A. L. LE GRAND.

SAFETY ATTACHMENT FOR HOISTING ENGINES.

APPLICATION FILED APR. 27, 1909.

946,236. Patented Jan. 11, 1910.

6 SHEETS—SHEET 1.

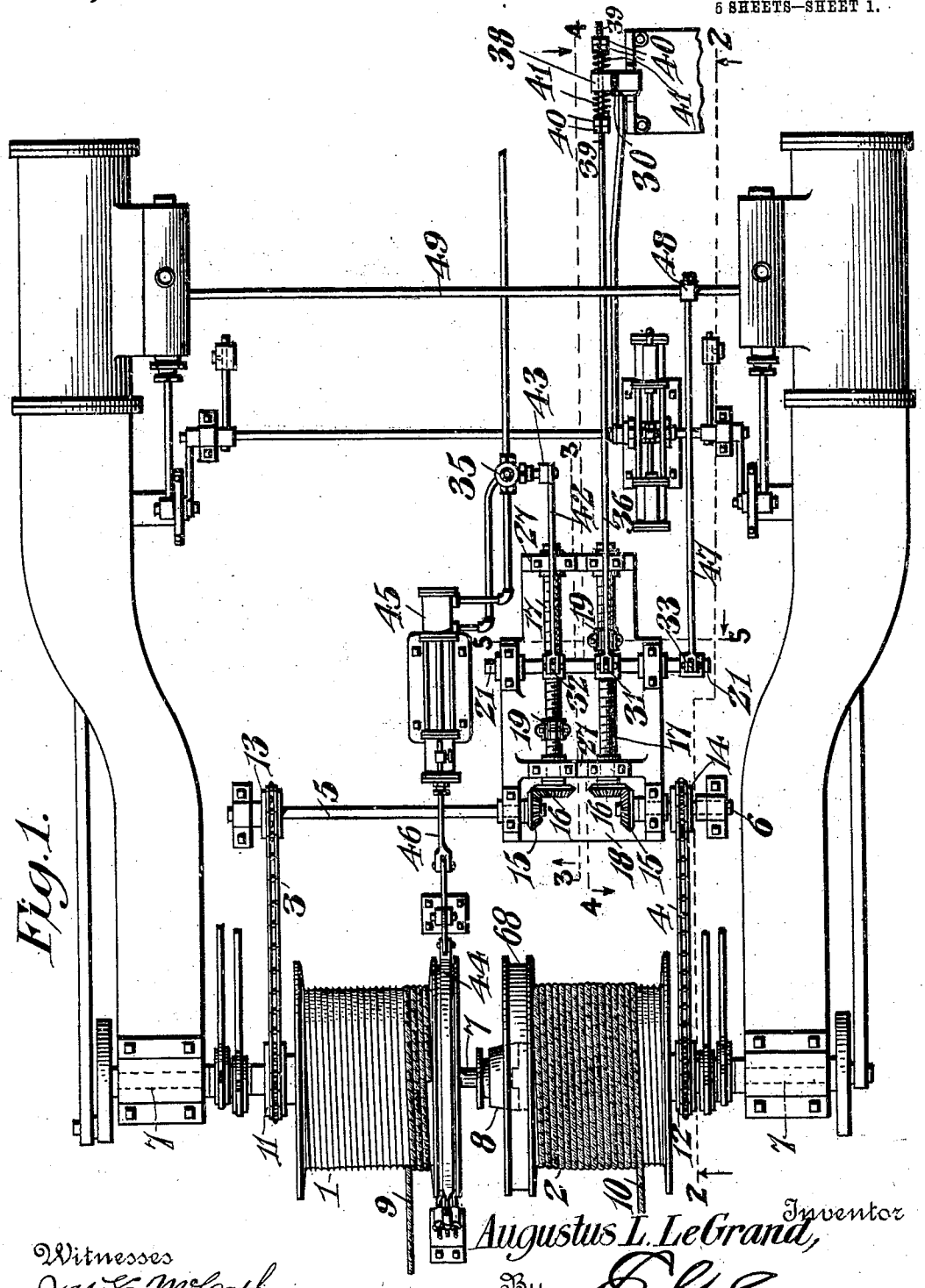

Fig. 1.

Witnesses

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5 SHEETS—SHEET 2.

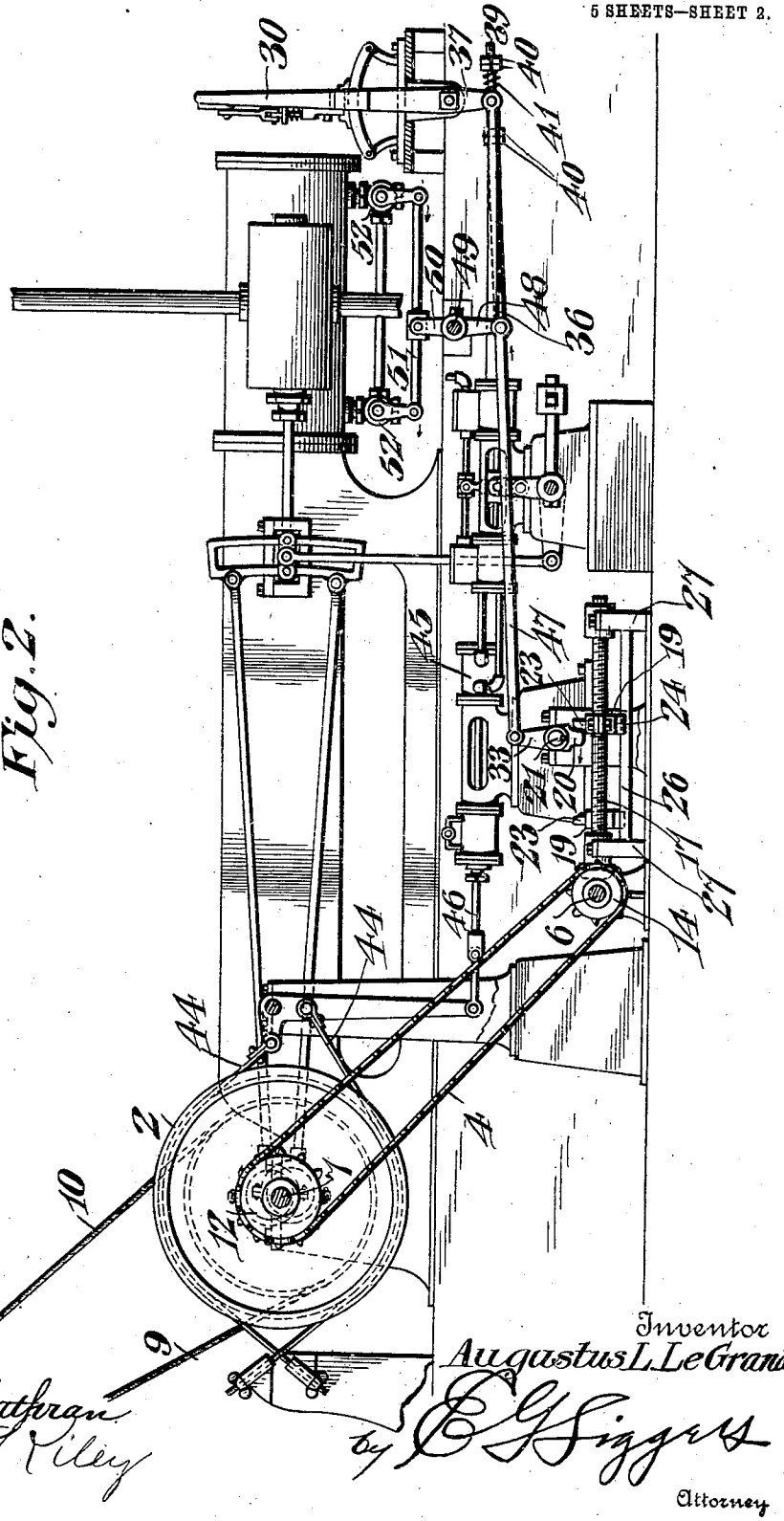

Fig. 2.

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5 SHEETS—SHEET 3.

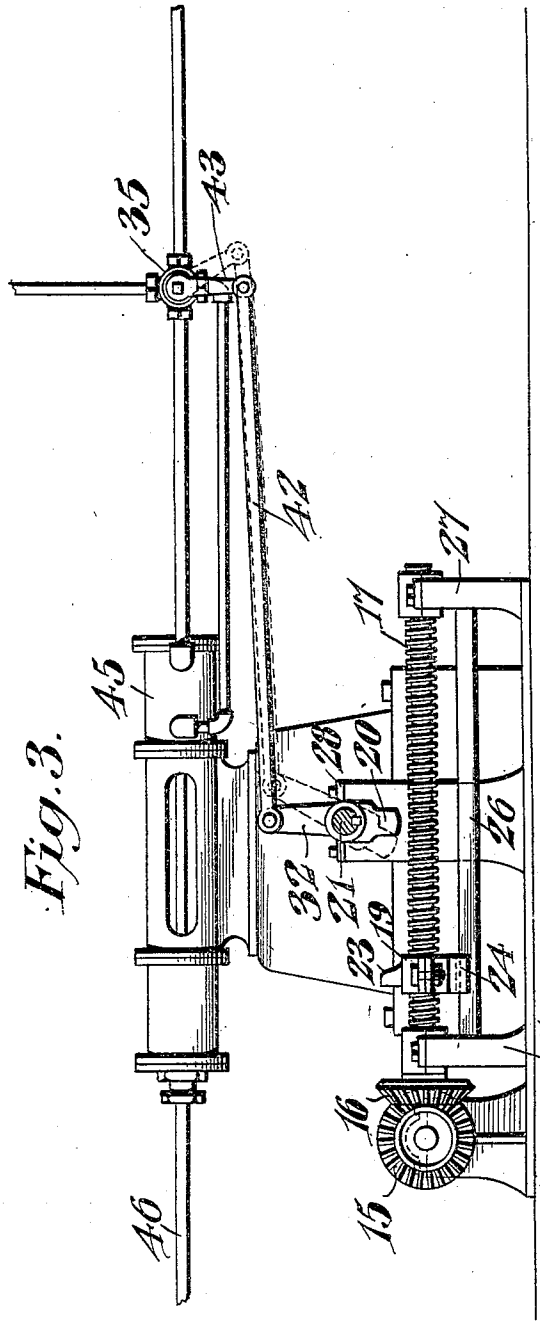

Fig. 3.

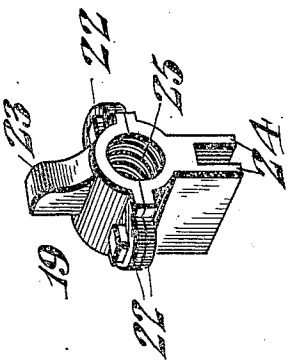

Fig. 7.

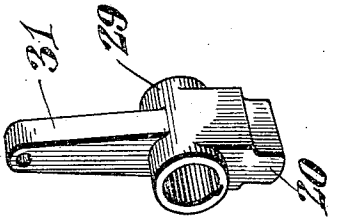

Fig. 6.

Witnesses

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5 SHEETS—SHEET 4.

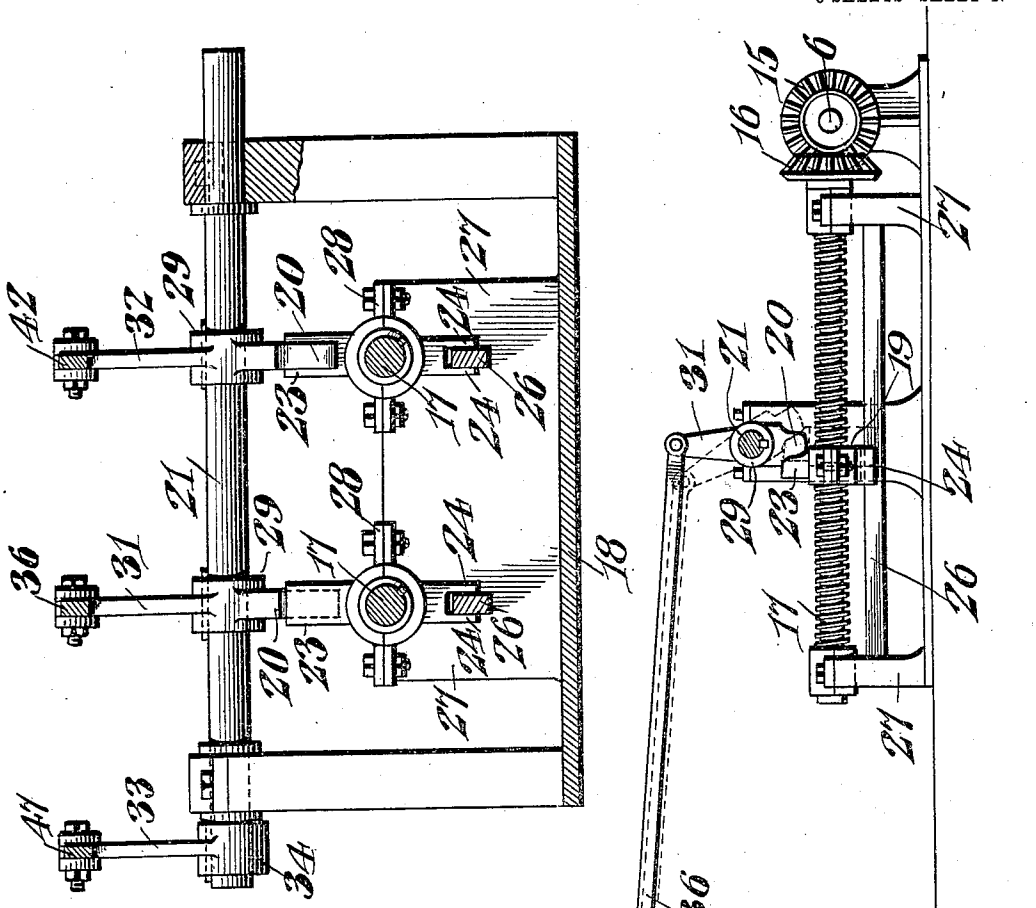

Fig. 3.

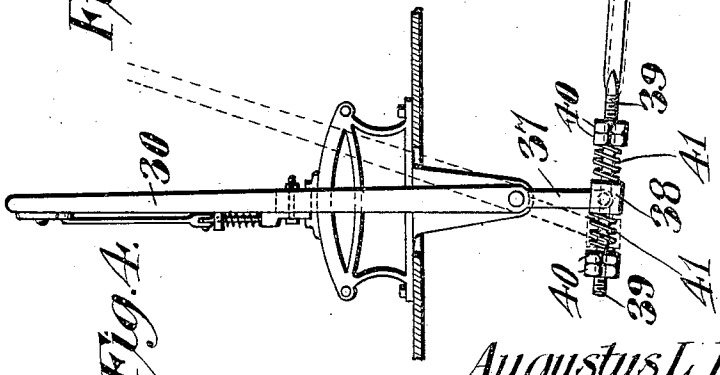

Fig. 4.

Witnesses

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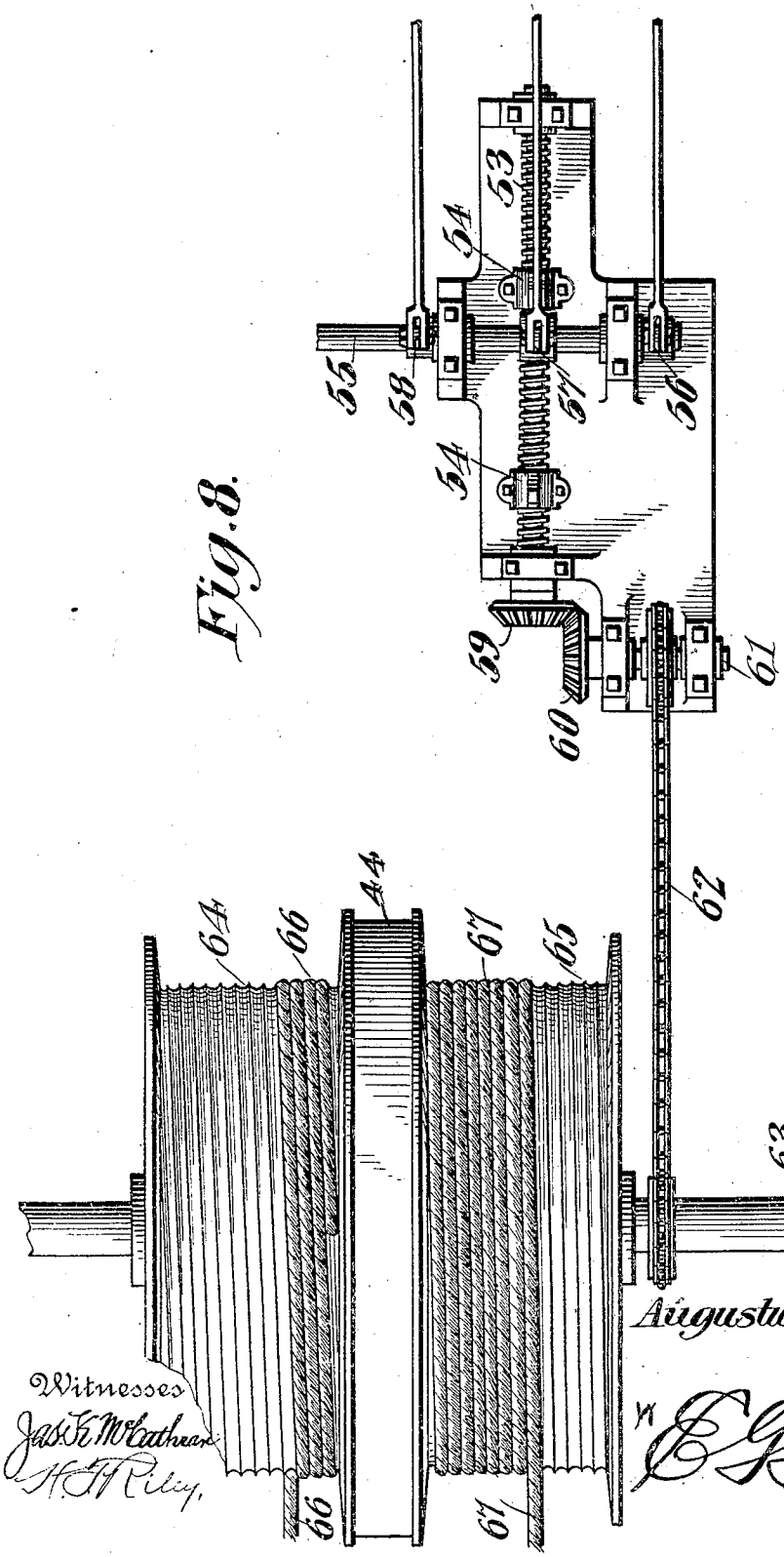
5 SHEETS—SHEET 5.

Fig. 8.



Witnesses
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UNITED STATES PATENT OFFICE.

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SAFETY ATTACHMENT FOR HOISTING-ENGINES.

946,236. Specification of Letters Patent. Patented Jan. 11, 1910.

Application filed April 27, 1909. Serial No. 492,503.

To all whom it may concern:

Be it known that I, AUGUSTUS L. LE GRAND, a citizen of the United States, residing at West Pittston, in the county of Luzerne and State of Pennsylvania, have invented a new and useful Safety Attachment for Hoisting-Engines, of which the following is a specification.

The invention relates to a safety attachment for hoisting engines.

The principal object of the invention is to provide a simple, inexpensive and efficient automatic safety stop attachment, applicable to various types of hoisting engines without necessitating any alteration in the construction thereof, and capable of preventing overwinding and of also preventing the operator from starting the engine in the wrong direction, when the load has been hoisted to the limit of its upward travel.

With these and other objects in view, the invention consists in the construction and novel combination of parts hereinafter fully described, illustrated in the accompanying drawings, and pointed out in the claims hereto appended; it being understood that various changes in the form, proportion, size and minor details of construction, within the scope of the claims, may be resorted to without departing from the spirit or sacrificing any of the advantages of the invention.

In the drawings:—Figure 1 is a plan view of an automatic safety attachment, illustrating the preferred form of the invention and showing the same applied to a reversing engine. Fig. 2 is a longitudinal sectional view, taken substantially on the line 2—2 of Fig. 1, and illustrating the connection between the safety attachment and the waste valves of the engine. Fig. 3 is a similar view on the line 3—3 of Fig. 1, and illustrating the connection between the attachment and the steam brake. Fig. 4 is a vertical longitudinal sectional view, taken on the line 4—4 of Fig. 1 and illustrating the connection between the device and the reversing lever of the engine. Fig. 5 is a transverse sectional view, taken on the line 5—5 of Fig. 1. Fig. 6 is a detail perspective view, illustrating the construction of the arms of the rock shaft. Fig. 7 is a detail perspective view of one of the screw actuated slides. Fig. 8 is a plan view, illustrating the simplest form of the invention.

Like numerals of reference designate corresponding parts in all the figures of the drawings.

1 and 2 designate hoisting drums, connected by sprocket gearing 3 and 4 with transversely alined shafts 5 and 6. The hoisting drums 1 and 2 are mounted on the main shaft 7 of a reversing engine, which may be of any preferred construction, the attachment being applicable to various types of hoisting engines. The hoisting drum 1, which is fast on the shaft 7, may be keyed or otherwise fixed to the same, and the other hoisting drum 2, which is loose on the shaft 7, is connected with the same by a suitable clutch 8, adapted to connect the drum 2 with the shaft 7 and disconnect it therefrom to permit an adjustment of the hoisting ropes or cables 9 and 10, as hereinafter more fully explained. The hoisting ropes or cables 9 and 10 are reversely wound around the drums 1 and 2, and when the shaft is rotated, one of the cages or elevators (not shown) connected with the ropes or cables will be raised and the other lowered in the usual manner. The sprocket gearings 3 and 4 consist of sprocket wheels 11 and 12, connected with the hoisting drums, sprocket pinions 13 and 14 mounted on the transversely alined shafts 5 and 6 and suitable sprocket chains. The sprocket wheel 11 may be connected with the fast drum 1 in any suitable manner, and it rotates with the same and with the main shaft 7. The other sprocket wheel 12 is connected with the hub of the other hoisting drum 2, and is fast or loose on the shaft accordingly as the drum 2 is connected with or disconnected from the shaft by the clutch 8.

The transversely alined shafts 5 and 6 are arranged in parallelism with the main shaft 7, and are spaced apart at their inner ends, and are connected by bevel gears 15 and 16 with parallel longitudinal screws 17, journaled at their terminals in suitable bearings of a bed plate 18 and rotated to actuate a pair of slides or sliding nuts 19, simultaneously movable in the same direction and adapted to oscillate depending arms 20 of a rock shaft 21. Each of the slides is sectional, being composed of upper and lower sections, provided at opposite sides with horizontal ears 22, bolted or otherwise secured together. It consists of a horizontal interiorly threaded tubular portion, an up-

wardly projecting lug 23 and depending spaced longitudinal flanges 24. The threads 25 of the sleeve correspond with those of the screws, which simultaneously actuate the slides. The rock shaft 21 is disposed at right angles to the screws and is arranged centrally thereof, as clearly illustrated in Fig. 1 of the drawings, and it is located between the traveling nuts or slides 19, which are reversely movable with relation to the rock shaft, one of the slides or nuts traveling toward the rock shaft and the other away from the same, when their rotary thread-actuating means is operated. The depending flanges 24 are arranged upon opposite sides of the horizontal guide bars 26, located above the bed plate and supported by pedestals 27, which are provided with the bearings 28 for the screws. The horizontal longitudinally disposed guide bars 26 hold the slides or slidable nuts against rotary movement, whereby the latter are caused to travel toward and from the central rock shaft when the screws are rotated.

The upwardly extending lugs 23 have inner substantially inclined faces and are slightly rounded at their inner upper edges, as clearly illustrated in Fig. 7 of the drawings, and the depending arms 20 of the rock shaft 21 are correspondingly shaped at each side, as clearly illustrated in Fig. 6 of the drawings. The depending arms 20, which are located in the path of the lugs 23, are preferably formed integral with collars 29, keyed or otherwise secured to the central rock shaft 21, and adapted to be alternately engaged by the lugs of the traveling nuts.

The rock shaft, which is connected with the reversing lever 30 of the engine, is oscillated when the engine is started, the depending arms being carried to an inclined position by such operation of the reversing lever, as illustrated in dotted lines in Fig. 4 of the drawings. The main shaft 7 and the hoisting drums 1 and 2 are then rotated, and motion is communicated through the said gearing to the screws, which operate the sliding nuts. The operator in hoisting the engine begins gradually to cut off the steam as the load approaches the limit of the hoist, and if he fails to perform this duty, the lug 23 approaching the rock shaft will engage the depending arm with which it coöperates and gradually turn the rock shaft and thereby similarly operate the reversing lever.

The rock shaft is equipped with upwardly extending arms 31, 32 and 33, the arms 31 and 32 being preferably formed integral with the collars 29, and the other arm 33 being mounted on the rock shaft by means of a collar 34. The arms 31 and 32 may also, if necessary, be equipped with separate collars, as they, in practice, will be arranged in alinement with the reversing lever 30 and a steam brake valve 35, which may not occupy positions approximately in alinement with the parallel screws. The upwardly extending arm 31 is connected by a reach rod 36 with the lower depending arm 37 of the reversing lever, the latter being pivoted at an intermediate point, and the depending arm being provided with a sleeve or eye 38 through which the reach rod passes. The reach rod is provided at opposite sides of the reversing lever with threaded portions 39, receiving nuts 40, arranged in spaced relation with the depending arm of the reversing lever, which is yieldably engaged by coiled springs 41, interposed between the nuts and the lever. The nuts are arranged in pairs, the outer ones forming jam or lock nuts for securing the inner spring-engaging nuts in their adjustment for maintaining the springs at the desired tension. The springs are of sufficient strength to actuate the reversing lever without compression, and they provide a yieldable connection between the reversing lever and the rock shaft for the purpose of permitting a slight additional movement of the hoisting mechanism should the car rest upon keeps or bars, and be, therefore, necessary to raise the car slightly before lowering the same. The nuts in moving inward toward the rock shaft 21 gradually bring the arms of the rock shaft to a vertical position, and they are adapted to form a stop and block the movement of the rock shaft in one direction to prevent the operator from starting the engine in the wrong direction, and causing the same damage, which would result from an over-wind. When in this position, however, the yieldable connection will allow a sufficient operation of the reversing lever to enable the car or elevator to be lifted off the keeps, as above described.

The arm 32 is connected by a reach rod 42 with an arm 43 of the valve 35 of the steam brake. The steam brake, which may be of any preferred construction, includes a band brake 44, connected with the fast drum 1, and actuated by a steam cylinder 45 and piston 46. As the particular construction of the steam brake does not constitute any portion of the present invention, and as the attachment is designed for operating various kinds of power brakes, a detail description and illustration thereof is deemed unnecessary. The upwardly extending arm 32 corresponds with the arm 43, and when the arm 32 is brought to a central position, the valve is opened and the steam brake is applied to stop rotary movement of the hoisting drum. When the engine is reversed the arm 43 of the valve is operated to shut off the steam from the brake and release the hoisting drum.

The upwardly extending arm 33 is connected by a reach rod 47 with a depending arm 48 of a transverse rock shaft 49, extend-

ing across the engine and provided with upwardly extending arms 50, connected with links or rods 51 of the gear of the waste valves 52, which are opened to permit the escape of live steam to prevent the expansion thereof from further rotating the hoisting drums. The traveling slides or nuts of the safety attachment may be arranged so as to permit the engine to be controlled entirely by the operator, in which case they will not actuate the central rock shaft 21 until after the time when the reversing lever will ordinarily be operated, but they will be so positioned to produce a complete operation of the reversing lever and the steam brake and a complete opening of the waste valves in time to prevent over-winding.

The safety attachment is applicable to various types of motors, and the arms of the central rock shaft may be varied in number to operate the controlling means of any type of motor brake, or other device. In Fig. 8 of the drawings, I have illustrated the simplest form of the invention in which a single actuating screw 53 is employed for operating the traveling nuts or slides 54. In this form of the invention, the central rock shaft 55 will be equipped with only one depending arm, which will be alternately engaged by the traveling nuts or slides. The upwardly extending arms, 56, 57 and 58 correspond with the upwardly extending arms 31, 32 and 33 and will be connected by suitable reach rods with the controlling means of the engine, the steam brake and the valve gear of the waste valves. The screw 53 is connected by beveled gears 59 and 60 with a short transverse shaft 61, and the latter is connected by a sprocket gearing 62 with the main shaft 63. The shaft 63 carries a pair of hoisting drums 64 and 65, which are fast on the shaft, the ropes or cables 66 and 67 being reversely wound around the drums so that one will be winding while the other is unwinding. The form of the safety attachment illustrated in Fig. 8 is designed for simple engines, but that illustrated in Figs. 1 to 7 inclusive is preferred, as the loose drum will permit a ready attachment of the ropes or cables to arrange the attachment for hoists or lifts of different distances. When it is desired to change the ropes or cables, the engine is operated to wind up the cable on the drum 2, which causes its corresponding traveling slide or nut to move inward to the center. The drum 2 is then disconnected from the shaft by means of the clutch 8, and the engine is operated to arrange the other cable 9 of the fast drum to suit the new lift or hoist. As soon as the rope or cable 9 is wound up or unwound the desired distance, the clutch is operated to connect the drum 2 with the shaft 7. The unwinding of the fast drum 1 causes its corresponding traveling nut to move away from the central rock shaft, and is located at the limit of the outward movement while the other nut is at the limit of the inward movement, the car or cage of the rope or cable 10 being up while that of the rope or cable 9 being at the limit of the downward movement. The parts are thus in proper position for a continuous operation of the engine. The loose drum 2 is designed to be equipped with the friction member 68 of a manually operable brake for holding the drum 2 during the independent operation of the fast drum 1.

Having thus fully described my invention, what I claim as new and desire to secure by Letters Patent, is:—

1. In a safety attachment of the class described, the combination with hoisting drums, and reversely wound ropes or cables thereon, of a horizontal rock shaft, means for directly connecting the rock shaft with the controlling mechanism of an engine or motor, traveling nuts located at opposite sides of the rock shaft and reversely movable with relation to the same and adapted to actuate the said shaft, said nuts when at the limit of their inward movement forming a stop for the shaft to cause a reversal of the engine or motor to prevent the same from being started in the wrong direction, rotary threaded means for actuating the nuts, and gearing for connecting the latter means with the hoisting drums.

2. In a safety attachment of the class described, the combination with hoisting drums, and reversely wound ropes or cables thereon, of a rock shaft, yieldable means for connecting the rock shaft with the controlling mechanism of an engine or motor to permit a limited independent operation of the engine or motor, traveling nuts located at opposite sides of the rock shaft and reversely movable with relation to the same and adapted to actuate the said shaft, rotary threaded means for operating the nuts, and gearing for connecting the latter means with the hoisting drums.

3. In a safety attachment of the class described, the combination with a hoisting drum, and the reversing lever of an engine, of a rock shaft, a rod connected with the rock shaft and having a loose connection with the lever, springs mounted on the rod at opposite sides of the lever and forming a yieldable connection between the latter and the rod, traveling nuts located at opposite sides of the rock shaft and movable toward and from the same, rotary threaded means for actuating the nuts, and gearing for connecting the latter means with the drum.

4. In a safety attachment of the class described, the combination with a hoisting drum, of a reversing lever having an arm provided with an eye, a rock shaft, a reach rod connected with the rock shaft and extending through the eye of the lever and

having opposite threaded portions, springs arranged on the reach rod of the lever, nuts arranged on the threaded portions of the rod and engaging the outer ends of the springs, traveling nuts movable toward and from the rock shaft and arranged to actuate the same, rotary threaded means for operating the traveling nuts, and gearing for connecting the latter means with the hoisting drum.

5. A safety attachment of the class described including a pair of parallel rotary screws, a single continuous rock shaft extending across the screws and having relatively rigid arms, traveling nuts operated by the screws and movable toward and from the rock shaft and arranged to engage alternately the arms to actuate the rock shaft and adapted to form a stop to prevent movement of the shaft in one direction, means for connecting the rock shaft with the controlling mechanism of the engine or motor, and gearing for connecting the screws with hoisting mechanism.

6. A safety attachment of the class described including spaced screws, a single continuous rock shaft extending across the screws at a point intermediate of the ends thereof and provided with relatively rigid projecting arms, guides disposed longitudinally of the screws, traveling nuts slidable along the guides and actuated by the screws and movable toward and from the rock shaft, said nuts being arranged to engage the arms of the rock shaft, means for connecting the rock shaft with the controlling mechanism of a motor or engine, and gearing for connecting the screws with hoisting mechanism.

7. A safety attachment of the class described including spaced parallel screws, longitudinal guide bars located beneath the screws, a single continuous rock shaft extending across the screws and arranged above the same and provided with relatively rigid depending arms, sectional traveling nuts mounted on the screws and having depending flanges slidable along the guide bars, said nuts being also provided with upwardly extending lugs arranged to engage the arms of the rock shaft, means for connecting the rock shaft with the controlling mechanism of an engine or motor, and gearing for connecting the screws with hoisting mechanism.

8. A safety attachment of the class described including spaced parallel screws, longitudinal guide bars located beneath the screws, a single continuous rock shaft extending across the screws and arranged above the same and provided with relatively rigid depending arms, traveling nuts mounted on the screws and provided with projecting lugs to engage the arms of the rock shaft and having spaced depending flanges embracing and slidable along the guiding means, said nuts being also provided with upwardly extending lugs arranged to engage the arms of the rock shaft, means for connecting the rock shaft with the controlling mechanism of an engine or motor, and gearing for connecting the screws with hoisting mechanism.

9. In a safety attachment of the class described, the combination of hoisting mechanism including a main shaft, drums fast and loose on the main shaft, clutch mechanism for connecting the loose drum with the shaft, spaced screws, separate gearing for connecting the screws with the said drums, a rock shaft, traveling nuts mounted on the screws and arranged to actuate the rock shaft, and means for connecting the rock shaft with the controlling mechanism of an engine or motor.

10. In a safety attachment of the class described, the combination of hoisting mechanism including a main shaft, hoisting drums fast and loose on the same, clutch mechanism for connecting the loose drum with the shaft, alined counter shafts, sprocket gearing connecting the alined shafts with the main shaft, spaced screws, gearing connecting the alined shafts with the screws, a rock shaft crossing the screws, traveling nuts actuated by the screws for operating the rock shaft, and means for connecting the rock shaft with the controlling mechanism of an engine or motor.

11. In a safety attachment of the class described, the combination with hoisting mechanism, and an engine including waste valves, and a reversing lever, of a rock shaft, means for connecting the rock shaft with the waste valves and the controlling lever, opposite traveling nuts located at opposite sides of the rock shaft and arranged to engage and actuate the same and adapted to form a stop to limit the movement of the rock shaft in one direction, rotary threaded means for actuating the nuts, and gearing for connecting the latter means with the hoisting mechanism.

12. In a safety attachment of the class described, the combination with hoisting mechanism, and an engine including waste valves, and a reversing lever, of a rock shaft having projecting arms, opposite traveling nuts located at opposite sides of and adapted to oscillate the rock shaft, rotary threaded means for actuating the traveling nuts, gearing for connecting the said means with the hoisting mechanism, a reach rod connected with one of the arms and with the hoisting mechanism, another reach rod connected with the other arm of the rock shaft, and a transverse rock shaft connected with the latter reach rod and with the waste valves.

13. In a safety attachment of the class described, the combination with hoisting mech-

anism, a brake, and an engine including waste valves, and a reversing lever, of a central rock shaft having projecting arms, traveling nuts located at opposite sides of the rock shaft and arranged to actuate the same and adapted to form a stop for locking the rock shaft against movement in one direction, rotary threaded means for operating the traveling nuts, gearing for connecting the said means with the hoisting mechanism, reach rods extending from two of the arms and connected, respectively, with the reversing lever and with the brake, another reach rod extending from an arm of the central rock shaft, and a transverse rock shaft connected with the waste valves of the engine and with the last-mentioned reach rod.

14. In a safety attachment of the class described, the combination with an engine including waste valves, and a reversing lever, of a main shaft, hoisting drums mounted on the main shaft, a central rock shaft having upwardly and downwardly extending arms, traveling nuts arranged to engage the downwardly extending arms, screws for actuating the traveling nuts, gearing for connecting the screws with the hoisting drums, and reach rods connected with the upwardly extending arms of the central rock shaft and with the waste valves and the reversing lever.

15. In a safety attachment of the class described, the combination with an engine including opposite waste valves, and a reversing lever, of a main shaft, hoisting drums mounted on the main shaft, brake mechanism, a central rock shaft having depending and upwardly extending arms, traveling nuts located at opposite sides of the central rock shaft and arranged to engage the depending arms thereof, a transverse rock shaft extending across the engine and connected with the waste valves, reach rods connected with the upwardly extending arms of the central rock shaft and with the said reversing lever, brake mechanism and transverse rock shaft, screws for actuating the traveling nuts, and gearing for connecting the traveling nuts with the hoisting drums.

In testimony, that I claim the foregoing as my own, I have hereto affixed my signature in the presence of two witnesses.

AUGUSTUS L. LE GRAND.

Witnesses:

A. B. HOUSER,

ROBERT TAYLOR.