(No Model.) 3 Sheets—Sheet 1.

A. J. SHAW.

HOISTING MACHINERY.

No. 505,067. Patented Sept. 12, 1893.

Fig. 1.

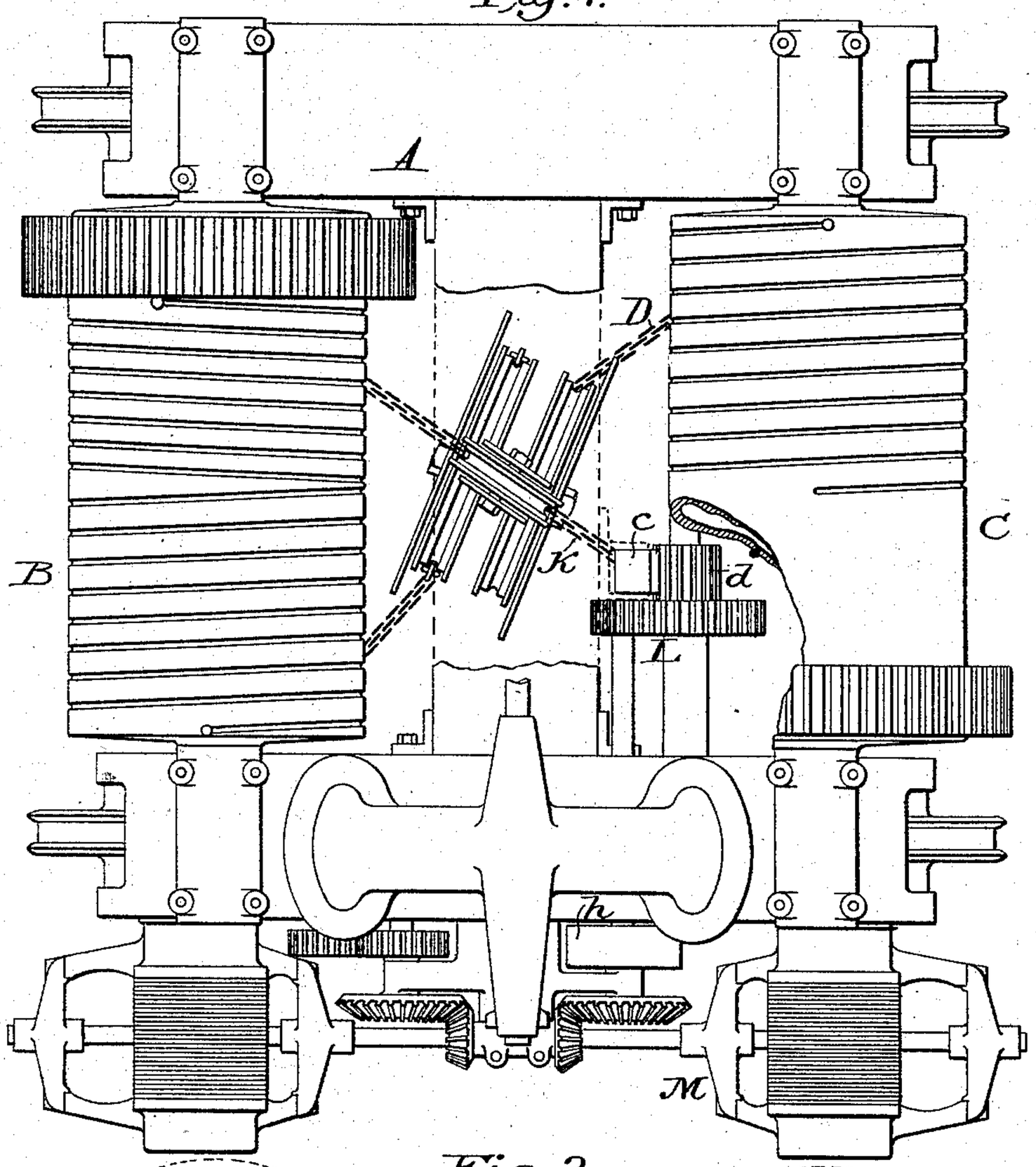
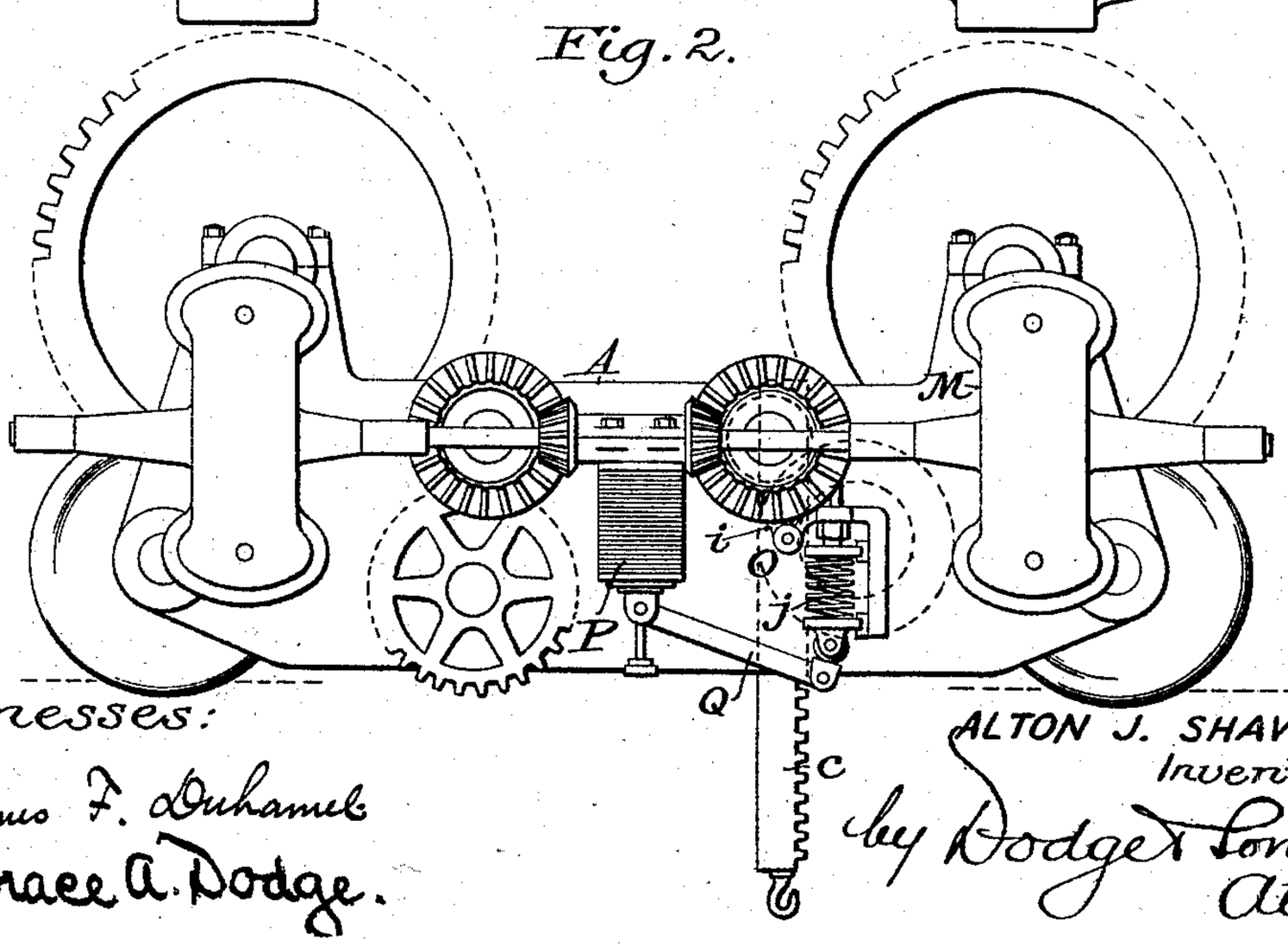


Fig. 2.



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(No Model.)

3 Sheets—Sheet 2.

A. J. SHAW.

HOISTING MACHINERY.

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Fig. 3.

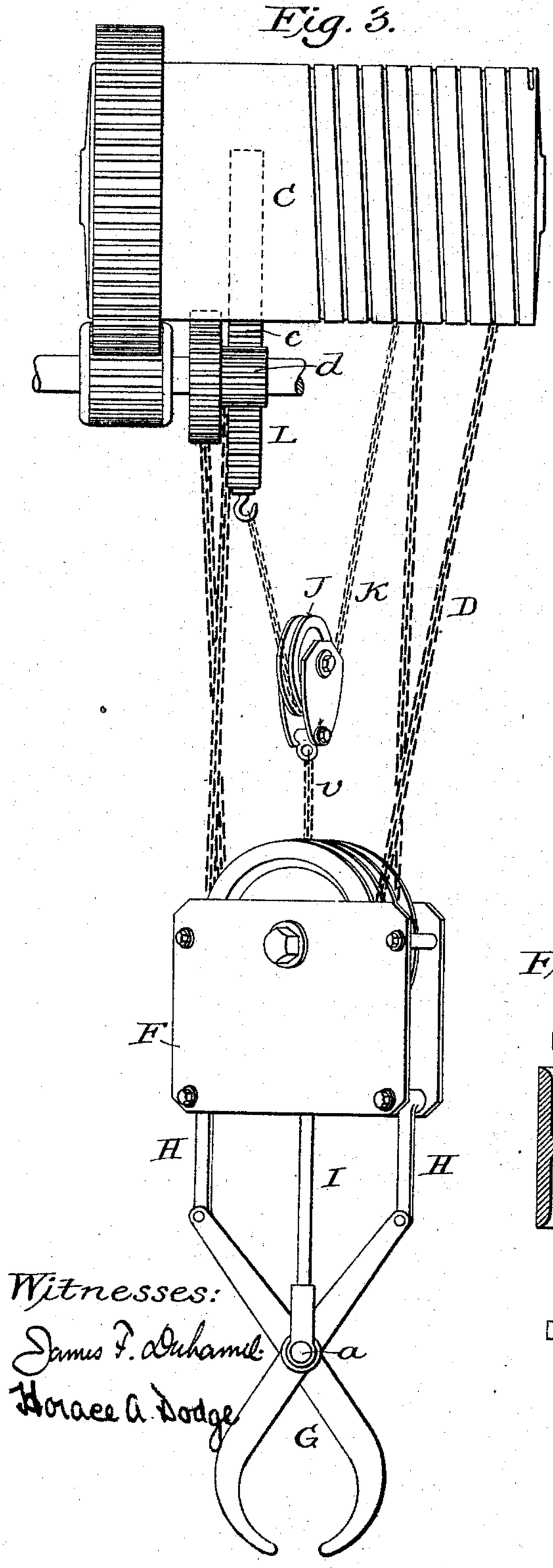


Fig. 4.

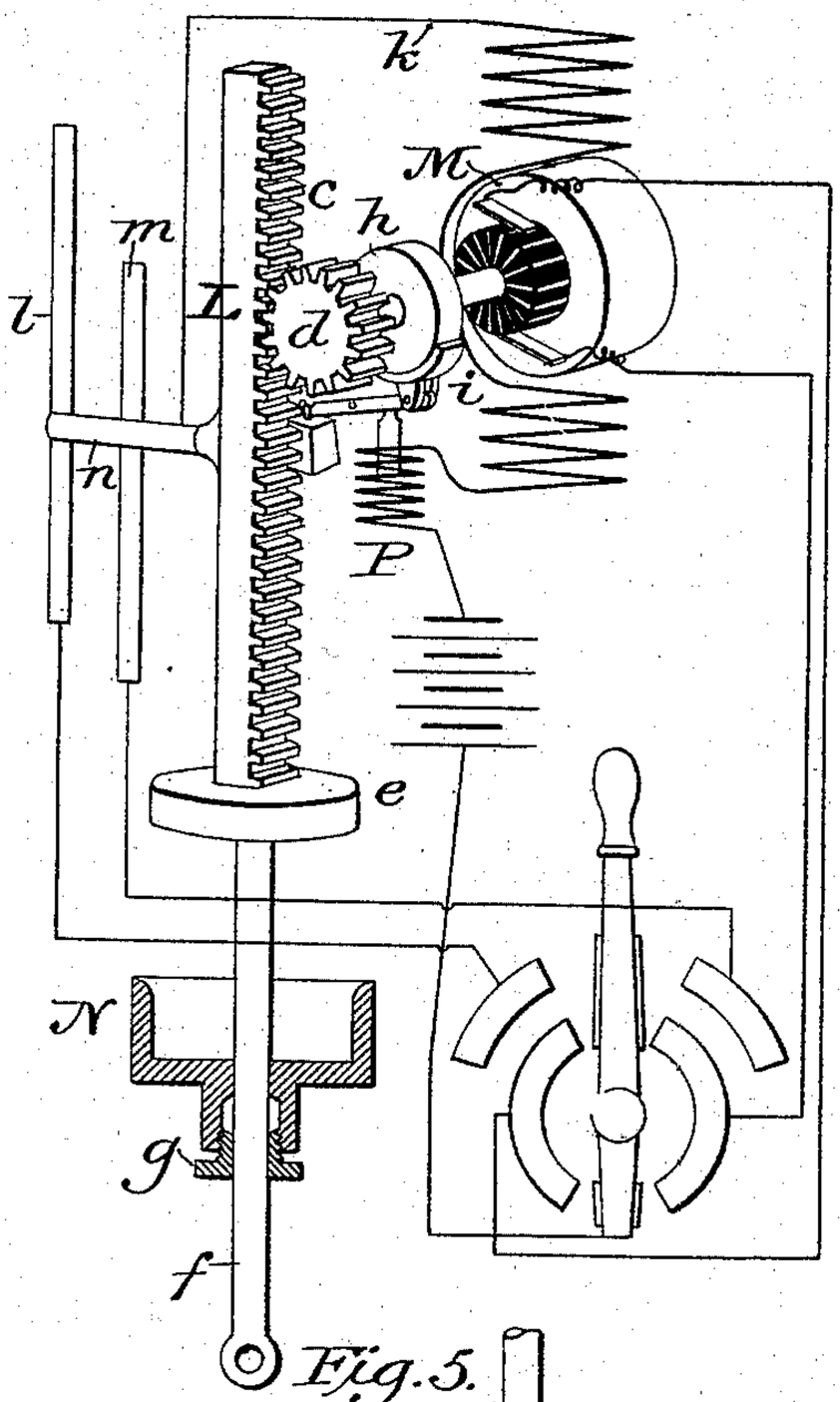


Fig. 5.

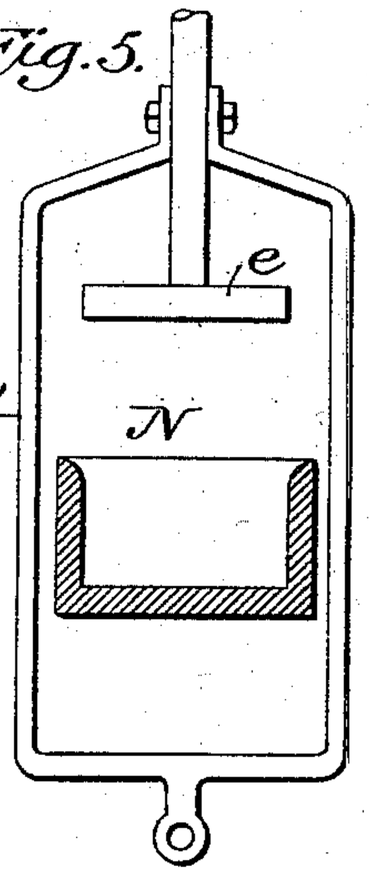
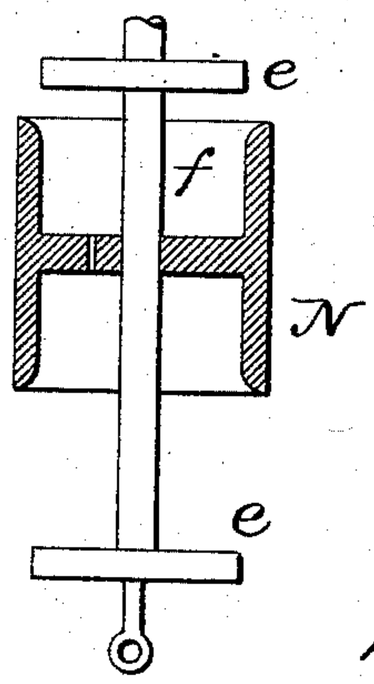


Fig. 6.



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(No Model.) 3 Sheets—Sheet 3.

A. J. SHAW.

HOISTING MACHINERY.

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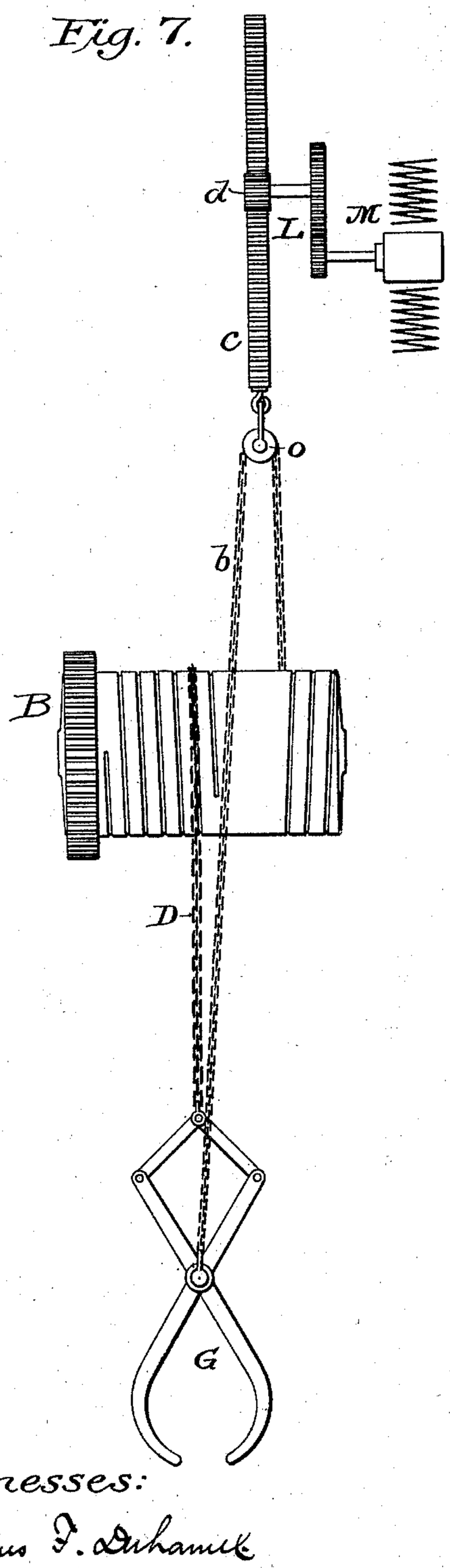
Fig. 7.



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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. 505,067, dated September 12, 1893.

Application filed February 17, 1893. Serial No. 462,713. (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 particularly to means for actuating the trip, or tripping mechanism employed therewith.

Though applicable to hoisting apparatus generally, the invention is more especially designed for use in connection with electric hoisting machinery, and some of its features are applicable to such only, hence I shall illustrate and describe it in that connection. It is, however, to be understood that as to all features except those which pertain only to electrical appliances, the illustrated apparatus stands for and represents any and all common forms of hoisting machinery.

Figure 1 is a top plan view of the trolley of a bridge crane embodying my invention; Fig. 2, an end or side elevation of the same; Fig. 3, a view showing the cable, running block, and tongs, and the trip or tongs-actuating mechanism on a larger scale than in Figs. 1 and 2; Figs. 4, 5, and 6, views illustrating the application of dash-pots to the take-up to prevent overrunning; Fig. 7, a view illustrating the invention as applied to a hoist without a running block.

The same construction and arrangement of the operative parts being employed with tongs, tipping ladles, and the catches or locking devices of scoops, buckets, or other carriers, I use the terms "trip," "tripping device," &c., in a generic sense, to include all such contrivances, they being common and well known. So too, the term "carrier" is used in a comprehensive sense, to include all those devices which are commonly employed to hold or carry the load, whether tongs, ladle, scoop, bucket or other carrier. Chains, wire ropes, hemp ropes and other flexible bands being equivalents for the purposes of the invention, the term "cable" is likewise used comprehensively. Finally, the word "take-up" is used generically, to indicate any part which may remain stationary during the raising and lowering of the load, but is moved to trip the carrier.

In another application I show, describe and claim an apparatus somewhat analogous to the present one, but employing an auxiliary or special drum for controlling the trip chain. The present application is intended to cover generically any and all forms of take-up device in the combinations claimed, that may be fairly deemed equivalents of the special form of take-up illustrated. At the same time, though regarding and including a drum as the inferior equivalent of said special device, it is not the full equivalent thereof in all particulars, because not admitting of application in all situations in which this one is available, and because of its not being capable of entering into all the combinations of which this may form an element.

Referring now to the drawings, A indicates a supporting framework, represented as that of a trolley, such as used upon a traveling bridge crane, but which may be any other support, fixed or movable.

B and C indicate two winding drums mounted in the framework A, and serving to take up or pay out the hoisting chain or cable D, which has its opposite ends wound upon the respective drums, between which is an idler pulley, forming two loops of chain, in which rest the pulleys of a double running block F. Obviously, the idler may be omitted and a single-pulley running-block be employed, or a single drum may be used, one end of the cable being made fast to the supporting frame A.

G, Fig. 3, indicates a pair of tongs, suspended from the running block F by means of links H. To actuate the tongs, I provide a rod I, the lower end of which connects with the pivot bolt *a* of said tongs, and the upper end of which is connected by a chain or flexible band *b*, with a secondary running block J. The block J is hung in the loop of chain, cable, or band K, one end of which winds upon one of the hoisting drums B, C, and is consequently wound on or off at precisely the same rate as the hoisting chain or chains, while the other end is attached to the take-up device L. The take-up in its preferred form, consists of a rack-bar *c* suitably guided,

and moved as required by a pinion *d* meshing therewith, as well shown in Fig. 4. Pinion *d* receives motion either directly or through suitable gearing, from a motor M, it being found desirable ordinarily to employ intermediate gearing, in order to prevent too sudden or extended movement of the take-up. It will be observed that the rod I and chain or band *v*, merely constitute a connection between the trip chain K and the pivot *a* of the tongs, and that the same effect would be produced were the chain K passed about the pivot *a* or a pulley thereon. Such arrangement would be inconvenient in that the chain K would be liable to become entangled with the block; but in either case the tripping is effected by raising the pivot *a*, the links H H, in such case causing the opening of the levers constituting the tongs. The upper ends of the levers or arms of the tongs, the pivot *a* and the links H H therefor constitute, in effect, a trip device. With ladles, scoops and the like, a latch bar is commonly employed, with which the trip chain would of course be connected the same as it is here connected with the pivot *a*. During the raising or lowering of a load, the rack-bar *c* remains in its lower position, but when it is desired to actuate the trip and discharge or release the load, the rack bar is lifted, thereby raising the secondary running block J, which in turn raises rod I and opens the tongs or actuates the trip, in whatever form the latter may be made. The motor M may be of any desired type, though I prefer to employ an electric motor, and one capable of reversal, so as to move the take-up positively in both directions.

To bring the rack-bar *c* to rest gradually, a dash-pot N may be employed, and this may be made to retard the movement in only one or in both directions, as found expedient.

In Figs. 4 and 5 the dash-pot N is shown in the single form, and the rack-bar is represented as having but one piston *e*,—Fig. 4 showing the trip chain connection in the form of a rod *f*, passing centrally through the bottom of the dash-pot, and provided with a packing gland *g;* while in Fig. 5, said connection is represented as in the form of a bail or yoke *g'*, passing about the dash-pot. The latter construction renders a packing gland unnecessary, and if the parts be nicely fitted it may be omitted under the construction shown in Fig. 4.

In Fig. 6 the rod *f*, forming an extension of rack-bar *c*, is shown with two pistons *e*, and the dash-pot N is represented as double in form, so that one or the other of the pistons *e* shall come into action whichever way the rack-bar may move.

In connection with the trip motor M, I employ, ordinarily, an automatic brake O, shown in position in Fig. 2. The construction of the brake may be varied considerably without affecting the present invention, but as represented, comprises a hub or disk *h*, on the motor shaft, or a shaft of the motor train,—a brake band or shoe *i* bearing upon said hub or disk,—and a strong spring *j*, or a weight, which normally acts to apply the brake band or shoe to the hub or disk with force sufficient to hold the parts at rest.

P indicates an electro-magnet, advisably made in the form of a solenoid as shown. The core of the magnet, if a solenoid be used, or the armature of the magnet if a different form be employed, is attached to one end of a lever Q, which acts upon the spring or pressure device *j* in a manner to relieve the brake band or shoe of its force, and thus to free the motor or motor train. The electro-magnet P is preferably arranged in series with the motor M, but may be in a shunt, or even in an independent circuit, if for any reason such arrangement should be found expedient. So long as the circuit in which the electro-magnet is included is closed, the magnet will be energized and will withdraw the brake, but the instant its circuit is interrupted the brake will be applied by reason of the release of spring *j* and its action upon the brake band or shoe. By including the magnet P in the motor circuit it is caused to withdraw the brake the instant the motor is set in operation, and to release its hold upon the brake and permit it to go into action the instant the motor current is interrupted, hence said arrangement is deemed most suitable.

To prevent the possibility of overrunning of the motor M through possible failure of the brake to stop it promptly, aided or not by the dash-pot, I employ an automatic circuit breaker Q.

I desire to have it understood that I make no claim to such circuit breaker, except as an element of a combination of which the rack-bar *c* is an element; its employment in connection with the trip motor, broadly considered, being the invention of one Harry Sawyer.

Upon referring to Fig. 4 it will be seen that the circuit wire or conductor *k* in which is included the motor M, is interrupted at a point near the rack-bar *c*, and that the separated ends are attached respectively to metallic bars *l* and *m*, parallel with and close to the rack-bar. A contact block *n* carried by but insulated from the rack-bar bridges the space between the bars *l* and *m* and bears upon both; but said bars are of such lengths and so arranged that just before the rack bar *c* reaches the extreme limit of its possible travel in either direction the block *n* rides off from one of the bars *l m*, and thereby opens or breaks the circuit. It will be understood that under normal conditions, or unless the rack-bar overruns its proper limit of movement, the contact with bars *l m* will not be broken,—the circuit breaker being merely intended to act in case of undue movement of the rack-bar, and consequent danger of injury of the apparatus.

It will be seen from the foregoing description that three agents are thus simultaneously brought into play to bring the trip motor to

rest promptly; that is to say its supply current is interrupted; the brake is applied, and the dash-pot comes into play.

As hoisting machinery of this class is largely used in handling molten metal, heavy molds and castings, costly machinery and other heavy and valuable commodities, the accidental or premature release of which would greatly endanger numerous lives and involve great loss, the importance of bringing together all practicable safeguards will be appreciated.

In the drawings I have represented, in Fig. 4, a manually controlled switch R for opening and closing the circuit of motor M, and I have indicated in a conventional way, at S, a battery or generator of electricity for supplying the necessary current for said motor. It will of course be understood that a dynamo electric generator will ordinarily furnish the requisite current.

The construction of scoop and bucket latches or trips, ladle-tipping devices, &c., being common and well understood, it is deemed unnecessary to illustrate the same herein, it being sufficient to say that whatever be the form thereof the block J will be connected with and actuate or control the same, if a running block be used in the hoist.

For hoisting apparatus in which a running block is not employed and in which the load is suspended directly from one end of the chain or cable, I adopt the arrangement illustrated in Fig. 7, in which one end of the hoisting chain or cable D and one end of the trip chain or band *b* are wound upon the hoisting drum B and consequently are taken in or given out alike. The trip chain *b*, which corresponds to chain K of Figs. 1 and 3, passes over a pulley *o*, carried by the rack-bar *c*, and consequently will be drawn up or let down by the upward or downward movement of said rack-bar, regardless of the movement of drum B. The operation of the device is therefore precisely the same as where the running blocks are used.

In speaking of the take-up as remaining at rest while the hoisting drum is in motion I do not mean to convey the idea that the take-up cannot, if desired, be operated while the drum is in motion, as this may be done whenever deemed expedient. Usually, however, the drum is at rest when the take-up is actuated, but its actuation is at all times independent of the drum, and in no way affected by the position of the carrier.

Being, so far as I am aware, the first to provide any form of take-up device having the peculiarity of being wholly independent of the drum in its action, and having devised various forms thereof which I propose to cover by other patents, a rotary drum among others, I wish it understood that I mean herein to claim broadly such a take-up, regardless of specific form; and likewise to claim herein specifically, the rack-bar construction, because of its peculiar adaptation for use in connection with the automatic circuit breaker.

Having thus described my invention, what I claim is—

1. In combination with a hoisting drum, a hoisting cable winding thereon, a carrier sustained by said cable, and a trip device for said carrier; a second cable connected with the trip device and having one end arranged to wind on and off the hoisting drum simultaneously with the hoisting cable; and a take-up connected with the second or trip cable, and adapted to take in or pay out the same independently of the rotation of the hoisting drum.

2. In combination with the hoisting drum, cable, running block and trip of a hoisting apparatus, a secondary cable having one end arranged to wind on and off the hoisting drum simultaneously with the hoisting cable; a take-up device connected with the opposite end of said secondary cable, and a secondary running block hung in a loop of the secondary cable and connected with the trip, substantially as set forth.

3. In combination with a hoisting drum, a hoisting cable winding thereon, a carrier sustained by said cable, and a trip device for said carrier; a second cable connected with the trip device and having one end arranged to wind on and off the hoisting drum simultaneously with the hoisting cable; a take-up connected with the second or trip cable; and a motor for actuating said take-up, the motor and take-up being independent of the hoisting drum, so that the movements of the trip relatively to the carrier are independent of the position of the latter.

4. In combination with the hoisting drum, cable, running block and trip of a hoisting apparatus; a secondary cable having one end arranged to wind on and off the hoisting drum simultaneously with the hoisting cable; a take-up device connected with the opposite end of said secondary cable; a secondary running block hung in a loop of the secondary cable and connected with the trip; and a motor for actuating said take-up; the motor and the take-up being adapted to actuate the trip independently of the hoisting drum.

5. In combination with a hoisting drum, a hoisting cable winding thereon, a carrier sustained by said cable, and a trip device for said carrier; a second cable connected with the trip device and having one end arranged to wind on and off the hoisting drum simultaneously with the hoisting cable; a rack-bar connected with the opposite end of said secondary cable; and a pinion meshing with said rack-bar and serving to move the same and thereby to take up the secondary cable and actuate the trip.

6. In combination with a hoisting drum, a hoisting cable winding thereon, a carrier sustained by said cable, and a trip device for said carrier; a second cable connected with the trip device and having one end arranged

to wind on and off the hoisting drum simultaneously with the hoisting cable; a take-up connected with the second or trip cable; a motor for actuating said take-up, and an automatic brake serving to bring the motor promptly to rest when the latter is thrown out of operation.

7. In combination with a hoisting drum, a hoisting cable winding thereon, a carrier sustained by said cable, and a trip device for said carrier; a second cable connected with the trip device and having one end arranged to wind on and off the hoisting drum simultaneously with the hoisting cable; a rack-bar connected with said secondary cable; an electric motor gearing with and serving to move said rack-bar; and a circuit breaker carried by the rack-bar and included in the circuit of said motor, all substantially as set forth.

8. In combination with a hoisting drum, a hoisting cable winding thereon, a carrier sustained by said cable, and a trip device for said carrier; a second cable connected with the trip device and having one end arranged to wind on and off the hoisting drum simultaneously with the hoisting cable; a take-up connected with the secondary cable and serving to actuate the trip device; an electric motor gearing with and serving to move the take-up, an automatic brake applied to a shaft of the motor train; an electro-magnet included in the motor circuit and serving normally to hold the brake off; and a circuit breaker carried by the take-up and serving to break the circuit in case of undue movement of the take-up.

9. In combination with a hoisting drum, a hoisting cable winding thereon, a carrier sustained by said cable, and a trip device for said carrier; a second cable connected with the trip device and having one end arranged to wind on and off the hoisting drum simultaneously with tbe hoisting-cable; a rack-bar connected with the secondary cable and serving to actuate the trip; and a dash-pot serving to retard the movement of the rack-bar.

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

ALTON J. SHAW.

Witnesses:
L. N. KEATING,
ARTHUR A. WHIPPLE.