F. TOMMASI & E. HEURTEBISE.

HYDRAULIC ELEVATOR AND HOIST.

No. 247,133. Patented Sept. 13, 1881.

Fig. 1.

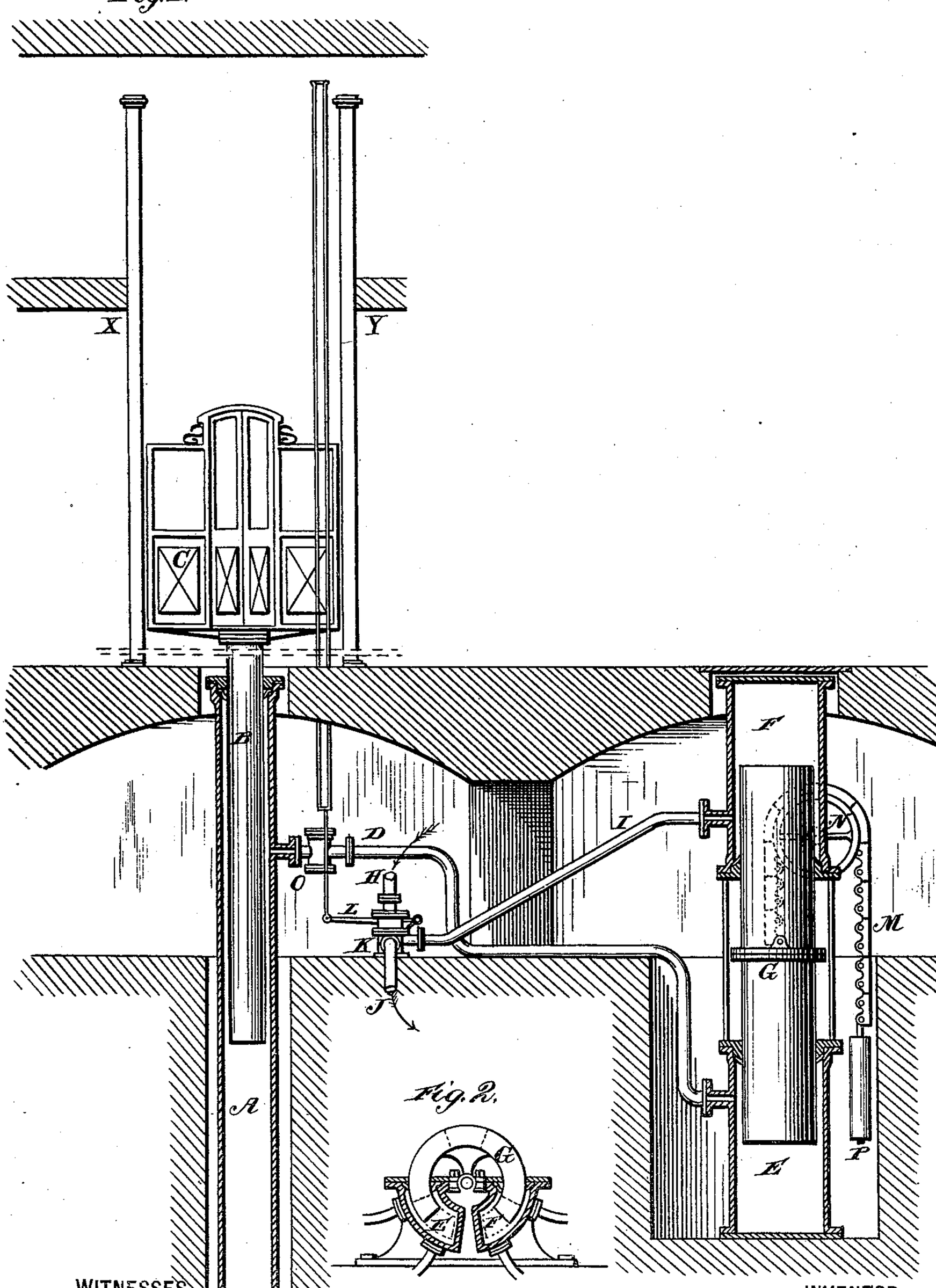

Fig. 2.

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FERDINANDO TOMMASI AND EMILE HEURTEBISE, OF PARIS, FRANCE.

HYDRAULIC ELEVATOR AND HOIST.

SPECIFICATION forming part of Letters Patent No. 247,133, dated September 13, 1881.

Application filed February 20, 1880. Patented in France October 9, 1878, and October 27, 1879, in Belgium October 30, 1879, in Italy January 12, 1880, in Germany March 2, 1880, and in Spain March 2, 1880.

To all whom it may concern:

Be it known that we, FERDINANDO TOMMASI and EMILE HEURTEBISE, of Paris, in the Republic of France, have invented a new and useful Balanced and Safety Arrangement Applicable to Hydraulic Lifts, Elevators, and Rising Platforms, of which the following is a specification.

Our invention relates to means applicable to rising platforms, hoists, and especially to hydraulic lifts, whereby these apparatus may be maintained always in a state of equilibrium, whatever be the position of the cabin or cage or platform—that is to say, however much of the main lifting piston or rod or stem may have left its long hydraulic cylinder.

It also relates to special arrangements designed to render the working of said balanced apparatus more easy and certain, to economize power, and to enable the cabin or platform to be raised to a greater height than that which corresponds to the charge of motive liquid.

Figure 1 is a cross-section, showing the general arrangement of a compensating or balanced lift on our system. Fig. 2 represents a modified arrangement for effecting the balancing of the piston or rod or stem supporting the cabin by affording compensation for the additional weight it assumes on coming out of the water.

A is a hydraulic cylinder, in which works the piston main rod or stem B, on whose upper end is the cabin or cage guided by the columns. Said piston B passes through a stuffing-box in the cylinder A, which is always full of water or other liquid. C is the cabin or cage, whose travel may be regulated from the interior. D is a water-pipe, providing free communication between the long cylinder A and the lower compensating-cylinder, E. F is an upper compensating-cylinder, receiving motive liquid; G, a plunger common to both cylinders E F; H, an inlet-pipe for motive liquid to act in the cylinder F; I, a pipe which conveys the motive liquid into the cylinder F, and by which such liquid is withdrawn after it has acted; J, an exhaust or draw-off pipe for liquid that has done work in the cylinder F; K, a distributing-chest, in which is a valve, a slide, or any other distributing organ, allowing of the passage of the liquid from the pipe H into the pipe I, or from the pipe I into the tube J, as required; L, a distributing-lever operated from the interior of the cabin or cage, and by means of which the descent may be accelerated, moderated, or stopped, as desired; M, an equilibrium-chain, for which may be substituted an arrangement such as that illustrated in Fig. 2, or a variable cam arrangement, as hereinafter explained, may be employed; N, a pulley turning freely on its axis, and over which the chain passes.

It will thus be seen that by our system the ordinary equilibrium-chains are dispensed with, and that the water or other liquid which passes from one cylinder to the other is not renewed. A lubricating or uncongealable liquid may be used, according to the particular case.

It will also be seen that the motive liquid arriving in the cylinder F impels the piston G, which passes into the cylinder E, forcing a quantity of liquid equal in bulk to the immersed portion of such piston. This has the effect of causing the piston main rod or stem B to move a corresponding distance out of its cylinder A, and if the cross-section of the piston G be greater than that of the piston or rod or stem B, this latter will travel proportionally faster, according to the extent to which the piston G may be greater, so that, for example, deducting friction, if the section of the piston G is double that of the piston or rod or stem B, with a charge of eight meters (eight cubic yards) of water the cabin or cage may be moved vertically about sixteen meters (sixteen cubic yards.)

To insure constancy in operation, a certain addition to the foregoing system was found to be indispensable. For, supposing the piston or rod B at the bottom of its stroke, and consequently the piston G at the top of its stroke, and that in this position there was an equilibrium between the weight of the cabin or cage and rod B on the one hand, and the weight of the piston G and charge it supported on the other hand, this equilibrium would be destroyed when the piston or rod B had passed a certain distance out of its cylinder. This destruction of equilibrium would correspond to the augmentation of weight which the piston or rod B would assume on emerging from the liquid contained

in the cylinder A, and this augmentation of weight would be equal to that of the volume of liquid displaced by the piston G. To counteract this augmentation of weight, therefore, the movement must be commenced with an excess of motive power, which would give rise to shocks, necessitate a heavier charge, and might cause arrestation of the movement commenced were the charge of water too exact. To avoid these inconveniences by preventing interruption of the state of equilibrium of the two principal parts of the system, we designed the compensating arrangements above mentioned, and of which we proceed to more fully explain the purpose and operation. The compensation may be obtained in several ways. We have indicated two methods in Figs. 1 and 2. That indicated in Fig. 1 consists of a large pitch-chain, M, which winds on the loose pulley N. This chain is attached at one of its ends to the piston G, the other end hanging freely, or it may also be provided with a supplementary weight, P. The acting weight of the piston G will therefore at any moment be equal to the absolute weight of this piston less the excess of weight of hanging chain, taken under the line *m n*, onto the other line of chain. This acting weight will therefore be variable, and its variability being proportioned to that of the weight of the piston or rod B, the equilibrium will be maintained at all points of the stroke of the pistons, and notwithstanding the influence of friction and the slight excess necessary on the return of the chain, the apparatus will work as a true hydraulic balance. Thus, supposing the piston or rod B to be at the bottom of its course and π (*p*) to represent the constant weight which balances it at the commencement of the movement, as soon as, by leaving the liquid, the piston or rod B shall have increased its weight by ten kilograms (twenty pounds) the weight of the hanging chain M will have become ten kilograms (twenty pounds) less—that is to say, the weight π (*p*) will, in its turn, have increased by ten kilograms, (twenty pounds.)

It is evident that compensation may be effected in many other ways. For example, supposing the chain M to be of little weight, but that it carries hung at its free end a heavy weight, in such case the pulley N, instead of being concentric, should be eccentric in such manner that the leverage of the weight would vary, according to the position or extent of turning motion of the said pulley, so as to augment or diminish its effect to the extent required for maintaining a constant equilibrium of the piston or rod B and cage. The required compensation may also be realized by making the piston G in the form of part of a circular ring, oscillating about its center, and the cylinders E F both at bottom of the same curved circular form. These cylinders are both closed similarly with covers, through which the pistons pass, and are furnished with packing-leathers. By suitably arranging the mass to the right and to the left of the vertical axis, with the addition, if need be, of the action of a weight properly arranged relatively to the center of oscillation, such leverage may at all times be had without the employment of a chain as will cause an equilibrium to be maintained in all the positions of the ring. Fig. 2 shows such an arrangement, and the ring, which is solid to the left of the vertical axis symmetrically, is hollowed out for a part of its length on the right.

What we claim is—

1. A hydraulic lift or hoist wherein the ordinary cylinder in which works the piston or main rod supporting the cabin or platform receives the motive liquid, not directly, but from a cylinder with which it freely communicates, and in which moves a heavy piston, impelled and impelling by turns, and which always draws or forces the same liquid, such liquid passing alternately from one to the other of said two cylinders, substantially as described.

2. In a hydraulic lift or hoist, the combination of two cylinders contiguous or adjacent to each other, in which works a heavy piston common to both, one of said cylinders receiving directly the motive liquid, while the liquid contained in the other cylinder (always the same) is caused to pass and repass from it to the cylinder in which works the piston or main rod of the cabin or platform part of the lift, substantially as described.

3. In a hydraulic lift or hoist, in combination with the cylinder F and pipes H I J, the distributing-chest K, with valve and operating-lever L, the whole arranged so that the distribution may be controlled at will, substantially as and for the purpose specified.

4. In a hydraulic lift or hoist, the combination, with a cylinder, A, containing a piston or main rod, B, and a cylinder, E, connected by a pipe or passage with said cylinder A, of a piston, G, arranged to work in said cylinders E F, and means for compensating the increase in the weight of said piston or main rod B as it moves out of the liquid in said cylinder A, substantially as described.

5. In a hydraulic lift or hoist, as means of compensating the increase in the weight of the piston or main rod of the cabin or platform when leaving the liquid, the combination, with the piston or plunger G, of a pitch-chain the links of which are calculated to maintain the system constantly in equilibrium in proportion as they pass over a pulley or wheel, N, substantially as described and illustrated.

6. In a hydraulic lift or hoist, the combination of the two large cylinders E F with piston or plunger G, common to both, connected to the long cylinder A, as shown, so as to suppress the ordinary equilibrium-chains, and for greater security, substantially as described.

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