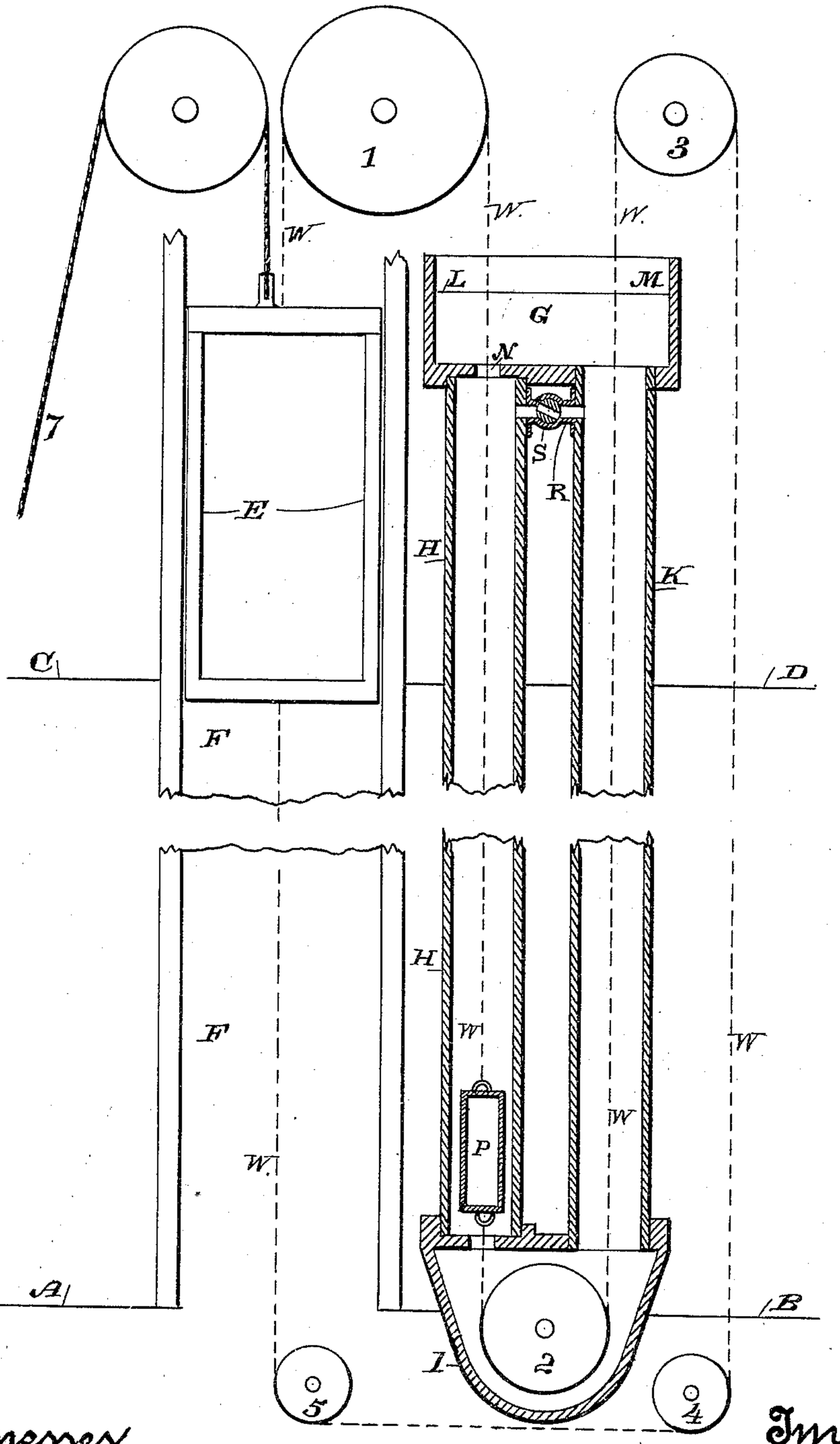
(No Model.)

F. GUTZKOW.

ELEVATOR.

No. 431,164. Patented July 1, 1890.



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FREDERICK GUTZKOW, OF SAN FRANCISCO, CALIFORNIA.

ELEVATOR.

SPECIFICATION forming part of Letters Patent No. 431,164, dated July 1, 1890.

Application filed March 19, 1890. Serial No. 344,516. (No model.)

To all whom it may concern:

Be it known that I, FREDERICK GUTZKOW, a citizen of the United States, residing in the city and county of San Francisco, State of California, have invented an Improvement in Elevator Brake and Speed Regulators; and I do hereby declare the following to be a full, clear, and exact description of the same.

My invention relates to a hydraulic brake and speed regulator, which is applicable to devices in which weights are raised and lowered by means of a rope, and especially to house-elevators.

It consists of a U-shaped tube containing liquid, a piston fitting loosely in one branch of the tube and connected from top and bottom with the top and bottom, respectively, of the elevator-cage by ropes passing over suitably-disposed guide-pulleys, and also of regulating-passages, through which the liquid moves with a retarded motion.

The object is to secure the easy descent of the cage to the bottom if the hoisting rope or machinery should break, and, in general, a self-acting regulator of the speed of ascent and descent without the aid of mechanical attachments, springs, clutches, or levers.

Referring to the accompanying drawing for a more complete explanation of my invention, the figure shows a vertical section of the upper and lower ends, the intermediate floors being broken away.

A B is the level of the basement-floor; C D, the level of the top floor. The distance between these two lines is consequently the lift of the elevator.

F is the elevator-shaft; E, the elevator-cage.

The rope 7 represents the ordinary customary rope which connects the cage with the hydraulic or other hoisting machinery.

The apparatus required for working my invention is constructed of iron, and consists, essentially, of a U-shaped tube H I K, which is filled with water. The horizontal part of the U-tube is represented by the part I, which serves as a returning-elbow and contains the pulley or sheave 2. The two vertical branches of the U-tube are the pipes H and K, which extend the whole height of the elevator-shaft. The open mouths of these two pipes are secured to the bottom of the open tank G, in which the water stands to the level L M. H and K are also connected together by a pipe R placed near the bottom of tank G. The communication between H and G is contracted to the opening N, which is just large enough to allow a wire rope to pass comfortably through it. The area of R may be regulated by a stop-cock S. Through the rest of the apparatus the water can circulate without restriction. The size or shape of I, K, and G are not essential as long as the dimensions are liberal.

The wire rope W passes through the tube H I K and over the sheave 2. Its course is clearly indicated in the drawing by the dotted lines, and it passes over the sheaves 1, 2, 3, 4, and 5. It is endless, being fastened to the top and bottom of the elevator-cage E, and is as strong as the hoisting-rope 7. Inside the tube H this rope is interrupted by the piston or plunger P, which does not fit closely into the tube, but allows the passage of water through the annular space left between P and H. It is evident that (E and P being in the position shown) when the cage E sinks the piston P will rise, so that when the cage E is at the bottom of the elevator-shaft the piston P will be near the upper end of the leg H; also, that when the cage E ascends, the piston P is pulled downward by the returning rope W.

I shall refer, in the first place, to the descent of the elevator-cage from the position in the drawing. The water displaced by the rise of the piston P will escape from the chamber formed in H between piston P and the opening N, through the opening N, and through the annular space between the piston P and the leg H, the stop-cock S being considered closed. This outlet has been constructed too small to allow a free passage of the water, and consequently a pressure will ensue in the aforesaid chamber, which is indicated by a water-gage or manometer connected with H near the top of that pipe. This pressure is reduced by opening the stop-cock S and brought under control. The stop-cock S is so far opened that the water-gage shows a certain constant pressure during the normal speed of the piston P, say one or two pounds on the square inch.

The regulation by stop-cock S, as described, is required only once during the first trial of

the apparatus. Now, every increase of speed of the cage E and piston P will increase also the pressure in the chamber between the piston P and opening N, because at the same time a larger volume of water has to pass through the same outlet as during the normal speed of cage E and piston P. The pressure on the piston P being thus increased, its speed is reduced. In order to illustrate still further, let the loaded elevator-cage E weigh eighteen hundred pounds, let the normal speed of the cage be one foot in one second, the area of the piston P one square foot, and the normal pressure in the chamber between the piston P and opening N two pounds per square inch. Under this pressure one cubic foot of water will discharge through nine square inches of outlet. If the speed of the cage E and piston P should increase to two and one-half feet per second, the pressure in the chamber between the piston P and opening N will be two and one-half by two and one-half by two pounds velocity, being proportionate to the square of pressure, or twelve and one-half pounds, or eighteen hundred pounds on the one hundred and forty-four square inches area of the piston P—that is to say, the loaded cage is balanced. If, in the position represented in the figure, the rope 7 should break, the falling cage will be balanced after falling one inch, because according to the law of falling bodies two and one-half feet per second would be the speed then attained by the cage E and piston P. With this speed as a maximum the cage E will sink to the bottom of the shaft F, when the speed will be further reduced by the piston P closing the opening of R or a similar contrivance for reducing the outlet of the water when the piston P approaches the end of its possible stroke. In a similar manner the ascent of the cage E is regulated. What has previously been the outlet for the chamber between the piston P and opening N now becomes the inlet. If the piston P should move faster than the water can follow, it would work against the atmospheric pressure and also lift the water column existing between the level of the piston P and L M.

By employing the U-shaped tube the following advantages are secured.

First. The column of water in one tube counterbalances that in the other, which is important in very high buildings. It is not necessary for this purpose that the pipes should be of the same size or bear any particular proportion to each other.

Second. By this construction I am enabled to fix a guide-pulley at the bottom of the U-tube, and the rope passes through the water in both tubes and around this pulley. This avoids the necessity of any provision for the passage of the rope or a rod out of the tube at such a point that a stuffing-box or water-tight joint would be necessary.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. A speed-regulator for elevator-cages, consisting of a U-shaped pipe containing liquid and having the lower ends connected, a piston fitting loosely in one of the legs of said pipe, so that when moved the liquid may pass it, a rope connected with the top and bottom of the piston and also with the top and bottom of the elevator-cage, and a direction-pulley within the pipe over which the rope passes, substantially as herein described.

2. A speed-regulator for elevator-cages, consisting of a U-shaped pipe containing liquid, a tank into which the upper ends of the pipe open, and a connecting-pipe between the legs of the pipes below the tank, with a cock by which the flow of liquid through the passage is regulated, a piston fitting loosely in one leg of the pipe, ropes connecting its upper and lower ends with the upper and lower ends of the elevator-cage, and direction-pulleys over which the ropes pass, substantially as herein described.

3. A speed-regulator for elevator-cages, consisting of a U-shaped pipe containing water, a tank with which the upper ends of the legs of the pipes connect, a piston fitting loosely in one of the legs of the pipe and connected with the elevator-cage by ropes passing over direction-pulleys, as described, contracted openings in the top and bottom of the piston-containing pipe for the passage of the ropes and water, and a passage connecting the two legs of the pipes below the tanks with a cock by which the flow of water through it may be regulated, substantially as herein described.

4. In connection with an elevator-cage and for regulating its speed, the U-shaped tube filled with water, containing a sheave, over which and through the whole length of the tube there passes a wire rope fastened to the top and bottom of the cage, and the plunger P, connected with the rope and moving against hydraulic pressure, which is dependent on the speed of the cage, substantially as herein described.

In witness whereof I have hereunto set my hand.

FREDERICK GUTZKOW.

Witnesses:
S. H. NOURSE,
H. C. LEE.