plan of the same. Fig. 3 is a vertical section through axis of hopper and center line of inclined slot.

In the drawings, A is the casting forming the standard of the machine. B is the conical hopper having in its neck the two sleeves, M and J. C is the inclined plane provided with the longitudinal slot, and D is the box having the transverse bins d', d^2, &c.

The power is applied to my machine by the pulley E which is driven by a belt from any suitable source of power. The pulley E is keyed to, and turns, a horizontal shaft bearing in the standard A and having on its other end the crank-disk F carrying the crank-pin *f*. This crank-pin works in a slot *g* in a rocker arm G, keyed to a short shaft *h* above, which turns in bearings raised above the plate L which is secured to, and covers, the top of the standard A. As the crank-disk revolves, the shaft *h* is, by means of the rocker arm G, given an oscillating motion which is consequently shared by the bell-crank lever H keyed on the other end of the shaft *h* over the center of the machine. The bell-crank lever H has two arms, H′ and H^2, at right angles to each other, having geared sectors on their ends which mesh with, and consequently give a reciprocating motion to, two racks. The sector on the end of the short downwardly projecting arm H^2 meshes with the rack *i* on the upper surface of the slide I. This consists of a flat plate sliding in a suitable recess in upper surface of the frame A, and held in position by the removable plate L. The slide I has near its left-hand end, Fig. 3, a port *k* which, by the reciprocation of the said valve, is alternately placed in line with the delivery spout K which projects downward through the top of the standard, and the sleeve M which forms communication with the hopper B. The exterior of this hopper has the shape shown in Fig. 1, having its neck screwed into the boss *l* on the top of the plate L, and being prolonged upward by the cylinder B′. The inside of the hopper is funnel-shaped, as shown in Fig. 3. As the neck N is screwed into the plate L, it embraces under its end the flange *m* of the hollow tube or sleeve M which is thus held firmly in position. The said tube M projects downward through the plate L so that it is flush with the under side of said plate, and upward through the neck, into the conical portion of the hopper. Its inner edge at the upper end is beveled in the form of a funnel. The sleeve J surrounds the tube M and slides up and down in the annular space between it and the inner walls of the neck N of the hopper. This sleeve has its upper outside edge beveled in the form of a truncated cone and carries on its side the rack *j* which meshes with the sector on the end of the horizontal arm H′ of the reciprocating bell-crank lever H. The sleeve J therefore oscillates vertically in the apex of the hopper and keeps the mass of balls there in agitation so that they will move continuously down through the tube M and not become clogged. In the lowest position of the sleeve J, the upper edge of its conical end is in the same plane as the upper edge of the inside sleeve M, the ends of the two sleeves thus presenting a sharp edge on which it is impossible for any balls to lodge. As J then moves upward it will be seen that it is impossible for the balls to become clogged in the mouth of

the sleeve M. The inner diameter of the sleeve M is only a trifle larger than that of the balls so that it is impossible for two balls to pass through it side by side. A ball in the bottom of this tube will lie on the plate I, if in the position shown in Fig. 3. But as soon as I slides over to the right-hand position, the port *k* comes beneath the tube N, and the ball drops into said port. The plate I then slides back again carrying the ball in the port until it is over the delivery spout K when the ball drops through on to the inclined slot as shown in Fig. 3. The plate I is of such thickness that there is room for only one ball at a time in the port. The upper edges of the port are slightly rounded so as to push upward any other balls except the one in the port, which may project down from the tube above; otherwise there might be a tendency to shear off any such balls and consequently to clog the machine.

The inclined plane C, having the longitudinal slot O through it is pivoted at its upper end at *c* to ears on the standard of the machine, in order that by raising or lowering the lower end, its inclination may be varied so as to obtain the best results. This inclined plane C is made in two separate sections, placed side by side, having the slot O between them, down which the balls roll. The upper end of this slot comes directly under the delivery spout K, and beneath the slot is placed the box D with the transverse bins d', d^2, d^3, &c. The upper edges of the slot are beveled so as to form a V trough in which the balls may roll. The sides of the slot are very accurately finished and are formed by two plates, R', R^2, Fig. 2, which are secured by screws to the two sections of the inclined plane. These plates R', R^2, are set so that their inner edges project over the inner edges of the sections to which they are secured, and consequently after a ball has dropped between them it has nothing to impede its free fall. The two sections of the inclined plane carrying the plates which form the walls of the slot are connected at the upper and lower ends by micrometer screws, P at lower end, and Q at upper end. By means of these micrometer screws the walls of the slot may be accurately separated any desired amount and consequently the flare of the slot may be varied so that it is possible to know at exactly what diameter the balls will drop into each transverse bin beneath. By allowing the balls alternately to roll down over the inclined slot O, greater freedom is given them, for were two or three deposited on the slot together, the friction of one against another would overcome the inclination to roll down and the machine would become clogged.

I claim—

1. A measuring machine consisting of a suitable standard and hopper having a neck provided with an inside stationary sleeve M, an outside vertically moving sleeve J, both mounted in the apex of the hopper, all arranged as and for the purpose substantially as described.

2. In a measuring machine, consisting of a suitable standard, a hopper B, a sleeve M, a sleeve J, a slide I, a lever H, and suitable driving mechanism whereby the balls are alternately discharged on to the inclined plane C, substantially as described.

3. A measuring machine, consisting of a suitable standard and hopper, provided with a vertically movable sleeve J, having its upper outside edge beveled, and connecting mechanism, as and for the purpose substantially as described.

4. A measuring machine consisting of a suitable standard and hopper provided with a fixed sleeve M, having its inside upper edge beveled, in combination with an outside sleeve J, having its outside upper edge beveled, and connecting mechanism, as and for the purpose substantially as described.

5. A measuring machine consisting of a suitable standard provided with a hopper, and suitable driving and discharging mechanism, in combination with the inclined plane C, provided with a longitudinal flaring slot O, substantially as described.

6. A measuring machine, consisting of a standard A, a hopper B, the sleeves M and J, the slide I, the bell crank lever H, the inclined plane C, and the bins d', d^2 &c., and suitable driving mechanism, substantially as described.

In witness whereof I have hereunto set my hand.

ROBERT HOWARD GRANT.

Witnesses:
WM. B. H. DOWSE,
E. H. GILMAN.