(No Model.)

3 Sheets—Sheet 1.

C. H. COOLEY & F. H. RICHARDS.

GRAIN WEIGHER.

No. 442,859. Patented Dec. 16, 1890.

Fig. 1

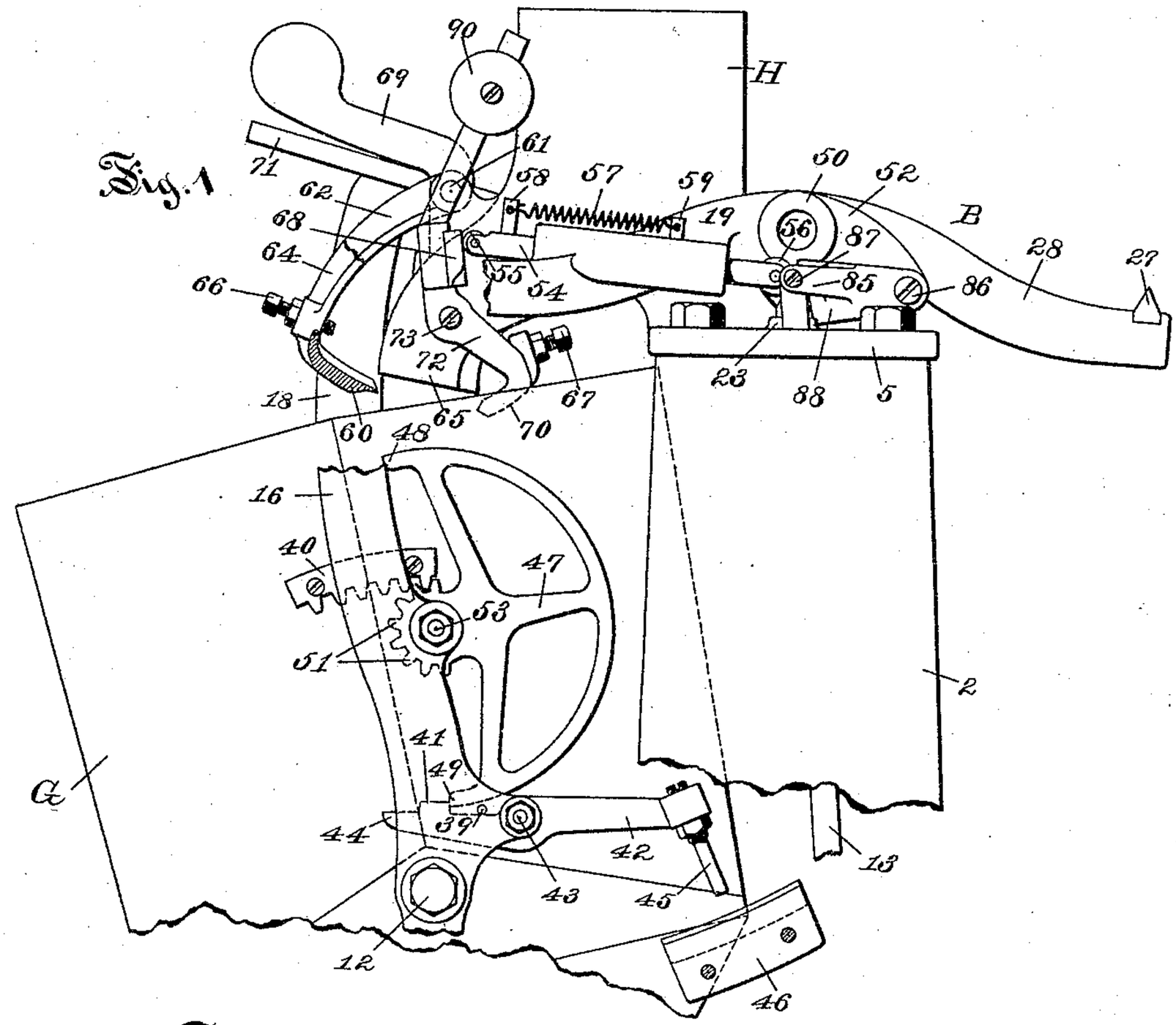
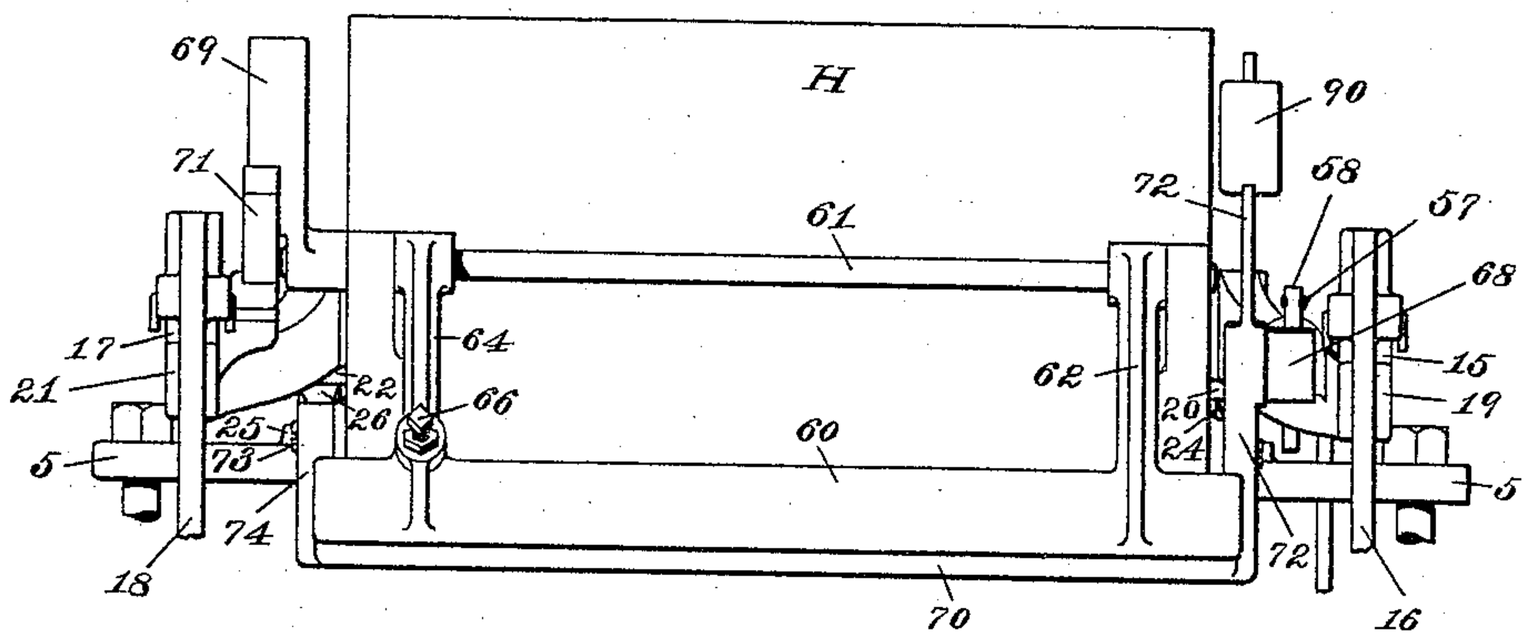


Fig. 2



Witnesses:

Wm. Byerkman.

Henry L. Reckard.

Inventors:

Charles H. Cooley

Francis H. Richards

No Model.) 3 Sheets—Sheet 2.

C. H. COOLEY & F. H. RICHARDS.

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Fig. 3

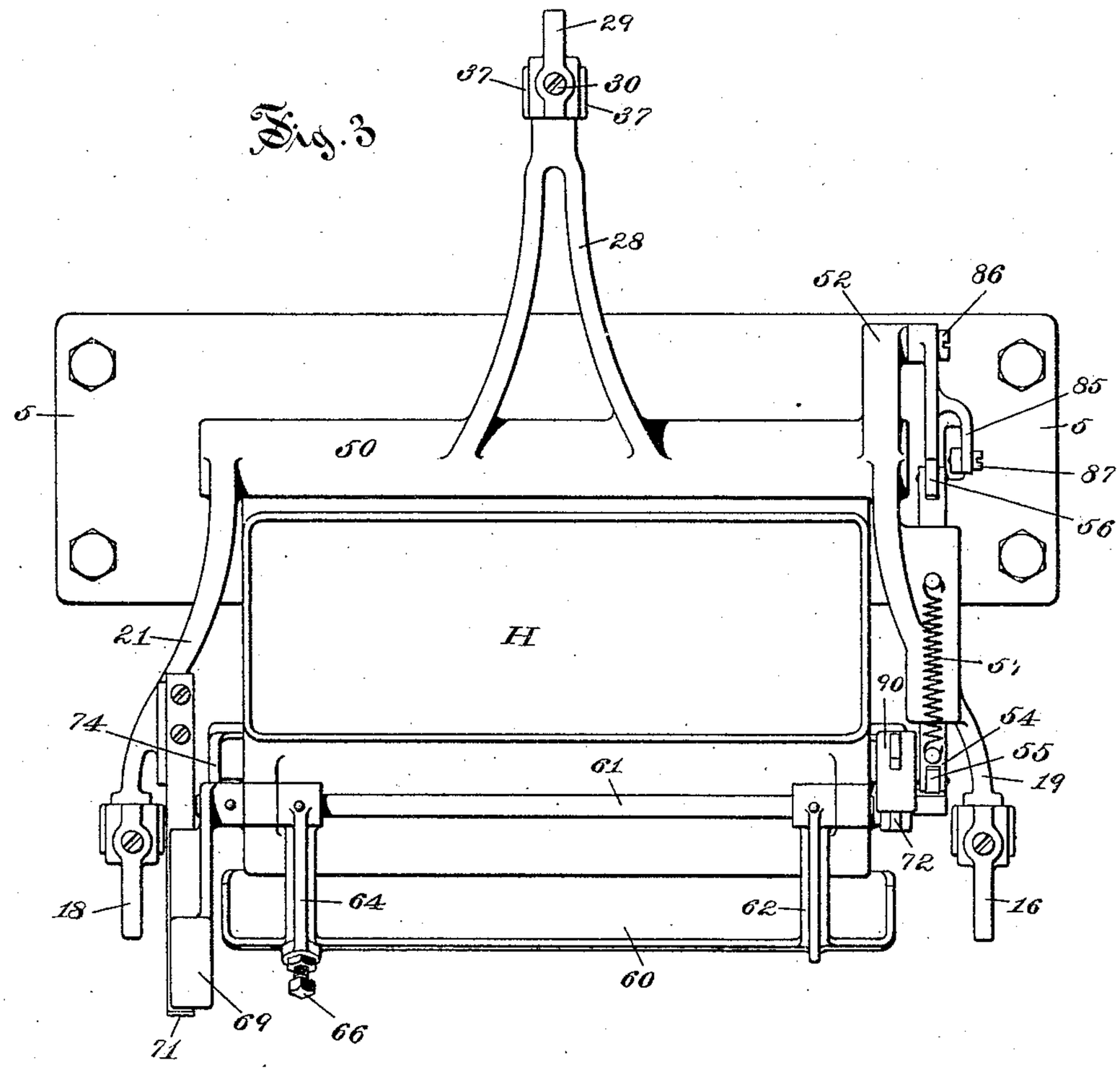
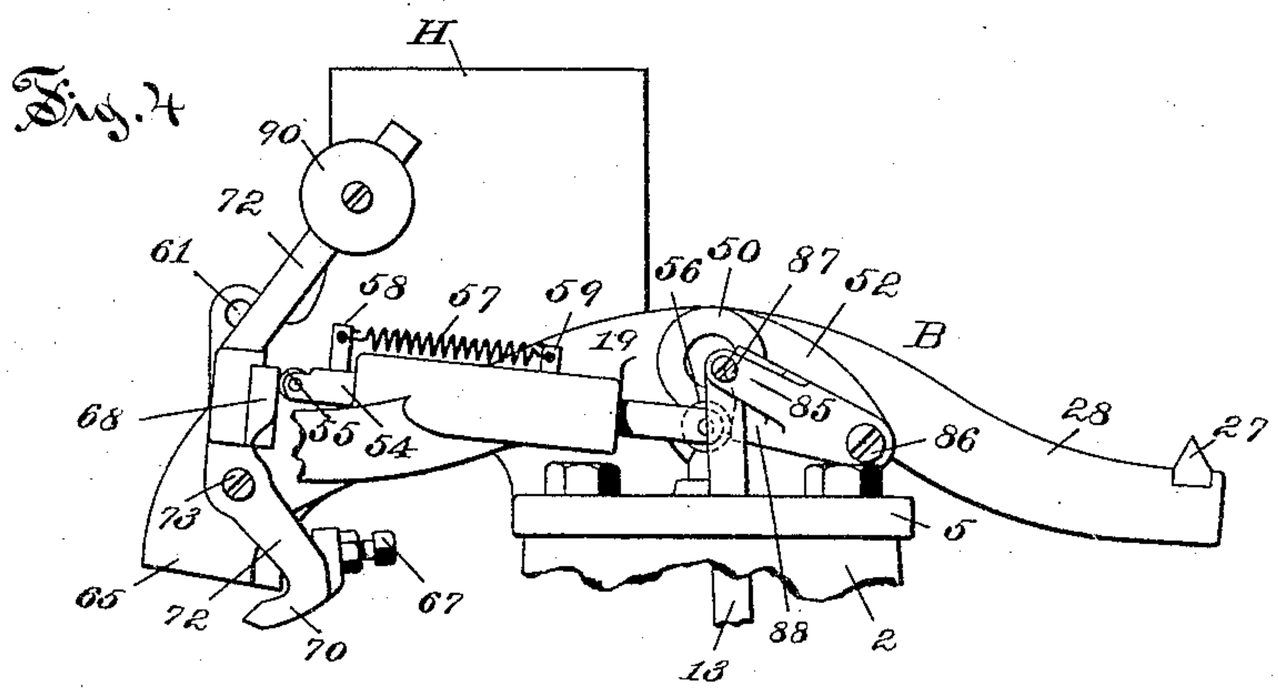


Fig. 4



Witnesses:

W. M. Dyorkman.

Henry L. Reckard.

Inventors:

Charles H. Cooley

Francis H. Richards

(No Model.)

3 Sheets—Sheet 3.

C. H. COOLEY & F. H. RICHARDS.

GRAIN WEIGHER.

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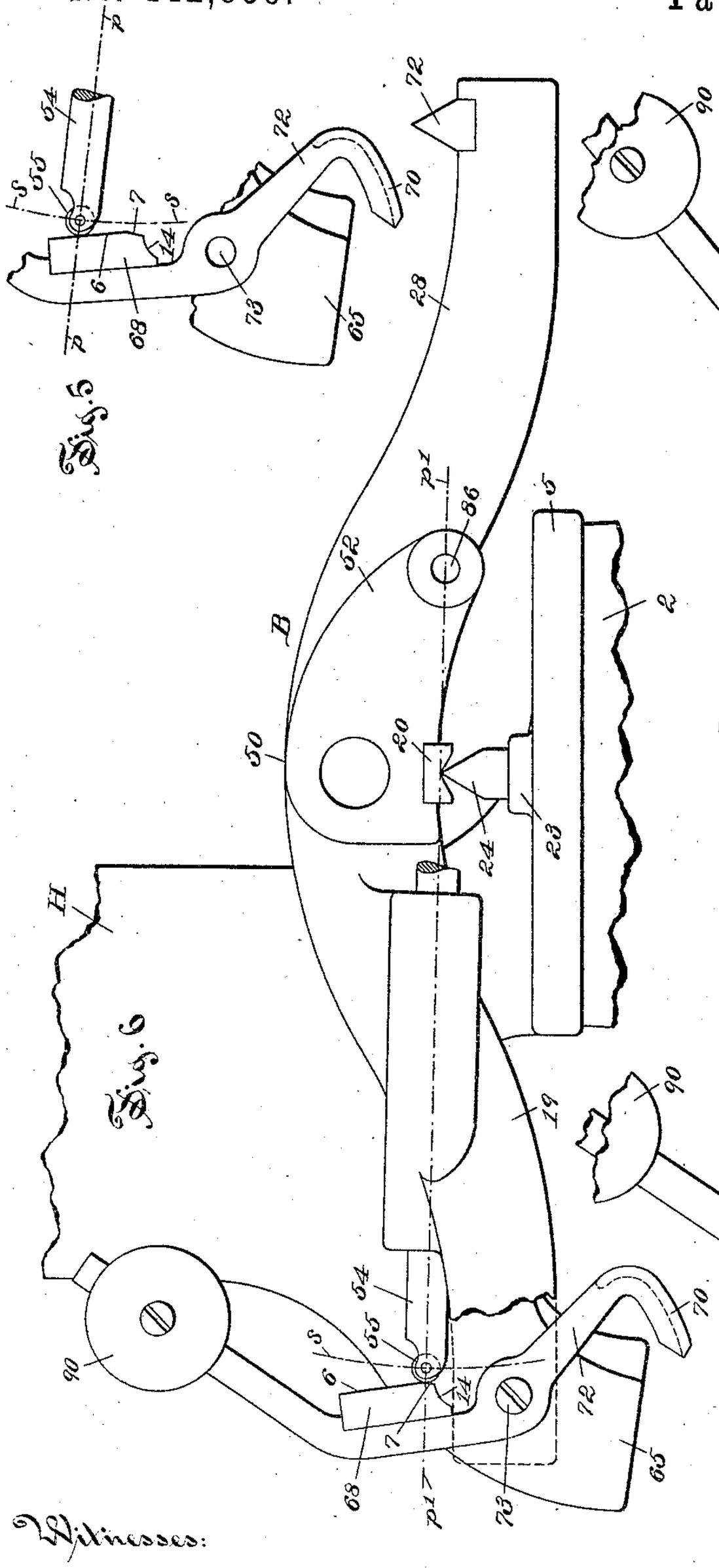

Fig. 5

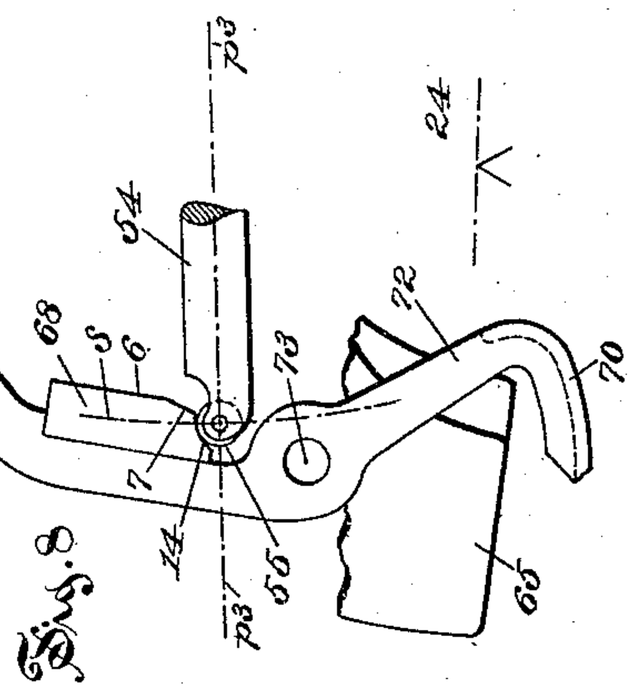

Fig. 8

Fig. 6

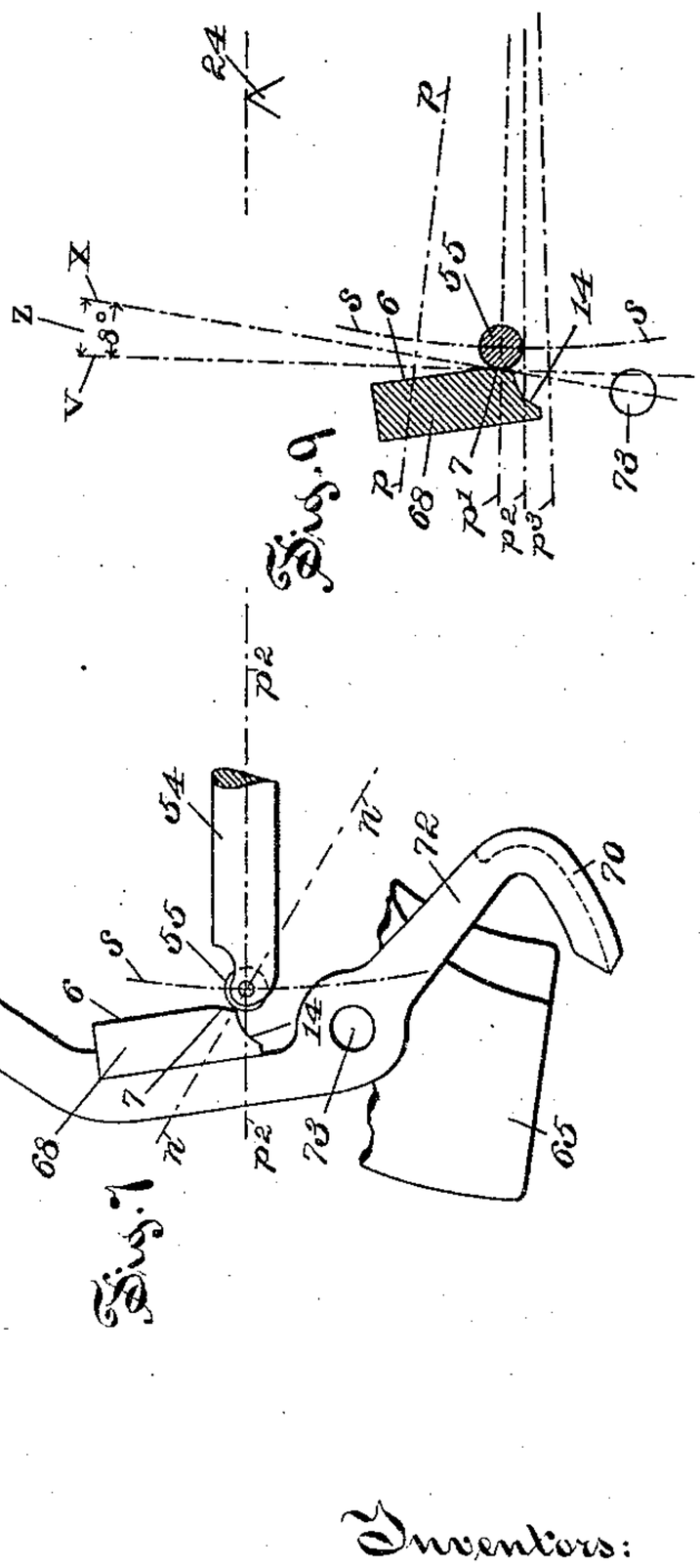

Fig. 9

Fig. 7

Witnesses:

W. M. Byerkman.

Henry L. Rockland.

Inventors:

Charles H. Cooley

Francis H. Richards.

UNITED STATES PATENT OFFICE.

CHARLES H. COOLEY AND FRANCIS H. RICHARDS, OF HARTFORD, CONNECTICUT, ASSIGNORS TO THE PRATT & WHITNEY COMPANY, OF SAME PLACE.

GRAIN-WEIGHER.

SPECIFICATION forming part of Letters Patent No. 442,859, dated December 16, 1890.

Original application filed February 11, 1890. Serial No. 339,967. Divided and this application filed July 14, 1890. Serial No. 358,658. (No model.)

To all whom it may concern:

Be it known that we, CHARLES H. COOLEY and FRANCIS H. RICHARDS, citizens of the United States, residing at Hartford, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvement in Grain-Weighers, of which the following is a specification.

This invention relates to automatic grain-weighers, and has for its object the improvement of the machine by furnishing improved valve mechanism therefor.

This application is a division of our application, Serial No. 339,967, filed February 11, 1890, for Letters Patent for an improvement in grain-weighers, and reference may be had to the said prior application for a particular description of some of the principal parts of the grain-weigher which are not fully described in this application.

In the drawings accompanying and forming a part of this specification, Figure 1 is a side elevation of a portion of a grain-weigher embodying my present improvements. Fig. 2 is a front elevation of the valve mechanism and accessory parts shown in the upper portion of Fig. 1. Fig. 3 is a plan view of the parts shown in Fig. 2. Fig. 4 is a side view similar to a portion of Fig. 1, and is illustrative of the operation of the machine. Figs. 5, 6, 7, 8, and 9 are enlarged diagrammatic views illustrating the leading features of the machine and the construction and operation of the same.

Similar characters designate like parts in all the figures.

The frame-work for carrying the operative parts of the machine usually, and as shown in the drawings, comprises two side frames or uprights, as shown in the said prior application, and there numbered 2 and 4, respectively. In this application only one of said side frames 2 is shown. The supply-chute H is carried on said frames, being formed on the top plate and set forward of said frame-work uprights.

The grain-bucket C is journaled at 12 in bearings formed in the hangers 16 and 18, which are suspended by V-shaped bearings on the pivots or knife-edges 15 and 17, respectively, of the arms 19 and 21 of the scale-beam B. This beam has V-shaped bearings 20 and 22, one at each end of the hollow shaft 50 thereof, which rest on the pivots or knife-edges 24 and 26, respectively, that are suitably supported, as by bearings 23 25, on the frame-work. Opposite to arms 19 and 21 an arm 28 extends rearwardly of the scale-beam shaft 50 and is provided with a pivot or knife-edge 27, on which the main weight is suspended, as set forth in our said prior application. The oscillation of the grain-bucket G within the hangers is limited by suitable stops. (Not shown in this application.) For detaining the bucket in either its forward or rearward position we have shown in this application the device described and claimed therefor in our said prior application. This detent device comprises the detent latch or lever 42, which is pivoted at 43 to the hanger 16, and whose long arm carries the adjustable pin 45, secured in the end thereof for regulating the operation of said lever by the latch-bracket 46, that is fixed on the frame-work. The short arm 44 of said lever 42 has the catch 41 formed thereon, a stop-pin 39 being provided to normally limit the upward movement of said catch. The lever 47, which in form is or may be a segment of a wheel, as shown, has two end catches 48 and 49, adapted to engage with the aforesaid catch 41 of the detent-lever 42. The lever 47 is pivoted at 53 to the hanger 16, and its hub has thereon suitable gear-teeth, as 51, meshing with similar teeth on the block 40, which is secured to the side of the grain-bucket G in any suitable manner, as by screws or rivets. The mode of operation of this detent apparatus is fully described in our said prior application. As shown in Fig. 1, the end 49 of the segmental lever 47 rests against the catch 41 of the latch 42. If, now, the lever 42 be raised, the said catches will be disengaged and the part 47 will be free to rotate on its said pivot. The rearward side of the bucket, at the right hand in Fig. 1, being loaded, the bucket tends strongly to move toward the right hand. This turns the lever

47, through the gearing described, until the bucket movement is stopped by the bucket-stops referred to, but not herein shown, when the catch 41 engages with the opposite end 48 of said lever and thus locks the bucket in its rearward position. The latch arm or lever 42 extends rearwardly of the hangers to a point over the latch-bracket 46, which is fixed on the frame-work at some distance back from said catch. By this means an effective leverage is obtained for overcoming the resistance of the bucket-catches, so as to easily unlock the same. The position of said bracket vertically in the machine is such that the contact of the latch-lever therewith does not take place until a particular point in the downward movement of the beam has been reached, so as to insure the proper disengagement of the bucket-catches by the force exerted on the beam by the weight-arm of the cut-off valve, as hereinafter more fully set forth.

The valve mechanism for reducing and for cutting off the flow of grain to the bucket is actuated from and by the scale-beam. The reducing-valve 60 is carried by the arms 62 and 64, that are carried on the pivot-shaft 61, said valve being furnished with a suitable stop, sometimes made adjustable, as the stop 66, to regulate or limit its closing movement. This valve 60 closes under the outlet 65 of the chute H somewhat more than half the width thereof. The valve is actuated by the valve-lever 69 from the valve-actuating arm 71 of the beam B. The construction and mode of operation of this reducing-valve in its preferred form are fully set forth in the prior application of C. H. Cooley, Serial No. 338,818, filed January 31, 1890, to which reference may be had.

The cut-off valve 70 is carried by the arms 72 and 74, pivoted at 73 to the supply-chute H, the said valve having, if desired, an adjustable stop 67, to limit its closing movement. The arm 72 is continued above the pivot 73, and carries the cam 68 and some suitable weight, as 90. The mode of operating the cut-off valve is shown more fully in the enlarged views, Figs. 5 to 9, inclusive.

For the purpose of illustrating the ordinary mode of operation let us assume the actuator 55, which in this case is a small roller carried by the stem (or slide) 54, to be carried at a fixed point on the beam-arm 19, as shown in Fig. 6. We may then divide the vertical movement of said actuator (and also of the beam) into several periods, represented by the positions p, Fig. 5; p', Fig. 6; p^2, Fig. 7, and p^3, Fig. 8. In Fig. 5 the beam is at its highest point, as in Figs. 1 and 4. In Fig. 6 the beam has descended to the theoretical poising point, when the reducing-valve is supposed to be closed. (When reference is herein made to the movement of the "scale-beam" the movement of the bucket-supporting arms thereof is meant, this coinciding, of course, with that of the bucket itself.) In Fig. 7 the beam has descended to the end of the poising period, or the "actual" poising point, this being the position where the valve-weight 90, acting through the lever and cam, acquires a sufficient power to accelerate the downward movement of the beam. At this actual poising point the roll 55 stands on a line $n\,n$, passing through the edge of the cam, and which is considerably inclined to the line p^2, so that at said moment (when there is no longer any need for more grain to flow into the bucket) the closing movement of the cut-off valve is rapidly accelerating and cuts off the drip-column very suddenly. Immediately after this, when the drip is substantially cut off, the bucket-latches strike the abutments 46 and unhook the bucket, and the beam descends to the position shown in Fig. 8. During this latter part of the beam movement the curved cam-face 14 bears with a greatly-increased force on the roll 55, and thereby exerts a powerful downward thrust on the beam, thus furnishing ample power for unlocking said bucket-latches.

The cam 68 being above the pivot 73 of the cut-off valve and the valve-arm being of a short radius, the cam follows the beam in its downward movement and thus has a more direct and effective action thereon. This arrangement and combination of the several parts enables us to use a large angular movement of the valve relatively to the extent of the beam movement, thereby obtaining a long stroke for the weight 90 on the arm of the cut-off valve. This result is highly important because it is necessary that the position and stroke of said weight shall be such as to have only a very small effect on the beam when in the position shown in Figs. 1 and 6, and shall have a rapidly-increasing effect when said valve begins to close. In Fig. 6 said weight stands almost directly over the pivot 73, thus exerting a very slight effect on the beam. In Fig. 8 the effective leverage of said weight is several fold increased, owing to its aforesaid large angular movement.

There is another feature of our improved valve mechanism illustrated in Fig. 9, which is, perhaps, not obvious from Figs. 5 to 8, inclusive. It will have been observed that the cam 68 has three faces 6, 7, and 14. The part 6 of the cam-face is used during the closing of the reducing-valve, the part 7 during the poising period and is substantially coincident in extent with the poising movement of the beam, and the part 14 is used to cut off the drip and to effect the discharge of the grain. Since the face 7 bears with some pressure against the actuator 55 on the beam during the poising period, it is obvious that any resistance caused by such pressure will to that extent vitiate the precision of the machine. To overcome this result we make the face 7 neutral to the downward movement of the beam, but not to the upward movement thereof. In Fig. 9 the line V is supposed to be at right angles to the poising-line p'. If the face 7 were parallel with the line V, it is

obvious there would be some little resistance to the beam movement in either direction, due to the friction of the roller 55 on its pin and on the said face 7. Accordingly we construct the face 7 to neutralize said resistance by setting said face on the line *x* at an angle to line V, representing what is generally designated by mechanics as "the angle of repose." This angle Z is shown in the drawings to be about eight degrees, being so figured in said Fig. 9. For the purpose of reference thereto we designate the face 7 as being "undercut," since the lower part thereof is cut under the line V by an amount corresponding substantially with the angle of repose. By this means during the subpoise period from point p' to point p^2, the angle of the face 7 causes the weighted valve to exert substantially the same downward thrust on the beam, as the pressure on said actuator causes resistance to the downward movement of the beam. This accurately neutralizes the said resistance and renders the same of no injurious effect. By this means we attain the important result of materially diminishing the percentage of error of the weighing.

The cut-off valve has a surplus or extra closure for the purpose of cutting off the "drip" prior to beginning to open the bucket-latches, so that the impact of the falling column of grain entirely ceases before the beam encounters any resistance to its downward movement. This cut-off valve and the combinations therewith are in the nature of an improvement on the corresponding valve mechanism and combinations set forth in the application of C. H. Cooley, Serial No. 338,544.

The cut-off valve 70 is utilized as a regulator-valve by means of connections from the shiftable actuator to a regulator situated below the grain-bucket, and which may be the "regulator P" described in our said prior application. To said regulator is connected the rod 13, which is pivoted at 87 to the arm 85 of the rotary reciprocating cam 88, that is pivoted at 86 to the arm 52 of the scale-beam B. The valve-actuator slide 54 has journaled at the rearward end thereof the cam-roll 56, which bears on the face of the regulator-cam 88, and at the forward end thereof carries the aforesaid actuator-roll 55, which bears on the face of the cut-off-valve cam 68. The slide 54 may be retracted by the spring 57, one end of which is attached to a pin 58, fixed in said slide, and the opposite end to a similar pin 59, fixed in the arm 19 of the beam B; or said slide may be freely fitted and be retracted by the weight of the cut-off valve acting through the cam 68. This regulator apparatus is not of our invention, but is described and claimed in separate applications filed by F. H. Richards, Serial No. 340,814, filed February 17, 1890, Serial No. 341,104, filed February 20, 1890, and Serial No. 324,242, filed September 17, 1889.

Having thus described our invention, we claim—

1. In a grain-weigher, the combination, with the weighted cut-off valve, arranged and supported substantially as described, the weight being substantially over the valve-axis when the valve is open, of the cam on the valve-arm above the valve-axis and the valve-actuator carried on the beam, said cam having a substantially neutral face bearing against said actuator during the poising, and below said substantially neutral face having a face constructed to permit the closing of the valve and also to communicate a downward thrust on the scale-beam when the beam descends below the poising period.

2. In a grain-weigher, the combination, with the cut-off valve, pivotally supported substantially as described, of the cam carried on said valve above the axis thereof and having an upper non-effective face and a lower effective face, substantially as described, and the actuator carried on the scale-beam and operating said valve through said cam.

3. In a grain-weigher, the combination, with the cut-off valve, pivoted and weighted substantially as described, of the cam 68, having the three faces 6, 7, and 14, and the actuator carried on the beam and operating said valve through said cam, said face 7 being substantially coincident with the poising period of the beam movement.

4. In a grain-weigher, the combination, with the cut-off valve, supported and weighted substantially as described, of the cam on the valve-arm and the actuator on the scale-beam and operating said valve through said cam, the cam having a face used during the poising period, and undercut, substantially as described, whereby said poising cam-face is made neutral as to the downward beam movement.

5. In a grain-weigher, the combination, with the scale-beam carrying the valve-actuator and with the bucket supported by hangers suspended from said beam, of the weighted cut-off valve, pivotally supported substantially as described, and having a cam above the valve-axis, which cam has a lower face adapted to impart a downward thrust on the scale-beam, and bucket detent-catches, substantially as described, constructed to be disengaged by a fixed stop or bracket on the descent of the beam to permit the valve-actuator to pass under said lower cam-face, whereby the said cam-face follows down said actuator and furnishes the power for disengaging said detent-catches.

CHARLES H. COOLEY.
FRANCIS H. RICHARDS.

Witnesses:
L. C. HEERMANN,
HENRY L. RECKARD.