(No Model.) 4 Sheets—Sheet 1.

J. B. SOULE.

SAFETY ALARM FOR ELEVATOR OR OTHER BELTS.

No. 433,549. Patented Aug. 5, 1890.

Fig 1.

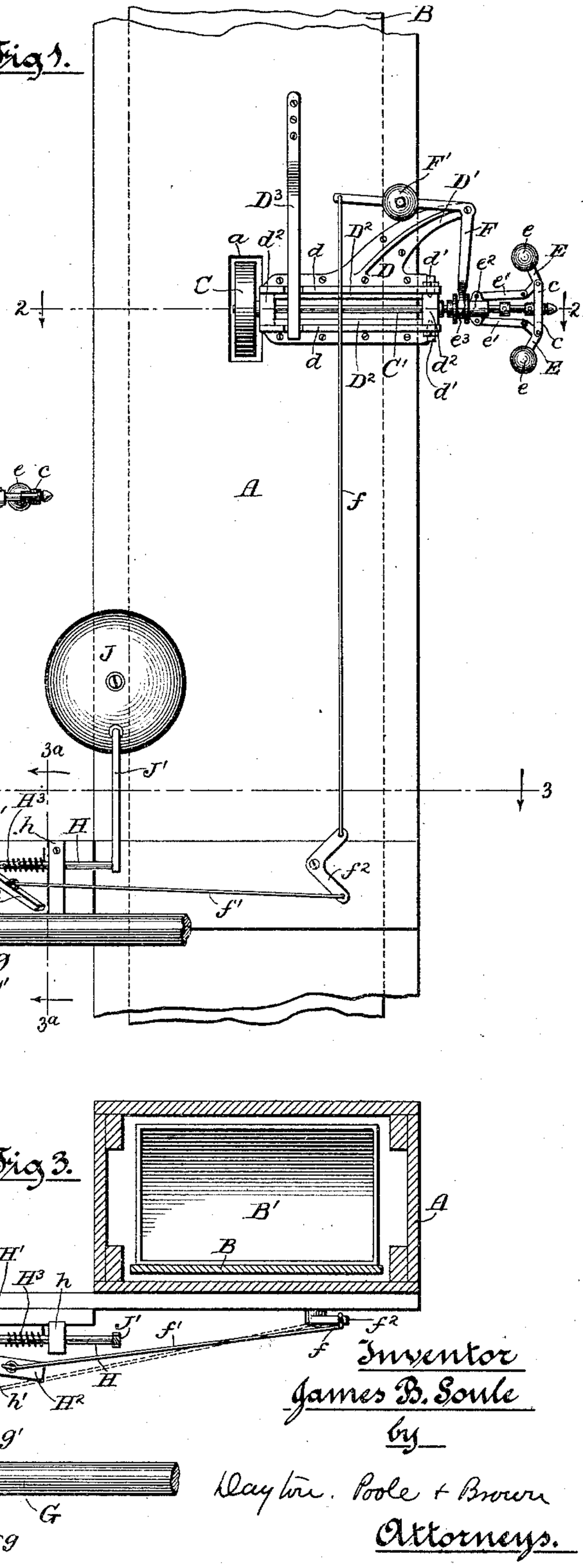

Fig 2.

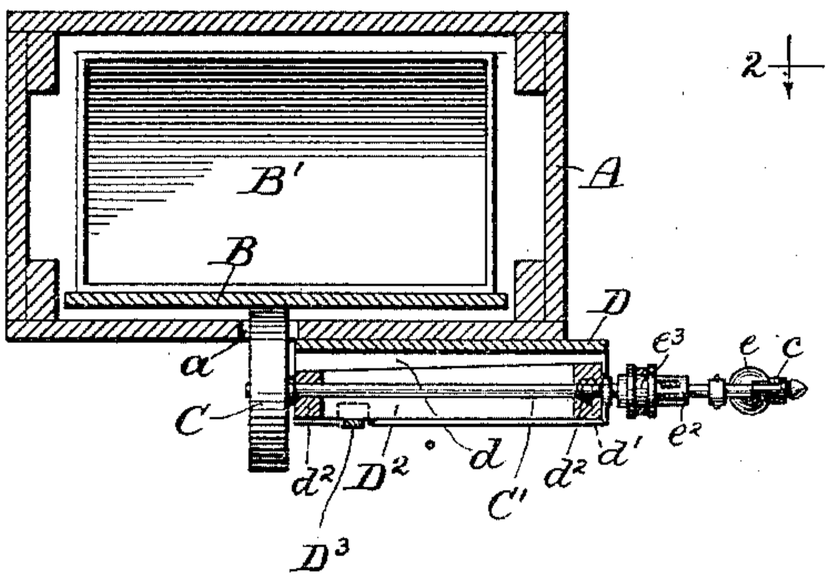

Fig 3a.

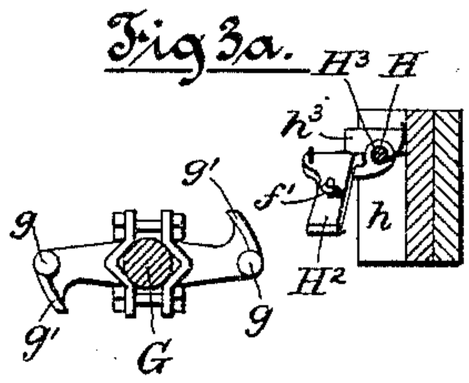

Fig 3.

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(No Model.) 4 Sheets—Sheet 2.

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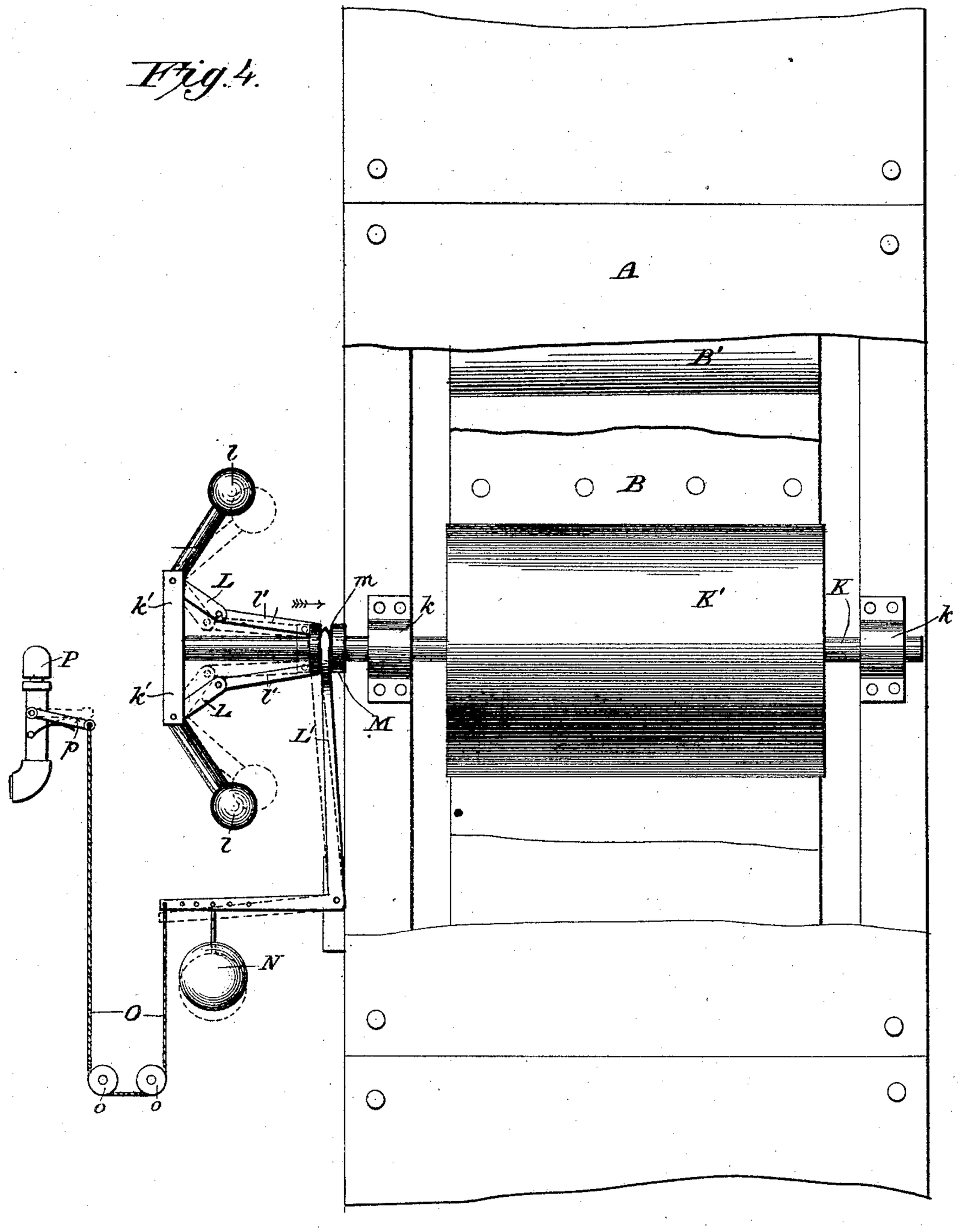
Fig. 4.



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J. B. SOULE.

SAFETY ALARM FOR ELEVATOR OR OTHER BELTS.

No. 433,549. Patented Aug. 5, 1890.

Fig. 5

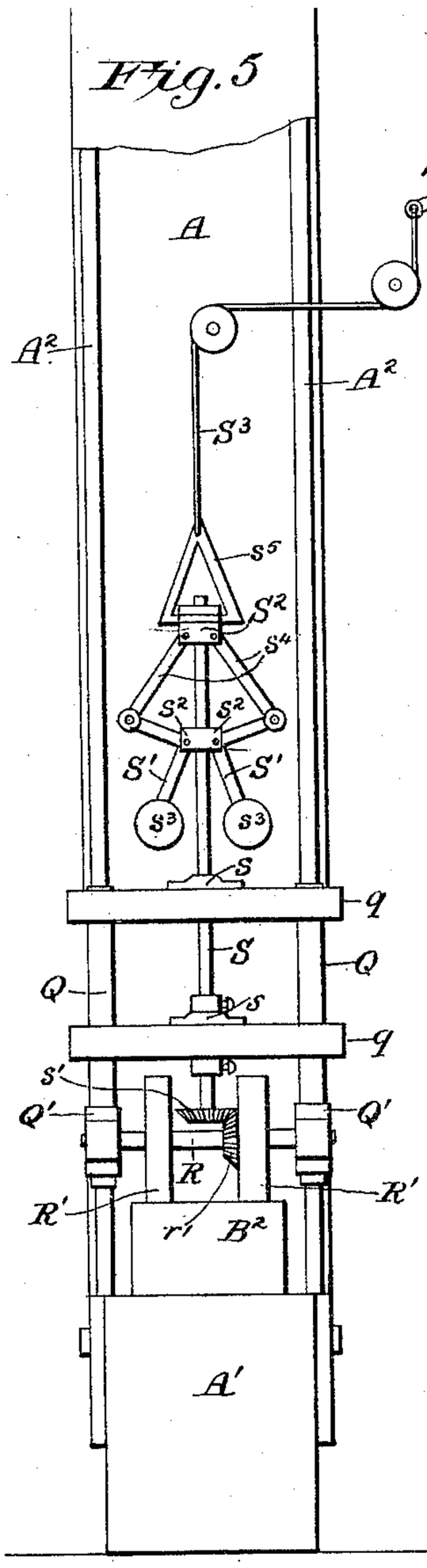
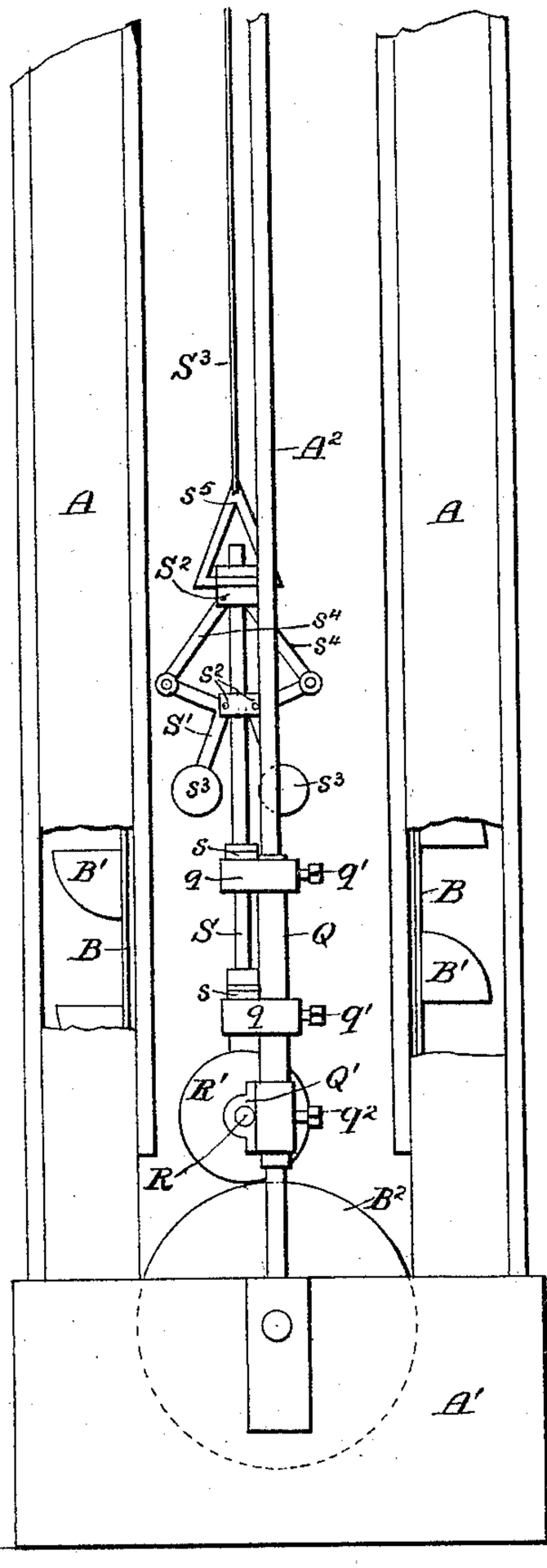


Fig. 6.



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SAFETY ALARM FOR ELEVATOR OR OTHER BELTS.

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Fig 7.

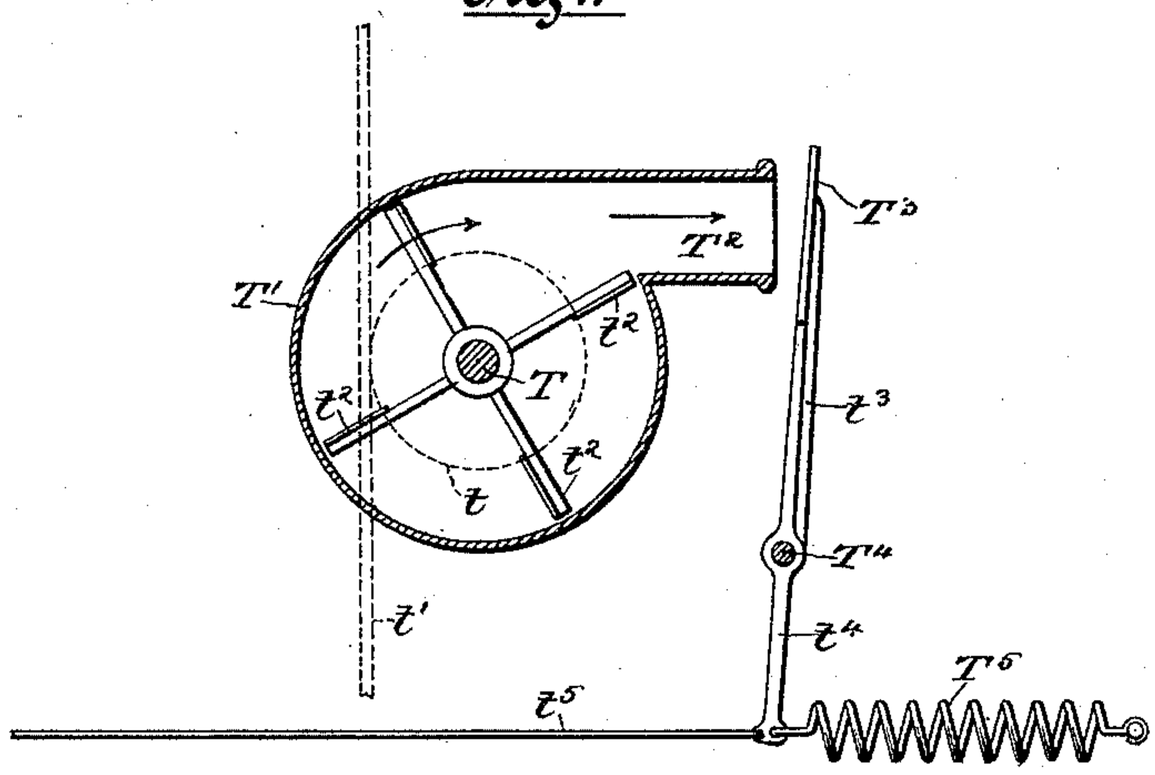
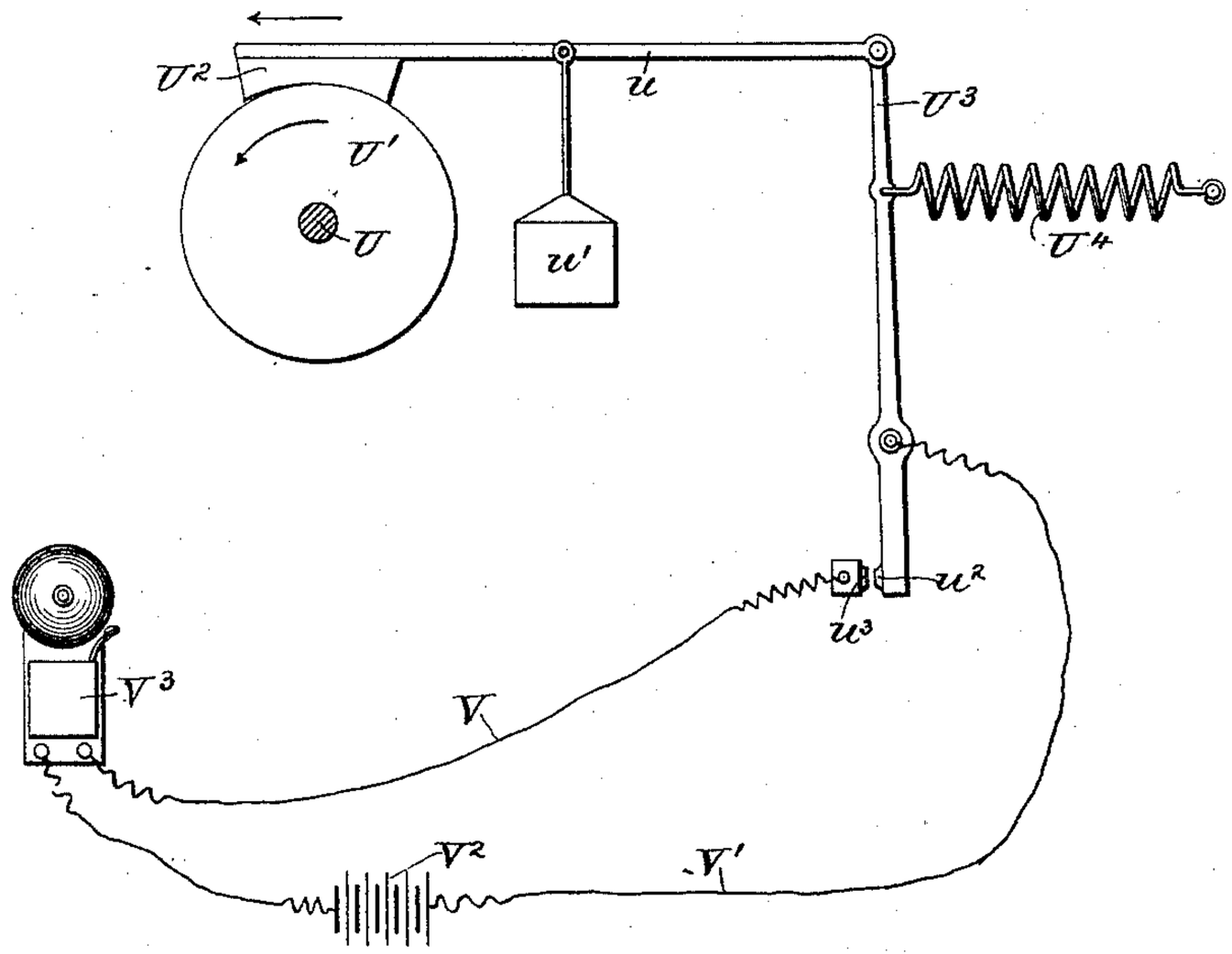


Fig 8.



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UNITED STATES PATENT OFFICE.

JAMES B. SOULE, OF MINNEAPOLIS, ASSIGNOR OF ONE-FOURTH TO ROLLIN R. SMITH AND GUSSIE R. SMITH, BOTH OF DULUTH, MINNESOTA.

SAFETY-ALARM FOR ELEVATOR OR OTHER BELTS.

SPECIFICATION forming part of Letters Patent No. 433,549, dated August 5, 1890.

Application filed December 17, 1889. Serial No. 334,039. (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-Alarms for Elevator or other Belts; 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 indicator or signaling apparatus for the purpose of indicating an accidental stoppage of elevator-belts, or belts used for transmitting power.

The prompt indication of an accidental stoppage of a belt is highly important, especially in the case of elevator-belts, for the reason that the continued rotation of the driving-pulley in contact with the belt when the latter is held immovable is likely to create so much friction as to produce combustion, it being a fact well known to those familiar with grain-elevators, for example, that fires in such structures very often occur from this cause. It often happens that such an elevator-belt becomes choked by accumulation of grain therein, in which case the belt is likely to be stopped, when fire is soon produced by the friction of the driving-pulley against the belt. By the use of an indicating device for calling attention of the operator to the stoppage of the belt at the instant the same occurs the machinery may be stopped, or other precaution taken, so as to avoid the disastrous results likely to arise from the stoppage of the belt. The same results are likely to ensue from the stoppage of belts other than those employed in elevators, and the use of a signaling device or indicator showing instantly the stoppage of any belt which rests in contact with a live or driving pulley may be fully as advantageous as the use of a similar apparatus in connection with an elevator-belt.

The invention consists, in its main or essential features, of an indicator or signaling device which is actuated by means independent of the parts driven by the belt or the belt itself, and controlled by the movement of the belt and which is adapted to show, by giving an audible alarm or otherwise, when the belt ceases to move. In an apparatus embodying the main features of my invention the signaling device may be made in any one of a great variety of different forms—as, for instance, it may consist of a steam-whistle or bell, which will be sounded to give an audible alarm, or it may be in the nature of an indicator, showing to the eye the stoppage of the belt. In cases where a number of belts are under the control of one person the signaling device may have the form of an annunciator provided with a call-bell and arranged to indicate which of the several belts have stopped. The signaling device, furthermore, may be located adjacent to the belt for the observation of a person working near the same, or it may be located at a distant point in the same building or elsewhere. Furthermore, the alarm may be transmitted from the belt to the signaling device either by mechanical means or by the use of an electric circuit. The specific mechanism, through the medium of which the control of the indicating device by the movement of the belt is effected, may be constructed in a variety of forms. One device for the purpose, which I have employed in practice, and which for some reasons I prefer to any other herein suggested, consists of a revolving weight or weights arranged like those of the common steam-engine governor and driven by the belt, and connected with the signaling device in such manner as to hold said signaling device out of operation or inactive during the time that said weight is thrown or held outward by centrifugal action. Other devices may, however, be employed with the same general effect—as, for instance, a blast of air created by a fan driven from the moving belt may be employed to hold the signaling mechanism out of action, or a shoe or block in frictional engagement with a pulley driven by the belt may be employed for the same purpose.

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

In the accompanying drawings, illustrating my invention, Figure 1 is a face view of one

desirable form thereof. Fig. 2 is a sectional view taken upon line 2 2 of Fig. 1. Fig. 3 is a plan section of the same taken on line 3 3 of Fig. 1. Fig. 3ª is a section taken on the lines 3ª 3ª of Fig. 1. Fig. 4 is a view in front elevation of another form of apparatus embodying my invention. Figs. 5 and 6 are side and front elevations of an elevator casing and belt provided with signaling apparatus embodying another form of my invention. Figs. 7 and 8 are diagrams illustrating other ways of carrying out the main features of the invention.

As shown in Figs. 1, 2, 3, and 3ª, A indicates one of the parts or legs of an elevator-casing, and B a belt running therein and provided with a series of buckets B′ B′. C is a smooth-faced wheel or pulley inserted through the hole or opening *a* 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.

The devices shown for sustaining said shaft, as above described, are constructed as follows:

D is a metal frame or casting secured to the elevator-casing A adjacent to the hole *a*, 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 said shaft C′ are fixed two rigid arms *c c*, in the outer ends of which are pivoted two bell-crank levers E E, the outer and longer arms of which are provided with weights *e e*. The inner or shorter arms of said bell-crank levers 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. Said collar is provided with an annular groove e^3, which is engaged by the forked end of a bell-crank lever F, which is pivotally supported upon the arm D′ of the casting D, hereinbefore described.

The upright or vertical arm of the bell-crank lever F is engaged with the sleeve e^2, and the horizontal arm thereof is provided with a weight F′, which tends to move the bell-crank lever in a direction to thrust the sleeves e^2 outwardly upon the shaft, and to thereby throw the weights *e e* of the bell-crank levers inwardly or toward said shaft. The weight F′ is adjustable upon the arm of the bell-crank lever, and may be shifted to act with more or less leverage in accordance with the resistance to be overcome by the weight, or other considerations arising in practice. The said bell-crank lever F is connected by means of a wire *f*, or otherwise, with the indicator or signaling device of the apparatus. When the belt is running and the shaft C′ revolving, the weights *e e* are thrown outwardly by centrifugal force, thereby thrusting the sleeve e^2 inwardly upon the shaft and moving the bell-crank lever F against the action of the weight thereon. As soon as the belt stops and the centrifugal action of the weights *e e* ceases, however, the weight F′ will depress the horizontal arm of the bell-crank lever F, and thereby throw the sleeve e^2 outwardly and bring the said weights *e e* toward the shaft. The signaling device employed in connection with a construction of this character is so arranged that it will remain inactive whenever the belt is running and the weight F′ is lifted; or it may be arranged to display at such time a signal indicating that the parts are operating properly. Such signaling device is so arranged, however, that as soon as the belt stops the weight F′ will act to move or permit the movement of the indicator or alarm device.

As shown in said Figs. 1, 2, 3, and 3ª, the signaling device is of the character of an alarm mechanism embracing a bell or gong, and said signaling device is actuated by a revolving shaft forming part of the mechanism which actuates the elevator-belt, so that the signaling device can come into operation only at times when the belt is moving. In other words, the signaling device is driven by one of the moving parts of the elevator mechanism, so that the customary stoppage of the elevator-belt at night, or when all of the other machinery in the elevator is stopped, will produce no alarm.

As shown in said Figs. 1, 2, 3, and 3ª, G is a revolving shaft forming part of the actuating mechanism by which the elevator-belt is operated. Attached to said shaft are two radial arms G′ G′, having on their outer ends lugs or strikers *g g*, extending parallel with the shaft, and having straight transverse advance edges and beveled or inclined rear edges, as indicated at *g′ g′*. H is an oscillat-

ing shaft arranged parallel with the shaft G and mounted in suitable stationary bearings *h h*. Attached to said shaft is a short rigid arm H′, to which is pivoted a second arm H², adapted to swing on a pivot *h′*, arranged at right angles with the shaft H, so that said arm H² is adapted to swing in a plane parallel with the axis of the shaft H. The said arm H² is so arranged that when swung upon its pivot *h′* its outer or free end may be brought into the path of the strikers *g g*, or swung clear of the same. A spring H³, secured to the shaft H and to an adjacent stationary part, serves to throw said shaft in a direction opposite to that in which it will be turned or moved by the contact with the arm H² of the strikers *g g*. When the said arm H² is encountered by one of the strikers *g*, said arm is swung around against the action of the spring H³ until the striker passes the arm, when the arm is released and allowed to spring backward under the action of said spring. The backward movement of the arm H² under the action of said spring H³ is limited by a suitable stationary stop *h³* located in position to be encountered by the rigid arm H′. It follows from this construction that when said arm H² is located in position for engagement with the strikers *g g* said arm and the shaft H will be given a continuous oscillatory movement by the contact of the strikers therewith during the turning of the shaft. A spring I is applied to the arm H² for the purpose of throwing the said arm into position for engagement with the strikers *g g*. Such spring may be arranged in any convenient manner; but, as herein shown, it consists of a spirally-coiled spring I, secured at one end to the said arm H² and at its opposite end to a stationary piece or part *i*. The said arm H² is held out of the path of the revolving strikers *g g* against the action of the spring I by suitable connection with the actuating devices which are driven by the elevator-belt, and which are so arranged that said arm H² will be held out of the path of said strikers during the time the elevator-belt is running.

The rear edges of the strikers are inclined or beveled, as shown, so that in case the shaft G is turned backwardly, either by accident or design, the arm H² will be thrust sidewise by the said inclined edges, and the strikers will pass the arm without injury.

In the devices shown in said Figs. 1, 2, 3, and 3ª a wire *f′* is attached to the said arm H² and to a bell-crank lever *f²*, to which latter the wire *f* leading to the bell-crank lever F is also connected. It follows from this construction that when the weights *e e* are thrown outwardly by the rotation of the shaft C the bell-crank lever F will be moved in a direction to draw the said arm H² out of the path of the strikers *g g*, thereby allowing the said strikers to revolve freely without contact with the said arm. When the elevator-belt stops, however, the lever F is moved by the weight F′ thereon, so as to thrust or draw inwardly the weights *e e* and allow the arm H² to move or swing under the action of the spring I into the path of the strikers *g g*, whereby the shaft H will be given a continuous oscillatory movement in the manner hereinbefore described. Any suitable signaling or alarm device may be actuated by the oscillatory movement of said shaft H, the drawings showing for this purpose an alarm bell or gong J, which is struck by a vibrating hammer J′, attached directly to the oscillating shaft H.

The signaling device illustrated in said Figs. 1, 2, 3, and 3ª, and above described, I find to be highly advantageous in practice, because of its cheap and simple construction, and because it may be readily and quickly applied to any elevator-belt, and for the further reason that the alarm device is simple and positive in its action, and is always in readiness for operation when the machinery which drives the elevator-belt is running, while being incapable of action at times when the driving machinery is stopped and it is not needed. By reason of the advantages obtained by this construction the novel features thereof are herein claimed as part of my invention in addition to the main features common to all of the safety-signaling devices herein illustrated.

I will next describe that embodiment of my invention shown in Fig. 4. In said Fig. 4, A indicates the elevator leg or casing, B the belt, and B′ a bucket thereon. K is a transverse shaft journaled in bearings *k*, which are secured to the sides of the leg or casing. Said shaft K carries a friction wheel or pulley K′, which bears against the inner side of the belt B, and is given a rotary motion thereby during the movement of the belt. On the outer end of the shaft K are located two rigid arms *k′ k′*, to the outer ends of which are pivoted bell-crank levers L L, the outer and longer arms of which carry weights *l l*. The inner or shorter arms of said bell-crank levers are connected by means of links *l′ l′* with a sliding collar M, sliding upon the shaft K. L′ indicates a bell-crank lever, which is pivoted to the casing A below the shaft K, and the vertical arm of which is provided with a forked end engaging a groove *m* in the collar M. The horizontal arm of said bell-crank lever carries a weight N, preferably adjustable upon the said arm. A cord or wire O is attached to the end of the horizontal arm of the bell-crank lever, passes over rollers *o o*, and is connected with the valve-lever *p* of a whistle P, or with any other suitable signaling or alarm device.

When the belt of the elevator is in operation, it turns the shaft K and roller K′, thereby throwing outwardly the weights *l* by centrifugal action and thrusting the collar M in the direction of the arrow, and lifting the horizontal arm of the bell-crank lever L′ against the action of the weight N, and hold-

ing the alarm inactive, the same being thrown into position for operation by means of a spring p' acting against the lever p. In case the elevator becomes clogged or the belt stops moving from any accidental cause, the rotation of the shaft K will cease, the weight N will act to draw inwardly the weights $l\ l$, the weighted arm of the bell-crank lever L′ will descend, and the alarm will be sounded.

In Figs. 5 and 6 is illustrated still another embodiment of the main features of my invention. In this instance A A indicate the elevator legs or casing, and A′ an elevator-boot located at the lower ends of said legs. B is the elevator-belt, and B′ B′ the buckets thereon. 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. The elevator-boot A′ is shown as supported upon the lower ends of vertical adjusting-rods $A^2\ A^2$ in the usual manner. Q Q are vertical tubes mounted to slide endwise upon the adjusting-rods $A^2\ A^2$, said tubes being attached to and adapted to support horizontal frame-bars $q\ q$. Said frame-bars are desirably secured adjustably upon the said tubes by means of set-screws $q'\ q'$. Q′ Q′ are boxes or bearings mounted upon the tubes Q Q below the frame-bars $q\ q$ and conveniently secured thereto by set-screws $q^2\ q^2$. In said bearings or boxes Q′ Q′ is journaled a transverse shaft R, provided with friction-wheels R′ R′, which rest upon or bear against the upper part of the periphery of the boot-pulley B^2. S is a vertical shaft mounted in bearings $s\ s$ on the frame-bars $q\ q$, and provided at its lower end with a miter-gear s', intermeshing with a miter-gear r' upon the shaft R. The upper ends of the shafts contain a device similar to a weight-governor and like that shown in Fig. 1, the same consisting of bell-crank levers S′ S′, pivoted to rigid arms $s^2\ s^2$ on the shaft and provided with weights $s^3\ s^3$, the short arms of said bell-crank levers being connected by links $s^4\ s^4$ with a sliding sleeve S^2 upon the said shaft S. The endwise movement caused by the stoppage of the belt and the falling of the centrifugal weights s^3 s^3 is transmitted to a suitable alarm device or signaling apparatus. In the particular construction illustrated in said Fig. 5 a yoke s^5 is engaged with an annular groove in the sliding collar S^2, and to said yoke is connected a wire S^3, which passes over suitable guide-rollers and is connected with the actuating-lever p of a steam-whistle P, which actuating-lever is held normally in position to hold the alarm inactive by the centrifugal action of the weights $S^3\ S^3$, and is actuated by means of a spring p' to open the valve. It is clear from this construction that when the elevator-belt is in motion the alarm device will be held inactive, and as soon as the belt is arrested from any cause the alarm mechanism is immediately thrown into action.

It is to be noted that in all of the several devices embodying my invention hereinbefore described the actuation of the alarm or signaling devices takes place through the medium of weights which are moved by centrifugal action in a manner corresponding with the action of the weights in a familiar form of steam-engine governor. The same general results may, as far as the main features of my invention are concerned, however, be obtained by the use of devices operating in an entirely different manner, and in the diagrams, Figs. 7 and 8, I have shown other forms in which the main features of my invention may be embodied in practice. In Fig. 7, for instance, T is a shaft to which rotary motion is given from the traveling belt in any convenient manner—as, for instance, by means of a friction-pulley (shown in dotted lines at t) placed in contact with the belt. (Indicated by dotted lines at t'.) The shaft T is provided with fan-blades $t^2\ t^2$, which are surrounded by a fan-casing T′, provided with an exit-passage T^2 in a familiar manner. T^3 is a flat disk or plate arranged opposite or in contact with the mouth of the passage T^2, said plate being conveniently supported by means of an arm t^3, attached to a rock-shaft T^4. The plate T^3 is held in position in contact with or adjacent to the mouth of the fan-casing by a suitable spring or weight adapted to yield under the action of the air-blast during the rotation of the shaft T, the said plate being connected with a suitable signaling device which is held out of action at all times except when the stoppage of the air-blast allows the plate to be drawn or thrown toward the fan-casing. As herein shown, the rock-shaft T^4 is provided with an arm t^4, to which is connected a spring T^5, which acts to throw the plate T^3 toward the fan-casing. A wire t^5 is attached to said arm, which wire may be connected with any suitable alarm or signaling device —such, for instance, as the one illustrated in Figs. 1, 2, 3, and 3ª, or that shown in Fig. 4. It is entirely obvious that when the elevator-belt is running the air-blast produced by the action of the fans will hold the plate T^3 away from the mouth of the fan-casing against the action of the spring T^5, and that as soon as the belt is stopped from any cause said spring T^5 will be allowed to contract and will act upon the wire t^5, and thereby actuate the alarm device, or, in case the same is self-acting, allow the same to act.

In Fig. 8 is shown a simple form of signaling device embracing an electric-alarm apparatus. In this instance U is a revolving shaft actuated by the elevator-belt and provided with a pulley U′, having a smooth peripheral surface. U^2 is a brake-shoe resting on the surface of the pulley U′ and connected by means of a rod u with a vertical lever U^3. The shoe U^2 may be held in contact with the pulley by its own weight alone, or by means of a weight u', which may be attached to the

rod *u*, if found necessary. The pivoted lever U^3 is provided with a contact-point u^2, adapted for contact with a stationary contact-point u^3, said contact-points being connected in an electric circuit formed by means of conductors V V′ and a battery V^2, one of said conductors being connected with the pivot of the lever U^3 and the other with the contact-point u^3. A spring U^4, attached to the lever U^3, tends to hold the said lever in position with the contact-points together, so as to complete an electric circuit through the conductors V V′ and an electrical alarm device V^3. When the pulley U′ is out of action, the spring U^4 holds the lever U^3 in position to complete the electric circuit in the manner described; but when the said pulley is rapidly turned by the movement of the belt the friction developed by the contact of the pulley with the shoe U^2 will tend to drag or carry said shoe in the direction of the arrow, thereby moving the lever U^3 against the action of the spring U^4 and holding the contact-points apart. It follows from this construction that whenever the belt is running properly the contact-points will be held separate and the electric circuit will be broken; but as soon as the belt stops the spring U^4 will draw backwardly the shoe, so as to close the electric circuit and give the alarm.

I claim as my invention—

1. The combination, with a traveling belt, an indicator or signaling device, and means actuating the latter independently of the belt or parts driven thereby, of a wheel or pulley driven by the belt and controlling the said alarm or signaling device, substantially as described.

2. The combination, with a traveling belt, an indicator or signaling device, and means actuating the latter independently of the belt or parts driven thereby, of a spring or weight applied to said alarm or signaling device and tending to throw the same into action, and mechanism actuated by the belt and acting in opposition to said spring or weight to hold the indicator or signaling device out of action during the movement of the belt, substantially as described.

3. The combination, with a traveling belt, an indicator or signaling device, and means actuating the latter independently of the belt or parts driven thereby, of a movably-supported revolving weight or weights actuated by the belt and controlling said indicator or signaling device, substantially as described.

4. The combination, with a traveling belt, an indicator or signaling device, and means actuating the latter independently of the belt or parts driven thereby, of a wheel or pulley driven by the belt, a revolving movably-supported weight driven by the pulley, and an indicator or signaling device controlled by said weight, substantially as described.

5. The combination, with a traveling belt, an indicator or signaling device, and means actuating the latter independently of the belt or parts driven thereby, of a wheel or pulley mounted in movable bearings and held yieldingly against the belt, and an indicator or signaling device controlled by said pulley, substantially as described.

6. The combination, with a traveling belt and actuating mechanism giving motion to the same, of an indicator or signaling device operated by said actuating mechanism independently of the belt or parts driven thereby, said indicator or signaling device being controlled by the belt, substantially as described.

7. The combination, with a traveling belt and actuating mechanism giving motion to the same, of an indicator or signaling device operated by said actuating mechanism independently of the belt or parts driven thereby, a spring or weight applied to said alarm or signaling device and tending to throw the same into action, and mechanism actuated by the belt and acting in opposition to said spring or weight to hold the indicator or signaling device out of action during the movement of the belt, substantially as described.

8. The combination, with a traveling belt, of a shaft driven by the same motor which actuates the belt, a signaling device provided with an actuating-arm, an arm or striker on the shaft adapted to act upon the actuating-arm of the signaling device, said actuating-arm being movable into and out of the path of the striker, a spring tending to hold said actuating-arm in the path of the striker, and mechanism actuated by the belt acting to draw said actuating-arm out of the path of the striker against the action of the said spring, substantially as described.

9. The combination, with a traveling belt, of a pulley adapted for contact with the belt, a shaft supporting the pulley, a shaft which is driven by the same motor which actuates the belt, a signaling device provided with an actuating-arm, an arm or striker on the shaft adapted to act upon the actuating-arm of the signaling device, said actuating-arm being movable into and out of the path of the striker, a spring tending to hold said actuating-arm in the path of the striker, and mechanism actuated by the belt acting to draw said actuating-arm into the path of the striker against the action of the said spring, substantially as described.

10. The combination, with a traveling belt, of a wheel or pulley in contact with the same, 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 in contact with the belt, and an indicator or signaling device controlled by said pulley, substantially as described.

11. The combination, with a traveling belt, of a wheel or 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 centrifugally-acting weight movably sustained upon the said shaft, and an indicator or signaling device controlled by the movements of said weight, 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:
C. CLARENCE POOLE,
HARRY COBB KENNEDY.