(No Model.) 5 Sheets—Sheet 1.

H. E. SMYSER.

FEED MECHANISM FOR WEIGHING MACHINES.

No. 570,109. Patented Oct. 27, 1896.

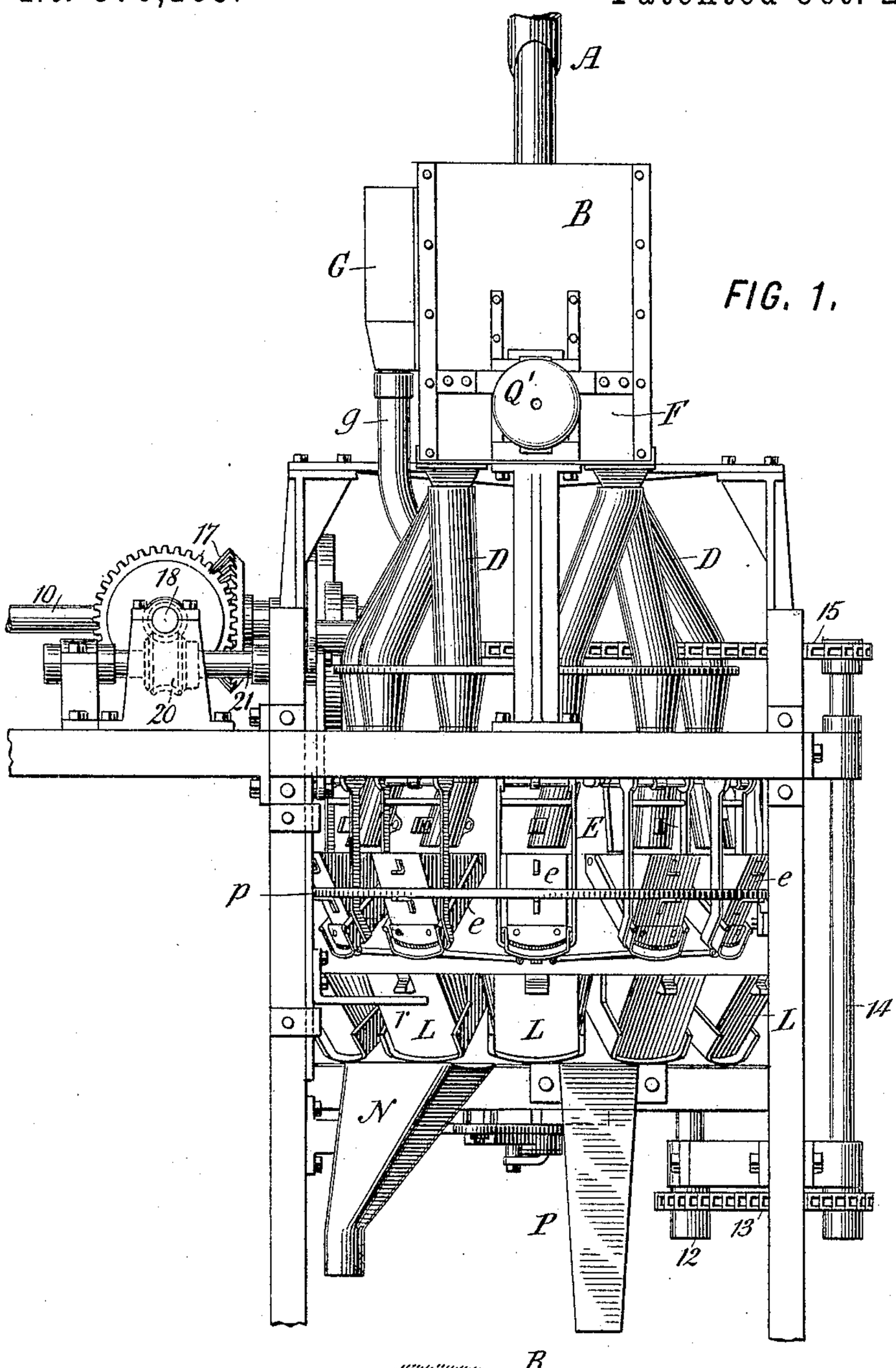

FIG. 1.

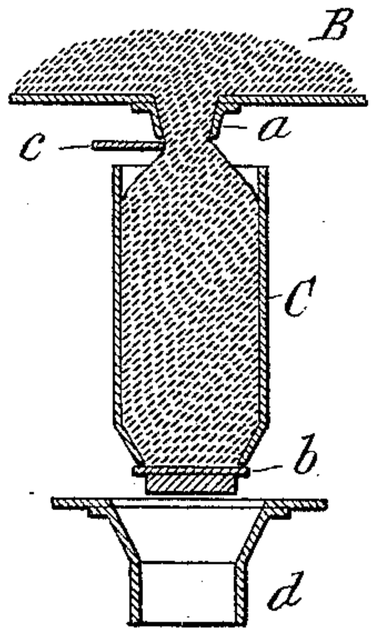

FIG. 10.

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(No Model.)

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FEED MECHANISM FOR WEIGHING MACHINES.

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FIG. 2.

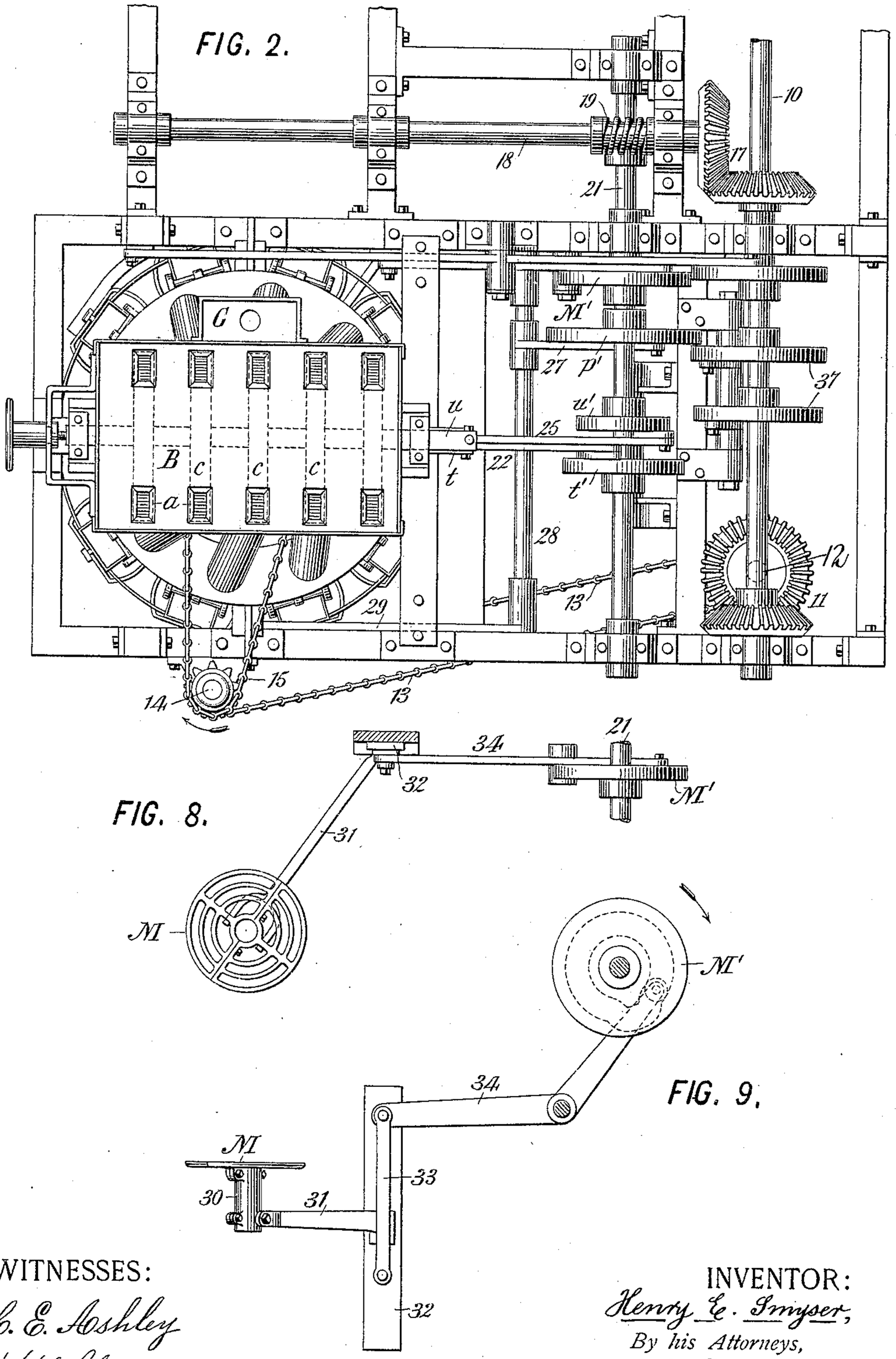

FIG. 8.

FIG. 9.

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(No Model.) 5 Sheets—Sheet 3.

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FEED MECHANISM FOR WEIGHING MACHINES.

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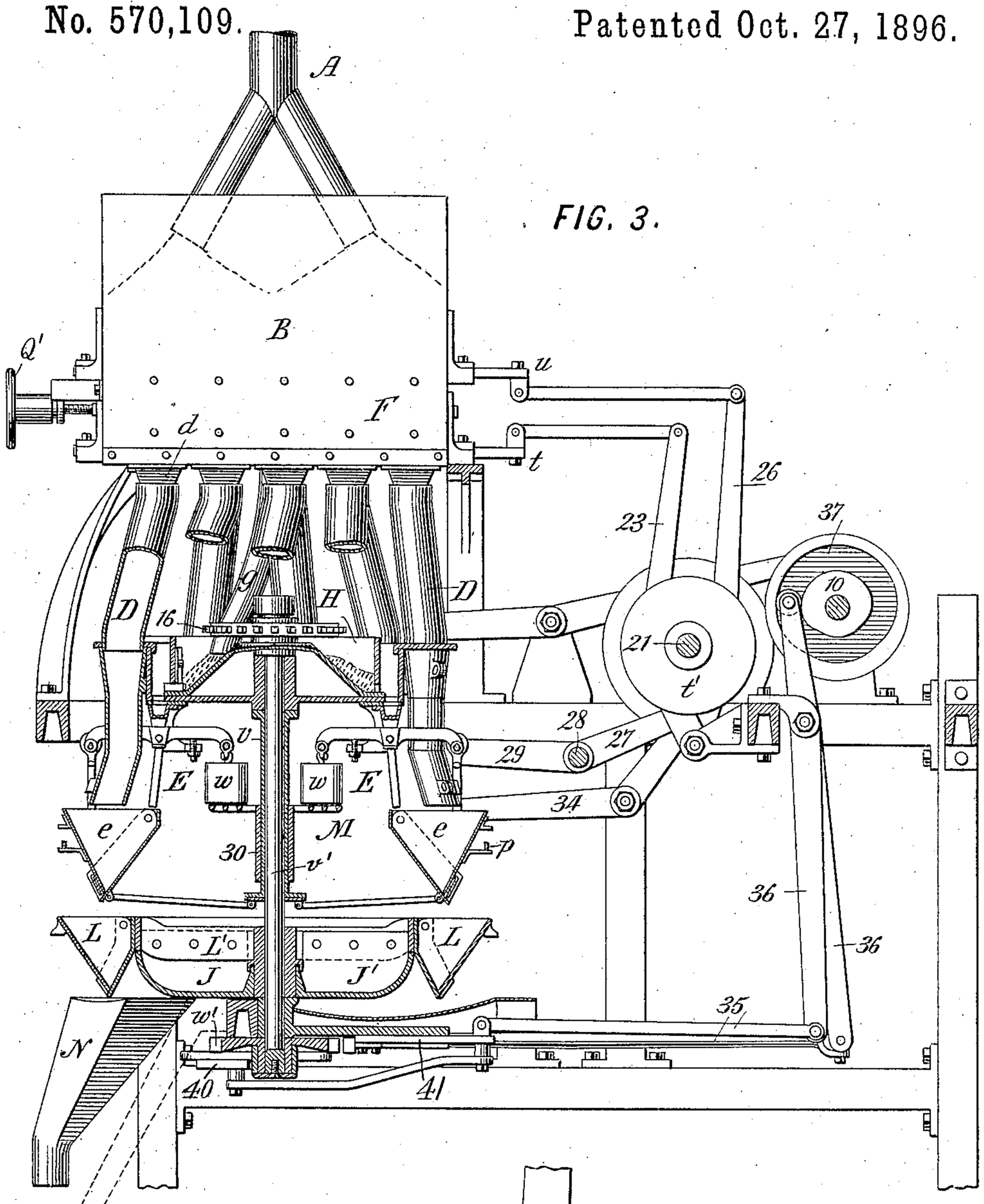

FIG. 3.

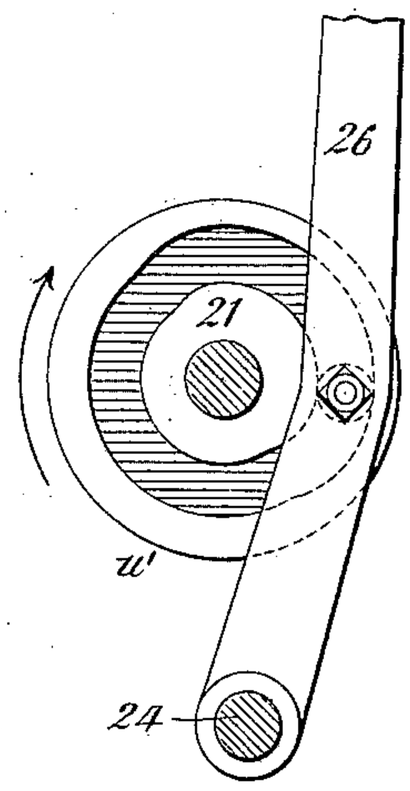

FIG. 6a.

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FEED MECHANISM FOR WEIGHING MACHINES.

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FIG. 4.

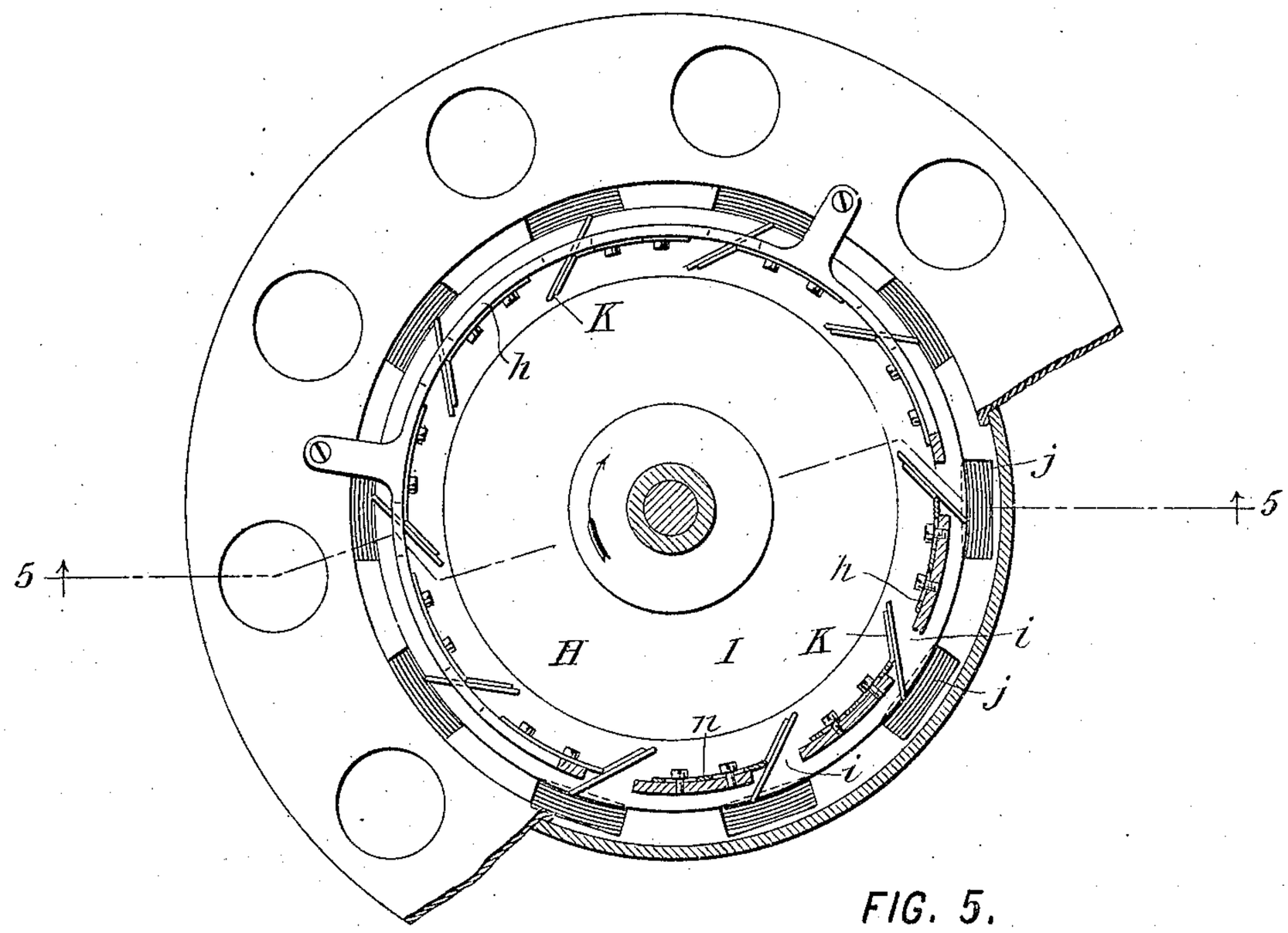
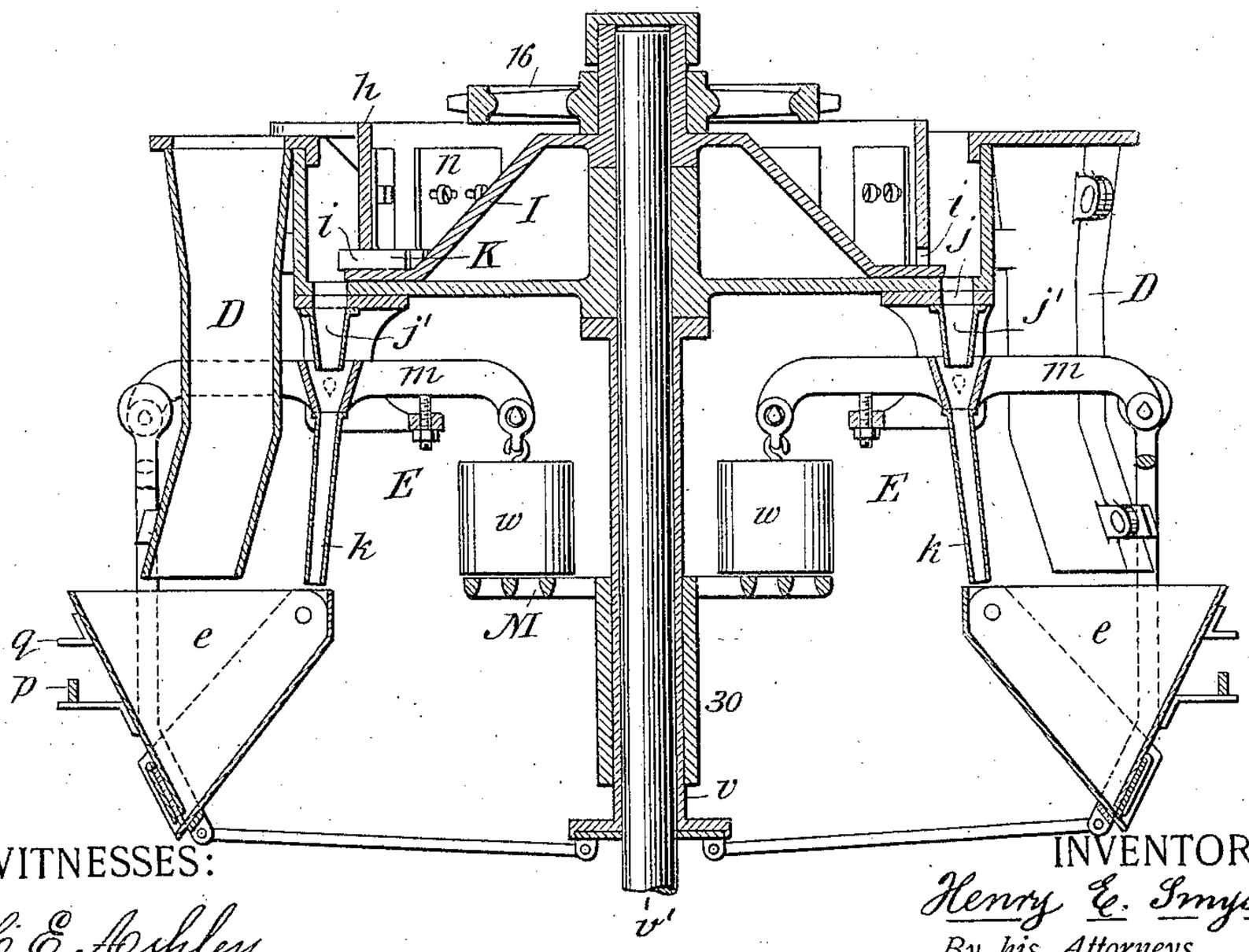


FIG. 5.



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(No Model.) 5 Sheets—Sheet 5.

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FEED MECHANISM FOR WEIGHING MACHINES.

No. 570,109. Patented Oct. 27, 1896.

FIG. 6.

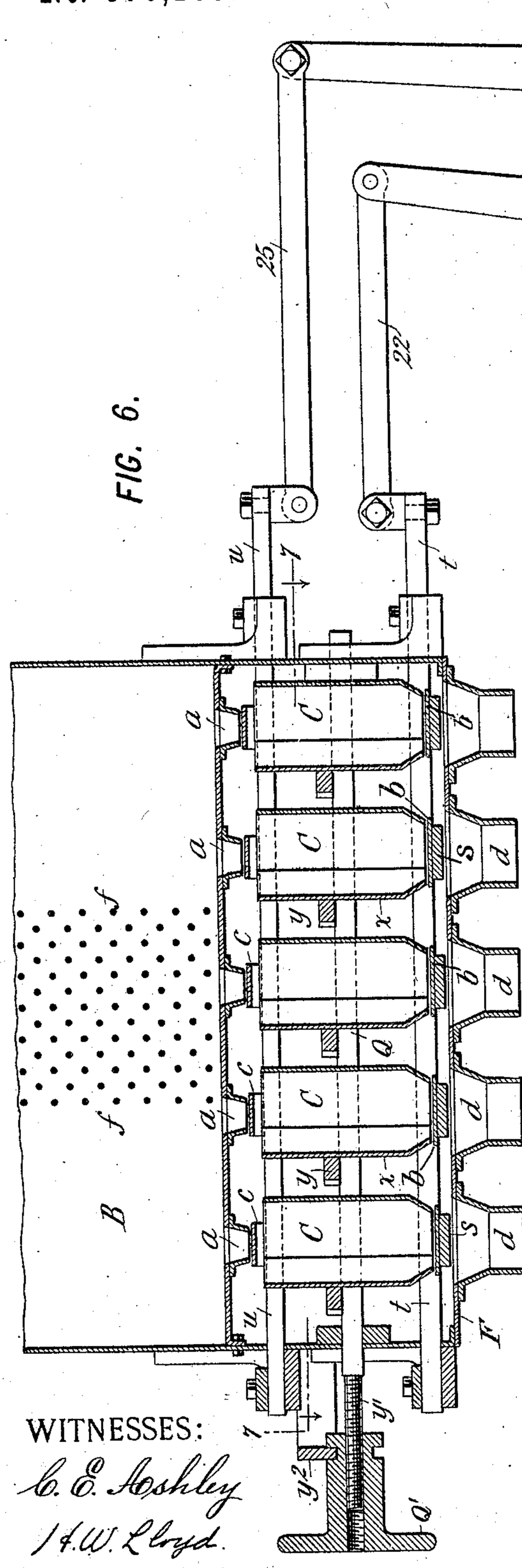
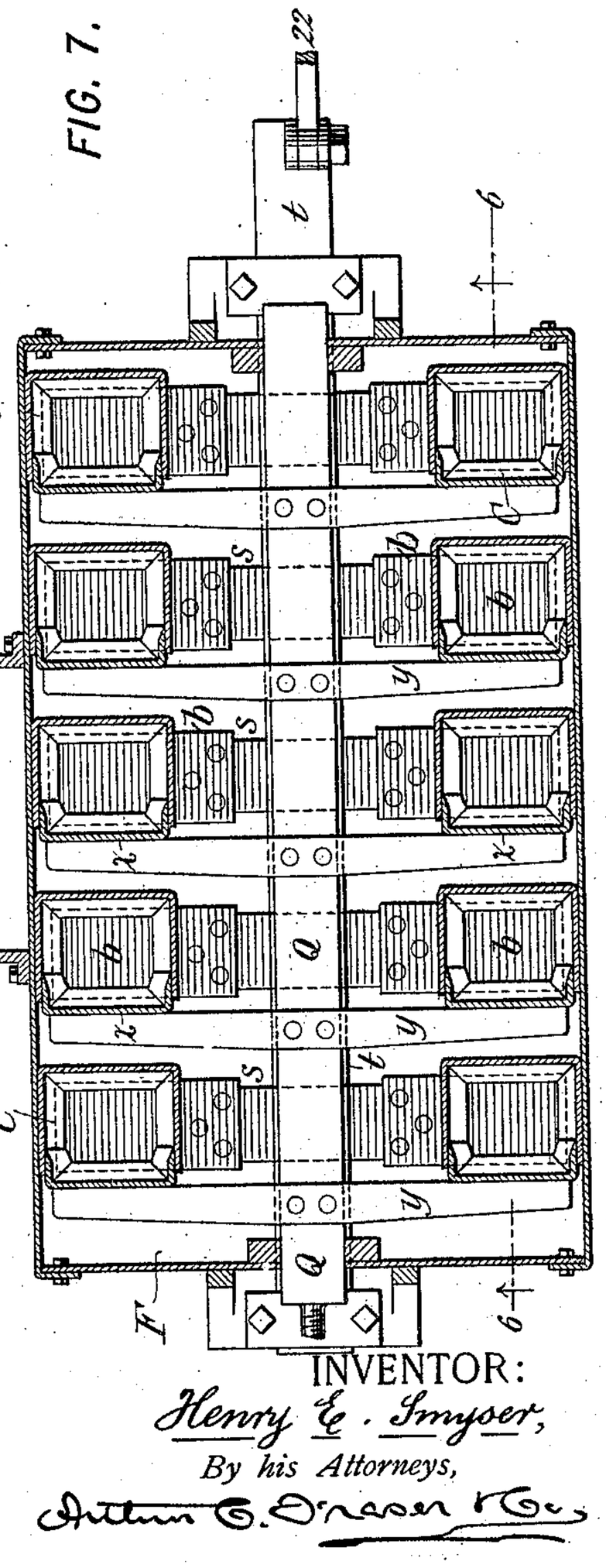


FIG. 7.



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UNITED STATES PATENT OFFICE.

HENRY E. SMYSER, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO ARBUCKLE BROTHERS, OF NEW YORK, N. Y.

FEED MECHANISM FOR WEIGHING-MACHINES.

SPECIFICATION forming part of Letters Patent No. 570,109, dated October 27, 1896.

Application filed March 22, 1895. Serial No. 542,761. (No model.)

To all whom it may concern:

Be it known that I, HENRY E. SMYSER, a citizen of the United States, residing in Philadelphia, (Germantown,) in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Feed Mechanism for Weighing-Machines, of which the following is a specification.

This invention introduces certain improvements in weighing-machines in which a granular or powdered material is subdivided into uniform weights, and particularly to that class of such machines in which the material is first measured out into charges of somewhat less than the full weight desired and a small stream of material gradually added until the full weight is reached, whereupon the stream is cut off. Weighing apparatus acting on this principle are disclosed in my following patents: No. 376,683, granted January 17, 1888; No. 449,276, granted March 31, 1891; No. 470,146, granted March 1, 1892, and Nos. 493,795, 493,796, 493,797, and 493,798, granted March 21, 1893.

In the construction embodied in Patent No. 470,146, for example, the material to be weighed is first measured in a series of reciprocating boxes, which at intervals drop the measured charges of material through different chutes into the respective scale-pans of a series of scales. Each of the scales is then fed with a graduated stream or dribble of the material, these streams being fed by a feeding device consisting of a hopper having bottom openings communicating through chutes with the respective scale-pans and a moving feed plate or disk having perforations through it, into which the material falls, and from which, when the perforations move over said openings, the material falls through the chutes to the scales. Such a feeding mechanism has been found to operate very successfully for feeding unground coffee, and is equally applicable with peas, beans, rice, and coarsely-granulated substances in general; but in operating with sugar, salt, and other finely granulated or powdered substances, and especially such as are very hygroscopic, difficulty is experienced by reason of the cohesiveness of the material, which may prevent it from falling into the perforations in the feed-plate, or from filling them, or from falling out of them, or may otherwise render the supplemental feed to the scale-pans insufficient or irregular, and by reason of the harsh or crystalline and in some cases the adhesive nature of the materials being weighed difficulty is encountered in measuring them by means of such reciprocating measuring-boxes. It is to overcome these difficulties that my present invention is designed.

According to my present invention I no longer provide for measuring the material by a reciprocating box or measuring-cell; nor do I provide for completely filling the box or cell in which the measuring is effected. The measuring device consists of a stationary box or cell (or preferably a series thereof) open at top and bottom, with a slide or trap-door for closing the bottom and a slide for cutting off the supply of material tending to enter the box from the general reservoir above, the construction being such that the material may enter in a stream into the box and fill the same to such extent that it ceases to flow, remaining piled within the upper part of the box, after which it is cut off by the movement of the upper slide to close the inlet-opening, and subsequently the bottom of the box is opened to discharge its contents. By this means a sufficiently accurate measurement is effected for giving the initial supply to the scales. For feeding the supplementary streams of material my invention provides a hopper with a rotating coned disk forming its bottom and scraping-blades for scraping off each a small portion of the material from the edge portion or rim of the disk, chutes being arranged to catch the material falling from the scraping-blades to conduct the same to the scales.

Figure 1 of the accompanying drawings is an end elevation of the preferred embodiment of my invention. Fig. 2 is a plan thereof. Fig. 3 is a side elevation viewed from the right in Fig. 1, being partly in vertical mid-section. Fig. 4 is a sectional plan, on a larger scale, of the supplemental feed-hopper. Fig. 5 is a vertical section thereof on the line 5 5 in Fig. 4. Fig. 6 is a fragmentary vertical longitudinal section through the measuring apparatus, taken on the line 6 6 in Fig.

7. Fig. 6ª is an elevation showing a cam which is concealed in Fig. 6. Fig. 7 is a sectional plan cut in the plane of the line 7 7 in Fig. 6. Fig. 8 is a plan, and Fig. 9 is a side elevation, of a detail of the mechanism for operating the scales. Fig. 10 is a fragmentary vertical section answering to Fig. 6 and showing one of the measuring-boxes in operation.

The drawings show a machine having ten scale-pans, and consequently ten measuring-boxes. The apparatus as shown in the drawings constitutes a part of a complete machine adapted not only to subdivide the material into weighed charges, but also to deposit it in bags and to close these bags to form packages, which are thus automatically made and delivered from the machine. The mechanisms for these apparatus, however, are not shown in the drawings, as they form no part of my present invention.

The material to be weighed, for example sugar, is conducted downward from any suitable storage-bin or receiving-hopper, through a chute A, Figs. 1 and 3, into a reservoir or supply-box B. Preferably the chute A is divided into branches, as shown in Fig. 3, so as to distribute the material more uniformly throughout the reservoir. The material descends uniformly in proportion as it is taken away from the reservoir, the chute being kept full of material. In the bottom of the reservoir B is a series of supply-chutes *a a*, equal in number to the measuring-boxes—in this case ten. Directly beneath these chutes are placed the measuring-boxes C C, which are preferably so mounted as to remain stationary. These boxes are open at top and bottom and have slides or trap-doors or any other equivalent construction for closing their bottoms. These bottom slides are lettered *b b*. For cutting off the supply of material to the boxes a series of top slides *c c* is provided, coming directly beneath the chutes *a a*, so as to stop the flow of material through these chutes. Beneath the measuring-boxes C C are arranged delivery-chutes *d d*, from which extend conducting tubes or chutes D D, which lead downward into the respective scale-pans *e e* of the weighing-scales E E, Fig. 3. Preferably the measuring-boxes C C and their slides are inclosed in a box or chamber F, which is conveniently constructed as a downward continuation of the box constituting the reservoir B.

In operation the lower slides *b b* are first moved into position beneath the boxes C C to close their bottoms, as shown in Fig. 6, and then the upper slides *c c* are moved to one side to open the chutes *a a*, whereupon the material flows from the reservoir through these chutes into the boxes, nearly filling them, the stoppage of the flow of material leaving it approximately as shown in Fig. 10, that is to say, heaped up in the upper part of each box beneath the chute *a*. The slides *c* are then moved under the chutes *a* to close them, as shown in Fig. 6, thereby cutting off the flow of material into the boxes. Shortly thereafter the slides *b* are moved out from under the boxes, thereby permitting the contents thereof to fall through the chutes *d d* and D D into the respective scale-pans. After a sufficient time to permit all the material to run out the slides *b b* are moved back under the boxes. The slides *c c* are then moved out from under the supply-chutes and the boxes are again filled as before. The scale-pans of the several scales now contain each a measured charge of material of somewhat less than the desired weight, say, for example, about nine-tenths of such weight. To automatically supply enough more material to complete the full weight, a supplemental feed mechanism is provided which in its general operation does not differ greatly from that shown in some of my previous patents. A portion of the material escapes from the reservoir B through a series of perforations *f*, Fig. 6, in the side of the box and falls thence into a box G, from which it descends, Fig. 1, through a chute *g*, which conducts it into the supplemental feed-hopper H. This hopper is constructed with a stationary outer wall *h*, Figs. 4 and 5, and with a bottom consisting of a rotary feed plate or disk I.

Some suitable means is provided for giving the material in the hopper a tendency to move outwardly toward the wall *h*, this result being preferably effected by forming the feed-plate I with its central portion swelled upwardly in the form of a cone, as best shown in Fig. 5. The material thus slides down the sides of this cone, and is thus impelled by its own weight outwardly against the wall *h*. This wall is formed at intervals with openings or notches *i i* in its lower sides, these openings being equal in number to the scales. The weight of the material as it is impelled outward by the cone causes it to flow toward these openings, and it is pushed through each by a scraper K, falling thence through an outer opening *j* and stationary chute *j'* into a movable chute *k*, carried by the scale-beam *m*. So long as the weight in the scale-pan is less than the weight of the counterweight *w* this chute *k* delivers the material into the pan, as shown in Fig. 5, but as soon as the full weight desired is delivered into the pan the descent of the latter by tilting the scale-beam throws the chute *k* so that it discharges outside the scale-pan, the discharge then falling into a receiver J beneath. (See Fig. 3.) The mere rotation of the feed-plate I in connection with its construction as a cone to cause the material to gravitate outwardly might cause some discharge of material through the openings *i* into the chutes *j*, but the quantity thus discharged would be indeterminate and difficult of regulation, and would, presumably, be wanting in uniformity by reason of the material being introduced from the chute *g* eccentrically into the hopper H.

To provide a uniform and progressive feed for the respective scales, I arrange in each opening a scraping blade or plate K, these blades being set tangentially, so that each one stands oblique to the direction of motion of the material as it is carried around by the rotation of the feed-plate I, so that each blade scrapes off a portion of the material and causes it to be pushed through the opening and off the edge of the feed-plate into the chute *j*. The outward gravitation of the material after passing each scraping-blade and before reaching the next carries sufficient material in front of the next blade to afford a sufficient supply to be pushed by that blade through the opening. Preferably the blades all extend inwardly to an equal distance from the center, and to provide means for relatively adjusting the flow of material through the respective openings the blades are so mounted that they can be adjusted forward or back, so as to vary the area of the free passage through the openings. To this end each blade is mounted on a plate *n*, which is adjustably fastened to the wall *h*, preferably by set-screws engaging slotted holes in the plates, as shown in Fig. 4. If too much material is passing through any opening, the blade is moved nearer to the opposite side of the opening, so as to contract the passage through it, thereby reducing the amount of material which is forced through the opening by the blade. All the material that is arrested by the blade and cannot pass through the opening piles up against the blade and flows over its top, falling back of it and being carried on to the next blade. By means of this construction of supplemental feed mechanism a uniform and continuous stream of material is caused to descend through each of the scale-chutes *k*.

The weighing apparatus is constructed to afford a sufficient time after the dumping of the measured charges of material into the scales to permit the full weight to be fed thereto by the supplemental feed mechanism, and after all of the scales have thus completed the weighing operation they are simultaneously dumped by means of a ring *p*, which is raised to engage ears *q*, projecting from the pivoted front walls of the scale-pans, whereby these walls are moved up to permit the material to flow out from the bottom. The material falls into pockets or receptacles L L beneath, equal in number to the scales. In order to prevent the sudden flying up of the scale-pans when relieved of their weight by the running out of the material, a movable weight-lifter M is provided, which at the instant of dumping moves up beneath the counterweights *w* and supports them, so that their weight is taken off from the scale-beams.

The pockets or receptacles L L revolve intermittently, and as each one reaches a position over the discharge-chute N its contents are dumped into this chute by means of a movable arm *r*, Fig. 1, which lifts and strikes a projecting lug on the movable outer wall of the pocket, thereby lifting this wall and permitting the material to run out beneath it into the chute. The pockets are carried around the receiver J, into which is constantly flowing the overflow from the weighing-scales, and the wheel L′, which carries the pockets, carries a scraper J′, which pushes the accumulated material around until it comes over another discharge-chute P, by which it is conducted away to any suitable place, from which it can be again elevated, if desired, and conducted back to the reservoir B.

I will now describe the mechanism by which the described parts are operated.

Power is applied through a driving-shaft 10 by miter-gears 11 to an upright shaft 12, which through a sprocket wheel and chain 13 drives an upright shaft 14, and this in turn by a sprocket-wheel drives a chain 15, which runs over a sprocket-wheel 16, Fig. 5, which is fixed on the hub of the feed-disk I, by means of which the latter is rotated.

The driving-shaft 10 through miter-gears 17 drives a horizontal shaft 18, carrying a worm 19, which meshes with a worm-wheel 20, Fig. 1, on a shaft 21 beneath the worm and worm-wheel, being proportioned to turn the shaft 21 at one-tenth the speed of the shaft 10, (its speed thus corresponding to the ten weighing-scales.)

The bottom slides *b* for the measuring-boxes are mounted on transverse bars *s s*, Fig. 7, fixed on a slide *t*, which passes out through the end of the box F and is connected by a link 22 to a lever 23, fulcrumed at 24, carrying a roller which works in the cam-groove of a cam *t′*, Fig. 6, on the shaft 21. The upper slides or cut-off plates *c c* for closing the supply-chutes *a a* are constructed, preferably, as transverse plates, (shown in dotted lines in Fig. 2,) which are fixed on a longitudinal slide *u*, which passes out at the end of the box F and is connected by a link 25 to a lever 26, fulcrumed also at 24 and carrying a roller which works in the cam-groove of a cam *u′*, Fig. 6ª. The cams *t′* and *u′* are set relatively as shown in Figs. 6 and 6ª, their construction being such that the slide *u* is first moved to close the chutes *a*. The slide *t* is then moved to open the bottoms of the measuring-boxes, held for an instant, and then returned to close these boxes, after which the slide *u* is moved back to open the inlet-chutes and permit the boxes to refill.

The dumping-ring *p* is operated, as heretofore, by a cam *p′* on the shaft 21, acting through a lever-arm 27, rock-shaft 28, and two lever-arms 29. The weight-lifter M is constructed as a disk carried on a sliding sleeve 30, movable freely on a stationary sleeve *v*. The sleeve 30 is engaged by a rigid arm 31, Figs. 8 and 9, projecting from a vertically-moving slide 32, which is operated by means of a link 33 and lever 34 from a cam M′, fixed on the shaft 21.

The pockets L L, which constitute no novel part of my present invention, are operated as many times faster than the weighing mechanism as the total number of scales. In this instance, there being ten scales, the pockets are advanced intermittently by connection with the shaft 10, which revolves ten times to one revolution of the shaft 21, which drives the weighing mechanism. The pockets are carried on a wheel L′, which is fixed on an upright shaft v', the lower end of which has fixed on it a wheel w', Fig. 3, having ten peripheral notches, which are engaged by a propelling-bolt 40, carried by a radial arm, the arm being vibrated one-tenth of a revolution at each movement and the bolt being protruded into engagement with a notch before each movement and retracted therefrom before the return movement. A locking-bolt 41 is also provided to hold the parts stationary during the return movement. The vibrating arm and the bolts are separately operated through links 35 and levers 36 from two cams 37, fixed on the shaft 10. This mechanism is shown in detail in my said Patent No. 493,795, except that in the construction there illustrated the parts are differently arranged, the cams being on two different shafts instead of on the same shaft, as at present.

It is desirable to provide some means for varying at will the contents of the measuring-boxes in order to compensate for differences in ratio of bulk to weight of different materials, as well as of different lots of the same material. Such adjustment should be capable of being made simultaneously for all of the measuring-boxes, and by an operation which can easily be performed while the machine is in operation. To accomplish this, the present invention provides the construction best shown in Figs. 6 and 7. Each measuring-box is constructed with three sides fixed in place and a fourth side x movable. This movable side may consist of a plate with its opposite edges turned in, as shown in Fig. 7, or may be constructed in any other way, so that it may be moved into or out of the fixed sides to thereby vary the capacity of the box. For simultaneously moving all these movable sides to like extent, they are mounted on a series of cross-bars y y, fixed to a longitudinal slide Q, which is longitudinally movable in the casing F, an adjusting hand-wheel Q′ being provided for moving it. This hand-wheel preferably engages the slide through some construction of screw adjustment, as, for example, by forming a screw y' on the end of the slide and constructing the adjusting-wheel as a nut screwing on this screw and prevented from moving longitudinally by being engaged by a fixed part y^2 entering an annular groove in the nut, as shown in Fig. 6, so that the turning of the nut propels the slide longitudinally in either direction.

It is characteristic of my invention that the supply-chute a of each measuring-box C is arranged above the top of the box and is of considerably smaller area, in order that however long it may be left open the material shall not overflow the box, but shall remain in a heap or pile, as indicated in Fig. 10, and that the upper slide or cut-off c shall operate in the space between the chute and the box, so that as it advances it shall cut through this pile, leaving the portion of material beneath it held by the box, while the portion above it is sustained in the chute and kept from further running or leaking down during the period of emptying of the box. In this construction the slide c is enabled to move freely without coming in contact with any of the fixed parts, without working through slots or slideways, and encountering no resistances except that of the material which it touches in its progress.

As shown in Fig. 6, the slides c c are slightly below and out of contact with the bottoms of the chutes a a, and the slides b b are also below and out of contact with the bottoms of the measuring-boxes. This is practically requisite for operating with sugar or other granulated substances having hard particles, as, if the parts worked in metallic contact, much unnecessary friction would be created by the wedging of the granules between them. The arrangement shown is admissible with nearly all materials except perhaps very fine or light powders.

My invention is susceptible of considerable modification in matters of structural or mechanical detail and in the general proportioning and arrangement of the parts. For example, it is not by any means confined to the use of ten scales and ten measuring-boxes, but any other suitable number of scales and measuring-boxes may be employed. In fact part of the gist of my invention would be embodied in an apparatus having only one scale and one measuring-box, although such an apparatus could not work rapidly enough to be profitable for the uses for which an automatic weighing-machine is liable to be required. The arrangements of cams and levers for actuating the moving parts may be greatly varied.

I claim as my invention the following-defined novel features, substantially as hereinbefore specified, namely:

1. In a weighing-machine, the combination with its scale pan and beam of a measuring apparatus adapted to measure a given bulk of material and dump it into the scale to be weighed, comprising a measuring-box having an open top, a supply-chute for directing material into said box, terminating near to, and of less area than, the top of the box, so that material entering the box by gravity from said chute may assume its natural slope in the box without running over, a slide working beneath said chute for cutting off the pile of material, a movable bottom for the box adapted to open and dump its contents, a delivery-chute leading thence to the scale-pan, and driving mechanism for operating said

slide and bottom, adapted to first close said bottom, then open said slide and leave it open long enough for the material to flow from the chute into the box and to fill the latter and cease flowing, standing in a pile under said chute, then to close said slide to cut off said pile, and finally to open said bottom.

2. In a weighing-machine having a plurality of scales, the combination of a measuring apparatus comprising a reservoir B for the material to be weighed, formed with a series of supply-chutes *a a*, slides *c c* working beneath said chutes for cutting off the supply, stationary measuring-boxes C C arranged beneath said chutes, having open tops of larger area than the bottoms of the chutes, bottom slides *b b* movable to close or open the bottoms of said boxes, a casing F inclosing said boxes and slides, having bottom openings under the respective boxes, and chutes D D leading from said bottom openings to the respective scale-pans.

3. In a weighing-machine of the described class, a supplemental feed mechanism consisting of a feed-box comprising an outer wall which is stationary with relation to the scales, and a relatively revolving bottom plate projecting beneath it with means for directing the material outwardly over said plate toward said wall, said wall having a series of openings, a series of scraping-blades projecting diagonally through said openings to remove material from the portion of the plate adjacent to said wall, and direct it through the openings and over the edge of the plate, and a series of chutes arranged to conduct the streams of material from said blades to the respective scales.

4. In a weighing-machine of the described class, a supplemental feed mechanism consisting of a feed-box H comprising a stationary wall *h*, having bottom openings *i i*, and a revolving feed-plate I coned to direct the material outwardly toward said wall and projecting beneath said wall, a series of scraping-blades K K projecting diagonally through said openings to direct material through the openings and over the edge of the plate, and a series of chutes *j' j'* arranged to conduct the streams of material to the respective scales.

5. In a weighing-machine of the described class, a supplemental feed mechanism consisting of a feed-box H comprising a stationary wall *h* having bottom openings *i i*, and a revolving feed-plate I, with means for directing the material outwardly toward said wall, a series of scraping-blades K K projecting diagonally through said openings, fastening devices for said blades constructed to permit adjustment of the blades in direction parallel with said wall *h*, so as to increase or reduce the effective area of the openings, and a series of chutes arranged to conduct the streams of material from said blades to the respective scales.

6. In a weighing-machine of the described class comprising a circularly-arranged series of scales E E and mechanisms for feeding material to the scale-pans, the combination therewith of means for dumping the scale-pans at intervals, and means for preventing any sudden upward movement of the scale-pans on being discharged of their load, the latter means consisting of a vertically-movable lifter M arranged beneath the counterweights *w* of the scales, mounted upon a vertically-movable slide, with a cam and intervening connections adapted to raise the lifter against the counterweights immediately before the dumping of the scale-pans, and to lower it slowly after the dumping of the pans.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

HENRY E. SMYSER.

Witnesses:

JAMES J. FROST,

W. F. HEISSENHELTRE.