(No Model.) 2 Sheets—Sheet 1.

A. J. SHAW.

HOISTING MACHINERY.

No. 505,066. Patented Sept. 12, 1893.

Fig. 1.

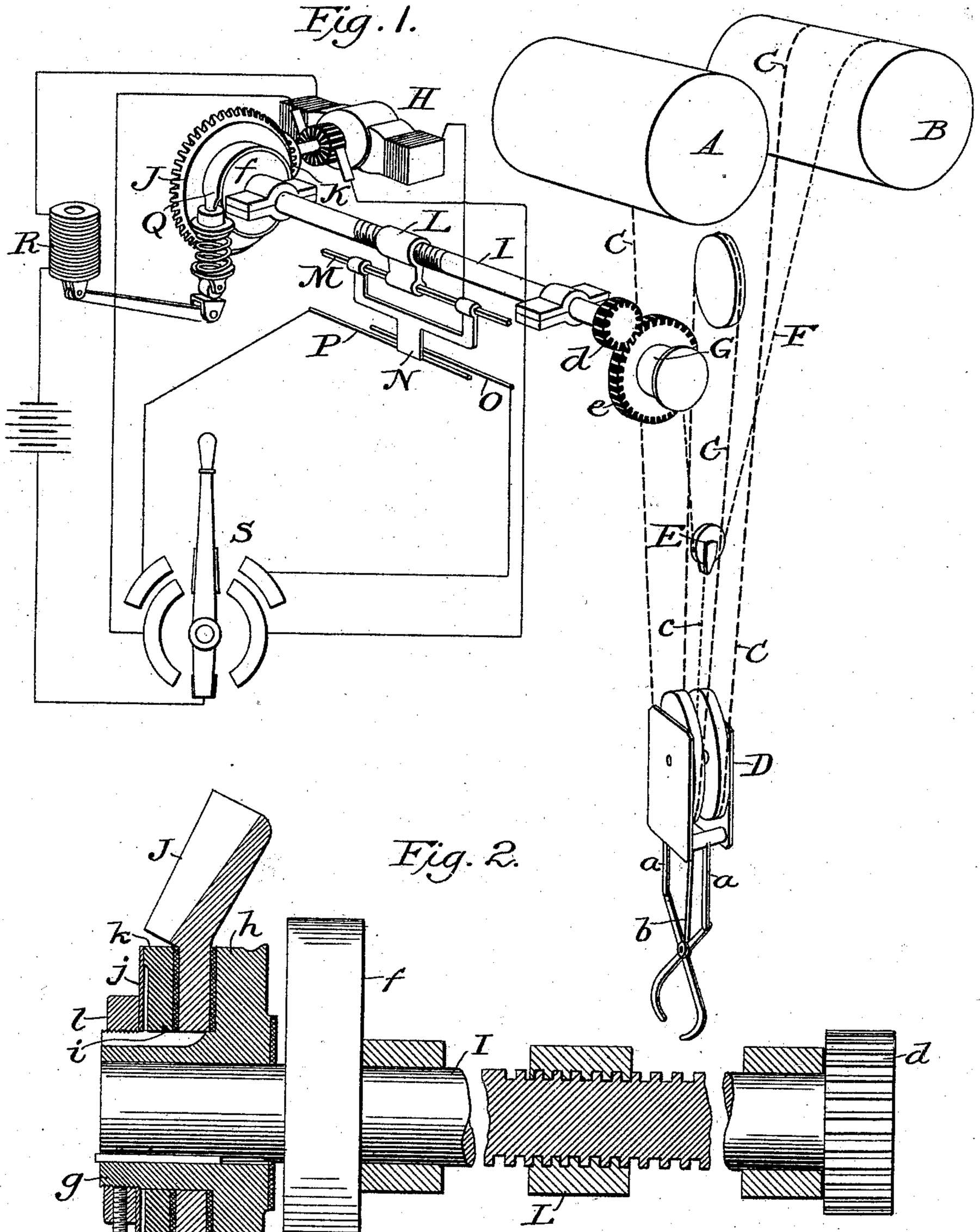

Fig. 2.

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(No Model.) 2 Sheets—Sheet 2.

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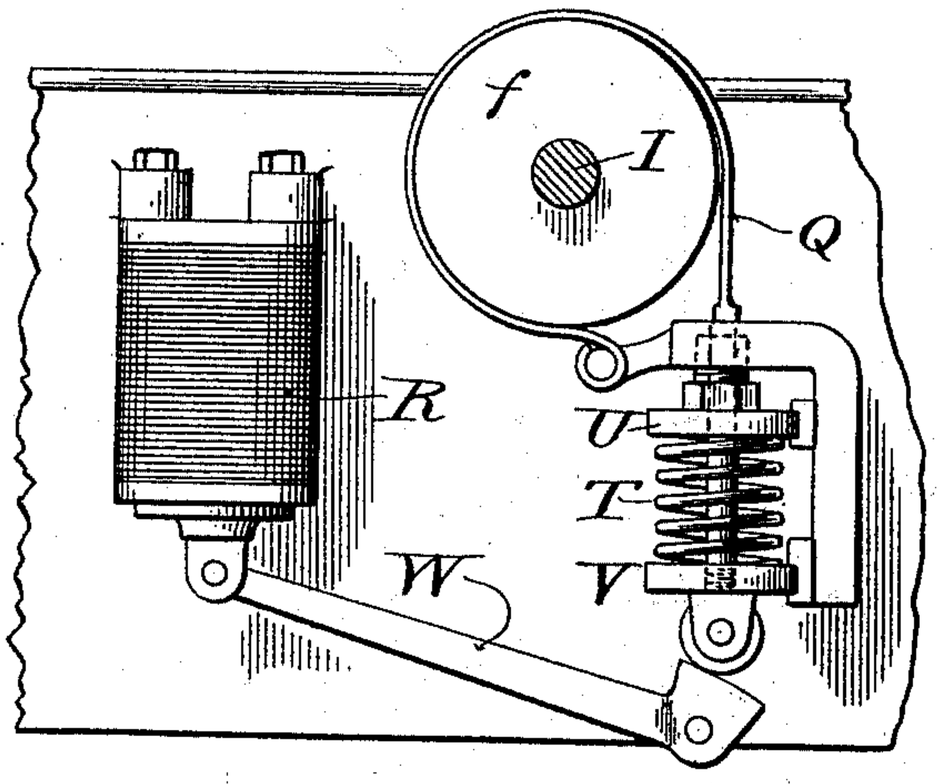
Fig. 3.



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UNITED STATES PATENT OFFICE.

ALTON J. SHAW, OF MUSKEGON, MICHIGAN, ASSIGNOR TO THE SHAW ELECTRIC CRANE COMPANY, OF SAME PLACE.

HOISTING MACHINERY.

SPECIFICATION forming part of Letters Patent No. 505,066, dated September 12, 1893.

Application filed February 11, 1893. Serial No. 461,865. (No model.)

To all whom it may concern:

Be it known that I, ALTON J. SHAW, a citizen of the United States, residing at Muskegon, in the county of Muskegon and State of Michigan, have invented certain new and useful Improvements in Hoisting Machinery, of which the following is a specification.

My invention relates to hoisting machinery, and consists in the introduction therein of a friction device, as hereinafter more fully set forth, by which injury and accident will be prevented should other safeguards fail to act.

In the drawings,—Figure 1 is a diagrammatic perspective, illustrating the general arrangement of all parts necessary to a proper understanding of the invention; and Fig. 2, a sectional view of the friction device in its preferred form; Fig. 3, an enlarged view of the brake mechanism.

It is proper to state at the outset that much of the apparatus represented in Fig. 1 is not of my invention, and is merely illustrated to enable proper explanation to be made of that which is original with me. Thus, the trip mechanism, automatic circuit breaker, and reversing switch are the inventions of others, and are disclaimed by me.

In hoisting machinery, such as is employed in foundries and machine shops, it has been found advantageous to operate the hoisting drums, actuate the tongs, trip the scoops or buckets, tip ladles, and otherwise actuate or control the carriers, by means of electricity. The relatively high speed of electric motors renders them liable to overrun, to guard against which dangerous occurrence automatic circuit breakers and automatic brakes have been devised and employed, designed to prevent possible accident. The present invention is designed to prevent serious results in the event of overrunning, and will preferably be adopted in addition to the safeguards above mentioned, though it may be used independently thereof if found expedient.

The drawings represent the several contrivances united in one complete organization, which will now be described.

A and B indicate two hoisting drums designed to be rotated simultaneously and equally and to wind on or off the two ends of a cable C, which being fixed or passed over a pulley at an intermediate point, forms two loops, in which is hung a double running block D, from which the carrier is suspended. In the present instance the carrier is represented as a pair of tongs, suspended by short links *a*, *a*, and controlled as to their opening and closing, by a rod *b*, connecting with the tongs pivot and serving to raise or lower the same. The rod *b* is connected by a short chain *c*, or otherwise, with a secondary running block E, which is hung in the loop of a secondary or trip chain or cable F, the opposite ends of which are arranged to wind upon one of the hoisting drums A, B, and upon a normally stationary drum G, respectively. It follows from this arrangement that when the drums A, B, rotate to raise or lower the load, the two running blocks will rise and fall alike, and there will be no change in the position of the jaws or levers of the tongs. If, however, the drum G be rotated in one or the other direction, it will take up or pay out its end of cable F and thereby cause the tongs to open or close, as the case may be.

It will be seen that the upper arms or extensions of the tongs levers, together with the links *a*, *a*, constitute in effect a trip mechanism while the chain F, block E, chain *c* and rod *b* constitute a connection between the take-up and the trip mechanism. This, however, is merely one embodiment of the general plan, and the trip device may be simply the latch of a bucket or scoop; or any other usual contrivance for causing the carrier to retain or release its load, at the will of the operator.

The drum G is rotated, when required, by means of an electric motor H, through any suitable connection or intermediate gearing. A shaft I, having at one end a small pinion *d* meshing with a gear wheel *e* on the shaft of drum G, and having at the other end a bevel gear wheel J, meshing with a pinion K on the armature shaft of motor H, is shown in the drawings as the intermediate connection, this answering quite well and giving a proper reduction of speed, and adequate power. The shaft I is threaded, and is encircled by a traverse nut or block L, which, as the shaft rotates, travels lengthwise of the shaft, its direction depending upon that in which the

shaft rotates. The nut or block L is guided, and is held against rotation, by a rod M, suitably supported, which rod serves also as a guide and support for a sliding yoke N, which is included in circuit with the field of the motor H. A tongue or projection of the yoke N rides upon and normally bridges the space between two conducting bars O and P which are also included in circuit with the motor field.

Secured upon any shaft in the train, from the motor shaft to that of the drum G, is a hub *f*, upon which bears a brake shoe or band Q, whenever the motor circuit is interrupted, but which is withdrawn through the action of an electro magnet or solenoid R, in circuit with the motor field, and with the generator or source of electric energy.

As more plainly shown in Fig. 3, one end of the brake strap or band is made fast to a bracket or other fixed support, while the other end passes through a strong spiral spring T, which bears at one end against a fixed disk U and at the other end against a similar disk V, which latter is made fast upon the prolonged end of the brake strap or band. The tendency of the spring is to press disk V downward, the extension of the brake strap or band sliding freely through a central opening of disk U, and hence, if not prevented, the spring will draw the brake band firmly about the disk or hub *f* and prevent its rotation.

To enable the solenoid or electro-magnet to overcome the power of the spring, without being unduly bulky, a lever W is interposed between the movable core of the solenoid and the disk V, so that as the core is drawn into the coil the lever shall compress the spring and relieve the hub *f* from the friction of the brake band. In practice it is found expedient to provide the disk V with an antifriction roller and to fashion the end of lever W into a cam, which, bearing beneath the roller, lifts the disk with but little loss of power from friction.

The details of the brake are immaterial to the present invention and are not claimed herein.

S indicates a switch by which the current from the generator may be reversed in the armature of the motor without reversing it in the field, or in the brake-controlling magnet or solenoid R,—so that the brake shall be held off during rotation of the armature in either direction, but allowed to go into action the instant the motor circuit is interrupted. By setting the switch lever in medial position the current is interrupted, and the motor is promptly brought to rest by the brake. Should the operator or attendant neglect to interrupt the circuit within the proper time, the nut or lock L passing out of contact with that one of the bars O, P, through which the current is at the time passing, will interrupt the circuit, and, if the brake Q acts promptly and efficiently, the shaft I and drum G will be brought to a standstill. Owing to the serious consequences that might follow failure of the drum G to come to rest promptly, I combine with the gear wheel J a friction device, such as shown in Fig. 2, so that, if an undue strain or load be brought upon the drum G or shaft I, said shaft shall cease to turn, even though the motor continue in operation, and so also that the teeth of the connecting gear shall not be broken in the sudden stopping of the shaft. Different forms of friction device may be employed, but that illustrated is preferred. It consists of a hub or sleeve *g*, keyed fast upon shaft I, and provided with a radial disk *h*,—a second disk *i*, fitting freely upon the hub or sleeve *g*,—a spring plate or disk *j*, bearing at or near its outer edge upon a raised rim *k* of the disk *i*,—the nut *l* serving to press and hold the spring plate or disk against disk *i* with the required force; and lastly, the gear wheel J, which encircles the hub *g* and is frictionally held between the two disks *h* and *i*, with a force determined by adjustment of nut *l*. With this friction device introduced at any convenient point between the motor H and drum G, any undue resistance to rotation of the drum or shaft I, whether caused by failure of the trip device to operate freely; by the traverse nut binding upon the screw or becoming jammed against one of the boxes in which the screw shaft turns; or by any other cause, will result in the slipping of gear wheel J between the disks *h* and *i*. It will thus be seen that every possible source of danger is guarded against, the current being automatically interrupted if not seasonably opened by the attendant, the brake being applied promptly upon interruption of the circuit, and a safety release or slip connection coming into play if other safeguards fail.

A very important result of using the friction device is that the gear teeth will not be broken by the sudden action of the brake in bringing the drum G and shaft I to rest, as might otherwise happen.

It is not to be understood from this provision of numerous safeguards that experience has demonstrated a greater liability or frequency of accident with electrically operated hoisting machinery than with other kinds, for such is not the fact; but owing to the greatly increased speed of operation, travel, &c., an accident might be more serious in its results and it is desired to preclude the possibility of such occurrence. Obviously, any other form of take-up device may be substituted for the drum G in this combination,—a rack-bar for instance, and the hoisting machinery and carrier may be of any approved type.

No claim is made to the specific construction of the friction device, nor is any broad claim made to the employment of friction couplings in machinery generally between the power and the load or work,—the claims being restricted to certain novel relations or combinations wherein the friction device cooperates with other mechanisms, to afford

greater safety than would otherwise be attainable.

Having thus described my invention, what I claim is—

1. In a hoisting apparatus, the combination of a load-hoisting drum, a carrier provided with a trip device, a hoisting chain and a trip chain arranged to wind simultaneously on or off the hoisting drum, a take-up connected with the trip chain and serving to actuate the trip device, an electric motor wholly independent of the hoisting motor and drum and serving to actuate the take-up, gearing connecting the take-up motor and the take-up, and a friction coupling introduced into the gear train at a suitable point, substantially as and for the purpose set forth.

2. In a hoisting apparatus, the combination of a load-hoisting drum, a carrier provided with a trip device, a hoisting chain and a trip chain arranged to wind simultaneously on or off the hoisting drum, a take-up G connected with the trip chain, electric motor H provided with pinion K and wholly independent of the hoisting motor and drum, shaft I provided with pinion *d* to actuate the take-up and with gear wheel J, the latter meshing with the take-up motor pinion, and friction coupling *h*, *i*, *j*, *l*, serving to connect gear wheel J with shaft I, substantially as described and shown.

3. In a hoisting apparatus, the combination of a load-hoisting drum, a carrier provided with a trip device, a load-hoisting chain and a trip chain arranged to wind simultaneously on or off the hoisting drum, a take-up connected with the trip chain, an electric motor for actuating said take-up, a gear train connecting the motor and the take-up, an automatic electric brake, and a friction coupling or slip device included in the motor train and serving to prevent injury to the gearing by the sudden application of the brake.

4. In a hoisting apparatus, the combination of a load-hoisting drum, a carrier provided with a trip device, a load-hoisting chain and a trip chain arranged to wind simultaneously on or off the hoisting drum, a take-up connected with the trip chain, an electric motor for actuating said take-up, a gear train connecting the motor and the take-up, an automatic circuit breaker actuated by the take-up motor, an automatic brake, a manual switch for starting, stopping, and reversing the take-up motor, and a slip gear or friction coupling included in the motor train and serving to prevent excessive strain upon the gearing or the take-up.

In witness whereof I hereunto set my hand in the presence of two witnesses.

ALTON J. SHAW.

Witnesses:
I. J. POCHER,
J. J. O'REILLY.