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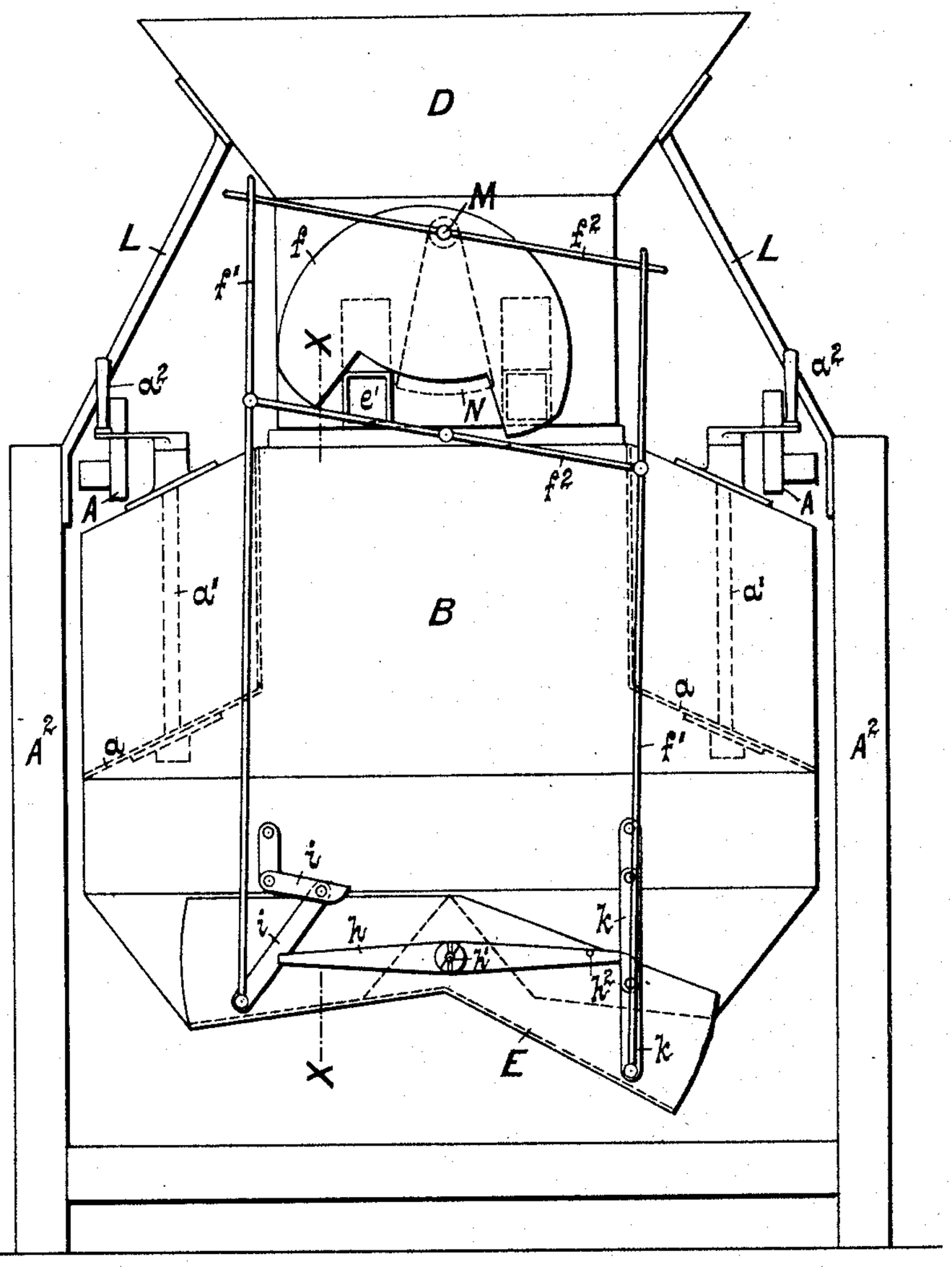
E. O'BRIEN.

APPARATUS FOR WEIGHING GRAIN.

No. 428,816. Patented May 27, 1890.

FIG 1



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(No Model.) 6 Sheets—Sheet 2.

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APPARATUS FOR WEIGHING GRAIN.

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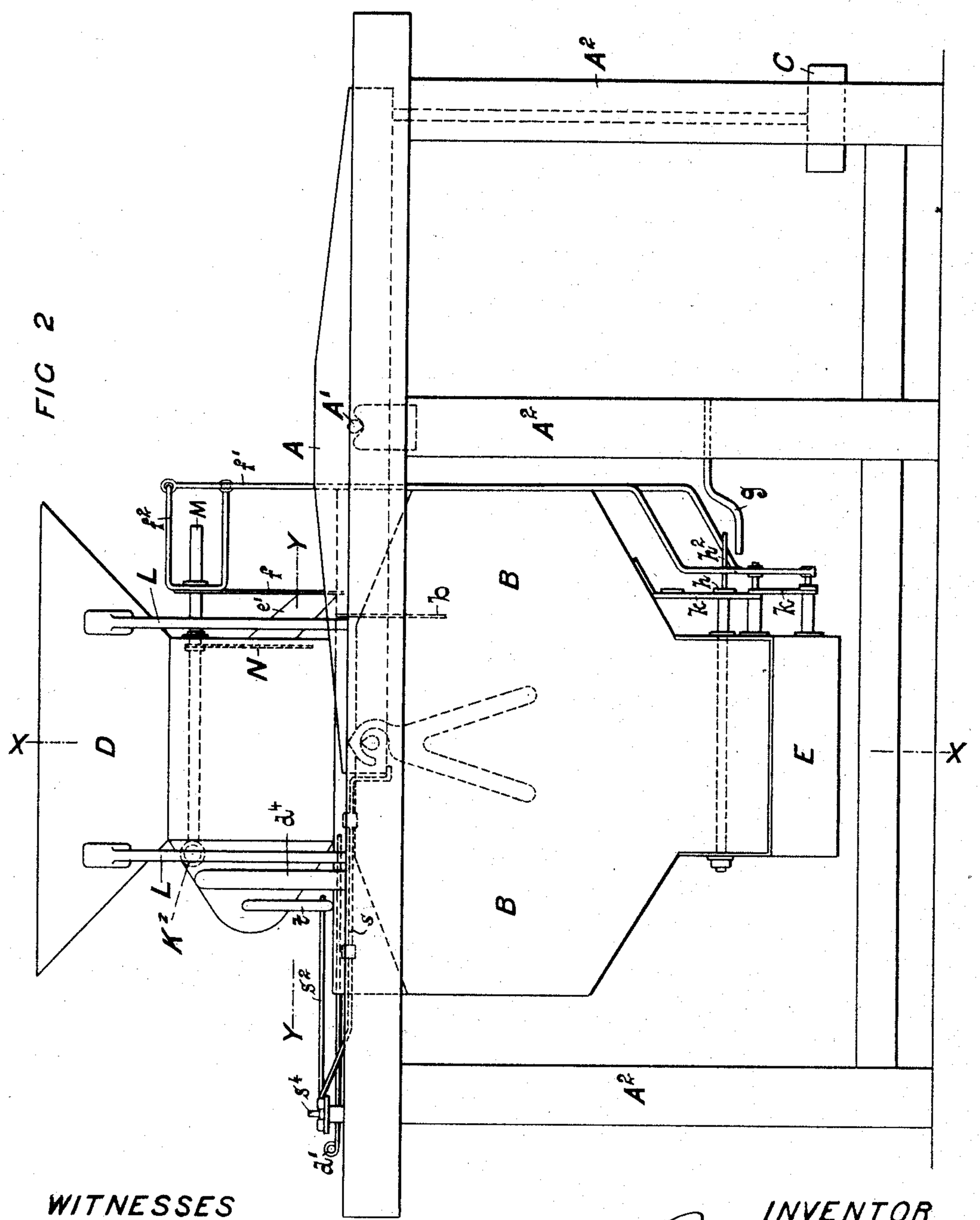
FIG 2



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(No Model.) 6 Sheets—Sheet 3.

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APPARATUS FOR WEIGHING GRAIN.

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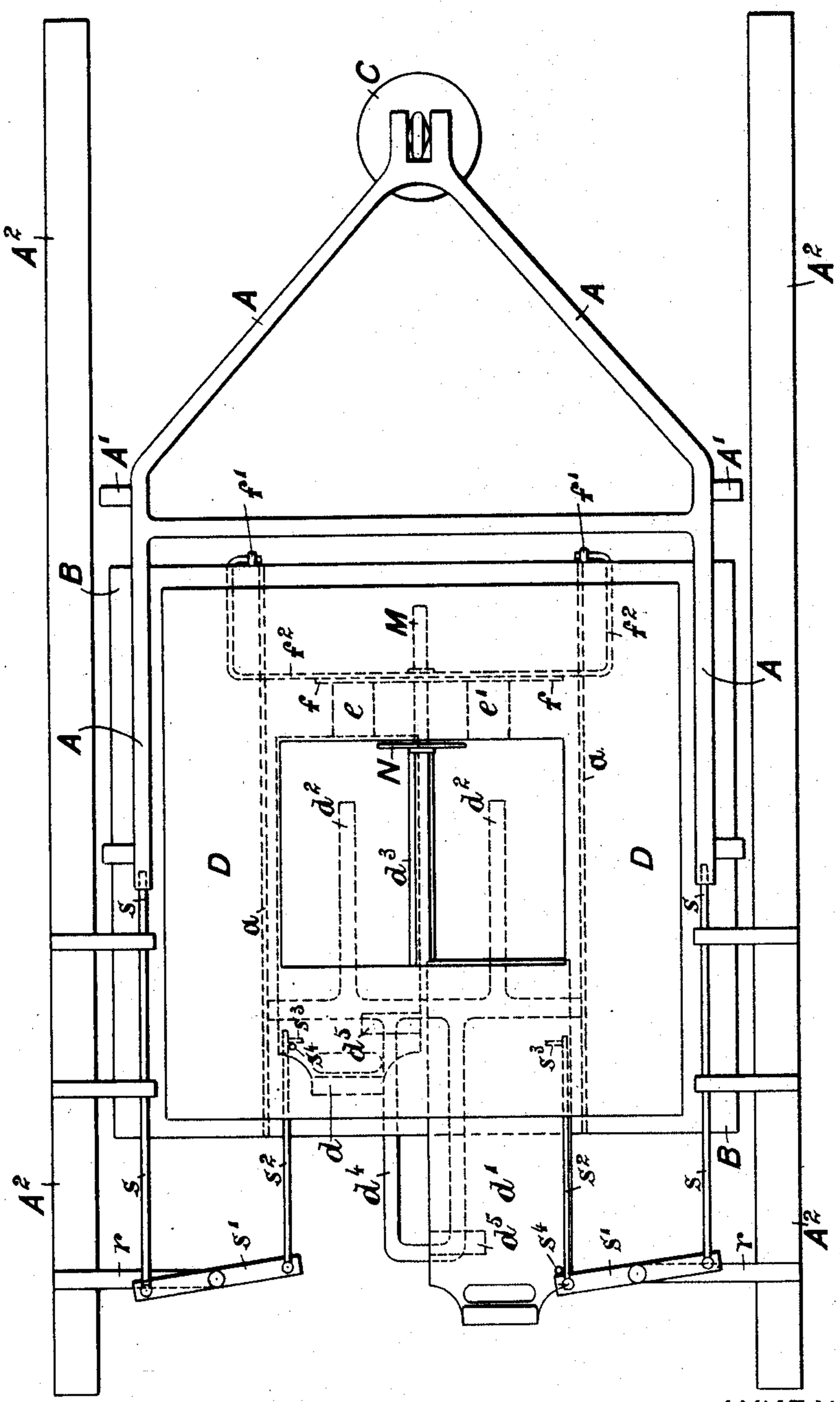
FIG 3



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APPARATUS FOR WEIGHING GRAIN.

No. 428,816. Patented May 27, 1890.

FIG 5

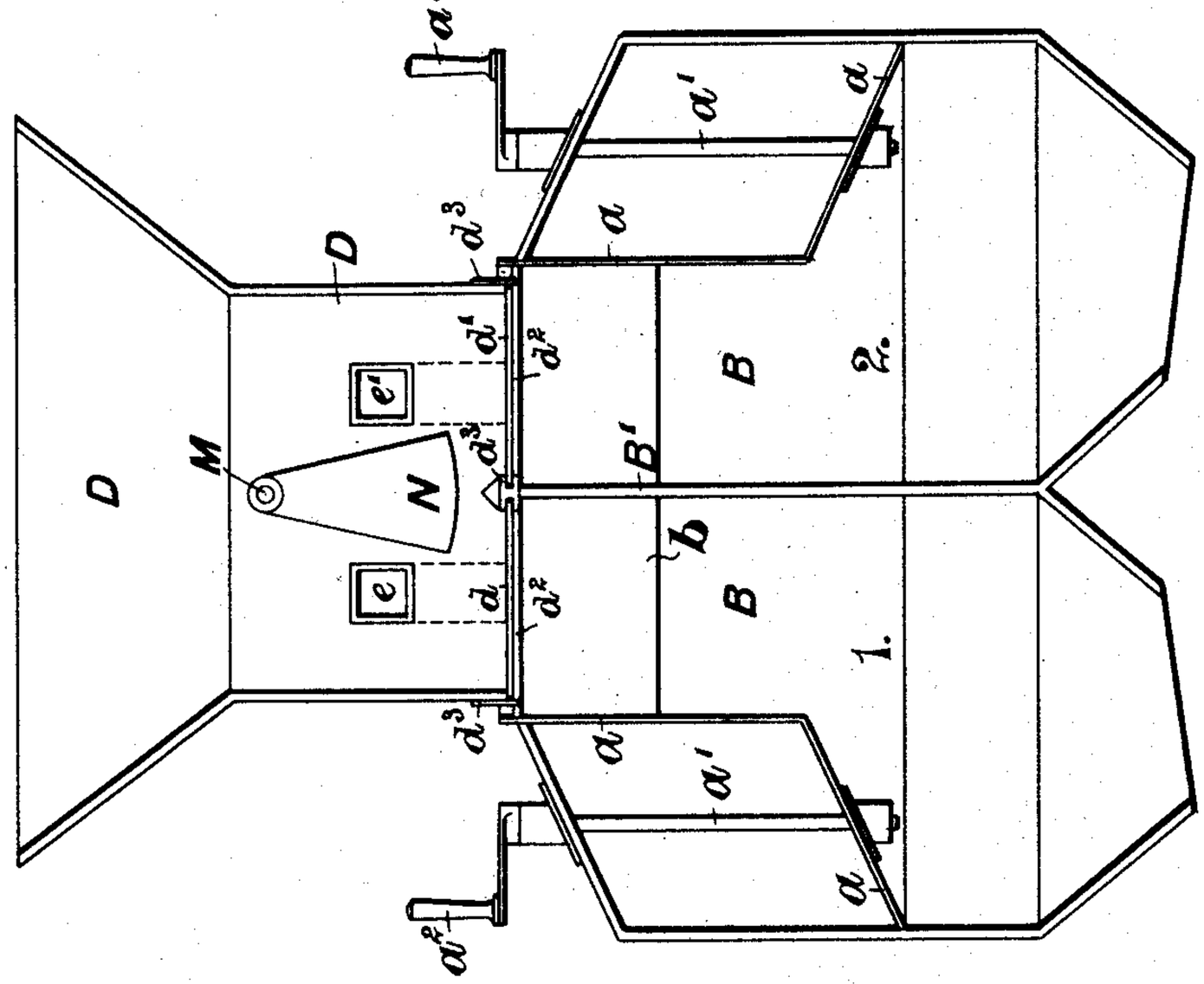

FIG 4

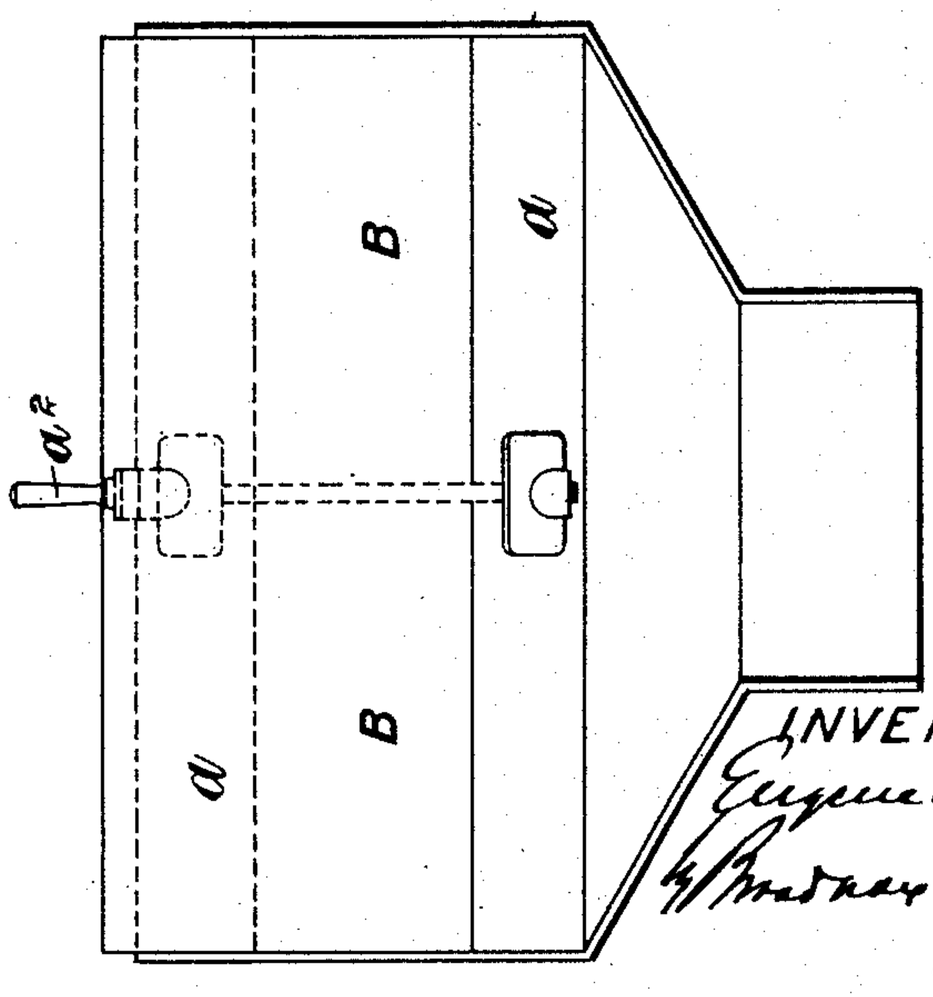

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FIG 7

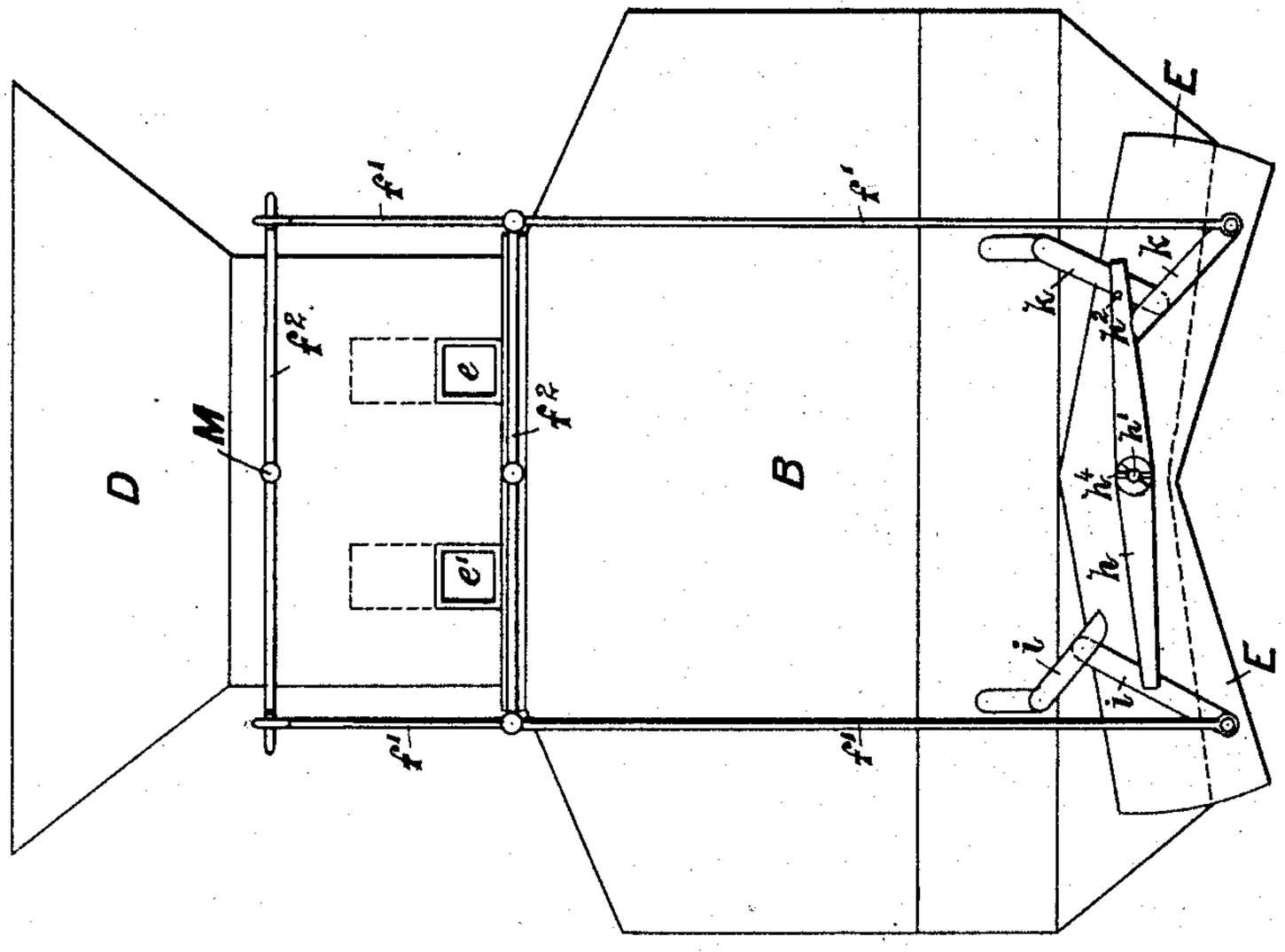

FIG 6

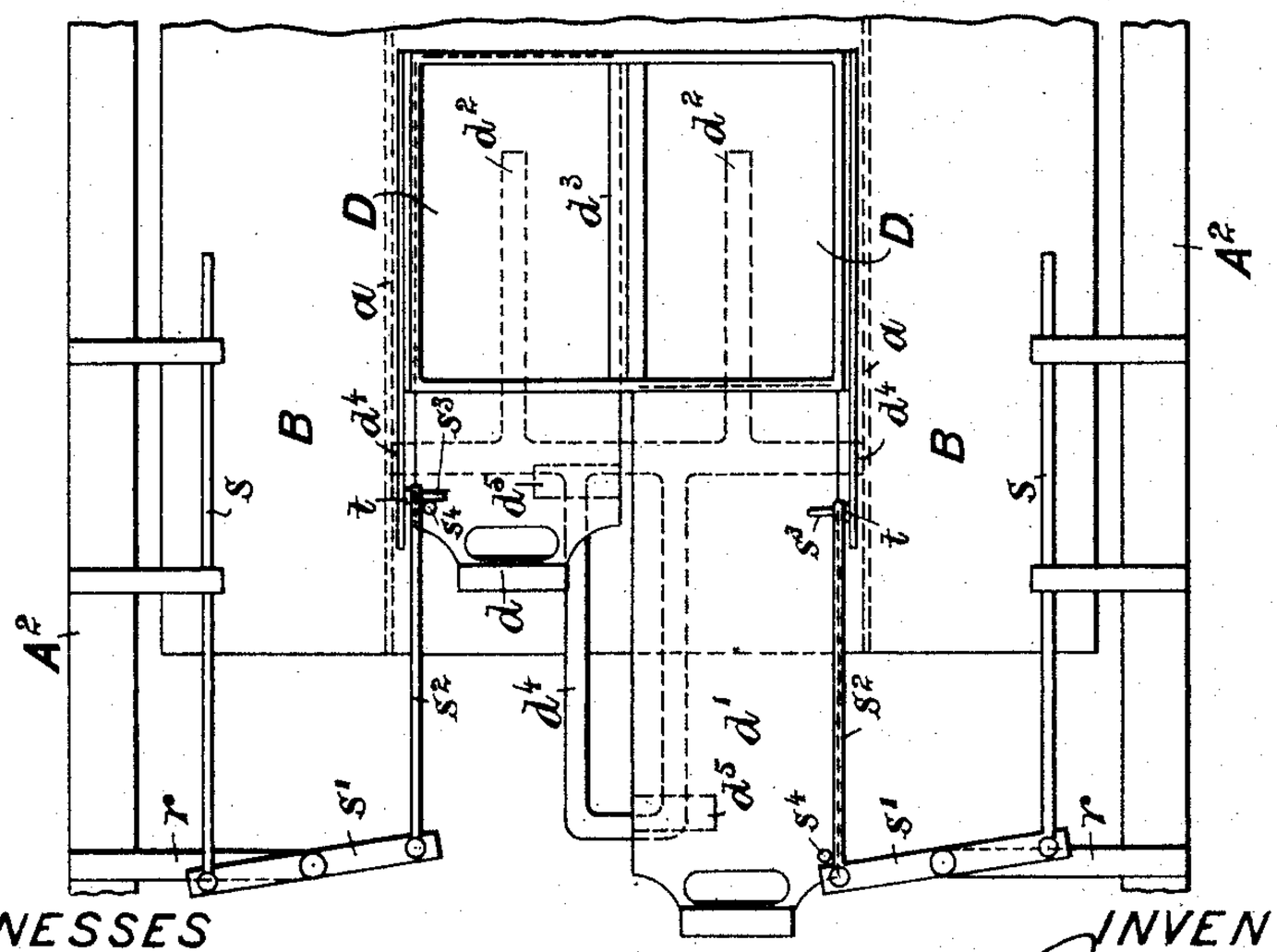

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FIG 8

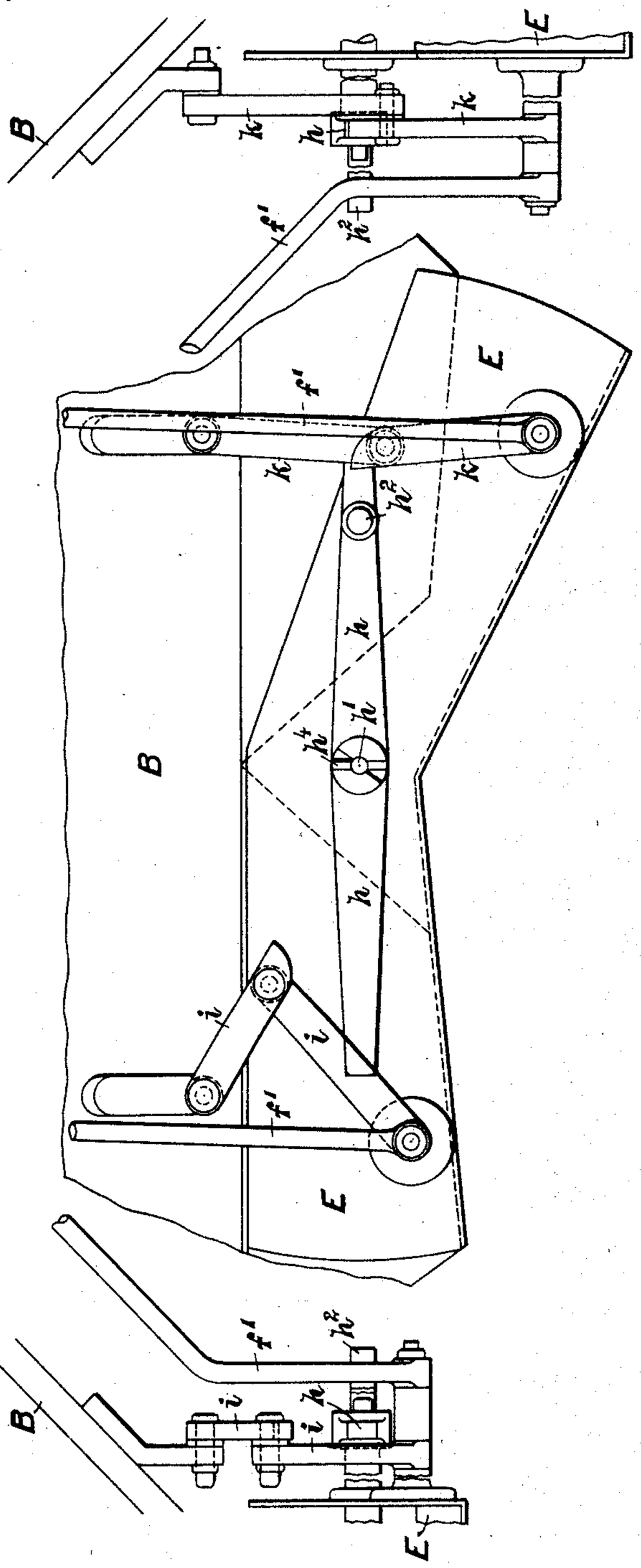
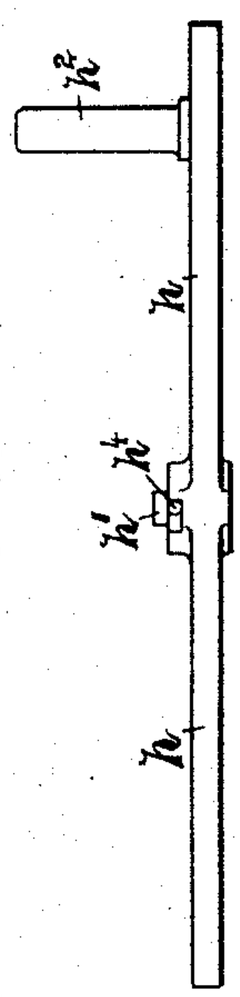


FIG 9

FIG 11



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UNITED STATES PATENT OFFICE.

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APPARATUS FOR WEIGHING GRAIN.

SPECIFICATION forming part of Letters Patent No. 428,816, dated May 27, 1890.

Application filed July 30, 1886. Serial No. 209,503. (No model.) Patented in England August 10, 1885, No. 9,489, and in Canada August 10, 1885, No. 24,694.

To all whom it may concern:

Be it known that I, EUGENE O'BRIEN, customs officer, a subject of the Queen of Great Britain, and a resident of the city of Liverpool, in the county of Lancaster, in that part of the United Kingdom of Great Britain and Ireland called England, have invented new and useful Improvements in Apparatus for Measuring and Weighing Grain and other Granulated and Pulverous Substances, (for which I have obtained a patent in Great Britain, No. 9,489, dated August 10, 1885, and a patent in Canada, No. 24,694, dated August 10, 1885;) and I do hereby declare that the following is a full, clear, and exact description of the construction and operation of the same, reference being had to the annexed drawings, making a part of this specification, like letters and figures marked thereon being used to denote the same or corresponding parts throughout the various views.

Figure 1 is an end elevation of a double-chambered weighing-machine in its preferred form according to my invention. Fig. 2 is a side view of the device shown in Fig. 1. Fig. 3 is a plan of the device shown in Fig. 1. Fig. 4 is a section through X X, Fig. 1. Fig. 5 is a section through X X, Fig. 2. Fig. 6 is a plan in section through Y Y, Fig. 2. Fig. 7 is an end view of the machine, showing the locking and valve gear in their central position. Figs. 8, 9, 10, and 11 show the locking-gear drawn to a larger scale.

This my invention relates to that type of weighing-machines in which a weighing receptacle or receptacles having a tilt bottom or door or doors is suspended from one end of an equal-armed weigh-beam having a weight at the other end, the weighing receptacle or receptacles discharging the substance in weighed or measured quantities from the weighing receptacle or receptacles as it or they are filled and weighed.

My improvements consist of a certain method of working herein set forth, and of a certain construction and arrangement of parts, whereby I obtain more accurate and better weighing with a great increase in the speed of weighing over common practice with this type of machine.

In weighing-machines of the duplex type herein defined the correctness of weighing often depends upon the regularity of the supply, which, when not sufficient to keep the feeding-outlet full, particularly when the final weighing is taking place, will give a stream of the substance being weighed varying in bulk. The length of this stream—namely, the length between the feeding-chute and the upper surface of the material in the weighing-receptacle—also varies even when the supply is regular, according as there is being weighed more or less of the material, and the upper surface is at a higher or lower level in the weighing-receptacle and near to or farther from the feeding-chute, which, when the weighing is completed in one compartment, diverts the stream into the other compartment, leaving the varying suspended stream to fall into the compartment, then discharging, and since this varying stream cannot be compensated for by a determinate weight the weighing by this class of machines is more or less inaccurate.

In the carrying out of my invention as applied to duplex weighing-machines the weighing-beam and double-chambered receptacle with a double vibrating tilt bottom are connected and weigh or measure and discharge, as above described; but I so construct the weighing-receptacle that it can be varied in size—namely, each of the two equal compartments can be enlarged or reduced, so as to contain when full the required maximum or minimum, or other intermediate measure. This varying of the cubic weighing capacity of the chambers of the weighing-receptacle is effected by providing each compartment with a device so constructed as to cut off or reduce the capacity of the chamber. These devices, which may take the form of slides, are worked by screwed rods or their equivalents, by which they may be raised or lowered, and when lowered cut off and isolate certain equal portions in each compartment. Thus when the slides are down the compartments hold the least and when the slides are raised the cut-off or isolated portion is added, giving the compartment its full capacity. This varying weighing-receptacle is fed or supplied

with the substance to be weighed by a fixed chute having two small equal valves in its side and a double outlet at its bottom. The bottom of this chute fits loosely into the top of the double-chambered weighing-receptacle, its outlets opening, respectively, into the respective compartments of the weighing-receptacle. Each of the outlets of the feeding-chute is provided with a sliding door or damper to be worked by hand. To fill one compartment of the weighing-receptacle, the hand-slide in the feeding-chute directly over the compartment is pulled out. After the compartment is filled the hand-slide is pushed in, so cutting off the supply. The flow of grain into this compartment being thus severed from the supply the balance to make up the required weight, herein called the "make-weight," is fed from one of the valves in the side of the supply-spout into a reserved portion at the back of the weighing-receptacle. The beam then descends under its load and a locking-gear, hereinafter described, being released allows the tilt bottom to open and discharge. The small valves on the side of the supply-spout are provided with a cut-off, which is worked by an automatic mechanism by suitable connecting-rods from the tilt bottom to a lever on the cut-off, which is arranged so that when one valve is shut the other is open.

In operation the slide doors or dampers of the feeding-chute are worked alternately, and thus the weighing goes on from side to side. In pulling out either of the slide-doors to fill the weighing-receptacle it shoots a bolt or locking device under the weighing end of the weigh-beam, and so prevents the descent of the weighing-receptacle by the momentum of the inflowing substance, the superweight of the material in the supply-chute resting on the material which fills the weighing-receptacle. The pushing in of the slide-door severs this extra weight from the weight in the weighing-receptacle, which latter must always be less than the required weight. It also pulls back the weigh-beam-locking device, leaving the beam free for weighing, so that when the make-weight has been received from the valve in the supply-spout the beam descends and the contents of the weighing-receptacle discharge. The speed of weighing depends upon the volume of the supply, the size of the outlet of the feeding-chute, and the inlet of the weighing-receptacle, which latter must always be less than its outlet, in order that the discharging-compartment may be emptied before the filling-compartment is filled. If, for example, in the case of a machine for weighing grain, these inlets and outlets are made as large as practicable, the weighing-receptacles may be alternately filled and discharged with a speed greatly exceeding the duty performed by other weighing-machines of this type. Inasmuch as the upper surface of the grain in that part of the weighing-receptacle before mentioned which receives the make-weight is always the same distance from the valve which supplies the make-weight, and that the supply, for example, in the case of grain, is always sufficient to pass full bore through this valve, which is of small dimensions—say two inches square—therefore the volume of this stream is unchangeable, and as the cut-off, as hereinafter shown, is near the surface of the grain in the weighing-receptacle, the length of the stream at the time the weighing-receptacle begins to descend is inconsiderable. The weighing-receptacle only descends about three-quarters of an inch before its discharge commences and before the cut-off is closed by the action of its connection with the discharging-door. Therefore the quantity of grain to be compensated for is that which passes through the valve while the weighing-receptacle is descending this three-quarters of an inch, and this, under all circumstances, may be considered a determinate or unvarying and compensatable weight. Therefore great accuracy and speed of weighing are obtained.

In the drawings, A represents an equal-armed weigh-beam mounted and having its fulcra A′ on a frame A^2, which may be of any convenient construction.

B is a weighing-receptacle mounted on one end of the weigh-beam A and divided by a central partition B′ into two equal chambers 1 and 2 and having a double vibrating tilt bottom E.

C is a weight suspended from the other end of the weigh-beam A.

D is the chute or spout through which the substance to be weighed is fed into the weighing-receptacle.

The weighing-receptacle B is so constructed that its capacity can be increased or reduced—for example, each of the chambers 1 and 2 is provided with a slide device *a* for varying their size, which is so constructed that it can be raised or lowered by a screwed rod *a′* and a handle a^2. This device is shown in its lowered position in the drawings, and by raising the device *a* the capacity of the weighing-receptacle can be increased.

The bottom of the chute or feed-spout D is provided with two slide doors or dampers *d d′*. These feed-doors *d d′* are constructed as hand-slides and slide on the bars d^2 and between the guides d^3 and the central bar d^2 of the chute D, and when closed shut off the main supply from the chute D to the weighing-receptacle B, and are opened by hand alternately for filling the chambers 1 or 2 with the material to be weighed, the main supply of which, passing through the opening caused by the withdrawal of the slide-door *d* or *d′*, must be less than the required weight. To provide for this deficiency, the main chute D is provided with two small side chutes or valves *e e′*, provided with a cut-off device *f*. The function of these side valves *e e′* is to supply the make-weight after the sliding door *d′* has been closed and the main supply shut

off. This make-weight passes through the side valve *e* or *e'* into the reserved portion cut out from the receptacle 1 2 by the partition *b* until the weighing-receptacle descends, when the locking device, hereinafter described, is released and the double-vibrating tilt bottom E opens the chamber being weighed, and in opening moves the cut-off device *f*, so as to close the valve *e* or *e'* (and open the opposite one) by means of the rods *f'* and levers f^2, which are so connected together (see Fig. 2) as to allow for the primary descent of the weighing-receptacle before the cut-off is effected. As before mentioned, and for the reasons set forth, the make-weight is fed from the valves *e e'* into a portion of the weighing-receptacle, which is cut off or reserved by the partition *b*. (See Figs. 2 and 5.)

Upon the frame A^2 there is a fixed bracket or projecting arm *g*, which, as the weighing-receptacle B descends, operates the locking and releasing device of the double vibrating tilt bottom E, which I will now describe. This locking device consists of a lever or prop *h*, fulcrumed at *h'*, and serving as a prop to the knee-joint, formed by the links *i* for one side of the door E, and to the knee-joint formed by the links *k* for the other side of the door E. The position of the lever-prop *h* in relation to the links *i* and *k* will be understood upon reference to Fig. 1 and to the details shown in Figs. 7, 8, 9, 10, and 11. The lever-prop *h* is provided with a pin h^2, which, as the weighing-receptacle descends, comes in contact with the bracket *g*, before mentioned, thus taking the prop *h* from the knee-joint of the links *i*, or from the knee-joint of the links *k*, whichever it may then be supporting, the prop *h* being caused to take the position to hold up the other side of the door E by reason of the opening of the then discharging side of the door E. It will be seen that the links *i* and the links *k* are connected with the weighing-receptacle, the vibrating bottom, and with one another by joints, which, when the links are in the position shown at *k*, are slightly out of line, the center joint being slightly inclined to the center *h'*. Thus the pressure borne by the links is supported by the prop-lever *h*, and when this lever is tripped up the links naturally give way and allow the tilt bottom E to tilt over and discharge. The less the links *i* and *k* are out of line the less is the pressure against the prop *h*, and the less is the downward pressure required to be exerted by the weighing-receptacle to trip up the prop *h*. The prop *h* is nearly balanced, the side with the pin h^2 being just heavy enough to overbalance the other side and return the prop *h* to its horizontal position, in which it is kept by the pin h^4, the pin h^4 coming in contact with the boss—that is, the center projection of the lever *h*, as shown in Fig. 11. This boss consists of a hub having V-shaped grooves cut in it at opposite sides of the center, as shown in Fig. 8. This locking and releasing gear is very sensitive—a most important consideration in machines of this class, which require the locking-gear to release with ease.

The feed-chute D is supported from the frame A^2 by the brackets L. Centrally within the feed-chute D there is a spindle M, one end of which passes through the back of the feed-chute and carries loosely the cut-off device *f*, and the other end passes through the other side of the feed-chute and terminates in a loop or handle K^2. (See Fig. 2.) On and fastened to this spindle M there is an inside cut-off or shutter N, which is used to stop either of the valves discharging when it is required to stop the weighing. This shutter is operated by turning the spindle M by the handle.

As before mentioned, the slide-doors *d d'* of the main chute D as they are pulled out and pushed in are guided by the guides d^3 and slide on the bars d^2, which bars d^2 form part of the bracket d^4, which is bolted to the under side of the main chute D.

d^5 are stops on the slides *d d'*, limiting the travel of the slides on the bracket d^4.

On each side of the frame A^2 there is provided a locking device for locking the weigh-beam while the weight of the column of material through the chute D is on the weighing-receptacle. This locking device is in duplicate, and consists of the bolt *s*, carried by guide-brackets and worked by a lever S', and a link s^2 from the slides *d d'*, respectively, working as follows: Each link s^2 is provided with a pin s^3, and each slide-door *d d'* is provided with a pin s^4, so that when the slide-door is closed the pin s^4 comes in contact with the pin s^3 on the link s^2, thereby causing the link s^2 to withdraw the weigh-beam lock *s*, and when the slide-door is opened the pin s^4 comes in contact with the end of the levers *s'*, and so inserts the weigh-beam lock under the end of the weigh-beam. The levers *s'* are supported by the brackets *r* and the links s^2 are supported from the main chute by the links *t*.

I have in this description shown an example of a means of contracting or enlarging the chambers of the weighing-receptacle; but I do not limit my invention to this particular means, as the chambers can be increased or reduced by being of a telescopic or other equivalent construction, or the sides of the weighing-receptacles can be so made as to move in or out and so enlarge or contract the weighing-receptacle.

I would also have it understood that a machine according to my invention is suitable for weighing all kinds of granular and pulverous substances and materials.

The method of operation may be thus briefly described: Presume the adjustable slides of the weighing-receptacle be set to weigh in the chambers 1 and 2 centals of grain, which adjustment can be readily ascertained. One of the slides *d* or *d'* is opened, the corresponding chamber-bottom being locked. The opening of the slide locks the weigh-beam and

allows the compartment to instantaneously fill from the chute D. The slide is now closed and the grain in the chute D is severed from the grain in the weighing-chamber. The closing of the slide unlocks the weigh-beam, and the make-weight, through the side valve, completes the weight and causes the receptacle to descend, the door to open, the cut-off of the make-weight to close, and the chamber to discharge its contents.

In the foregoing description I have particularly described a weighing-machine of a double-chambered form according to my invention; but I would have it understood that this is only one form of machine to which the improvements according to my invention may be applied, and that they are equally applicable to single-chambered weighing-machines of the type to which this class of machine belongs. In the case of single-chambered weighing-machines the parts will be arranged, as will be understood, on simple instead of duplex form, and to suit the particular requirements of the case.

Having now described my invention, I claim as follows:

1. In a weighing-machine, the combination of a weighing-receptacle, a hopper, said hopper being provided with two openings leading to said receptacle, one larger than the other, independently-operated gates for controlling said openings, a tilt bottom for discharging the contents of said receptacle, and a rod connecting said bottom with the gate of said smaller opening for simultaneously closing said opening when the bottom is tilted, substantially as described.

2. In a weighing-machine, the combination of a weighing-receptacle having two compartments, a hopper communicating with both of said compartments by an opening through which the main charge enters, doors for controlling said opening, two smaller openings, one communicating with each of said compartments, through which the make-weight enters, a tilting bottom for alternately controlling the discharge from said compartments, and a rod connecting the said bottom with the doors of said smaller openings to cause them to operate simultaneously, substantially as described.

3. In a weighing device, the combination of a scale-beam, a weighing-receptacle, a partition therein dividing said receptacle into a larger and a smaller compartment, a hopper, a main door communicating between the larger compartment and the hopper, a discharging-door for said receptacle, a locking device for the scale-beam, connected by a rod with said main door, to be released by the closing thereof, a smaller door communicating between said hopper and the smaller compartment, connected by a rod to said discharging-door, whereby it is automatically closed when said discharging-door is opened, substantially as described.

4. In a weighing-machine, the combination of a scale-beam, a weighing-receptacle, a hopper, and two openings of unequal dimensions communicating between said receptacle and hopper controlled by separate doors operating independently, a tilting bottom for said receptacle, and a locking device for the scale-beam connected with and operated by the door for the larger of said openings, substantially as described.

5. In weighing-machines, the automatically-operating mechanism for locking and releasing the tilting doors thereof, consisting of a lever h, a pin h^2, projecting from said lever, a stationary projection g, acting as a stop for said pin, knee-joints $i\ i$ and $k\ k$ and a pin h^4, and a grooved hub on the said lever, with which said pin engages, substantially as described.

6. In a weighing-machine, the combination of a weighing-receptacle, a scale-beam to which the receptacle is attached, a hopper provided with two openings, one larger than the other, leading to said receptacle, doors to control said openings, and a locking device for the scale-beam connected with and operated by the door controlling said larger opening, a tilt bottom for discharging the contents of said receptacle, and a rod connecting said bottom with the door of said smaller opening for simultaneously closing said opening when the bottom is tilted, substantially as described.

7. In a weighing-machine, the combination of a weighing-receptacle, a hopper, two separate and independent doors communicating between said receptacle and said hopper, one larger than the other, a vibrating tilt bottom for said receptacle, and a rod connecting said bottom with the door of said smaller opening for simultaneously closing said opening when the bottom is tilted, substantiallly as described.

8. In a weighing-machine, the combination of a hopper, a weighing-receptacle divided into two compartments, one for a main charge and the other for the make-weight charge, both in communication with the hopper, means, substantially as described, for varying the contents of said main-charge compartment so as to contain somewhat less than the total quantity of material to be weighed, and doors for controlling the communication between both of said chambers and the hopper.

9. In a weighing-machine make-weight device, the combination of chute D, slide doors or dampers $d\ d'$, weighing-receptacles 1 and 2, and make-weight device $e\ e'\ f$, constructed substantially as set forth.

10. In a weighing-machine make-weight device, the combination of a weighing-receptacle having two compartments, a hopper, an opening communicating between said hopper and each of said compartments, a shutter N for closing each of said openings, and a tilting door f for alternately opening and closing said openings, substantially as described.

11. In a weighing-machine, the combination

of a hopper, a weighing-receptacle divided into two compartments, one larger than the other, the larger for the main charge and the smaller for the make-weight charge, both in communication with the hopper, means, substantially as described, for varying the capacity of the main-charge compartment to contain somewhat less than the quantity of material to be weighed, and doors for controlling the communication between both of said chambers and the hopper.

12. In a weighing-machine, the combination of a hopper, a weighing-receptacle, a partial partition dividing the receptacle into two compartments, one for the main charge and the other for the make-weight charge, both in communication with the hopper, means, substantially as described, for varying the capacity of the main-charge compartment to contain somewhat less than the quantity of material to be weighed, and doors for controlling the communication between both of said compartments and the hopper.

13. In a weighing-machine, the combination of a hopper, a weighing-receptacle divided into two compartments, one for a main charge and the other for the make-weight charge, both in communication with the hopper, means, substantially as described, for varying the capacity of said main-charge compartment to contain somewhat less than the quantity of material to be weighed, independent doors for controlling the communication between both of said compartments and the hopper, a scale-beam to which said receptacle is attached, and a locking device connected with and operated by the main-charge door, so as to be locked when said door is open and to be released when it is closed.

14. In a weighing-machine, the combination of a scale-beam, a weighing-receptacle carried by said beam, a hopper provided with two openings, one larger than the other, leading to said receptacle, independently-operating doors for controlling the said opening, a locking device for said scale-beam attached to and operated by the door controlling one of said openings, a tilt bottom for discharging the contents of said receptacle, and a rod connecting said bottom with the door of said smaller opening, substantially as described.

15. In a weigh-beam-locking mechanism, the combination of doors *d d'*, pins s^3 s^4, links s^2 and *s*, bar *s'*, and weigh-beam A, substantially as set forth, for the purposes specified.

16. In a weighing-machine, the combination of a scale-beam, a hopper, a weighing-receptacle attached to said beam divided into two compartments, one for the main charge arranged to contain somewhat less than the total quantity of material to be weighed, and the other for the make-weight charge, and a door to relieve the charge contained in the main-charge compartment of the weight of the material remaining in the hopper.

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