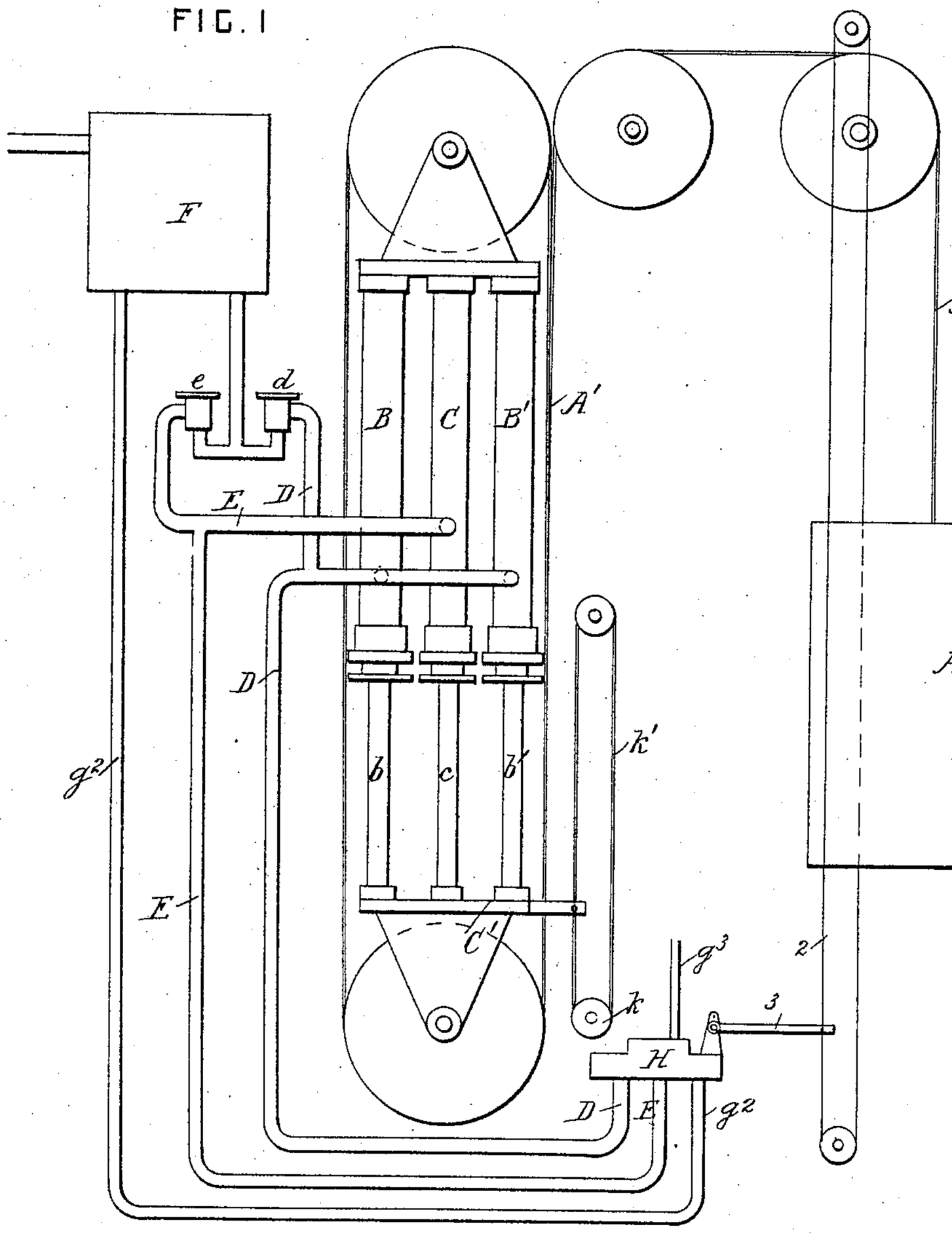
(No Model.) 3 Sheets—Sheet 1

R. CAREY.

HYDRAULIC LIFTING MACHINERY.

No. 575,698. Patented Jan. 26, 1897.

FIG. 1



Witnesses
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(No Model.) 3 Sheets—Sheet 2.

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FIG. 4.

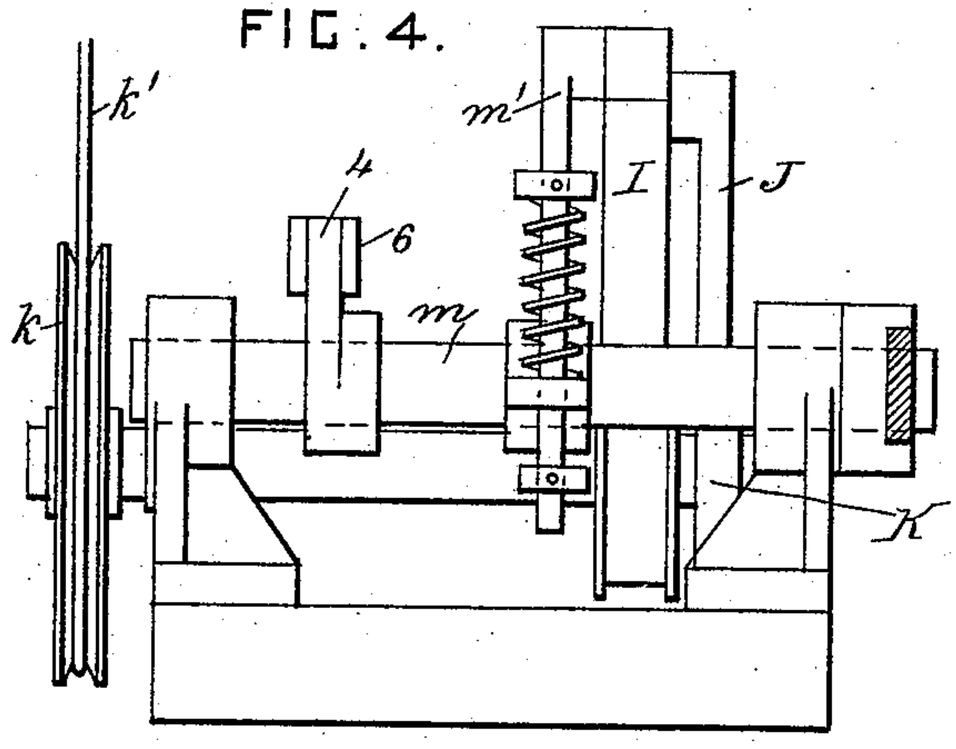
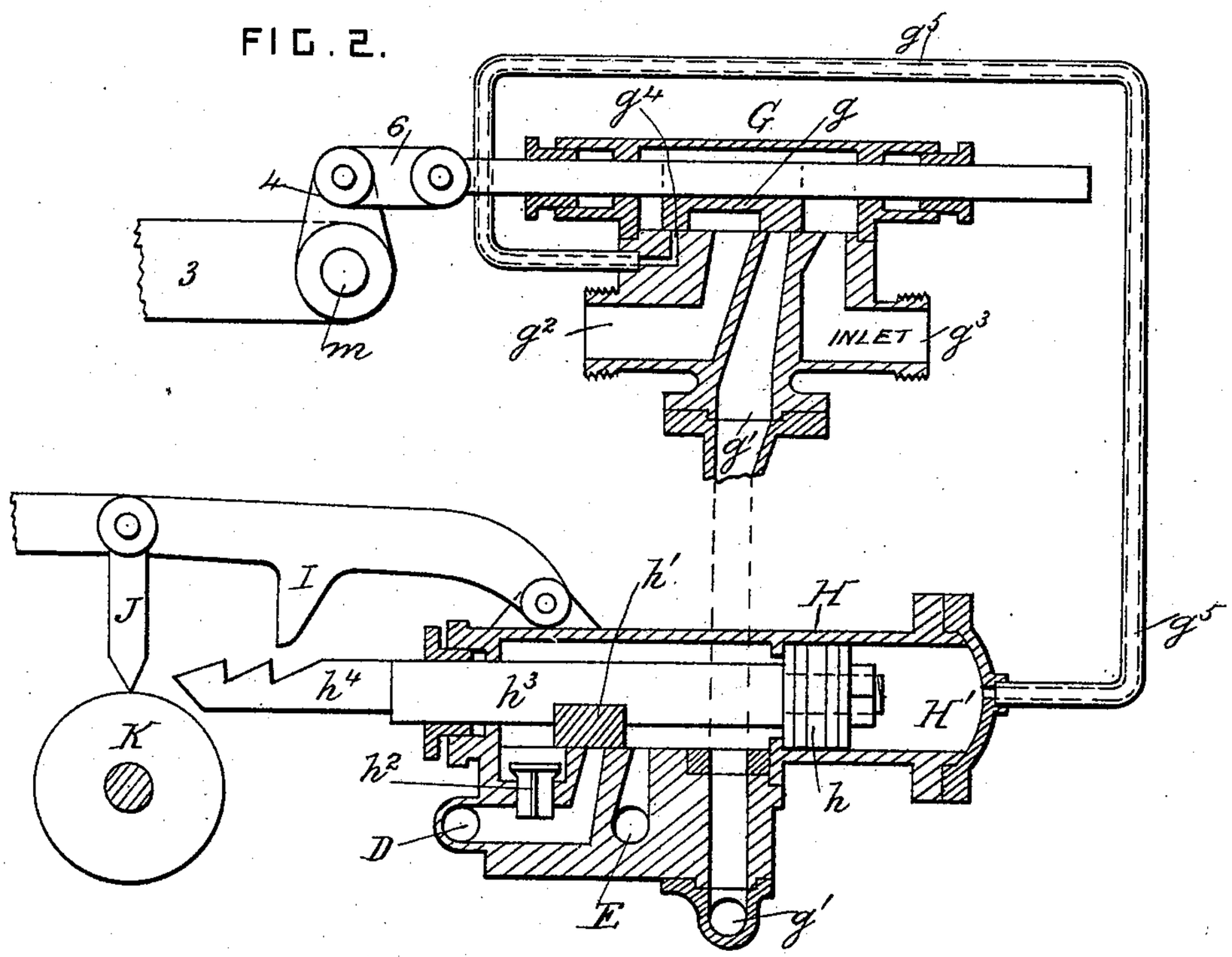


FIG. 2.



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(No Model.) 3 Sheets—Sheet 3.

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FIG. 3.

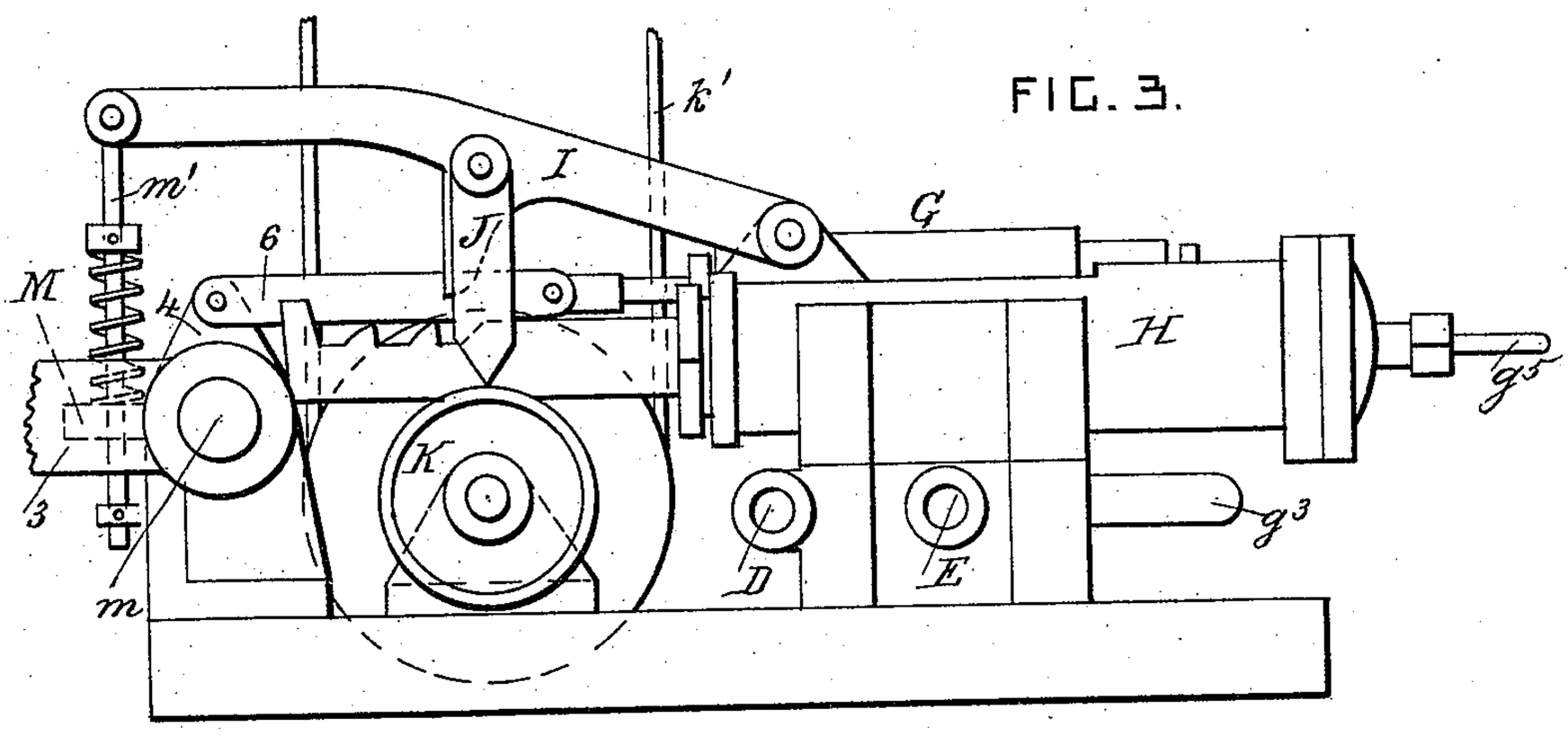
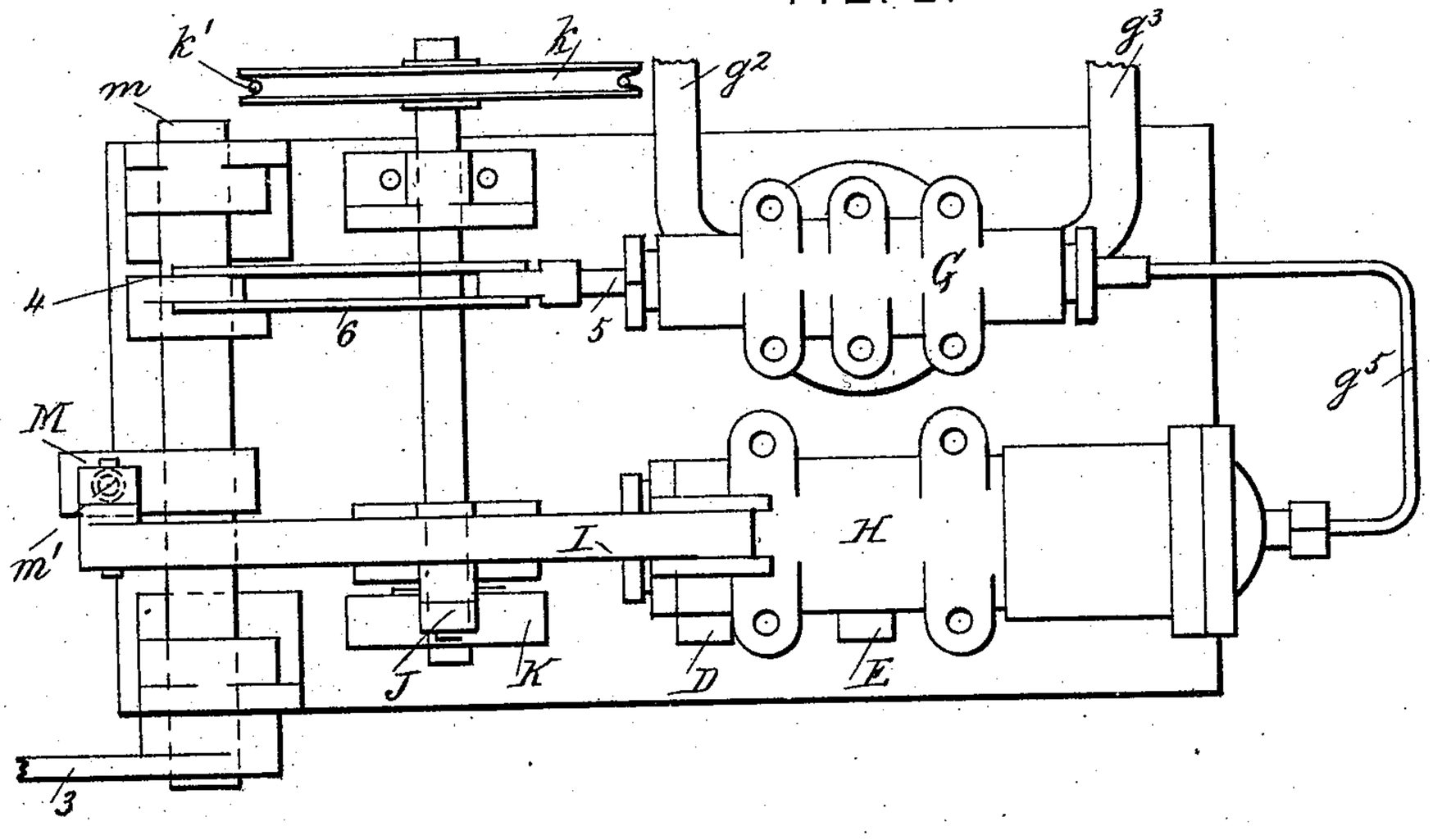


FIG. 5.



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UNITED STATES PATENT OFFICE.

ROBERT CAREY, OF LONDON, ENGLAND.

HYDRAULIC LIFTING MACHINERY.

SPECIFICATION forming part of Letters Patent No. 575,698, dated January 26, 1897.

Application filed March 13, 1895. Serial No. 541,553. (No model.)

To all whom it may concern:

Be it known that I, ROBERT CAREY, a citizen of Great Britain and Ireland, residing at 35 Gauden Road, Clapham, London, in the county of Surrey, England, have invented certain new and useful Improvements in Hydraulic Lifting Machinery; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to hydraulic lifts or elevators, cranes, or other machinery in which a load is raised by the admission of water to one or more suitable cylinders containing pistons or plungers connected with the lifting-gear. I use two or more cylinders or rams or their equivalent of ordinary construction and arrange suitable valves so that the admission of the actuating fluid is controlled step by step until the power is sufficient to lift the load. Each of the cylinders or compartments may have separate valves operated in due succession by one set of gearing, or a single valve may distribute the water to all the cylinders or the like. These valves or valve (hereinafter called indiscriminately the "power-setting" valve) may be of ordinary or of special construction and is independent of the ordinary controlling-valve or its substitute, (hereinafter called indiscriminately the "controlling-valve".) The latter valve serves to admit pressure to or allow exhaust from a pipe leading to the power-setting valve, which determines which of the cylinders or compartments are to receive the pressure-water.

In the accompanying drawings I have shown the method in which I generally construct my apparatus when applied to a hydraulic lift or elevator.

Figure 1 shows in outline the complete elevator. Fig. 2 shows diagrammatically the controlling and power-setting valves with their connections. Figs. 3, 4, and 5 show the valves and their gear in side elevation, end elevation, and plan, respectively.

In Fig. 1 the cage A is lifted by ropes A′, passing around the usual multiplying-sheaves of a hydraulic elevator having three cylinders B, B′, and C. The rams *b*, *b′*, and *c* of these cylinders are fixed to a common cross-head C′ and move up and down in unison. The outer cylinders B and B′ are connected together by a pipe D. The center cylinder C has a similar pipe E. These pipes lead away to the power-setting valve by which water may be admitted to either D and E separately or to all, so that one, two, or three of these cylinders may at will receive the pressure-water. These pipes are connected with the exhaust-tank F by non-return valves *d* and *e*, which prevent the escape of water from the cylinders, but allow ingress to them in order to keep full those cylinders whose rams are working idle.

The controlling-valve G has a plain flat chambered slide *g*, controlling the cylinder-port *g′*. The pressure-water enters at g^3. The exhaust leaves at g^2 and passes to the exhaust-tank F. So far the valve is of ordinary construction and performs the usual functions of locking the water in the cylinder-port and pipe *g′*, or of opening the same to the pressure g^3 or exhaust g^2, but I form a special port g^4 in the valve-face and connect it by a pipe g^5 with a cylinder H′ and piston *h* in the power-setting valve H. This latter-mentioned valve has a plain slide *h′*, which covers or uncovers two ports connected with the pipes D and E, leading to the cylinders, as previously mentioned. In the position shown the slide *h′* is in its normal position, *i. e.*, it is at the extreme left-hand portion of its travel. The pipe *g′* of the controlling-valve leads direct into the casing of the valve H. As the slide *h′* normally covers the port of pipe D, a non-return valve h^2 is arranged in this pipe to allow free exhaust in this position. The slide *h′* is held in a rod or ram h^3 of a smaller diameter than the piston *h* to which it is connected. The rod h^3 passes through a stuffing-box and is fixed to a ratchet-toothed rack h^4. Above this rack is mounted a pawl I, normally held out of action with the rack h^4 by a leg J, which rests on a wheel K, having a shaft and pulley *k*, driven by a cord *k′* from the cross-head C′.

The machine is started to lift in the usual way by moving the slide *g*, so that water under pressure may pass from g^3 along *g′* to the power-setting valve H and enter the pipe E, leading to the center cylinder. The slide *g* also simultaneously opens the port g^4 to the

exhaust g^2. The rod h^3 being smaller than the piston h and the space behind h being now open to the exhaust, the slide h' begins to travel to the right at a speed rendered slow by the constricted area of the pipe g^5. Should the load in the cage A be light, the ram c will commence moving and the cross-head will set in motion the cord k', trip the leg J, and so drop the pawl I into the first notch. The port E only is open. Should, however, the load in A be too much for ram c, the cross-head will not move and the slide will travel farther, covering E and opening D, to bring the second power into play. If this is insufficient, the slide travels farther on and leaves both D and E open to the pressure. As soon as the cylinder-rams begin to move the pawl I will drop and hold the slide h'.

When the cage A is to be lowered, the slide g opens the pipe g' to the exhaust g^2 and simultaneously opens g^4 to the pressure, thus returning the piston h to its normal position.

An operating-cord 2 is provided and is connected to the operating-lever 3, which is secured on the shaft m. An arm 4 is secured on the shaft m and is connected with the stem 5 of the valve G by the links 6. An arm M projects from the shaft m and is operatively connected with a rod m', which is pivoted to the free end of the pawl I. When the controlling-valve G is moved to the right by raising the lever 3, the arm M raises the pawl I and allows the leg J to drop into a vertical position ready to be supported by the wheel K when the valve G is moved back to its central position.

What I claim is—

1. The combination, with a hydraulic elevator provided with a cylinder having an inlet-pipe E, and two cylinders having a common inlet-pipe D; of a power-setting valve H connected to the said pipes and provided with a piston h and a slide h' connected together, and an inlet g'; a ratchet-bar secured to the said piston, a wheel operatively connected with the elevator and revolving when the elevator commences to move, and a pivoted pawl normally supported by the said wheel and arranged to drop into the said ratchet-bar when the said wheel commences to revolve, the said slide being operated by the said piston and controlling the passage of water from the inlet g' to the said pipes D and E, substantially as set forth.

2. The combination, with a hydraulic elevator provided with a cylinder having an inlet-pipe E, and two cylinders having a common inlet-pipe D; of a power-setting valve H connected to the said pipes and provided with a slidable rod, a rack, a slide h' and a piston h all connected together, and an inlet g'; a pivoted pawl for engaging with the said rack and arresting the motion of the said slide, and trip mechanism connected with the said elevator and operating to hold the pawl clear of the rack until the elevator commences to move, substantially as set forth.

3. The combination, with a power-setting valve H provided with pipes D and E, a non-return exhaust-valve h^2 connected with the pipe D, an inlet and exhaust pipe g', and a slide h' controlling the admission of water to the pipes D and E; of a controlling-valve G connected to the said pipe g', and provided with inlet and exhaust passages, and a slide g controlling the passage of water to and from the said pipe g', substantially as set forth.

In testimony whereof I have affixed my signature in presence of two witnesses.

ROBERT CAREY.

Witnesses:
EDMUND S. SNEWIN,
WM. V. BROWN.