(No Model.) 2 Sheets—Sheet 1.

J. B. SOULE.

SAFETY CUT-OFF FOR GRAIN ELEVATORS.

No. 433,550. Patented Aug. 5, 1890.

Fig. 2.

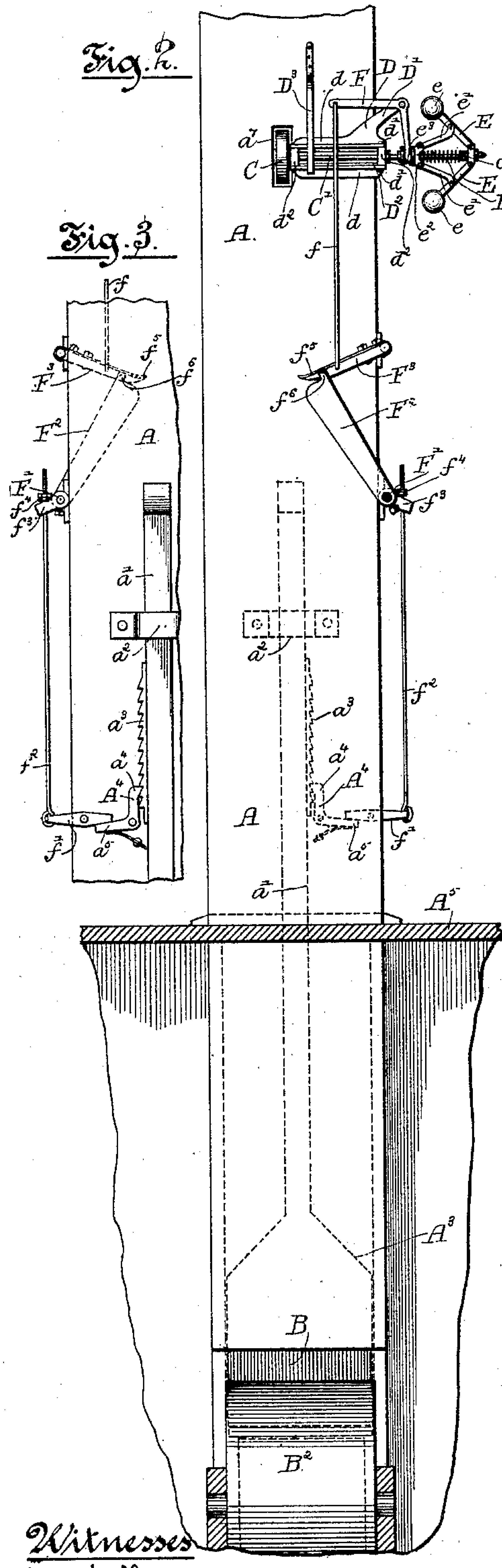
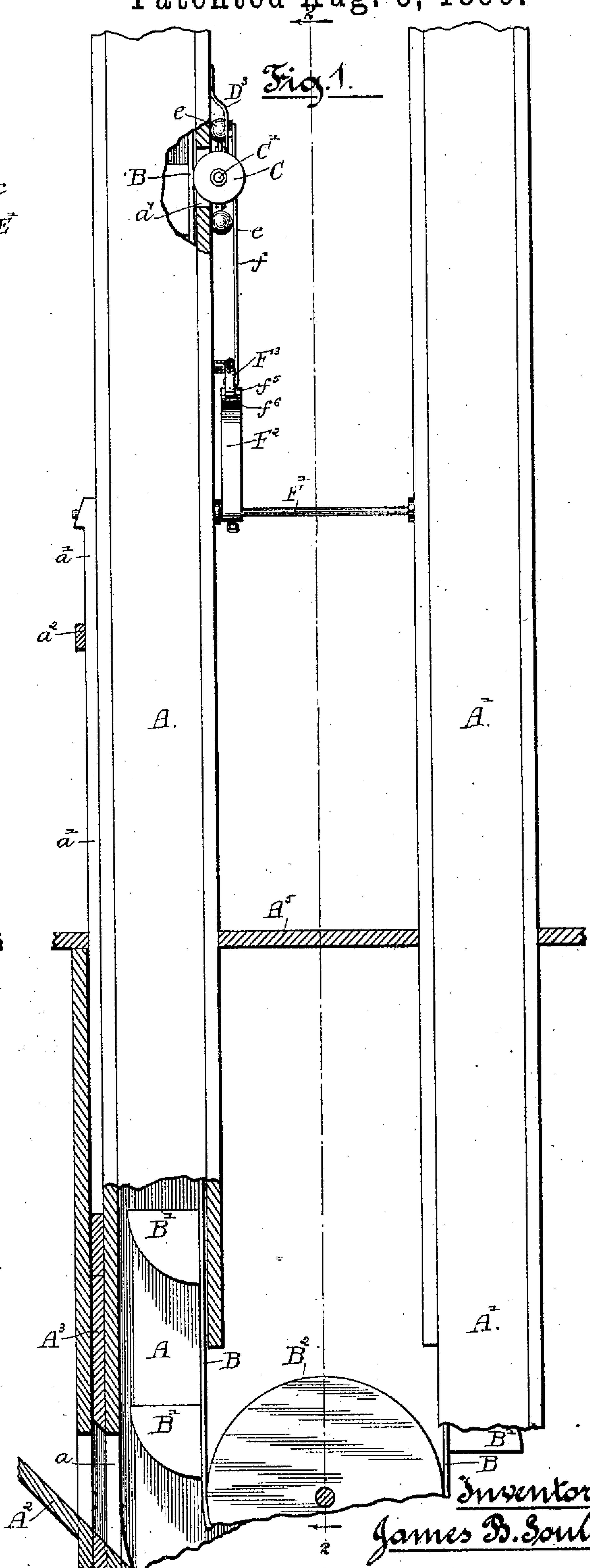


Fig. 3.

Fig. 1.



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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

(No Model.) 2 Sheets—Sheet 2.

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Fig. 5.

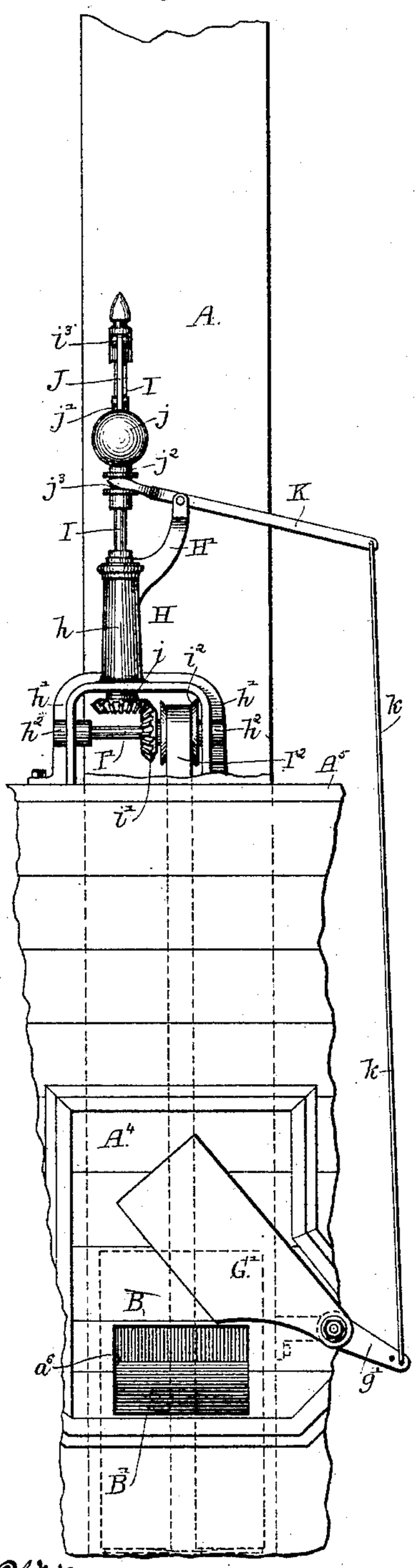
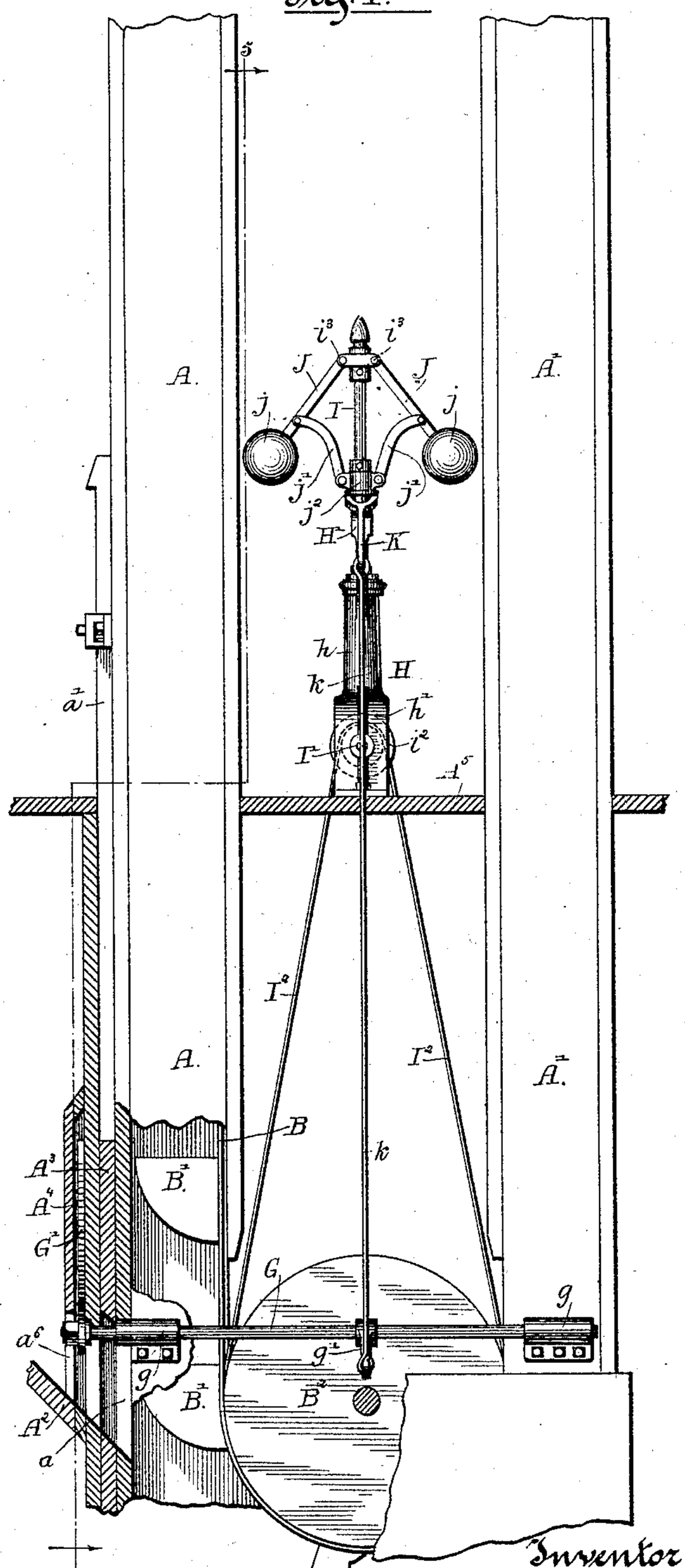


Fig. 4.



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UNITED STATES PATENT OFFICE.

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SAFETY CUT-OFF FOR GRAIN-ELEVATORS.

SPECIFICATION forming part of Letters Patent No. 433,550, dated August 5, 1890.

Application filed February 21, 1890. Serial No. 341,262. (No model.)

To all whom it may concern:

Be it known that I, JAMES B. SOULE, of Minneapolis, in the county of Hennepin and State of Minnesota, have invented certain new and useful Improvements in Safety Cut-Offs for Grain-Elevators; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to a novel safety device in the nature of an automatic cut-off for grain-elevators for the purpose of cutting off the supply of grain to the traveling elevator-buckets when from any cause their movement is impeded or stopped.

In grain-elevators it is highly important in case of the accidental stoppage of the traveling buckets that the supply of grain thereto be stopped, so as to permit the buckets to clear themselves of the obstruction and resume their normal operation, for the reason that the continued rotation of the driving-pulley in contact with the belt when the latter is not traveling at the same speed or is immovable is likely to create so much friction as to produce combustion, it being a fact well known to those familiar with grain-elevators that fires in such structures very often occur from this cause. It often happens that an elevator-belt becomes choked by accumulation of grain therein, in which case the movement of the belt is likely to be retarded or stopped, when combustion is soon produced by the friction of the driving-pulley against the belt.

My invention consists in its main or essential features of a gate or cutting-off device controlling the supply of grain to the elevator-leg, which gate or device is controlled by the movement of the belt and is adapted to close the grain-passage when the belt ceases to move or its speed decreases.

In an apparatus embodying the main features of my invention the gate for controlling the grain-passage can be made in any one of a great variety of different forms—as, for instance, it may consist of a suitable slide located in guides adjacent to the opening in the elevator-leg, or it may be pivoted so as to swing about a center and thus operate to control the said opening. The specific mechanism through the medium of which the control of said gate by the movement of the belt is effected may obviously be constructed in a variety of forms. The device for this purpose which is preferably employed, and is illustrated herein, consists of a revolving weight or weights arranged like those of a common steam-engine governor and driven by the belt and connected with the gate in such a manner as to hold said gate open during the time that said weight is thrown or held outward by centrifugal action.

The invention consists in the matters hereinafter fully described, and pointed out in the appended claims.

In the accompanying drawings, illustrating my invention, Figure 1 is a view, in side elevation and partly in vertical section, of the lower portions of the legs of a grain-elevator with safety cut-off devices applied thereto constructed in accordance with my invention. Fig. 2 is a rear elevation of the up-leg of the same, taken on the line 2 2 of Fig. 1. Fig. 3 is a front elevation of a portion of one of the legs. Fig. 4 is a side elevation, partly in vertical section, of the lower portions of the legs of a grain-elevator having an automatic safety cut-off device embracing a modified form of construction embodying my invention. Fig. 5 is a vertical sectional view of the same, taken on the indirect line 5 5 of Fig. 4.

As shown in Figs. 1, 2, and 3, A indicates the up and A′ the down leg of an elevator-casing, and B a belt running therein and provided with a series of buckets B′ B′.

B^2 is the lower or boot pulley of the elevator.

The upper or head pulley, which is driven by the actuating machinery of the elevator and gives motion to the belt, is not shown in the drawings, as it constitutes no part of the present invention.

C is a smooth-faced wheel or pulley inserted through the hole or opening a^7 in the casing A and adapted to bear against the rear surface of the belt B. Said pulley is attached to a shaft C′, which is mounted upon the elevator-casing or an adjacent stationary support in such manner that the said pulley C is

movably sustained and is adapted to be held yieldingly against the belt.

In an application for Letters Patent, Serial No. 334,039, filed by me in the United States Patent Office December 17, 1889, I have shown parts similar in construction to the parts above described, and like the devices hereinafter described for sustaining said shaft, which are constructed as follows:

D is a metal frame or casting secured to the elevator-casing A adjacent to the hole a^7, and provided with outwardly-projecting parallel flanges d d, between which is pivoted a swinging frame D^2, said frame being pivotally connected with the said casting at its outer end, or that remote from the pulley C, by means of pivots d' d'. The shaft C′ has bearings d^2 d^2 at opposite ends of said frame D^2, which frame is adapted to swing in and out between the flanges d d at its end nearest the pulley, thereby allowing the said pulley to be moved bodily toward and from the belt B.

D^3 is a spring acting against the frame D^2 and tending to thrust or hold the free end of said frame inwardly toward the elevator-casing, and to thereby press or hold the pulley C yieldingly against the elevator-belt. The said spring is shown as of leaf form and secured at one end to the casing A, with its free end pressing against the frame D^2; but a spring for the same purpose may be otherwise constructed or applied, as found convenient or desirable in practice. By the construction described the pulley is held with its periphery in contact with the belt, whereby continuous rotary motion is given to the pulley and its shaft during the time the belt is running, the pulley being held yieldingly or by spring-pressure against the belt in order to insure its contact with the same at all times.

To the outer end of the shaft C′ and to a ring or collar c, rigidly secured thereto, are pivoted two arms E E, provided in their outer or free ends with weights e e. The said arms E E are connected by means of links e' e' with a sliding sleeve or collar e^2, mounted upon the shaft C′ and turning with the same.

E′ is a coiled spring surrounding the shaft C′ and located between the fixed collar c and the sliding collar e^2. Said spring E′ acts by expansion and tends to thrust the sleeve e^2 inwardly upon the shaft, and to thereby throw the weights e of the arms E inwardly or toward said shaft. Said sliding collar is provided with an annular groove e^3, which is engaged by the forked end of the vertical or upright arm of a bell-crank lever F, which is pivotally supported upon the arm D′ of the casting D, hereinbefore described. The said bell-crank lever F is connected by means of a rod or bar f, or otherwise, with the devices for controlling the opening or grain-passage of the elevator. When the belt is running at the usual speed and the shaft C′ revolving, the weights e are thrown outwardly by centrifugal force, thereby thrusting the sleeve e^2 outwardly against the action of the spring E′ and depressing the horizontal arm of the bell-crank lever F. As soon, however, as the belt slackens up or stops and the centrifugal action of the weights decreases or ceases the spring E′ will thrust the sliding collar e^2 inwardly, and thereby elevate the horizontal arm of the bell-crank lever.

The devices for controlling the opening or grain-passage of the elevator employed in connection with a construction of this character are so arranged that they will remain inactive and keep the grain-passage open when the belt is running at the normal speed. Such controlling devices are so arranged, however, that as soon as the speed of the belt decreases the spring will act to permit the movement of the controlling devices to close the said grain-passage. As shown in said Figs. 1, 2, and 3, the leg A of the elevator extends downwardly near the bottom of the grain-pit A^2, (partly shown in Fig. 1,) and is there provided with an opening or grain-passage a.

A^3 is a sliding gate or door located in vertical or upright slides upon the elevator-leg adjacent to the opening a therein and adapted to close said opening. The said gate is provided with an upwardly-extending handle or bar a', by means of which it is operated, said handle being guided in its upper part by a bracket or guide a^2. In operation the said gate is lifted by hand or otherwise to open the grain-passage and is held in its elevated position by devices connected with the bell-crank lever F, which is actuated by the revolving weights e, said devices being constructed to release the said gate A^3 when the motion of the belt is retarded or its speed decreases, as hereinbefore described. When the said gate is released, its weight is sufficient to cause it to drop within its guides, and thereby partially or fully close the grain-passage a.

The devices for holding and releasing said gate are constructed as follows: The said handle a' of the gate is provided on one of its sides in its upper portion with a rack-bar a^3, the teeth of which have downwardly-facing horizontal faces. A spring-actuated pawl A^4 is located upon the front side of the casing of the leg A and in position to engage one of the teeth in the lower part of the rack-bar a^3 when said gate is in an elevated position. The said pawl A^4 is made in the form of a bell-crank lever, with its vertical or upright arm a^4 adapted for engagement with the rack-bar, while its horizontal arm a^5 extends outwardly toward one side of the leg A, in position to be engaged on its upper surface by one arm of a lever f', pivoted to the casing of the leg A. The other arm of said lever f' is connected by means of a rod or bar f^2 with a lug or arm f^3, fixed upon a horizontally-arranged rock-shaft F′, supported in bearings upon the legs of the elevator, as shown. The upper end portion of the rod f^2 is screw-threaded and passes through a smooth perforation in said lug f^3, and is provided above

said lug with an abutting-nut f^4 for regulating the length of the rod f^2.

F^2 is a weighted arm fixed to the rock-shaft F′ and so located thereon with reference to the lug f^3 that when said lug stands in a substantially horizontal position the arm F^2 will stand in an upwardly-inclined position on the other side of said shaft.

F^3 is a vibrating arm pivoted to the casing and provided with a spring-catch f^5, adapted to engage a lug f^6 on the upper end of the weighted arm when the latter stands in the upwardly-inclined position before mentioned. The said vibrating arm F^3 is connected with the lower end of the rod f. It will thus be obvious that when the belt is running at the usual speed and the weights e stand outwardly the arm F^3 and spring-catch f^5 will be held down in engagement with the weighted arm F^2 by means of their connection with the sliding collar e^2 on the shaft C′, connected with the weights.

The operation of the parts above described is as follows: In the drawings the parts are shown in the position maintained by them when the device is in operation with the belt running at a normal speed. In this position the weights e are extended and the collar e^2 thrust outwardly, thereby depressing the horizontal arm of the bell-crank lever F, which allows the spring-catch f^5 to descend and engage the upper end of the weighted arm F^2. The gate A^3 is held in an elevated position by the engagement of the pawl A^4 therewith. If from any cause the movement of the belt is impeded, the weights will turn more slowly and the spring E′ will thrust the sliding collar e^2 inwardly upon the shaft C′, and thereby elevate the horizontal arm of the bell-crank lever F, which raises the spring-catch f^5 and releases the weighted arm F^2. Upon being released said arm F^2 will fall, thereby turning the shaft F′ and raising the lug f^3, which by means of the rod f^2 swings the lever f' on its pivot and depresses the end in contact with the pawl and draws said pawl from engagement with the rack-bar a^3. The handle of the gate thus being released, said gate falls by its own weight and closes or partially closes the grain-passage a and lessens or prevents the entrance of grain into the said up-leg of the elevator.

As before mentioned, the safety cut-off device herein described is intended for operation in cases where the movement of the elevator-belt is accidentally impeded, as it often occurs from the grain being clogged therein or from other causes. It is obvious that in such cases if the supply of grain to the buckets is discontinued as said buckets unload their contents the load upon the belt is materially lessened, so that additional force can be directed against whatever obstruction impedes the progress of the belt to remove such obstruction and permit the belt to travel at its normal speed. When said belt resumes its normal speed, the weights e are again thrown outwardly, thereby depressing the vibrating lever F^3 and spring-catch f^5 In the form of construction shown in said Figs. 1, 2, and 3 it is necessary for an attendant to lift the gate to open the grain-passage, which is done in an obvious manner. It is preferable in setting the safety device to first swing the weighted arm F^2 upwardly until it engages the spring-catch f^5, which movement, through the intermediacy of the lug f^3, rod f^2, and lever f', permits the pawl A^4 to spring into position to engage the rack-bar a^3. When the parts are in this position, the gate can be easily lifted by hand until the grain-passage is opened and will be held in such position by the engagement of the pawl with the rack-bar.

It will be obvious that the change of speed on the part of the belt necessary to effect the operation of the safety cut-off devices is entirely arbitrary, and the parts can be so constructed that said devices will be operated at any predetermined change of speed.

In Figs. 4 and 5 is shown a modified form of construction embodying my invention. In this form of device the same general object is attained—namely, the closing of the inlet-passage of the elevator when the speed of the belt decreases; but the devices are further adapted for automatically opening said passage when the belt resumes its normal speed. In said figures, A A′ indicate the legs of the elevator; A^2, the lower portion of the grain-pit; B, the elevator-belt; B′ B′, the buckets thereon, and B^2 the lower or boot pulley. The said up-leg A is provided, as before described, with an opening or grain-passage a, adapted to be closed by means of a gate or slide A^3 in the ordinary manner.

Upon the front side of the leg A above and surrounding the opening a a casing or housing A^4 is located. The sides of said housing extend downwardly on either side of the opening a to the bottom of the pit, and the front of said housing is provided with an opening a^6 opposite the said opening a.

G indicates a rock-shaft supported in bearings g g secured to the sides of the elevator-legs. The end of the said rock-shaft G adjacent to the up-leg of the elevator extends into the housing A^4 thereon, and is provided with a gate or shutter G′, which is adapted to open and close the opening a^6 when the said rock-shaft is turned in its bearings. The said rock-shaft is provided with a crank-arm g' conveniently at a point about midway between its bearings, which arm serves as means for turning the shaft. The devices for moving said arm g' are operated by the movement of the belt, and are so constructed that when the said belt is traveling at its normal speed the gate or shutter is held in a retracted position, so as to leave open the grain-passage to the elevator. Said devices for controlling the movement of the shutter G′ are constructed as follows:

H is a frame conveniently located and se-

cured upon the floor A^5 of the structure above the grain-pit and between the legs of the elevator. Said frame H comprises a tubular upright portion *h* supported by legs *h' h'*. The tubular upright portion *h* serves as a bearing for a shaft I passing therethrough, said shaft I being provided at its lower end between the frame-legs *h'* with a bevel gear-pinion *i*, which intermeshes with a bevel gear-pinion *i'*, mounted upon a shaft I', which shaft is mounted in bearings h^2 h^2 upon the legs *h'* in an obvious manner. The said shaft I' is also provided with a belt-pulley i^2.

I^2 indicates a belt which is trained over the pulley i^2 and the boot-pulley B^2 of the elevator, said belt I^2 being located between the elevator-belt and said pulley B^2, as shown in Fig. 4. The upright shaft I extends a considerable distance above the upper end of the upright *h*, and is provided at its upper end with two arms J J, pivoted to lugs i^3 i^3 fixed to said shaft I. Weights *j j* are secured to the outer ends of the arms J, and said arms are connected by means of links *j' j'* with a sliding collar j^2, mounted upon the shaft I, said links *j'* being pivotally connected with both the arms and collar. Said sliding collar is provided with an annular groove j^3, which is engaged by the forked end of a lever K. The lever K is pivotally supported by means of a laterally-projecting arm or bracket H' upon the upright portion *h* of the frame H. The other end of the lever K is connected with the arm *g'* on the rock-shaft G by means of a rod or bar *k*.

In operation it is obvious that when the boot-pulley B^2 is turning the shaft I will also turn through the intermediacy of the gearing connecting said parts. In the drawings the parts are shown in the position they will assume when the elevator-belt is traveling at its normal speed. In such case the weights *j* are thrown outwardly by centrifugal force, thereby lifting the sliding collar j^2 and the inner end of the lever K, which depresses the outer end thereof and swings the arm *g'* on the rock-shaft downwardly. This latter movement turns said rock-shaft in its bearings, with the effect of lifting the gate G' from the opening a^6. The parts will remain in this position until the speed of the belt decreases, whereupon the weights *j* move inwardly, and the movement of the parts is reverse of that above described, which closes the gate G' over the opening a^6 in an obvious manner. As soon, however, as the elevator-belt attains its normal speed the weights are again thrown outwardly, and thus the gate is open.

It is obvious that the extent to which the opening a^6 will be closed when the speed of the belt decreases will be in proportion to the change of speed.

I claim as my invention—

1. The combination, with an elevator-belt, of a movable gate controlling the supply of grain to the belt, a pulley driven by the belt, and mechanism actuated by the pulley and embracing a movable part which is shifted in position by a change of speed in the pulley and which is connected with and actuates the gate, substantially as described.

2. The combination, with an elevator-belt, of a movable gate for controlling the supply of grain to the belt, a pulley driven by the belt, and mechanism actuated by the pulley and embracing a movably-supported revolving weight, and connections between said weight and the gate by which the gate is actuated when the weight is shifted in position by a change of speed in the pulley, substantially as described.

3. The combination, with an elevator-belt, of a self-closing gate controlling the supply of grain to the belt, a pulley driven by the belt, a catch holding the gate in its retracted position, mechanism actuated by the pulley and embracing a movably-supported revolving weight, and connections between said weight and the catch, whereby the latter is released when the weight is shifted by a reduction in the speed of the pulley, substantially as described.

4. The combination, with an elevator-belt, of a gate controlling the supply of grain to the belt, a catch holding the gate in its retracted position, a weighted arm acting upon said catch for disengaging it from the gate, a second catch engaging and supporting the weighted arm, a pulley driven by the belt, mechanism actuated by the pulley and embracing a movably-supported revolving weight, and connections between the said weight and the catch last mentioned, whereby the weighted arm is released when the weight is shifted by a reduction in speed of the pulley, substantially as described.

5. The combination, with an elevator-belt, of a gate controlling the supply of grain to the belt, a catch holding the gate in its retracted position, a weighted arm acting upon said catch for disengaging it from the gate, a pivoted arm provided with a spring-catch adapted for engagement with the said weighted arm when the latter is elevated, a pulley driven by the belt, mechanism actuated by the pulley and embracing a movably-supported revolving weight, and connections between the said weight and the said pivoted arm, whereby the weighted arm is released when the weight is shifted by a reduction in the speed of the pulley, substantially as described.

6. The combination, with an elevator-belt, of a gate for controlling the supply of grain to the belt, a catch holding the gate in its retracted position, a weighted arm acting upon said catch for disengaging it from the gate, a second catch engaging and supporting the weighted arm, a pulley driven by the belt, a revolving shaft deriving motion from said pulley, a movably-supported weight mounted upon said shaft, a spring acting in opposition to the outward movement of the weight, a sliding collar upon said shaft connected with

said weight, and a lever engaging said sliding collar and connected with said pivoted arm, substantially as described.

7. The combination, with an elevator-belt, of a gate controlling the supply of grain to the belt, a pulley in contact with the belt, a shaft supporting the pulley, a pivotally-supported frame affording bearings for the shaft, a spring acting against the frame to hold the pulley yieldingly against the belt, and mechanism actuated by the pulley and embracing a movably-supported revolving weight, and connections between said weight and the gate by which the gate is actuated when the weight is shifted in position by a change of speed in the pulley, substantially as described.

8. The combination, with an elevator-belt, of a pulley in contact with the same, a shaft upon which said pulley is mounted, a pivotally-supported frame affording bearings for the shaft, a spring acting upon the frame to hold the pulley in contact with the belt, a weight movably sustained upon the said shaft, a spring acting in opposition to the centrifugal action of the weight, a sliding collar upon said shaft connected with the weight, and connections between the said sliding collar and the gate by which the gate is actuated when the weight is shifted in position by a change of speed in the pulley, substantially as described.

In testimony that I claim the foregoing as my invention I affix my signature in presence of two witnesses.

JAMES B. SOULE.

Witnesses:
G. H. DICKEY,
J. W. O'HARROW.