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J. FENSOM.

Hoisting-Machine.

No. 209,336. Patented Oct. 29, 1878.

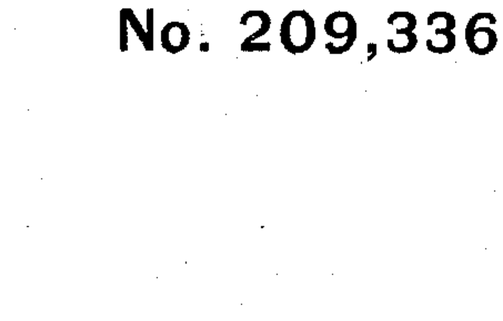

Fig. 3.

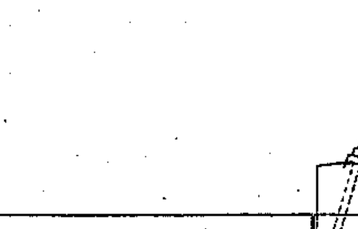

Fig 4.

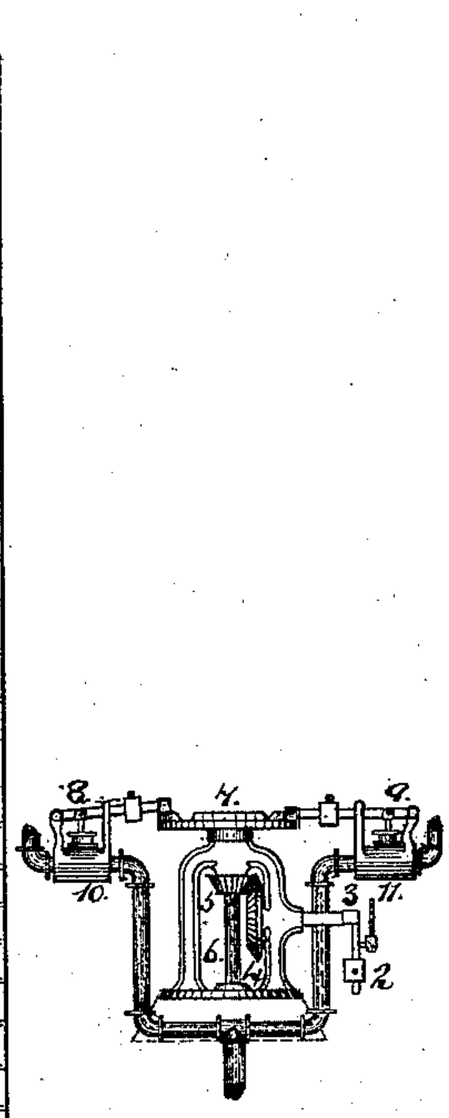

Fig. 10.

Fig. 1.

Witnesses:

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A. E. Cowan.

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J. FENSOM.

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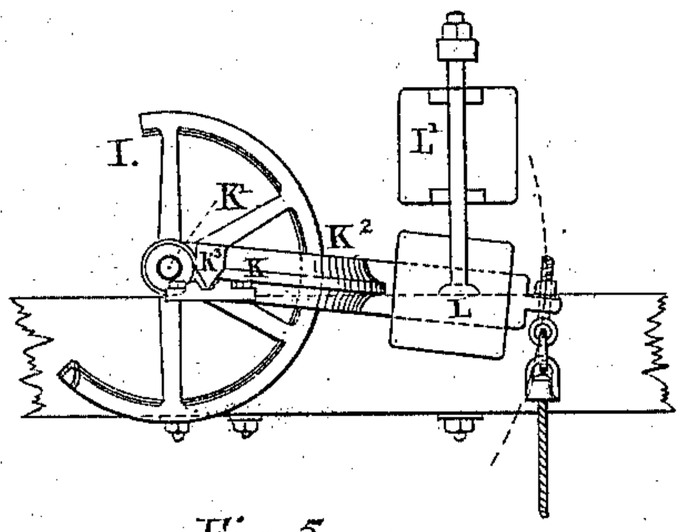

Fig. 5.

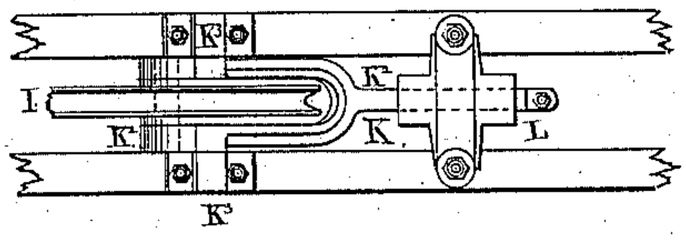

Fig. 6.

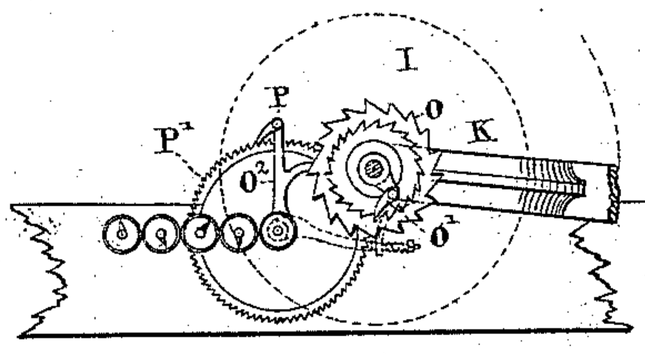

Fig. 7.

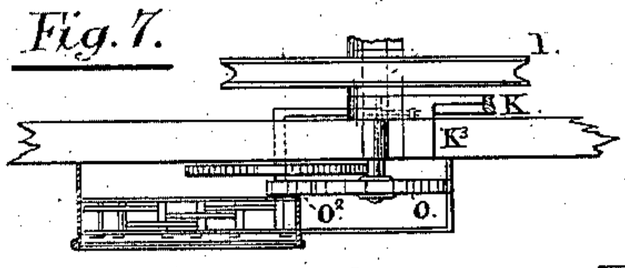

Fig. 8.

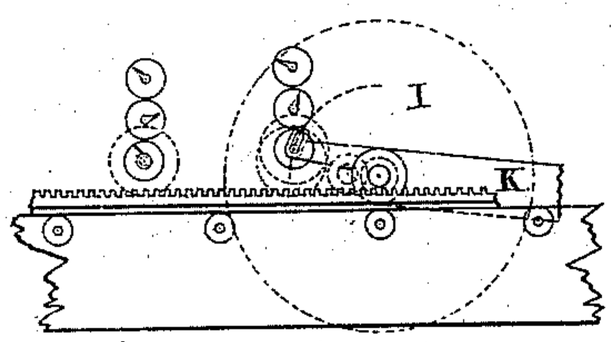

Fig. 9.

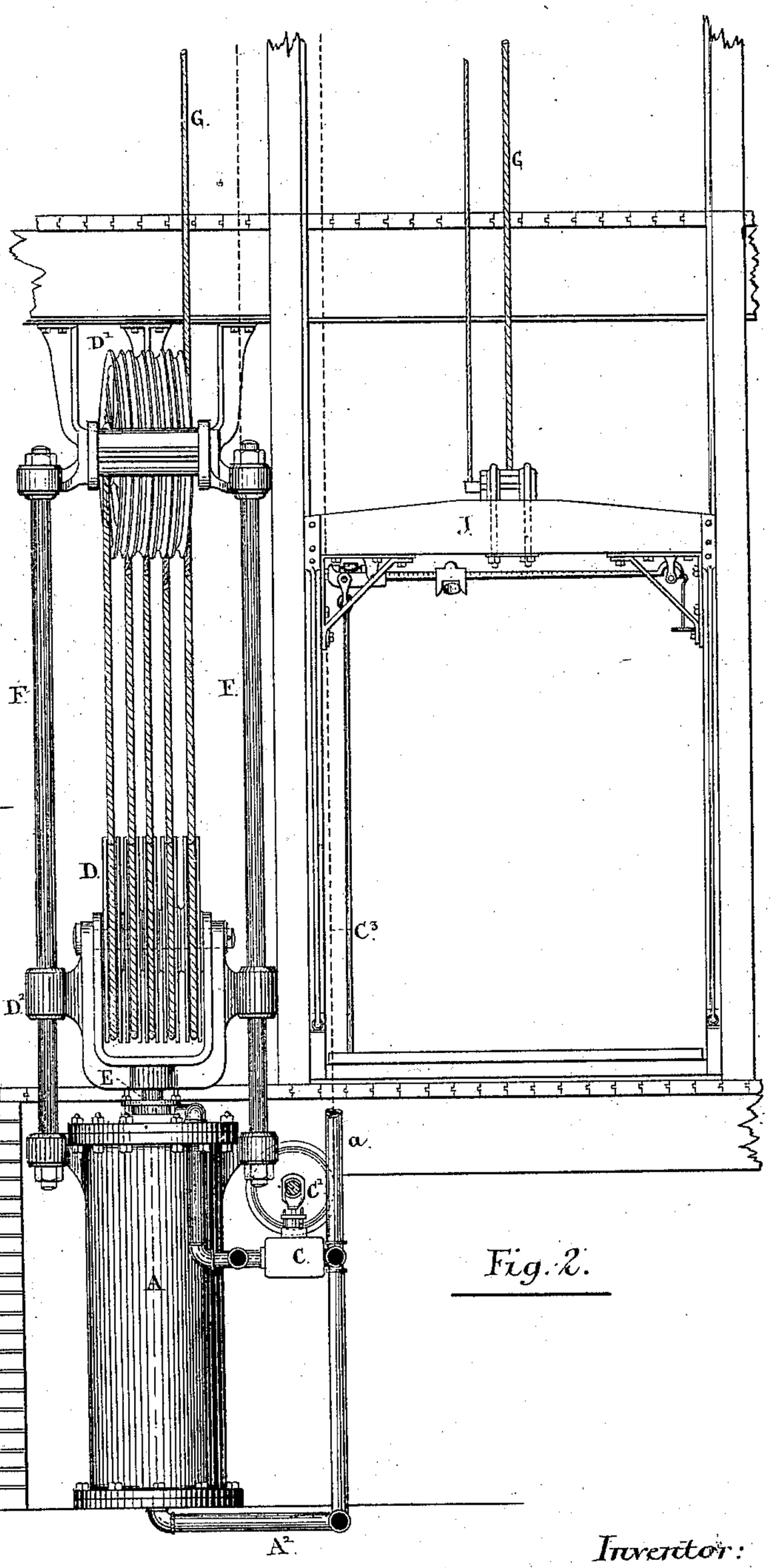

Fig. 2.

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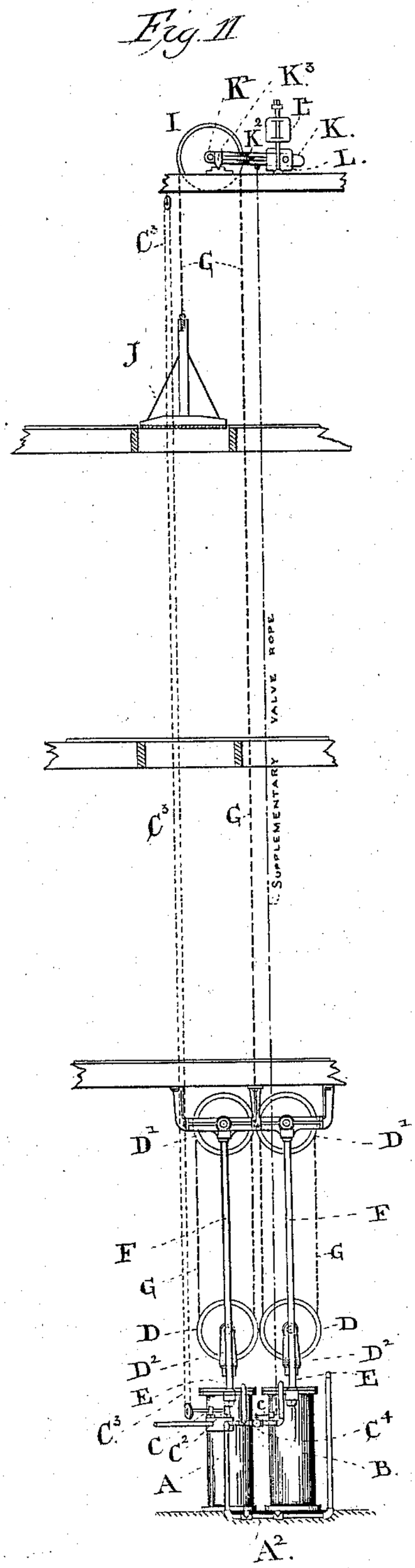
3 Sheets—Sheet 3.

J. FENSOM.

Hoisting-Machine.

No. 209,336. Patented Oct. 29, 1878.

Fig. II



WITNESSES:

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UNITED STATES PATENT OFFICE.

JOHN FENSOM, OF TORONTO, ONTARIO, CANADA.

IMPROVEMENT IN HOISTING-MACHINES.

Specification forming part of Letters Patent No. **209,336,** dated October 29, 1878; application filed January 10, 1878.

To all whom it may concern:

Be it known that I, JOHN FENSOM, of the city of Toronto, in the county of York and Province of Ontario, Canada, have invented certain new and useful Improvements in Hoisting-Machines; and I do hereby declare that the following is a full, clear, and exact description of the same.

My improvements relate more particularly to that class of hoisting-machines known as "hydraulic" hoists or elevators.

My invention consists, first, in the combination, with a water-cylinder of known lifting capacity, of one or more supplementary water-cylinders arranged in connection with suitable automatic mechanism to be thrown in and out of working connection as the load on the hoist is increased or diminished; second, in mounting the upper rope-wheel, which sustains the direct weight of the car and load upon a pivoted and adjustably-weighted lever, in such manner that the said lever will move upon its fulcrum when the load is increased over a given weight, and by means of valves suitably connected cause one or more of the supplementary lifting-cylinders to be thrown into working connection with the main cylinder, thus automatically increasing the lifting capacity of the hoist in proportion to the weight to be elevated; third, in an arrangement of valves automatically operated by the adjustably-weighted lever, by which either a small or large cylinder can be used independently of each other or their combined power applied as the load to be lifted requires; fourth, in the devices arranged to throw the supplementary cylinders out of gear when the load is diminished to the capacity of the main cylinder; fifth, in the means devised for automatically registering the amount of water used by the cylinders; sixth, in the general arrangement and construction of the hoist and parts more particularly described and claimed hereinafter.

In the accompanying drawings, Figure 1 is a side view of a two-cylinder hydraulic hoisting-machine embodying my improvements. Fig. 2 is an end view of the same. Figs. 3, 4, 5, 6, 7, 8, 9, and 10 are details of operating parts. Fig. 11 is a general view of my hoist.

A is the main cylinder, and B is the supplementary cylinder. The main cylinder is connected to the water-pipe by the double cam-valve C, the inlet and outlet valves C^1 C^2 being governed by the connecting check-rope C^3, extending the whole height of hoist. The second or supplementary cylinder, B, is also connected with the water-pipe, but the connection is closed to the cylinder by a second valve, C^4, which valve is only opened when the load requires the assistance of the supplementary cylinder B. D are the lower sheaves, mounted on cross-heads D^2, which connect directly to the piston-rods. E D^1, are the upper sheaves placed in a frame which is bolted to the joisting or other suitable supporting-frame.

The cross-heads travel up and down in the operation of the hoist upon guide-rods F, which guide-rods extend from the heads of the cylinders to the fixed frame above. G is the hoisting-rope, which, with the sheaves, is arranged in proportion to the stroke of the cylinders of ten to one.

The number and arrangement of the sheaves and the length of stroke may, however, be varied at discretion, and as circumstances may require. The water, it will be observed in the arrangement I illustrate, is admitted above the piston-head, thus utilizing the weight of the piston cross-heads and lower sheaves to lift the load, while the same parts in the descent of the car act as counter-balances to the extent of their weight.

A^2 is the outlet-pipe, connected to both cylinders and the outlet-valves C^2. The delivery end *a* of the outlet-pipe is carried above the height of the top of the cylinders in order that the supplementary cylinders may always be kept full of water, and to enable the piston of the supplementary cylinder or cylinders to move up and down in the cylinder. One or more relief-valves, H, are placed in the piston head, as shown in Figs. 3 and 4, or in the bottom of the cylinder, should the water-pressure be below the piston-head. The relief-valve clears the piston-head of the supplementary cylinder from atmospheric pressure when the cylinder is thrown out of connection at an intermediate point in the stroke of the piston by allowing the water to pass freely from the under to the upper side of the piston-head when the pressure is above the piston-head, or from the upper to the under side when the pressure is below.

I is the upper rope-wheel, around which the

hoisting-rope G finally passes to the car J. K is a lever-beam, divided into two arms, K^1 K^2, of an equal length, by the trunnion-arm K^3. These trunnion-arms form the fulcrum of the lever, on which is a turning-point. The beam is adjusted to be overbalanced when the weight of the car, which is attached to the short arm of the pulley I, mounted thereon on suitable bearings, overcomes the resistance of the weight L on the long arm of the lever. The proportion of the length of the short and long arms of the lever is arranged to suit the character of the work to be done, and the balance may be further adjusted by moving the weight L to or from the fulcrum. From the end of the long arm, K^2, a connection is made to the weighted lever of the valve C^4, in such manner that when the long arm is raised by the weight of the load on the short arm the valve will be opened, admitting water to the supplementary cylinder, and thus increasing the lifting capacity of the hoist to the requirement of the load.

Should additional power be required, a third or a number of cylinders can be used, the inlet-valves to which will be connected to the weight or weights L′, placed above the weight L, and supported upon stops to prevent interference with the working of the second cylinder.

When the pressure of the water is variable, one or more small cylinders, M, connected to the supply-pipe, may be used instead or in combination with the weight L.

So soon as the extra weight on the car is removed the lever-beam K will resume its original position, and the inlet-valves to the supplementary cylinders will be closed by the weight *c* on the valve-levers.

From the above description and an inspection of the drawings it will be seen that the weight on the car directly and automatically controls the admission of water to the supplementary cylinders. The operation of the hoist in this respect is not confined to any particular position in its elevation, as the admission of water to the supplementary cylinders will be at once cut off at any point in the stroke so soon as the overbalancing weight is removed and the beam K returns to its original position.

The importance of this will be understood when it is explained that the car may start with a heavy load, which may be removed as successive floors are reached, and which, as the car passes upward, may again be augmented, requiring greater lifting power.

J is the car, the platform of which is connected to a weighing-scale of any of the usual constructions. The car-platform thus converted into a weighing-platform permits the goods to be delivered directly on the car weighted and elevated without the extra handling and loss of time necessary under the ordinary system of transporting goods in warehouses.

Figs. 7 and 8 are an elevation and plan of a self-acting register for registering the amount of water consumed in each cylinder. Fig. 9 is one of a number of alternative methods for registering the quantity of water used by each cylinder.

The registering mechanism shown in Figs. 7 and 8 consists of a ratchet-wheel, O, mounted on the beam K, and drawn from the hoist-wheel I by a spring-ratchet, O^1. In connection with the ratchet-wheel O a spring-pawl, O^2, attached to the lever-beam K, is used. The pawl, when the beam is overbalanced, is drawn farther into the teeth of the ratchet-wheel, causing it to give a greater stroke at its upper end, and by means of a ratchet and ratchet-wheel, P P′, registering on a register of any of the usual constructions in proportion to the length of the stroke of the ratchet P. So soon as the lever-beam is returned to its original position the length of the stroke of the pawl O^2 is again reduced.

There are many ways in which a register of the quantity of water used by the supplementary cylinders could be operated from the tilting motion of the beam K. Therefore I do not limit myself to the device shown.

In the working of hoists constructed according to my invention a great economy of water is obtained, as the amount of water consumed is automatically regulated in proportion to the weight to be lifted, and varies automatically as the load varies.

The main cylinder may be of a capacity to suit the average weight of load, and its power is always constant and invariable, the supplementary cylinder or cylinders being only called into requisition at intervals for extra work.

The foregoing specification relates to the use of one or more supplementary cylinders automatically operated. The same automatic mechanism, in connection with the lever K, can be arranged by which one or more small or large cylinders can be used independently of each other, or their combined powers applied as the load to be lifted requires. Suppose, for instance, I construct a hoist having two cylinders, one capable of raising eight hundred pounds and the other twelve hundred pounds. So long as the load placed on the car does not exceed eight hundred pounds the small cylinder only is used. Should the load exceed that weight, the action of the lever K through suitable mechanism closes the supply-valve of the small cylinder and opens the valve of the large cylinder. Should the load exceed twelve hundred pounds, the mechanism connecting the valves to the lever K is so arranged that both valves open and the power of the combined cylinders is brought into action. In Fig. 10 I show an arrangement of mechanism for accomplishing this; but as there are several ways by which it can be effected through the action of the lever K, I do not confine myself to the special design shown. I may here mention that in this arrangement a relief-valve, H, would be necessary for each cylinder.

In Fig. 10, 2 is a lever connected to the ad-

justably-weighted lever K, and attached to the spindle 3, having a bevel-pinion, 4, keyed to it and meshing with the bevel-pinion. This latter pinion is keyed to the upright spindle 6, having the cam-disk 7 keyed to it, as shown. Upon this cam the two levers 8 and 9 rest, the lever 8 being connected to the valve 10, which closes the communication with the small cylinder, and the lever 9 operates the valve 11, which performs a like service for the large cylinder. When the hoist is at rest the valve 10 is open and the valve 11 closed. Consequently when the water is turned on the hoist is operated by the small cylinder so long as the weight does not exceed its calculated power—say, eight hundred pounds. The moment this weight is exceeded the lever K, which is suitably set, tilts, and thus, by raising the lever 2, the valve 10 is closed and 11 opened through the action of the cam-disk 7. When the weight exceeds the calculated power of the large cylinder, the lever K, through the mechanism shown, revolves the cam-disk 7, still farther reopening the valve 10, without closing the valve 11, thus obtaining the full power of both cylinders.

The tilting lever K is, of course, applicable to other descriptions of hoists in which the arrangement of ropes and pulleys and the mode of connection with the car differ from that shown in drawings. Therefore I do not limit my claim to the application of the lever K as shown.

I claim as my invention—

1. The combination, with a water-cylinder of known lifting capacity, of one, two, or more supplementary water-cylinders, arranged in connection with suitable automatic mechanism, to be thrown in and out of working connection as the load on the car varies, substantially in the manner shown and described.

2. The lever-beam K, mounted on trunnions and divided into two arms of unequal length, on the shorter arm of which the upper rope-wheel of hoist is mounted, and to the adjustably-weighted longer arm is connected a valve or valves of suitable construction, whereby when the load on the car is increased above a given weight the balance of the lever will be disturbed, causing it to move on its fulcrum and to throw one or more supplementary lifting-cylinders into working connection with the main cylinder, and when the extra load is removed from the car the lever will be returned to its original position, allowing the inlet-valves to the supplementary cylinders to be closed, all arranged substantially in the manner shown and described, to automatically regulate the lifting capacity of the host in proportion to the weight to be elevated.

3. The combination of the hoist J, rope G, wheel I, and adjustably-weighted lever-beam K with the inlet-valves of one or more supplementary lifting-cylinders, substantially as shown and described.

4. The piston-head of the supplementary cylinder or cylinders, provided with a valve, H, for the purpose of allowing the cylinder to remain always filled with water, in order that it may be thrown into and out of working connection, with no waste of water or time at any point in the stroke of the piston.

5. The combination, with the upper rope-wheel, I, mounted on a tilting-beam, of one or more registers or counters arranged to register the amount of water consumed by one or more cylinders, substantially as shown and described.

6. The valves 10 and 11, connected to and arranged in combination with the lever K, for the purpose of automatically operating cylinders of unequal capacity, either singly or jointly, as the load to be lifted requires, substantially as shown and described.

7. The valve C^1, operated from a single check-rope, in combination with the valve C^4, arranged to automatically connect and disconnect the supplementary cylinder or cylinders with the main cylinder of a lifting-hoist, substantially as shown and described.

8. The valves 10 and 11, arranged in connection with hydraulic cylinders, as described, in combination with the cam-disk 7, operated through suitable mechanism by the lever 2.

Toronto, 24th December, 1877.

JOHN FENSOM.

In presence of—
DONALD C. RIDOUT,
L. WHITEHEAD.