(No Model.) 2 Sheets—Sheet 1.

F. H. RICHARDS.

REGULATOR FOR GRAIN SCALES.

No. 410,116. Patented Aug. 27 1889.

Fig. 1

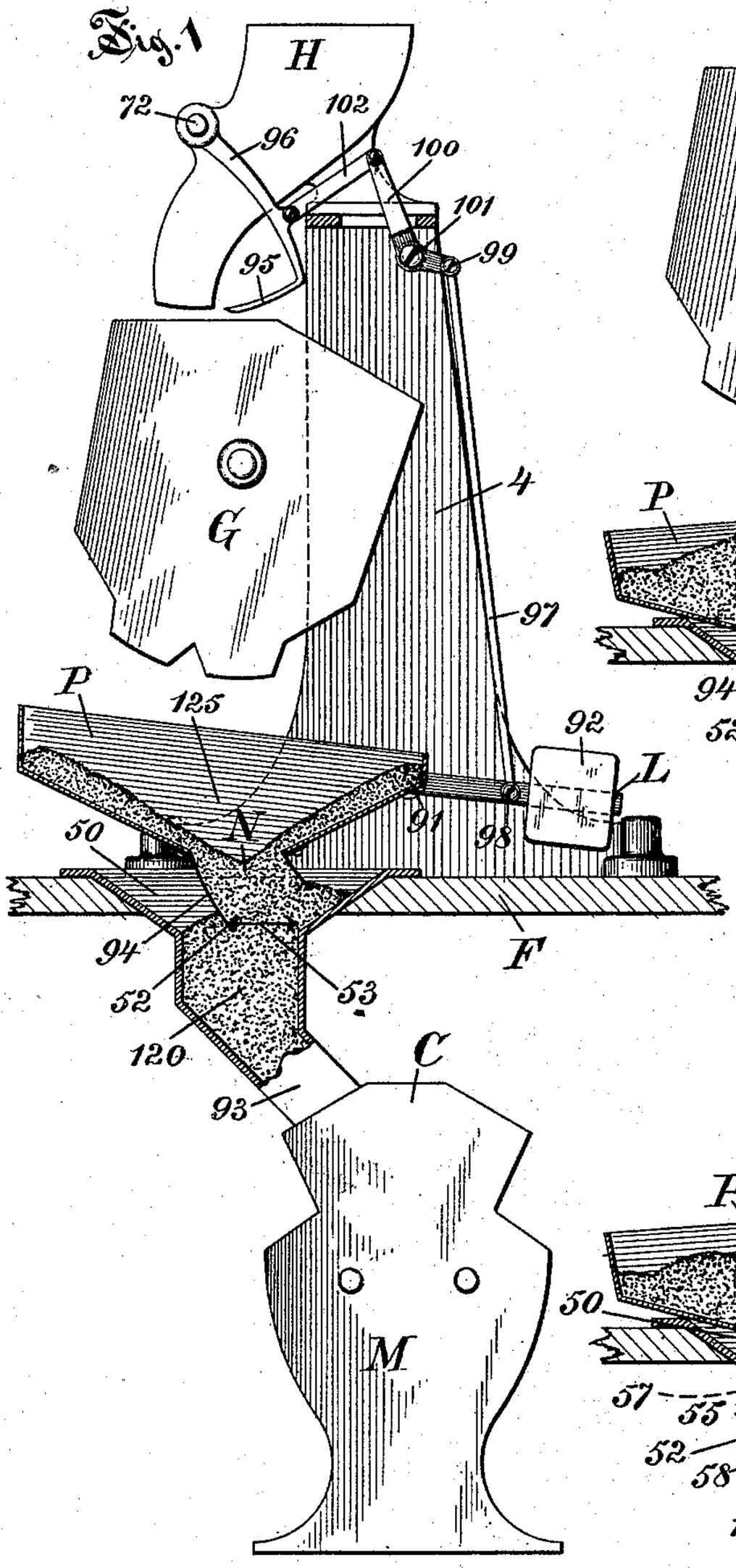


Fig. 2

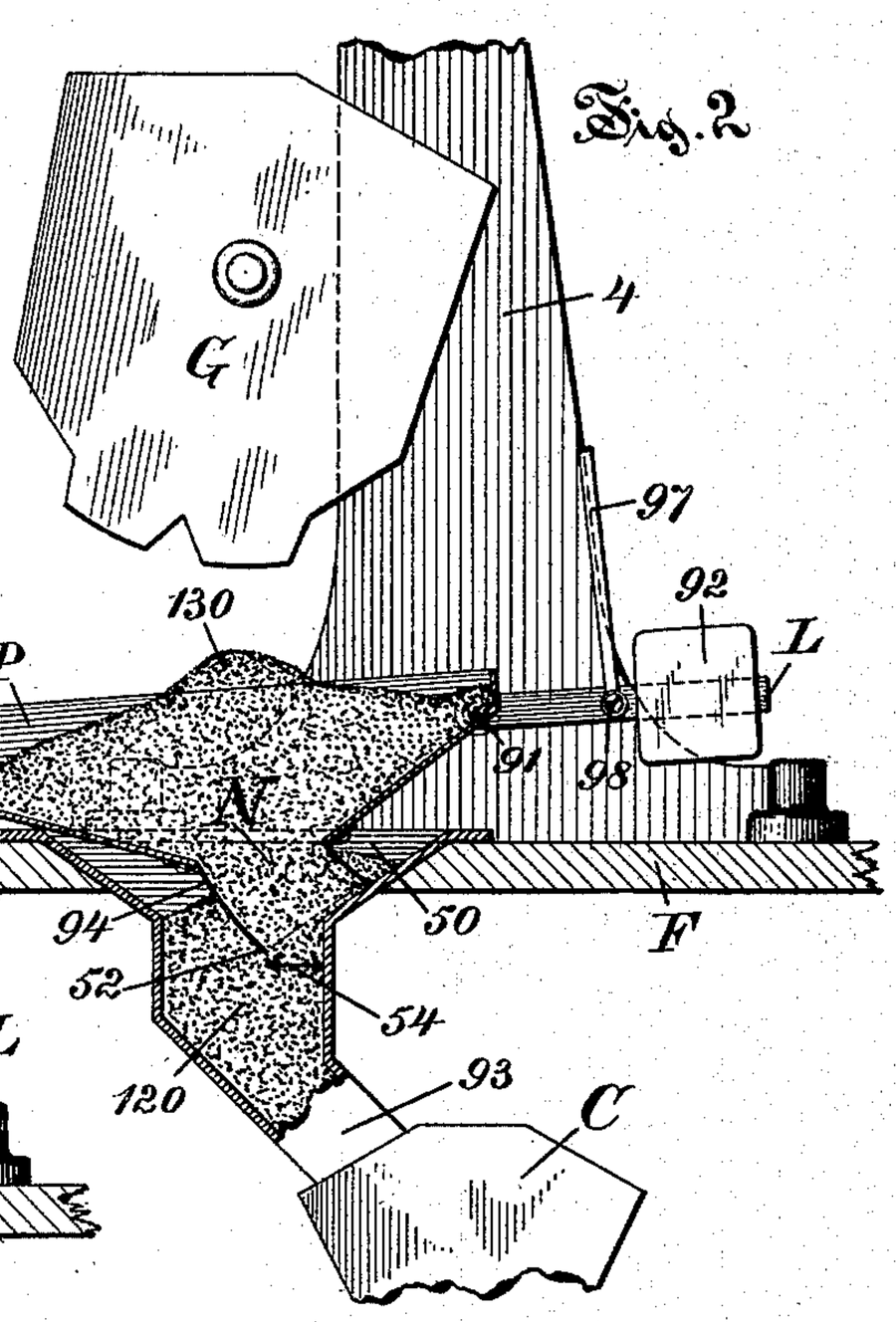
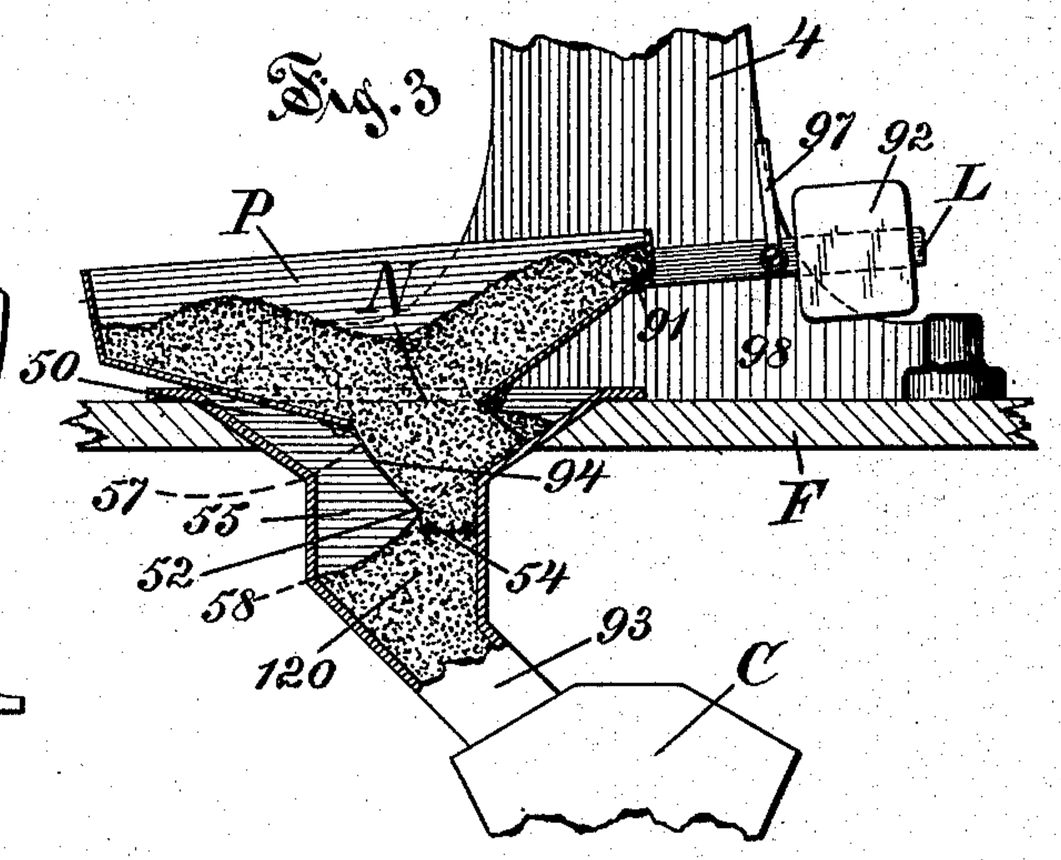


Fig. 3



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(No Model.) 2 Sheets—Sheet 2.

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Fig. 4

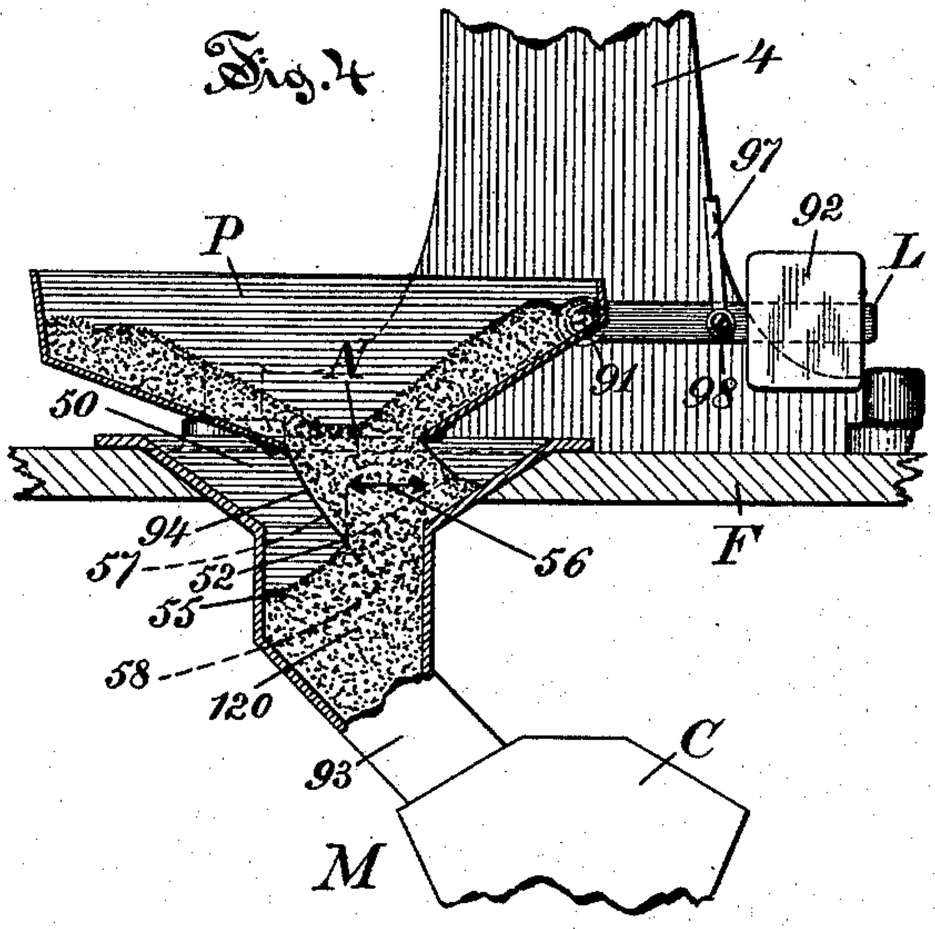
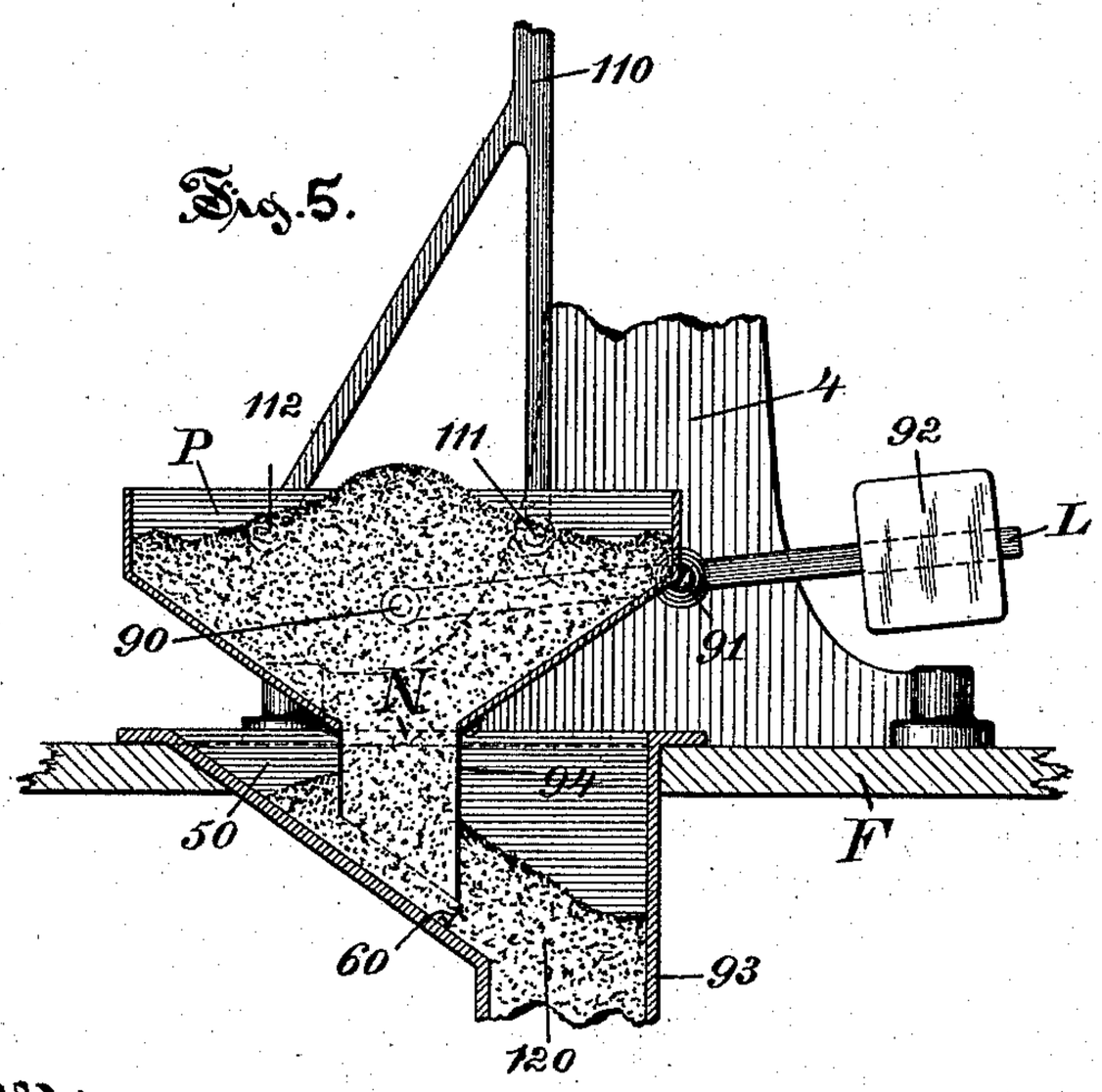


Fig. 5.



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UNITED STATES PATENT OFFICE.

FRANCIS H. RICHARDS, OF HARTFORD, CONNECTICUT, ASSIGNOR TO THE PRATT & WHITNEY COMPANY, OF SAME PLACE.

REGULATOR FOR GRAIN-SCALES.

SPECIFICATION forming part of Letters Patent No. 410,116, dated August 27, 1889.

Application filed November 9, 1888. Serial No. 290,393. (No model.)

To all whom it may concern:

Be it known that I, FRANCIS H. RICHARDS, a citizen of the United States, residing at Hartford, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Regulators for Grain-Scales, of which the following is a specification.

This invention relates to regulators for automatically controlling the operation of automatic grain-weighing machines, and more especially when these are operated in connection with some grain-working machine—as, for instance, a roller-mill—the object being to regulate the supply of grain to a grain-receiving machine of a given capacity by retarding, as required, the operation of a grain scale or meter of relatively larger capacity arranged to deliver grain to said receiving-machine.

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

In the drawings accompanying and forming a part of this specification, Figure 1 is a side elevation, partially in section, of a regulator apparatus embodying my improvements. Figs. 2, 3, and 4 are similar views of the principal parts of the apparatus shown in the preceding figure and illustrate the mode of operation of said apparatus. Fig. 5 shows a modification of the construction shown in the previous figure.

Similar characters designate like parts in all the figures.

My improved regulator apparatus is adapted to be used in connection with automatic grain-scales generally, and especially in connection with the improved grain-scale or grain-meter which is described in the prior application of C. H. Cooley, (to which I have permission to refer,) Serial No. 262,850, filed February 3, 1888; 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, shaft 72, arm or arms 96, carrying the regulator-valve 95, the vertically-movable regulator-hopper P, pivotally supported at 91 by the frame-work and having the lever L, the connections between the lever L and said valve 95, consisting of rod 97, pivoted to the lever at 98, and at 99 to an angle-lever 100, that is pivoted at 101 to the frame-work and connected by rod 102 to the valve, and the fixed conduit 93, located below the opening N of hopper P. The necessary and usual means for carrying and operating the grain-bucket are not shown in this application.

The pipe 93 leads downward to the receiving-chamber C of a roller-mill M, or other grain-working machine or apparatus that is to be fully supplied with grain by the said conduit 93. Such machines or apparatuses 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-scale (when an automatic grain-scale is used) of a normal capacity somewhat in excess of the maximum capacity of the machine M; but to successfully operate such automatic grain-scale for said purposes 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 scale. To attain this result by means of a simple and practical apparatus is the principal object of my present invention.

Under the discharge-opening N of the hopper P the conduit-pipe 93 is furnished with some suitable receiving tunnel or hopper, as 50, into which the grain is discharged from said opening. On the under side of the hopper P, surrounding said opening N, there is a depending and substantially rigid guard-pipe 94, whose form or longitudinal direction is in a line coinciding with the line of move-

ment of the said hopper P. By this means, and by reason of the part 94 being made thin enough, the said grain-dividing guard-pipe, which is usually made of sheet-steel and of firm construction, is readily forced down into the mass of grain 120 whenever the hopper descends from its position in Fig. 1 to that in Fig. 2, this hopper movement being effected by the mass of grain in said hopper P outside of the opening N.

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, and through pipe 93 into the normally oversupplied receiving-chamber C. Since the normal grain-discharging capacity of bucket G is greater than the actual grain-receiving capacity of machine M, it follows that said pipe 93, when once filled, will be kept full of grain, as indicated at 120, so that as long as the grain-scale is operating the machine M is normally oversupplied with grain. Supposing, now, the pipe 93 and the hopper P to have been filled, if the supply is then cut off while the machine M continues in operation, the grain then runs down, as indicated at 125, Fig. 1, and the said hopper rises, as there shown, being lifted by the counterbalance-weight 92. In doing this, however, the connections hereinbefore described draw back the regulator-valve 95 from underneath the chute H, which allows the grain to fill bucket G, and thus operate the grain-scale. On receiving its complete load said grain-bucket discharges the same into the said hopper P, as indicated at 130 in Fig. 2, and by thus heavily loading that hopper (by one or more bucket-loads) carries down the same, as in Fig. 3, thereby reversely operating valve 95, and again cutting off the supply of grain to the grain-bucket.

The operation of the hopper P and of the guard-pipe 94, in connection with grain-receiving conduit below said pipe, is a peculiar feature of my improvement. Under the conditions existing in this apparatus I find the guard-pipe 94, filled as it is with grain, to permit of that comparatively free movement of the regulator-hopper P which is necessary for properly working the regulator-valve.

The mode of operation above described appertains to the apparatus constructed in any of the forms shown in the drawings; but the form shown in Figs. 1 to 4, inclusive, embodies another feature. According to this part of my invention the hopper P is pivotally supported above the opening of conduit 93, and the pipe 94 is made curved concentric to said pivotal support. Consequently the lower edge 52 of said guard-pipe has a lateral as well as a vertical movement. This is shown by comparison of Figs. 1 and 2. In Fig. 1 the distance through the grain on line 53 is about equal to the width of pipe 94, while in Fig. 2 said distance is about one-half as much as in Fig. 1. The effect is therefore to vary the outlet for the grain according to the position of the hopper, the outlet being much reduced when the hopper is down, as in Figs. 1 and 2. The result of this variation is twofold—first, to reduce the rate of discharge from the hopper P into the conduit 93 while the said hopper stands lowered, and, second, to increase the rate of such discharge during the upward movement of the hopper. As a consequence of these features, when the hopper is once loaded and carried down, as in Fig. 2, it naturally remains down until the grain is well lowered in conduit 93, as shown in Fig. 3, leaving a considerable clear space at 55, and the slow discharge of grain through the reduced space 54 requires a longer time than would otherwise be required for the hopper P to be sufficiently unloaded to be raised again by weight 92, and when the time arrives, as shown in Fig. 4, that the said hopper begins to rise the widening opening 56 instantly (and constantly during said movement) increases the rate of discharge from the hopper. This action at once fills the space 55, (between the upper and lower limits 57 and 58, respectively,) thereby lightening the load in the hopper P by the quantity held in said space 55, regardless of and without the aid of the downward movement of the grain in the conduit 93, and the hopper P, being thus suddenly and certainly lightened by (relatively) so great a quantity, when it once starts up, immediately and quickly completes its upward stroke, thereby at once and fully opening the regulator-valve and starting the grain-scale into operation at its normal speed. This result is in practice of much importance in this delicate class of automatic machines, in which the error or variation of weighing is required to be within the one-tenth part of one per centum of the total quantity weighed, for it is considered established that a variation in the speed of the weighing-machine will to some extent vary the weight of the bucket-load. By my improvements, therefore, not only is the quantity of grain to be discharged duly regulated, but greater accuracy of the weighing is also insured.

In the modification shown in Fig. 5 the conduit 93 is set toward one side of the guard-pipe, and the latter is arranged to co-operate with one side of the tunnel 50 for effecting the said purpose. By the vertical movement of said guard-pipe the discharge-opening 60 will be increased or diminished similarly as described with respect of the form of apparatus shown in Figs. 1 to 4, inclusive. In this modification shown in Fig. 5 the levers L (one on either side of the hopper) are pivoted at 91 to the frame-work, and the hopper P is pivoted at 90 to the levers. (Only one lever L is shown.) The said hopper is held in an upright position by a connecting-rod

110, rigidly fixed thereto at 111 112 and connected at its upper end 114 to the arm 115 on the valve-shaft.

Having thus described my invention, I claim—

1. In a regulator for grain-scales, the combination of the regulator-hopper vertically movable, substantially as described, the fixed receiving-conduit below said hopper, and the guard-pipe depending from said hopper and having a motion in said conduit toward and from one side thereof, whereby the outlet from said hopper is reduced on the downward movement thereof, all substantially as described.

2. In a regulator for grain-scales, the combination of the oscillating hopper pivoted near one side thereof, the fixed receiving-conduit below said hopper, and the curved guard-pipe depending from said hopper concentrically to the pivot thereof and arranged to move toward and from one side of said conduit, whereby the outlet from the hopper is reduced on the downward movement thereof, all substantially as described.

3. In a regulator apparatus, the combination, with the regulator-valve, of the regulator-hopper connected to actuate said valve and vertically movable and counterbalanced, substantially as described, the fixed receiving-conduit below said hopper, and the guard-pipe depending from said hopper and having a motion in said conduit toward and from one side thereof, whereby the outlet from said hopper is reduced on the downward and increased on the upward movement thereof, and whereby the opening of the closed valve when once begun is fully completed, all substantially as described.

4. In a regulator apparatus, the combination of the pivotally-supported regulator-hopper P, having the discharge-opening N, the conduit 93 below said opening, and having the tunnel 50, and the curved guard-pipe 94, surrounding said opening and depending into the tunnel of said conduit, substantially as shown and described.

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