(No Model.)

D. E. CROSBY.

ELEVATOR.

No. 503,786. Patented Aug. 22, 1893.

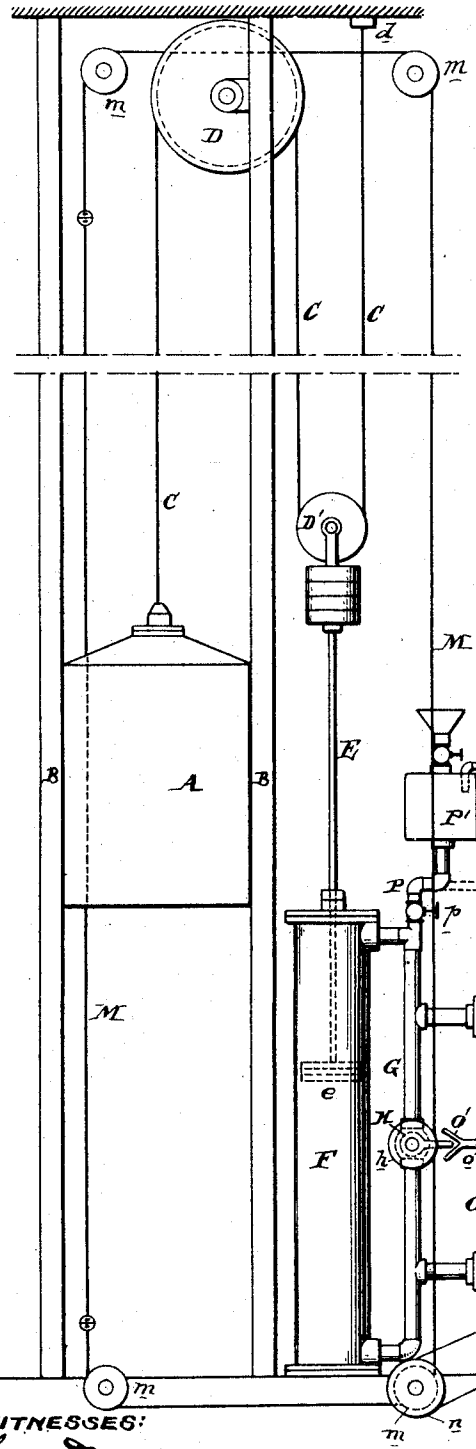

FIG. 1

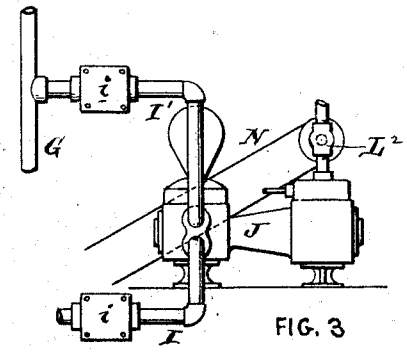

FIG. 3

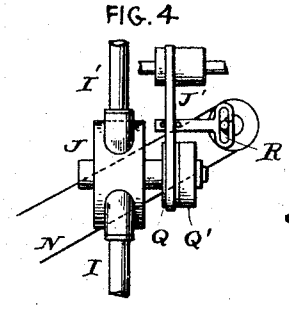

FIG. 4

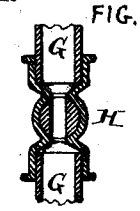

FIG. 2

WITNESSES:

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UNITED STATES PATENT OFFICE.

DARWIN E. CROSBY, OF PHILADELPHIA, PENNSYLVANIA.

ELEVATOR.

SPECIFICATION forming part of Letters Patent No. 503,786, dated August 22, 1893.

Application filed February 14, 1893. Serial No. 462,277. (No model.)

To all whom it may concern:

Be it known that I, DARWIN E. CROSBY, of the city and county of Philadelphia and State of Pennsylvania, have invented an Improvement in Elevators, of which the following is a specification.

My invention has reference to elevators, and consists of certain improvements which are fully set forth in the following specification and shown in the accompanying drawings which form a part thereof.

The invention forming the subject matter of this application is more particularly directed to that class of elevators which employ hydraulic power devices for raising and lowering the cage.

The object of my invention is to dispense with the usual tank upon the roof, or pressure tank and stand pipe which has heretofore been necessary to secure the requisite pressure and uniform working of the power devices.

In carrying out my invention, I provide the elevator with the usual hydraulic cylinder, piston, and connections, and combine therewith means adapted to be operated from the cage to permit the water to return from the upper part of the cylinder to the lower part thereof in lowering the cage, and with power devices to uniformly and positively force the water from the lower part of the cylinder to the upper part thereof when it is desired to raise the elevator, the said power devices being also controlled from the cage of the elevator. The power devices which I employ are so constructed that they are adapted to force the water through the pipes in a substantially continuous manner and without objectionable pulsations.

Referring to the drawings: Figure 1 is an elevation of an elevator embodying my invention; Fig. 2 is a sectional elevation of the controlling valve; and Figs. 3 and 4 are elevations showing modifications of the power devices illustrated in Fig. 1 for forcing the water from the lower part of the cylinder to the upper part thereof.

A is the elevator cage and is guided in vertical guides B in the usual manner. The cage is raised and lowered by a cable which passes over the sheave D at the top of the elevator shaft, then down under a sheave D′ and is moved vertically by the piston rod E and piston *e* working in a hydraulic cylinder F. This construction is that commonly found in hydraulic elevators.

The top and bottom of the cylinder F are connected by a pipe G containing a valve H having an operating sheave *h*. This valve is shown in section in Fig. 2. Connected with the pipe G above and below the valve H are respectively the discharge pipe I′ and suction pipe I leading to a pump J, and said pipes are provided with check valves *i* opening in opposite directions so that the water can only be drawn from the lower part of the cylinder F and discharged into the upper part by the action of the pump. The pump J is preferably a rotary pump such as will force the water without material pulsation, some of these pumps being extensively used on steam fire engines where great power and uniformity of flow are required. Rotary pumps are shown in Figs. 1 and 4. In place of a rotary pump, in some cases, such as freight elevator work, a duplex pump such as the Worthington pump may be employed, as indicated in Fig. 3. In any case, however, the pump must be one which will produce a substantially uniform flow of water, and in the case of passenger elevators said uniform flow of water must be such that the pulsations will not be materially felt in the cage.

Referring again to Fig. 1, the rotary pump J is driven by an electric motor K through a power transmitting device J′ of any suitable kind. The electric motor receives current from a motor circuit *k* which contains a double pole switch L′ for breaking the motor circuit, and a rheostat or regulator L for controlling the current delivered to the motor for the purpose of varying its speed. This motor is controlled from the elevator cage by means of a hand rope M which passes through the cage and about the sheaves *m* at top and bottom of the elevator shaft. Secured to one of the sheaves *m* is a sheave *n*, and passing over this sheave *n* is a cable, cord, or chain N for operating the rheostat or regulator L. It is quite evident that the regulator may be operated directly by the shaft of one of the sheaves *m*, or in any other suitable manner. The controlling rope M may also pass about

a sheave *h* on the valve H for the purpose of operating it from the cage.

As shown, the elevator cage is descending and the valve H is in the position shown in Fig. 2. The pump J may be operating slowly just so as to be in good running order and at all times ready to start up quickly, and the small amount of water being moved may be circulated through the shunt pipe O and a valve *o* similar to the valve H. If it is desired to stop the elevator, the rope M is pulled, which action will turn the valve H so as to shut off the pipe G and yet not completely shut off the valve in the pipe O. If it is now desired to ascend, the rope M is again pulled and a further movement of the valve H keeps it closed and also closes the valve *o* by the connection O′, and simultaneously therewith throws out sufficient of the resistance L to let the motor K operate the pump J with proper speed. The water is then drawn from the lower part of the cylinder F through the suction pipe I, and discharged through the discharge pipe I′ into the upper part of the cylinder F, depressing the piston *e* therein.

It is not necessary to my invention that an electric power device should be employed to operate the pump, as it may be driven by a belt J′ passing from a power pulley to and about a fixed pulley Q upon the rotary pump shaft. The belt shifter R may be employed to move the belt J′ from the fixed pulley Q to the idler pulley Q′ on the shaft J, and which shifter is adapted to be operated by a rope N as in the case of the rheostat. This construction is shown in Fig. 4. If the pump is steam actuated, the steam valve L^2 may be operated by a cord or chain N as indicated in Fig. 3. It is immaterial therefore what the particular power devices may be. It will be suited to the circumstances.

To compensate for leakage from the pipes, a reservoir P′ may be employed provided with a pipe P having a valve *p* for delivering the water into the upper part of the cylinder F to compensate for said leakage. A street water main P^2 may deliver water to the reservoir P′. If desired, the said street main P^2 may deliver water directly through the valve *p* into the cylinder as indicated in dotted lines.

If desired, the pipe O, valve *o*, and operating device O′ may be omitted, as they are not essential, but are preferable as permitting the pump to be continuously operated even when the valve H is closed.

It is evident that the hydraulic cylinder may be arranged horizontally in place of vertically, if desired, as is customary in many hydraulic elevators.

I do not limit myself to the mere details of the construction as they may be modified in various ways without departing from the principles of my invention.

What I claim as new, and desire to secure by Letters Patent, is—

1. In an elevator, the combination of the cage and lifting cable, a water cylinder, a piston working in said water cylinder and operating the cable, a pipe connecting the two ends of the water cylinder, a valve in said pipe, means extending from the cage to the valve for controlling it, a passageway communicating with the two ends of the cylinder about the valve, a rotary pump arranged to circulate the water through the passageway from one end of the cylinder to the other end thereof, one or more check valves in the passageway which contains the pump to prevent the water circulating through it except in one direction, means to control the operation of the pump from the elevator cage, a shunt pipe about the pump, a valve in said shunt pipe, and operative connections between the valve in the shunt pipe and the valve in the pipe connecting the ends of the cylinder.

2. In an elevator, the combination of the cage and lifting cable, a water cylinder, a piston working in said water cylinder and operating the cable, a pipe connecting the two ends of the water cylinder, a valve in said pipe, means extending from the cage to the valve for controlling it, a passageway communicating with the two ends of the cylinder about the valve, a rotary pump arranged to circulate the water through the passageway from one end of the cylinder to the other end thereof, one or more check valves in the passageway which contains the pump to prevent the water circulating through it except in one direction, means to control the operation of the pump from the elevator cage, a shunt pipe about the pump, a valve in said shunt pipe, operative connections between the valve in the shunt pipe and the valve in the pipe connecting the ends of the cylinder, power devices to continually operate the rotary pump, and means leading from the cage to vary the speed of the rotary pump.

In testimony of which invention I have hereunto set my hand.

DARWIN E. CROSBY.

Witnesses:
ERNEST HOWARD HUNTER,
R. M. HUNTER.