(No Model.) 2 Sheets—Sheet 1.

C. R. PRATT.

ELEVATOR.

No. 580,893. Patented Apr. 20. 1897.

Fig. 1.

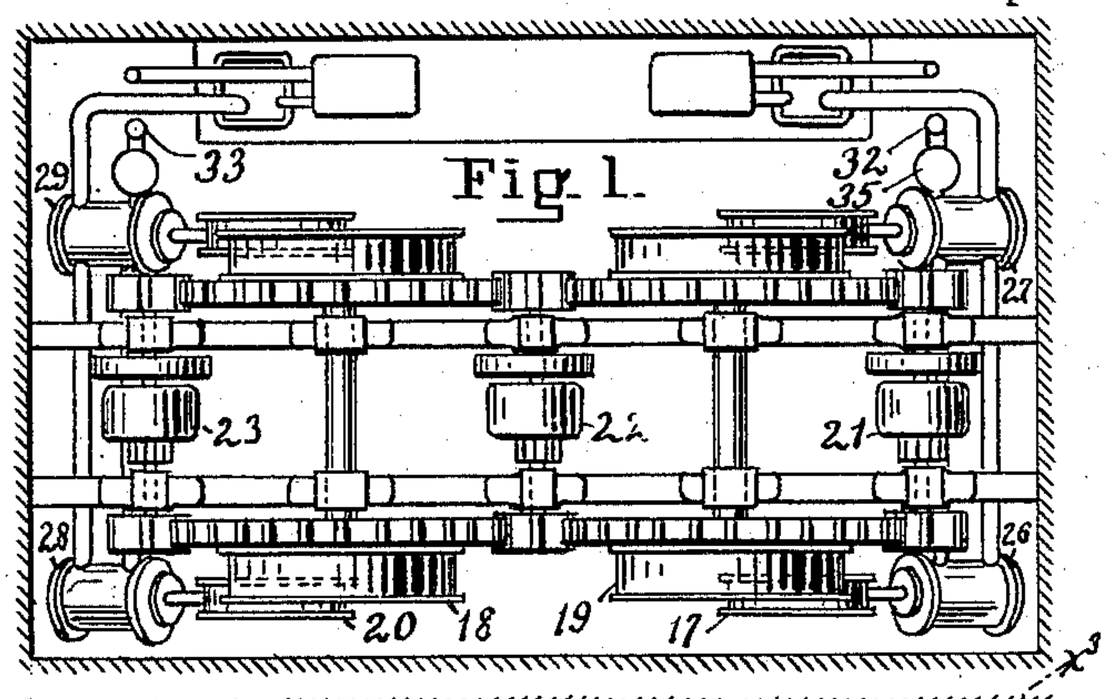
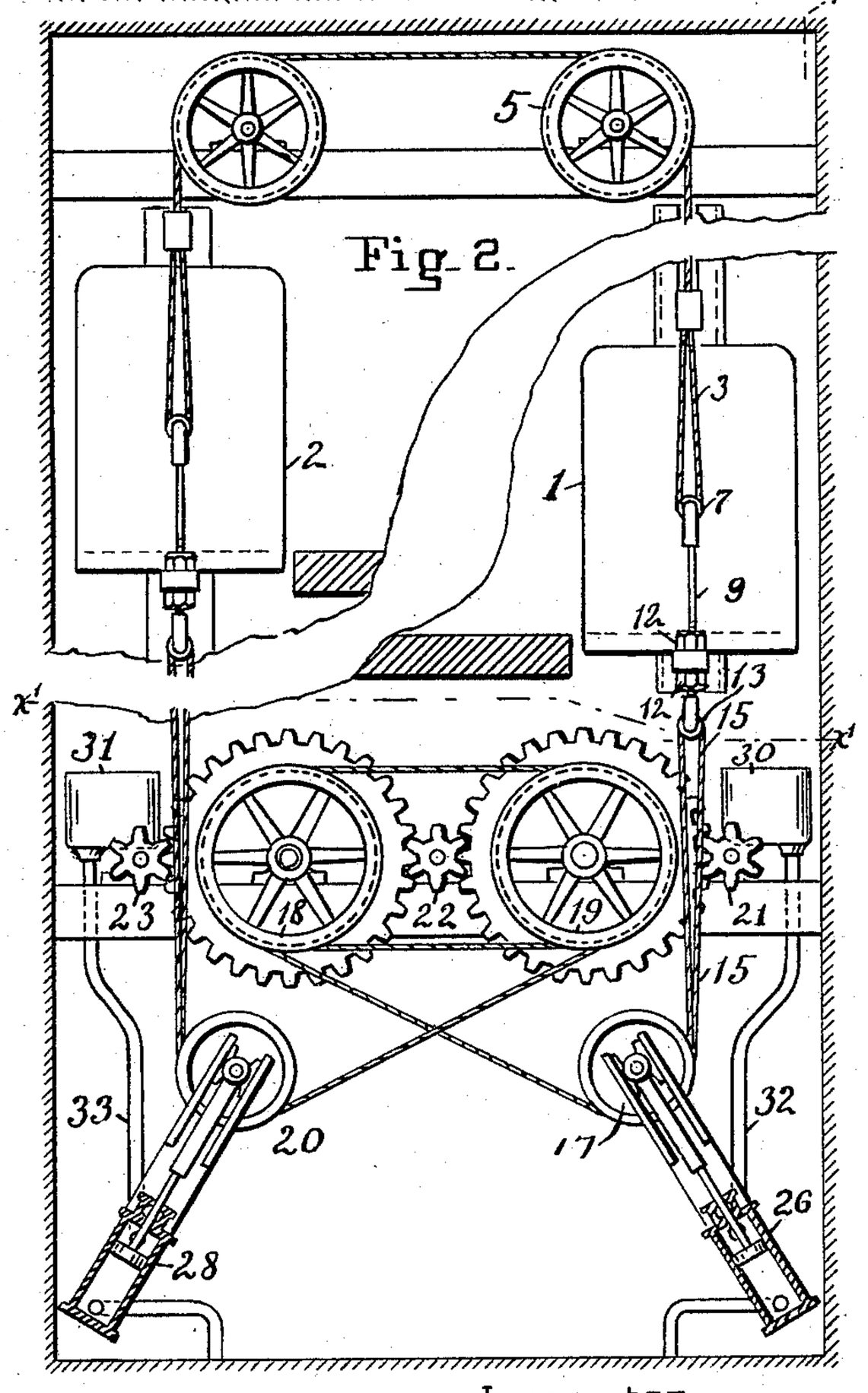


Fig. 2.



Witnesses:
Samuel W. Balch
Willard P. Shaw

Inventor,
Charles R. Pratt,
by Thomas Ewing Jr.
Attorney.

(No Model.) 2 Sheets—Sheet 2

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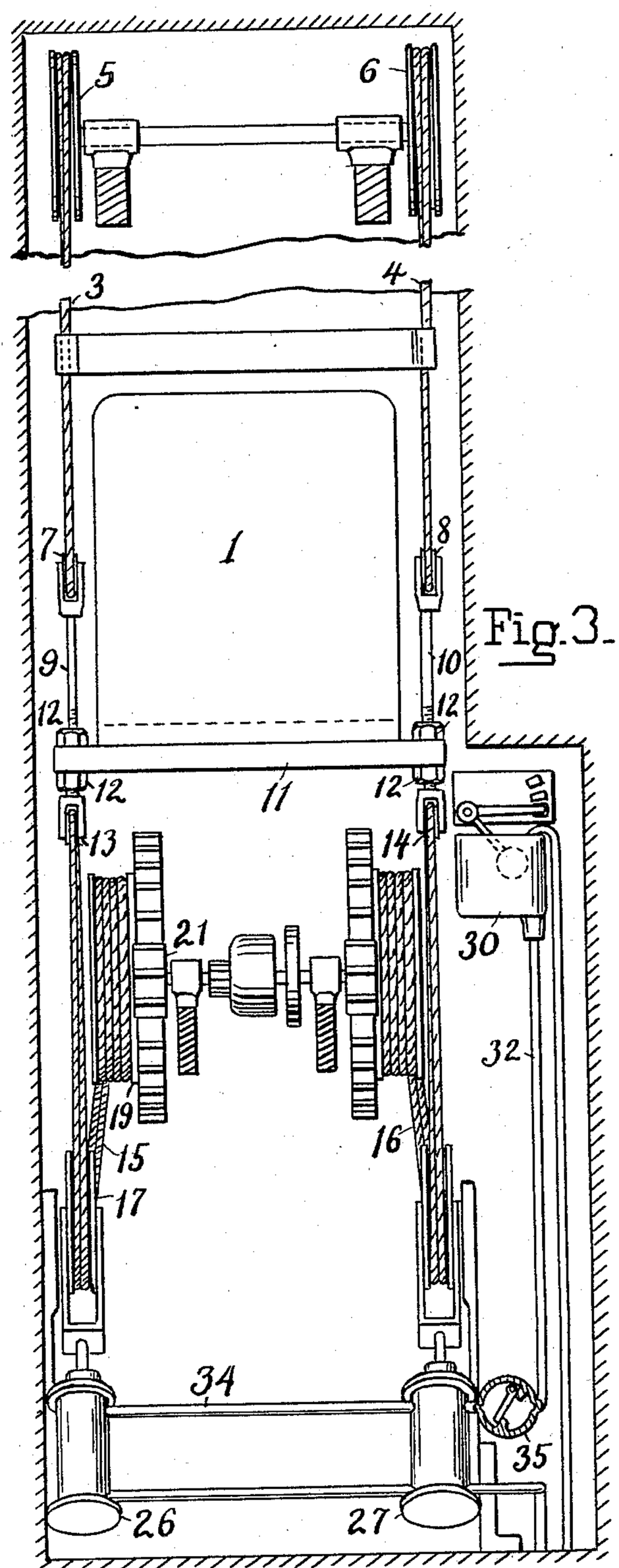

Fig. 3.

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by Thomas Ewing, Jr.
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UNITED STATES PATENT OFFICE.

CHARLES R. PRATT, OF NEW YORK, N. Y., ASSIGNOR TO THE SPRAGUE ELECTRIC ELEVATOR COMPANY, OF SAME PLACE.

ELEVATOR.

SPECIFICATION forming part of Letters Patent No. 580,893, dated April 20, 1897.

Application filed November 13, 1891. Serial No. 411,819. (No model.)

To all whom it may concern:

Be it known that I, CHARLES R. PRATT, a citizen of the United States of America, residing in the city, county, and State of New York, have invented certain new and useful Improvements in Elevators, of which the following is a specification.

My invention is an improvement in elevators, the object of which is mainly to operate cars through distances exceeding the practical limits of systems now in use, as in high towers, though it is adapted for general use.

It consists chiefly in the addition to a suitable traction system of certain tension devices. These will be described in connection with a twin-car elevator system in which one car is balanced against another and the two start, stop, and travel together. This is suitable for high-tower express elevator service, but for general use one of the cars should be replaced by a counterweight. Where in the claims I specify counterbalanced cars I mean two cars which counterbalance each other or one car with a counterweight connected in the manner of another car.

In the accompanying sheets of drawings, Figure 1 is a horizontal section on the line $x' x'$ of Fig. 2 through an elevator-well containing my system and showing the driving mechanism. Fig. 2 is a vertical section through the well on the line $x^2 x^2$ of Fig. 3, showing both cars. Fig. 3 is a vertical section through the well on the line $x^3 x^3$ of Fig. 2, showing one car.

Two elevator-cars 1 and 2 are shown, the one at the bottom and the other at the top platform, the frame of the well being broken above car 1 and below car 2. There are two independent suspension-cables 3 and 4. Each of the pair of cables is attached to each of the pair of cars at corresponding corners or sides and between the cars passes over one or more sheaves 5 6 at the top of the well. The suspending-cables thus lie in parallel planes on opposite sides of the car in slotted conduits along the sides of the well. Each is a continuous cable, so that there are two branches between the cars, and in the loops or bights are hung sheaves 7 8 at the sides of the cars. These sheaves are on the ends of threaded rods 9 10, which pass through cross-heads 11 under the cars, which carry nuts 12 at the upper and under sides of the cross-heads. The lower nuts allow an adjustment to compensate for stretch of the cables.

At the lower ends of the threaded rods are sheaves 13 14, over which are thrown the bights of the traction-cables 15 16. These are also two continuous cables attached to the cars in the same manner as the suspension-cables and lie, speaking roughly, in the planes of the suspension-cables, though this is not essential.

Starting from the sheave 13 on the lower end of one of the threaded rods 9 on car 1, the two sides or branches of one of these traction-cables can be traced down over tension-sheave 17, thence half-way round drum 18, thence to drum 19, back to 18, again to 19, thence under a second tension-sheave 20, and finally to the attaching-sheave on the corresponding threaded rod of car 2. The traction-cables attached to the other sides of the cars pass in like manner over similar sheaves or drums. By the use of more than one traction-drum the tendency to lateral movement of the cable along the drums is greatly diminished, and the drums may be set in different planes, so that the cables shall start around and leave them in planes at right angles to their axes, thus removing all tendency to lateral movement of the cables, as is well understood.

All four drums are driven by pinions on the axes of motors 21 22 23. The pinions on the axis 22 insure positive and uniform speed of the four drums, since they gear with all of them.

When the drums are driven by motors, one of the cars is hauled down by the pair of traction-cables and the other car is hauled up by the pair of suspension-cables.

In this form of elevator, as above described, two difficulties are encountered which my invention is designed to obviate. First, if the tension of the cables attached to the two sides of the cars is not the same the cars will be twisted somewhat and will jam against the guideways. This difference of tension may result from many causes, as, for example, a slight inequality in the diameters of the drums. Second, if the heavier of the two cars is ascending the suspending-cables will

stretch, and the traction-cables will therefore slacken under this car, and if the heavier car is descending and outweighs the other car sufficiently to drive the whole system the tension-cables will be slack under it. This slacking throws the cables off of the tension-sheaves. In order to obviate these two difficulties, a system of tension cylinders and sheaves is introduced. A hydraulic system is shown; but it may be replaced by a pneumatic system. There are four hydraulic cylinders 26 27 28 29, connected with the tanks 30 31 by pipes 32 33. In the tanks are floats, which control switches and cause the pumps to operate whenever the water falls below a certain limit; or the pumps may operate continuously, the overflow being carried into the supply-tank.

To obviate the first difficulty, namely, the unequal pull on opposite sides of the same car, the cylinders are connected in pairs by pipes 34, entering above the pistons. Discharge-pipes are shown below the pistons. Each pair operates the two tension-sheaves under one of the cars, and if the tension on one sheave is greater than the pull on the other the piston attached to the first sheave will be drawn up and the piston attached to the second sheave forced down until the tensions are equalized. A straight pull on the car is thus insured.

The second difficulty, namely, slack cable under a car which is heavier than the counterbalancing car or weight, is also obviated, since as soon as the tension of any cable is less than the pressure exerted by the head of fluid in the reservoir the piston attached to the corresponding tension-sheave will be forced down, and if the pressure is sufficient to maintain a taut cable and the pipe from tank to cylinder be sufficiently large the slack will be taken up almost instantly. For this purpose a head of about seventeen feet and a pipe about four inches in diameter, one-third the interior diameter of the cylinder, is recommended.

It is not desirable to have a greater pressure than is necessary to maintain a taut cable. To prevent the piston from being drawn up when a considerable tension is exerted on the tension-sheaves, a check-valve 35 is inserted in each of the pipes between the tank and cylinder and opening toward the latter. This valve is constructed to close whenever the pressure within the cylinder exceeds the pressure from the head of water. The piston is thus anchored except for such movement as results from leakage at the piston. Were it not for this check-valve or some equivalent the piston would strike against the cylinder-head.

What I claim, and desire to secure by Letters Patent of the United States, is—

1. In an elevator, the combination of counterbalanced cars, suspension and traction cables connecting the cars, and one or more traction-drums and tension-sheaves connected with the latter cables, and pressure-cylinders keeping the cables taut, substantially as described.

2. In an elevator, the combination of counterbalanced cars, a pair of cables connecting the cars, and traction and tension mechanism and means for equalizing the tension on the two cables, substantially as described.

3. In an elevator, the combination of counterbalanced cars, a pair of cables connecting the cars, and traction and tension mechanism, and pressure-cylinders united in pairs and operating the tension mechanism, substantially as described.

4. In an elevator, the combination of counterbalanced cars, pairs of suspension and traction cables connecting the cars, and tension and traction mechanism connected with the latter cables, substantially as described.

5. In an elevator, the combination of counterbalanced cars, pairs of suspension and traction cables connecting the cars, and traction and tension mechanism connected with the latter cables, and means for equalizing the tension on the two traction-cables, substantially as described.

6. In an elevator, the combination of counterbalanced cars, pairs of suspension and traction cables connecting the cars, and tension and traction mechanism connected with the latter cables, and pressure-cylinders united in pairs and operating the tension mechanism, substantially as described.

7. In an elevator, the combination of counterbalanced cars, pairs of suspension and traction cables connecting the cars, and tension and traction mechanism connected with the latter cables, means for equalizing the tension on the two traction-cables, and means for anchoring the tension mechanism, substantially as described.

Subscribed by me, this 12th day of November, 1891, in New York city, New York.

CHAS. R. PRATT.

In presence of—

THOMAS EWING, Jr.,

P. F. O'SHAUGHNESSY.