(No Model.)

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

GRAIN WEIGHER.

No. 434,702. Patented Aug. 19, 1890.

Fig. 1

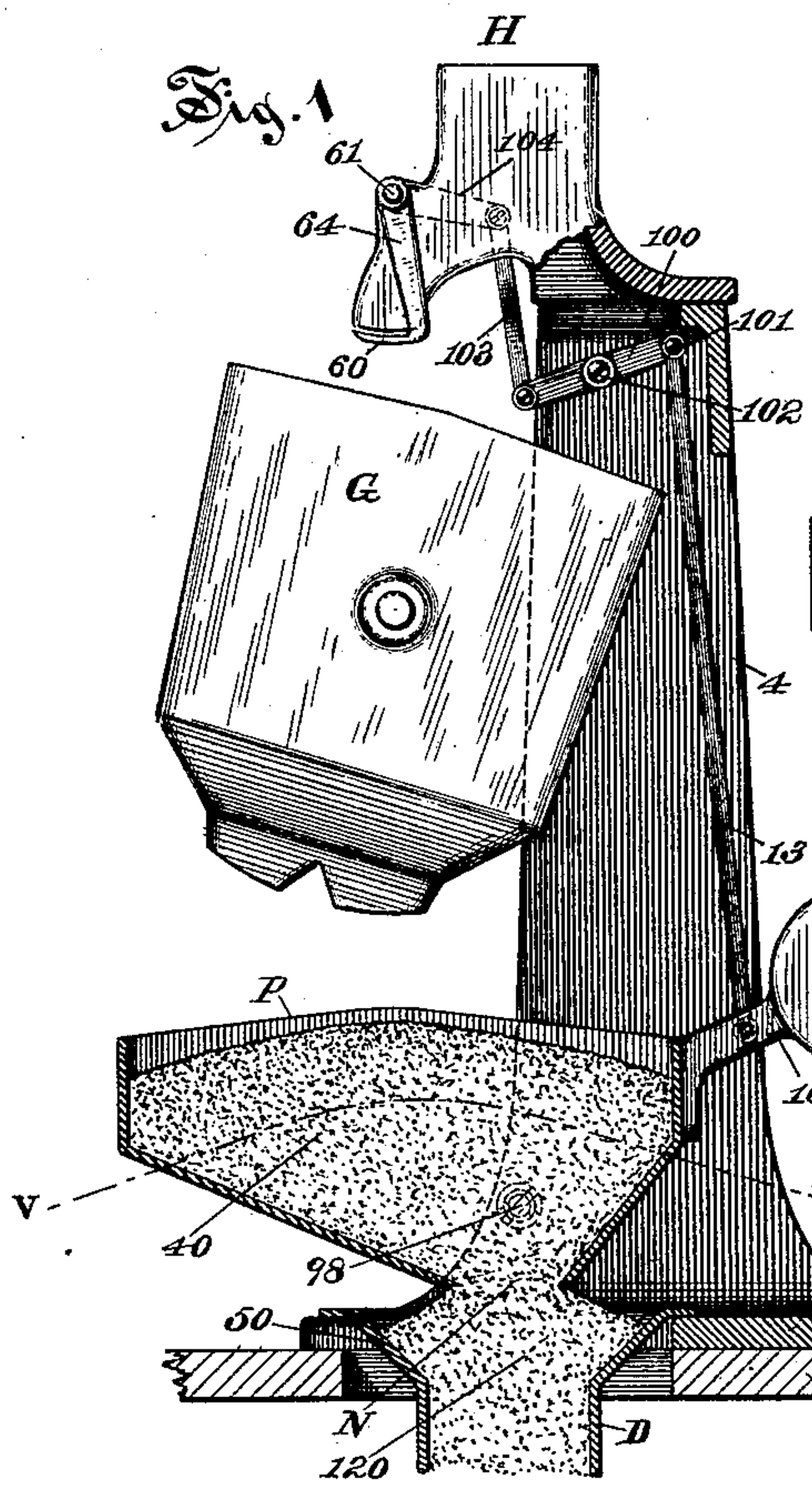


Fig. 4

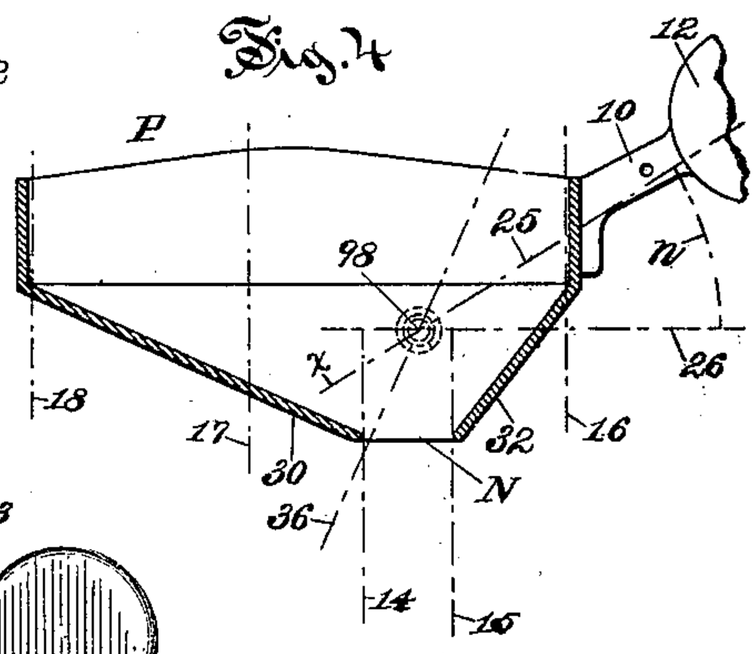


Fig. 2

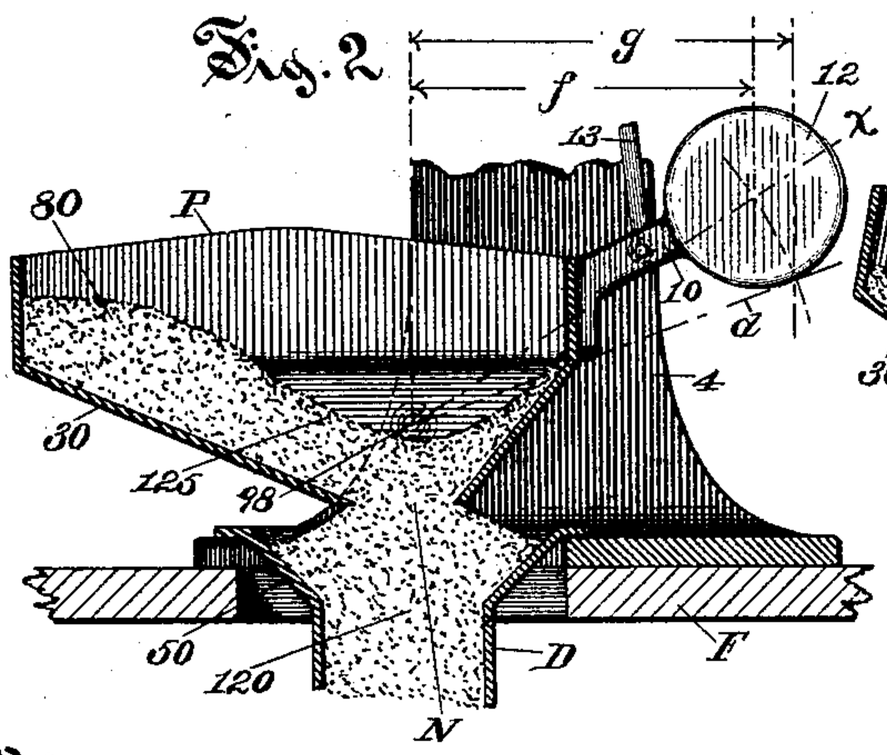
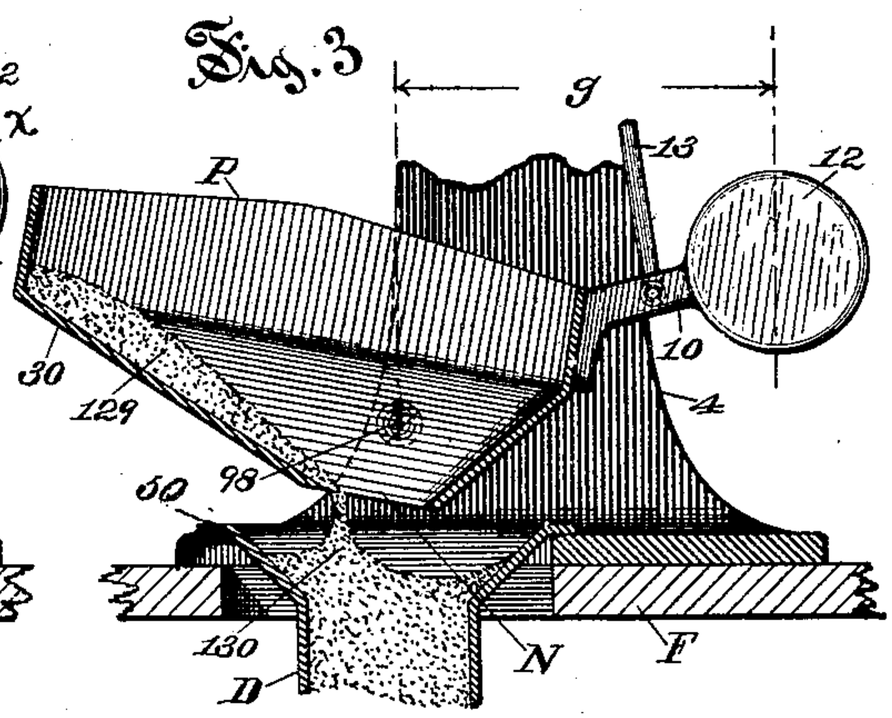


Fig. 3



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UNITED STATES PATENT OFFICE.

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GRAIN-WEIGHER.

SPECIFICATION forming part of Letters Patent No. 434,702, dated August 19, 1890.

Application filed February 13, 1890. Serial No. 340,284. (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 Improvements in Grain-Weighers, of which the following is a specification.

This invention relates to regulators for grain-weighers; and it has for its object to furnish improved apparatus for regulating the operation of automatic grain-weighers by means of the accumulation of grain discharged therefrom.

To this end the invention consists in the improvement hereinafter more fully set forth.

In the drawings accompanying and forming a part of this specification, Figure 1 is a sectional side elevation of a regulator apparatus embodying our improvements, shown applied to a grain-weigher. Figs. 2 and 3 are views similar to a part of Fig. 1 and illustrate the mode of operation of the apparatus. Fig. 4 is a diagrammatic view for illustrating certain features of the construction and operation of the mechanism.

Similar characters designate like parts in all the figures.

Our improved regulator apparatus is adapted to be used in connection with automatic grain-weighers generally, and especially in connection with the improved grain-weigher which is described in our prior application, Serial No. 339,967, filed February 11, 1890, and in this present application such details and parts as are common to both of said applications are generally designated by the same characters. Accordingly the following parts are or may be the same parts as are similarly designated in the said prior application, to wit: The grain-scale frame 4, the double-chambered grain-bucket G, the supply hopper or chute H, a shaft, as 61, whereon may be carried the regulator-valve, the vertically-movable regulator-hopper P, pivotally supported at 98 by the frame-work and having the counterweighted lever 10, and a connecting-rod 13, extending upward to connect with the regulator-valve. The rod 13 connects at its lower end to the lever 10 and at its upper end at 101 to the lever 100, which is pivoted at 102 to the frame 4. The opposite end of lever 100 is connected by a link 103 to the arm 104 of the shaft 61, whereon the valve 60 is carried by suitable arms, as 64.

There is a fixed conduit D located below the opening M of hopper P and extends down through the floor F to some grain-receiving bin, machine, or apparatus that is to be fully supplied with grain. The necessary and usual means for carrying and operating the grain-bucket are not shown in this application. Such machines or apparatus have in practice a substantially regular capacity or rate of consumption, which is uncertain in amount or which varies according to the variation in kind of the grain supplied thereto, or according to the conditions under which or the speed at which the mechanism is operated. For instance, roller-mills of the same kind and size vary somewhat in their actual capacity or product, and the same mill may usually be adjusted to give varying results in quality of grinding, with a corresponding variation in their consumption of grain. It is found desirable in practice, and principally for the reasons set forth, to employ a grain-weigher (when an automatic grain-weigher is used) of a normal capacity somewhat in excess of the maximum capacity of the machine; but to successfully operate such automatic grain-scale for said purpose it is found to be necessary, in order to obtain satisfactory results, to employ a sensitive and efficient automatic regulator to properly retard and control the operation of said weigher. To attain this result by means of a simple and practical apparatus is the principal object of our present invention.

Under the discharge-opening N of the hopper P the conduit-pipe D (unless this is of large size) is furnished with some suitable receiving tunnel or hopper, as 50, into which the grain is discharged from said opening. The opening N should stand about centrally, as shown, over said hopper 50. The hopper P is supported on an axis 98 at one side of the center thereof, (about midway between the center of the hopper and the side thereof,) and the outlet N is on the same side of the hopper as said axis. By this construction the said axis 98 is substantially above the

said opening, being near to the line 15, or within the vertical lines 14 and 15, Fig. 4, bounding said opening and the front bottom plate 30 is much wider than the rear bottom plate 32. The nature of this construction is such that much more grain is required to carry down the hopper and much less is required to hold down the same than would be required if the axis of the hopper were nearer the rear side thereof and not substantially above the said discharge-opening N. This is shown in Fig. 1, where it has required a nearly full hopper-load 40 of grain to carry down the hopper, and in Fig. 3, where the hopper had just risen with only a small part 129 of the grain remaining therein. The manner in which the grain leaves the hopper is illustrated in Figs. 2 and 3. Naturally the grain leaves the hopper centrally with the opening N, as in Fig. 2, so that the load between the lines 16 and 17, Fig. 4, is discharged first and the load between the lines 17 and 18 is discharged last; but said first part of the load between lines 16 and 17 is "dead load," being substantially centrally located relatively to the pivot 98, and therefore of no effect for the moving of the hopper. This dead load being discharged first leaves the "live load" between lines 17 and 18 of full effect until the hopper is nearly empty, and when said live load slides down the plate 30, as in Fig. 3, the hopper, when it begins to rise, instantly rises to the upper end of its stroke, thereby quickly opening the valve 60 and starting the grain-weigher.

The construction and mode of operation here described secure an important advantage in automatic grain-weighers. It will be remembered that the bucket G discharges its loads of grain intermittently into the hopper P, from whence the grain passes down through the opening N into the conduit D. One said load in practice constitutes a large proportion of the full load 40 of the hopper, and it is deemed necessary that the hopper shall not act by the discharge thereinto of one bucket-load, which would fill the hopper to about the line V V, Fig. 1. It will be observed that the grain below said line is largely balanced on the pivot-axis 98, so that only a part of the weight 12 is required to balance the remaining or live part of said bucket-load below said line V V; but should the grain below the line V V not be discharged prior to the discharge of the next bucket-load this latter load will fill the hopper far above line V V, overbalance the weight 12, and carry down the hopper, all as in Fig. 1. This closes the valve 60 and stops the grain-weigher. When the grain is lowered in pipe D, the grain flows down from the hopper P, as in Fig. 2, where the dead load is shown largely discharged while the live load at 80 is shown only very slightly reduced and still quite sufficient to hold down the said hopper. If now the descent of grain in pipe D should cease, the hopper and the grain therein will continue to stand as in Fig. 2; but if the said descent in pipe D continues then the dead load is substantially all discharged and the live load is reduced to about the quantity 129, which is overbalanced by weight 12, as in Fig. 3, thus allowing the hopper to rise, as there shown. In practice weight 12 should, when the hopper is up, resist one bucket-load plus the quantity necessary to hold the hopper down, which usually aggregates about one and one-third bucket-load. Under these conditions the capacity of the hopper P may be somewhat less than two bucket-loads. Since the normal grain-discharging capacity of bucket G is in practice greater than the actual grain-receiving capacity of the machine or apparatus fed by pipe D, it follows that said pipe when once filled will be kept full of grain, as indicated at 120, Fig. 1, as long as the grain-weigher is operating. Supposing now the pipe D and the hopper P to have been filled and the grain-weigher stopped while the grain-receiving machine continues in operation, the grain then runs down, as indicated at 129 and 130, Fig. 3, and the said hopper rises, as there shown, being lifted by the counterbalance-weight 12. In doing this, however, the connections hereinbefore described draw back the regulator-valve 60 from underneath the chute H, which allows the grain to again fill bucket G, and thus operate the grain-weigher; but it requires, owing to the construction and organization above described, a full hopper-load to stop the machine and only a small part of such full load to retain the machine stopped; hence it will be evident that this apparatus will regulate the machine with the fewest possible regulator movements, thereby securing the most effective regulation with the least action of the mechanism, the least wear and tear, and the fewest disturbances and changes in the operation of the grain-weigher.

The action above set forth of the hopper P is further and favorably modified by an improvement in the manner of counterweighting said hopper.

According to this feature of our invention the counter-wight 12 is set on a line *x*, Fig. 2, at a considerable inclination from the axis 98, as shown in the drawings. The result of this is that at the end of its stroke *d* the effective leverage of said weight is materially changed in a direction to co-operate with the normal action of the hopper. Thus when the hopper stands up, as in Fig. 2, the effective leverage of the weight 12 is shown by the distance *f;* but when that weight stands down, as in Fig. 3, said leverage is greater, being represented by the increased distance *g*. This difference is sufficient to materially add to the efficiency, as a whole, of the regulator apparatus. The angle *n*, Fig. 4, of the weight 12 above a horizontal line 26, through the axis 98, must, in order to be effective, be greater than the angle which is commonly known to mechanics as "the angle of repose." In prac-

tice and with our improved regulator-hopper we find the angle *n* should be not less than twenty nor greater than forty degrees, and within these limits we prefer said angle to closely approximate thirty degrees, being somewhat more or less, as the said weight is in the upper or lower part of its stroke, and by the term "set thereon at an angle from said axis of about thirty degrees from the horizontal" we mean that said weight 12 is set on the hopper on a line 25 from said axis 89, which line is at an angle with line 26 of not less than twenty degrees nor materially more than forty degrees. Within these proportions we find that the increasing leverage of the descending weight furnishes a power substantially equal to that required for opening the valve 60, so that on the starting up of the hopper P the opening of said valve is very quickly completed, and this is deemed desirable because strongly tending to render the operation of the grain-weigher most regular and uniform.

One feature of our improvements relates to the construction and mode of pivoting the hopper, whereby the front bottom plate 30, on the downward movement of the hopper, will act as a knife or blade to easily enter the mass of grain 120 with a lateral movement, and thus not impede the said hopper movement. For this purpose the hopper-pivot 98 (see Fig. 4) is located at a point at substantially right angles to the said plate at the lower edge thereof, as indicated by the dotted line 36, drawn at right angles to said plate near to said edge and through said axis.

Having thus described our invention, we claim—

1. In regulator apparatus for grain-weighers, the combination, with supporting framework and the regulator-valve, of the counterweighted regulator-hopper pivotally supported about midway between the center of said hopper and one side thereof and having the outlet substantially below its said axis, and connections adapted to actuate the regulator-valve from said hopper, all substantially as described.

2. In regulator apparatus for grain-weighers, the combination, with supporting framework and with grain-weigher mechanism having a regulator-valve, of the counterweighted regulator-hopper pivotally supported about midway between the center of said hopper and one side thereof and having the outlet substantially below its axis, the receiving-conduit below said hopper, and connections adapted to actuate the regulator-valve of the grain-weigher to open said valve on the rising of said hopper.

3. In regulator apparatus for grain-weighers, the improved regulator-hopper herein described, it consisting in a counterweighted hopper constructed to be pivotally supported on an axis about midway between the center of the hopper and one side thereof and having the outlet substantially below said axis, whereby the dead load is discharged first and the effect of the live load is longest retained, all substantially as described.

4. In regulator apparatus for grain-weighers, the combination, with a regulator-hopper pivotally supported on a substantially horizontal axis, of the counter-weight attached to said hopper and set thereon at about thirty degrees from the horizontal plane of said axis of the hopper, whereby the leverage of said weight increases as the hopper rises, all substantially as described.

5. In regulator apparatus for grain-weighers, the combination, with the regulator-hopper pivotally supported on an axis about midway between the center of the hopper and one side thereof and having the discharge-opening at one side of the center of the hopper and substantially underneath the axis thereof and with the regulator-valve, of the counter-weight set thereon at an angle of about thirty degrees above the horizontal plane of said axis, and connections operating the regulator-valve to open the same on the upward movement of the hopper, whereby the valve movement when once begun is continued with increasing effect.

6. In regulator apparatus for grain-weighers, the improved regulator-hopper herein described, it consisting in a counterweighted hopper constructed to be pivotally supported on an axis about midway between the center of the hopper and one side thereof and having the outlet substantially underneath said axis, whereby the dead load is discharged first, and having the bottom plate 30 forward of said opening set at substantially right angles to a line from the forward edge of said opening through the axis of the hopper, whereby said plate, on the downward movement of the hopper, enters the mass of grain edgewise and with least resistance.

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