(No Model.)

3 Sheets—Sheet 1.

N. C. BASSETT.

HYDRAULIC ELEVATOR.

No. 290,660. Patented Dec. 25, 1883.

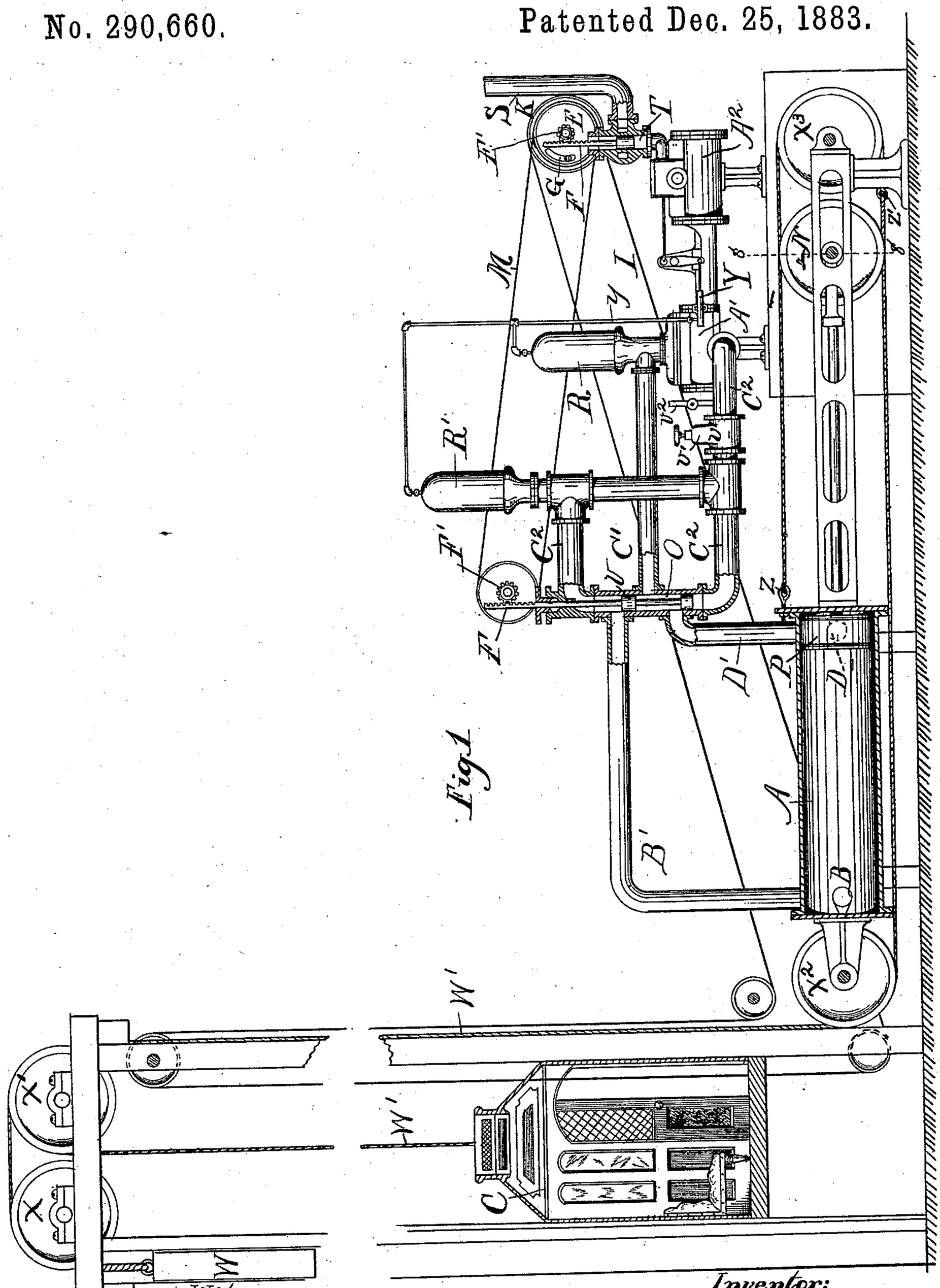

Fig. 1.

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A. M. Murray.

Inventor:
Norman C. Bassett,
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his Attorneys:

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N. C. BASSETT.

HYDRAULIC ELEVATOR.

No. 290,660. Patented Dec. 25, 1883.

Fig. 2.

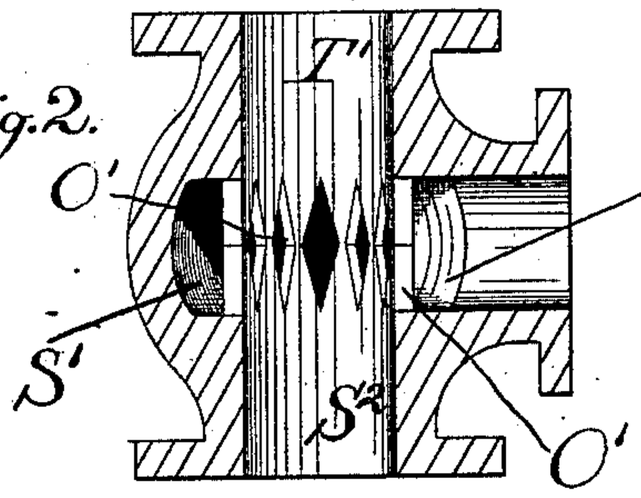


Fig. 3.

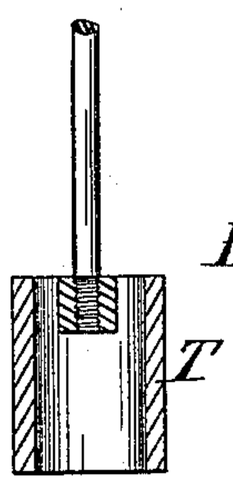


Fig. 4.

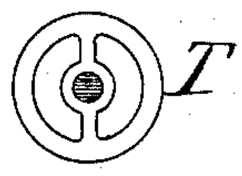


Fig. 6.

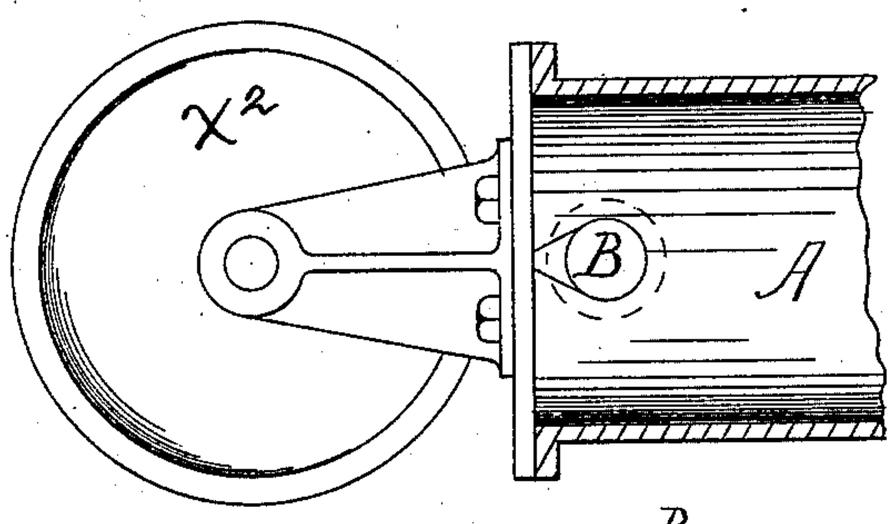


Fig. 5.

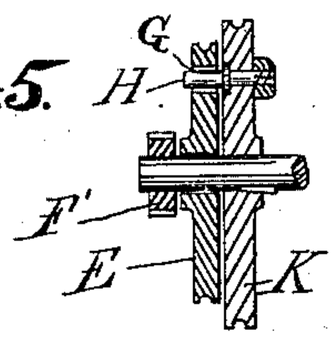


Fig. 7.

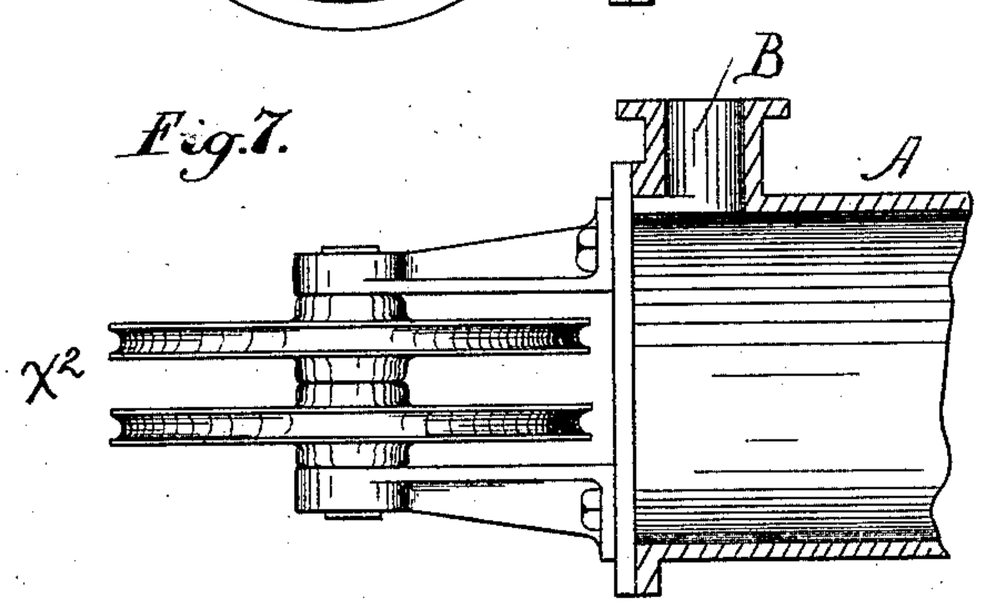
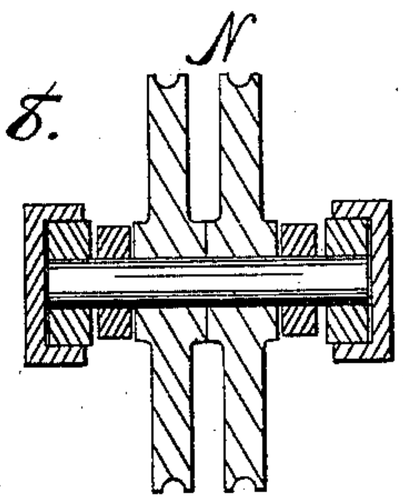


Fig. 8.



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HYDRAULIC ELEVATOR.

No. 290,660. Patented Dec. 25, 1883.

Fig. 9.

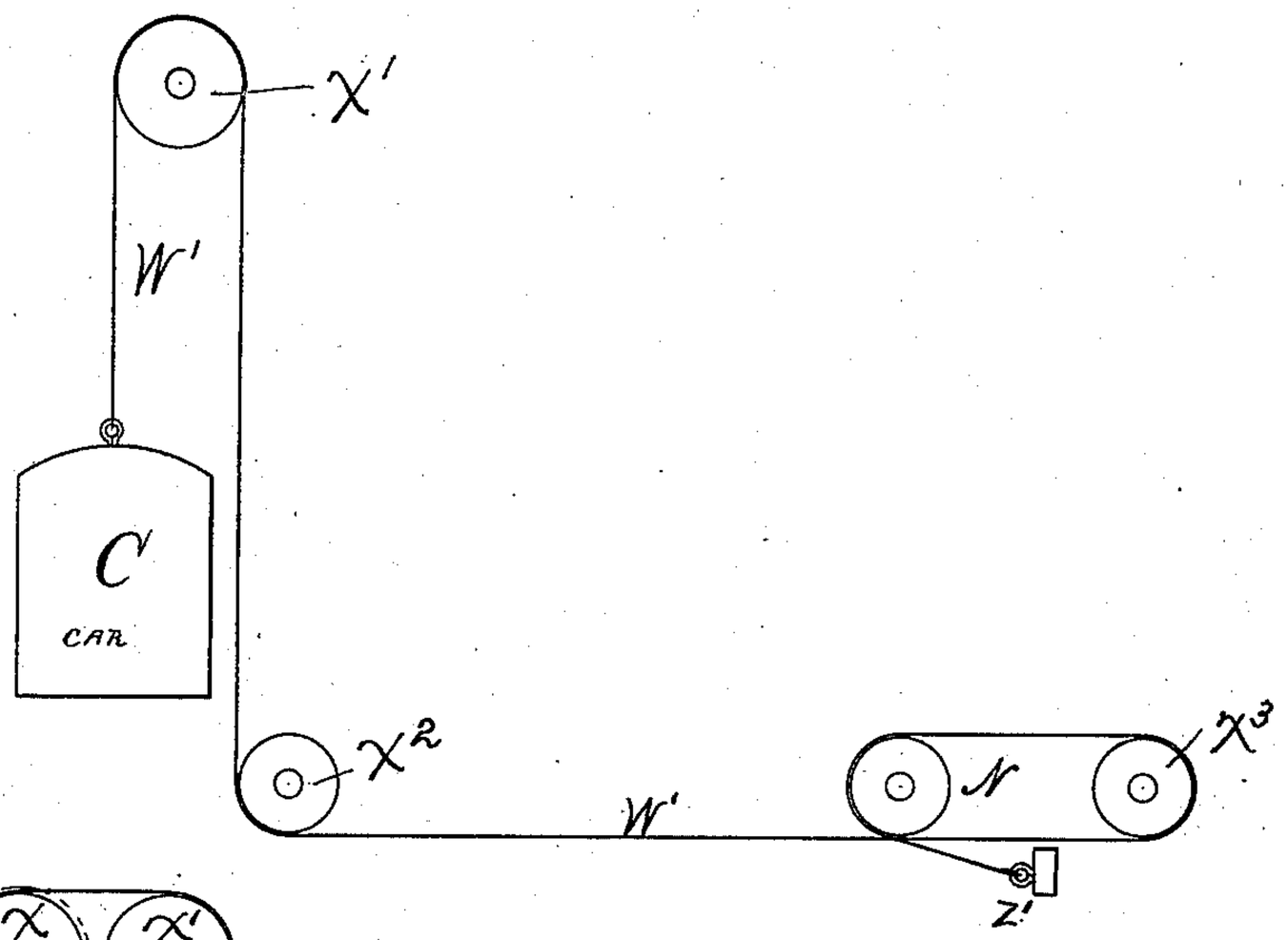
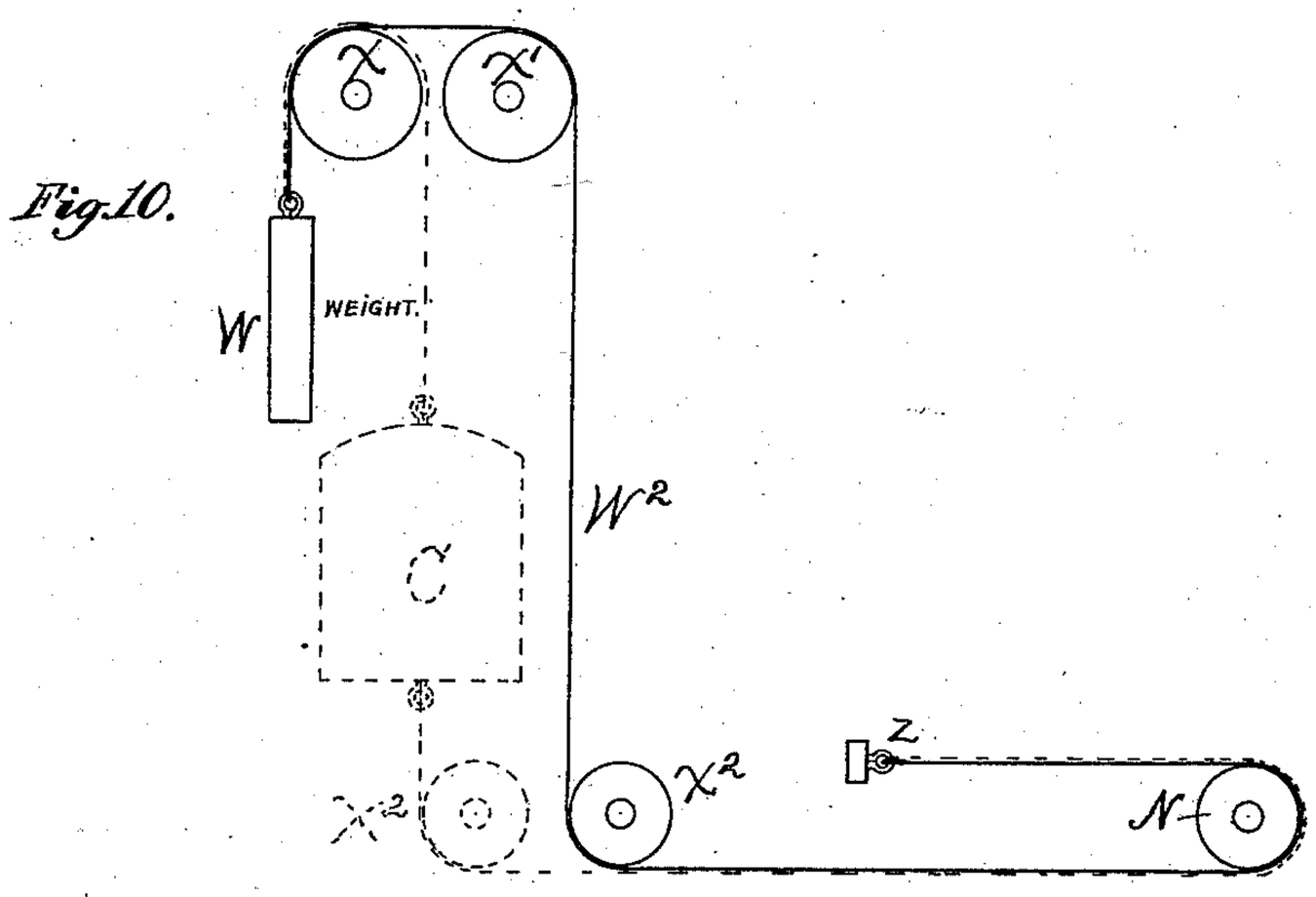


Fig. 10.



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UNITED STATES PATENT OFFICE.

NORMAN C. BASSETT, OF CHICAGO, ILLINOIS.

HYDRAULIC ELEVATOR.

SPECIFICATION forming part of Letters Patent No. 290,660, dated December 25, 1883.

Application filed May 14, 1883. (No model.)

To all whom it may concern:

Be it known that I, NORMAN C. BASSETT, a citizen of the United States, residing in Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Hydraulic Elevators, of which the following is a specification.

The present invention relates to improvements in hydraulic elevators; and it consists, essentially, in a closed or sealed hydraulic system wherein the cylinder-piston is balanced or sustained by the pressure of the fluid on each side of the same, in connection with the car and counterbalance-weights, the car being moved up or down by simply destroying the balance or changing the relation of the pressures on either side of the piston by means of a suitable pump, the cylinder and piston of which connect with or form a part of such closed hydraulic system, the pump operating to draw its supply from one end of the hydraulic cylinder and discharge into the other.

It also consists in combining with such closed hydraulic system a suitable mineral or other oil as the hydraulic fluid, so as to avoid the necessity of using leather or fibrous packings for the pistons, &c., and also to obviate all danger of damage from flooding buildings, as is the case where water is used.

It also consists, in connection with such closed hydraulic system, of a cushioning device for the purpose of avoiding shocks to the car, or irregularity in the circulation of the hydraulic fluid through such closed system.

It also consists, in connection with such closed system, of suitable induction and eduction ports and valves to the cylinder thereof, in combination with valves or other means of regulating the action of the pump, the same being so arranged as to insure the opening or closing of the proper ports of the hydraulic cylinder before the pump can be set in operation.

It also consists in the novel devices and combinations of devices herein shown or described.

In the accompanying drawings, which form a part of this specification, and in which similar letters of reference indicate like parts, Figure 1 is a side elevation of a device embodying my invention, shown partly in section. Figs. 2, 3, and 4 are enlarged detail views of the steam-valve and its parts. Fig. 5 is a sectional view of the cord-pulleys for regulating the valves. Figs. 6 and 7 are enlarged views of one end of the hydraulic cylinder. Fig. 8 is a section on line 8 8 of Fig. 1; and Figs. 9 and 10 are diagram views, showing the arrangement of cord and pulleys for the car and its counterbalance-weight, respectively.

The elevator-car C shown in the drawings is of the ordinary construction, supplied with such safety appliances as may be found desirable. The cylinder A, I prefer to place in a horizontal position, as shown, although a vertical cylinder may be used, if desired. This cylinder has openings B and D, which are alternately used as induction and eduction passages. The openings or ports are connected to the supply and discharge passages C' C^2 of a steam-pump by means of pipes B and D′ and a suitable valve-chamber, O, with its valve V, and in such a manner that the pump will draw its supply from one end of the cylinder A and discharge into the other through these connections. A′ represents the cylinder of the pump, and A^2 the steam-cylinder by which the pump is operated. As shown in the drawings, the pump is taking the liquid from the left-hand and forcing it into the right-hand end of the cylinder. This valve V and chamber O are so constructed that when the position of the valve is changed to the other extreme of its travel the pump will draw from the right-hand and discharge into the left-hand end of the cylinder. It will readily be seen that by reversing the valve V the direction of motion of the piston P may by changed at will.

Connected with and forming a part of the steam-supply pipe S is placed a throttle-valve, T, of such construction that it will, when at either extreme of its travel, admit steam to the steam-chest of the pump, but when near the middle point will entirely shut off the supply. In Figs. 2, 3, and 4 is shown the construction of the valve T and its chamber or seat T′. The steam passes into an annular chamber, S′, extending around the valve-seat S^2. From the former and leading into the latter are double V-shaped openings O′, through which the steam passes when they are uncovered by the valve T. The valve T is

hollow and cylindrical in form, and made a steam-tight fit to the seat S^2, but so as to move freely up and down. Now, it is evident that when the openings O′ are covered by the valve T no steam can enter the steam-chest of the pump. If the valve T be lowered until the upper ends of the openings O′ are uncovered, the steam will pass through them into the interior of the chamber T′, and thence down through the valve T into the steam-chest. When the valve T is raised, steam passes through the lower end of the openings O′ into the chamber T and into the steam-chest, as before. Thus it will be seen that at either extreme of its travel the valve T admits steam to the pump, but about the middle point shuts off the supply entirely. Now, if the openings O′ were made of a rectangular form, as is usual in such valve-seats, it is evident that when but very little steam is required to move the load the adjustment of the position of the valve T would be a very difficult matter, because of the small distance through which it would be necessary to move it to make a slight change in the amount of steam supplied to the pump. With the V-shaped openings, as shown, a much greater movement of the valve T will be required to produce a given change in the steam-supply, and the extent of this movement made more or less, as desired, by making the angle at the apex of the V-openings smaller or larger. Thus the openings O′ may be so proportioned as to render the regulation of the steam-supply such as not to require more than ordinary care on the part of the operator. This valve T, and also the valve V, may be moved by any suitable means, such as a rack, F, and pinion F′.

The pulley E is loose on the shaft of the pinion F′, and has a concentric slot in it, as shown at G. On the same shaft, but fast to it, is a second pulley, K, which carries a pin, H, projecting into the slot G. The cord I passes around the pulley K, and thence through the car C in the usual manner, and thus gives the operator complete control of the throttle-valve, and therefore of the steam-pump. The cord M leads from the loose pulley E to the pulley L, which moves the valve. Now, the slot G is in such a position and of such a length that the valve V is always nearly wide open before the throttle-valve T begins to open, and if it is found necessary to partially close the valve T to regulate the speed of the pump the valve V is left wide open. It is obvious that the same action will take place when the valves are reversed, and that by means of this construction I am enabled to keep the passages through which the fluid flows wide open while the pump is running, and to control the motion of the car entirely by the throttle T. Various forms of valve-gear may be used to accomplish the same result, and I do not confine myself to this particular arrangement.

Should the operator, because of accident to to the valve-gear or otherwise, lose control of the car, it is evident that the piston P might be driven against the cylinder-head with such force as to endanger the parts and to bring the load to a stop so suddenly as to severely strain the rope-fastenings, &c. To prevent this action, I make the ports B and D, at the ends of the cylinder A, V-shaped, as shown in Figs. 6 and 7. It will readily be seen that as the piston passes over the opening D in its travel toward the head the liquid is forced through an opening which contracts rapidly as it approaches the end of the cylinder, and that the resistance thus offered to the advance of the piston will retard its velocity and bring it gradually to a stop in contact with the head without perceptible shock.

Over the pulleys X and X′ passes a rope, to one end of which is suspended the counter-weight W. The other end of the rope is passed around the pulley X^2, thence around the sheave N in the end of the piston-rod, and finally fastened at *z*. The cord W′ leads from the car C over a pulley on the same axis with the pulley X′, around a pulley on the same axis with the pulley X^2, and thence around pulleys X^3 and N, and is fastened at *z*′. Now, it is evident that as the piston P moves to the left the weight W will be lowered, and the car C raised, and therefore that the weight W acts as a counter-balance to the car C and its load. I prefer to make this weight W sufficiently heavy to raise the car with its operator at the desired speed. Thus, when the car goes up without a load, the steam-pump is not started, but the cord I is pulled until the valve V opens, and the heavy weight W forces the liquid through the pump-valves into the right-hand end of the cylinder. Should there be a load to carry up, only enough steam is used as is required to lift that load. Should the load on the return-trip be a heavy one, the pump need not be started as before, as the load will raise the weight W and force the liquid through the pump-valves into the left-hand end of the cylinder. Should the load be insufficient to raise the weight W, the pump is started, and only steam enough is used to raise the difference in weight between the load and counter-balance W.

The usual air-chamber, R, on the steam-pump has its counterpart R′ placed in connection with the supply-pipe leading to the pump, as shown. Now, when the pump is started, the air in the chamber R is compressed, and that in the chamber R′ expands. When the elevator is not in use, the volumes of air in both chambers are compressed alike, and therefore the pressure is the same in all parts of the system to which the liquid has access. The piston is propelled by a difference in pressures obtained by starting the pump, and no more power is required to obtain this difference when the normal pressure is high than when it is low. As the system of liquid circulation is self-contained and sealed, there can be no loss of either air or fluid, excepting by leakage.

To supply the loss of air any simple device may be used, such as a small air-pump, Y, so

constructed that it may be connected to a moving part of the pump, and by suitable pipes, *y*, and valves, to the air-chambers R R′, as shown.

To supply loss of liquid a valve, as at *v*′ in the suction-pipe leading to the water-pump, may be closed, and a small valve, *v*², between *v*′ and the pump, opened, the valve *v*² being a part of a pipe-connection leading to a supply of the liquid. The pump being started slowly, the desired quantity may easily be forced into the system. Since the loss of liquid is, at most, very trifling, it becomes practicable to employ a fluid much better adapted to such use than water—for instance, a thin oil, free from chemical ingredients which will attack metals. Such a fluid I prefer to use for several reasons. It does not destroy the internal surfaces of the cylinder or valve-chamber, it is lighter and more easily forced through pipes, the wearing-surfaces of all the internal moving parts are thoroughly lubricated, owing to the perfect lubrication and small amount of wear where an oil is used, it is not so difficult to keep joints tight, and in most cases it is not necessary to use packing for the pistons or valves. However, when packings are used, they may be of metal, and will not require renewal. The power required to move the controlling-valve V will be so much reduced that the operator may easily control the motion of the car, all danger from freezing is avoided. Oil is more elastic in its action than water, and thus tends to reduce shocks and jars. Now, since a long column of liquid is held against the piston on either side, and the respective weights of the counter-balance W and the car C act in opposite directions on the piston, it follows that it is almost impossible to start or stop this mass suddenly, because of its inertia. Again, between the source of power and this mass is on both sides a cushion of air, which will absorb any sudden impulses given by the pump through carelessness on the part of the operator.

It is evident that the air-cushion cannot overcome the inertia of the car, the counter-weight and the fluid suddenly, and thus by reaction produce vibration of the car. Therefore the load will be started and stopped gradually, and its motion will be entirely smooth and agreeable.

It sometimes becomes necessary, because of lack of room for a horizontal cylinder, to place one in a vertical position. In such a case I prefer to make the piston of sufficient weight to take the place of the counter-weight W, and to balance a part of the weight of the car in the usual manner to avoid making an extremely heavy piston. Thus it will be seen that the system is equally well adapted to both classes of elevators.

It will of course be understood that the counterpoise-weight W, instead of being connected directly with the piston or its sheave, as shown in the drawings, so as to act against the piston in the opposite direction from that in which the car acts, may, if preferred, be connected indirectly with the piston, and the same result be accomplished. One method of doing this I have indicated in dotted lines in Fig. 10, in which case the weight W is connected directly to the car in the ordinary manner, so as to counterbalance the car, and a supplemental cord is attached to the bottom of the car and passed over a pulley at the bottom of the shaft, and thence around the sheave in the end of the piston, by which means the car may be pulled down or the weight raised when the latter is in excess of the car and its load.

I claim—

1. The combination, with an elevator-car and its counterpoise, of a closed liquid-circulating system and a hydraulic cylinder and piston forming part of said closed liquid-circulating system, and connected therewith by ports at each end of said cylinder, and means for circulating the liquid in such closed system in either direction and propelling said piston and the car and counterpoise connected thereto, thus making the cylinder double-acting, substantially as specified.

2. The combination of the double-acting cylinder and its piston with the car and its counterpoise, connected to said piston, a steam-pump, and suitable pipe-connections and valve mechanism connecting the supply and discharge passages of said pump with the ports at each end of said cylinder, thus forming a closed liquid-circulating system, so that by action of the pump said piston and the car and counterpoise connected therewith may be propelled in either direction, substantially as specified.

3. In a hydraulic elevator, the combination of a hydraulic cylinder and piston with a car and a counterpoise heavier than the car, said car and counterpoise being connected to said piston and acting to move the same in opposite directions, substantially as specified.

4. The combination, with a hydraulic cylinder, of the car and its counterpoise connected to the piston of said cylinder, a steam-pump, and a system of closed pipes provided with suitable valve mechanism, and connecting the supply and discharge passages of said pump with the ports at either end of said cylinder, so that said pump may be caused to draw its supply from either end of said cylinder and discharge into the other at the will of the operator, as may be required in moving the car up or down, substantially as specified.

5. The combination, with the hydraulic cylinder, of the car and its counter-weight connected with the piston of said cylinder, a steam-pump, a system of pipes connecting the supply and discharge passages of said pump with the ports at each end of said cylinder, provided with suitable valve mechanism, whereby the supply may be taken from either end of the cylinder and discharged into the other, and an air chamber or cushion communicating with said pipes, to relieve against shocks in

stopping or starting the car or moving parts, substantially as specified.

6. The combination of the car, counter-weight, cylinder, piston connected with said car and counter-weight, steam-pump, pipes connecting the supply and discharge passages of said pump with the ports of the cylinder, valve-chamber and valve, throttle-valve of said pump, and mechanism for simultaneously operating and controlling both said valves from the car, substantially as specified.

7. In a hydraulic elevator, the combination of the car, the cylinder, and its piston, with tapering or gradually-contracted ports at each end of said cylinder, and pipes provided with suitable valve mechanism and connecting said ports with the supply and discharge passages of a pump, whereby said car is relieved against shocks in stopping or starting the propelling-piston when at either end of said cylinder, substantially as specified.

8. The combination of the hydraulic cylinder and its piston, a steam-pump having its supply and discharge passages connected by suitable pipes and intermediate valve mechanism with ports at each end of said cylinder, thus forming a closed or self-contained hydraulic system, with the car and its counter-weight connected with and operated by said piston, and mechanism for controlling and operating said valve mechanism and the pump-valve simultaneously from the car, substantially as specified.

9. The combination of the car, the hydraulic cylinder, and its piston with a pump having its supply and discharge passages connected by suitable pipes and intermediate valve mechanism with the ports of said cylinder, thus forming a closed liquid-circulating system, and an oil filling said system as the circulating-liquid, substantially as specified.

10. The combination, with elevator-car, of the cylinder and its piston, and tapering or gradually-contracting ports at each end of said cylinder, substantially as specified.

11. The combination of cylinder A, having ports B and D, piston P, valve-chamber O, valve V, pipes B′ and D′, leading from said ports to said valve-chamber, a steam-pump provided with supply and discharge pipes C′ C^2, connected with said valve-chamber, throttle-valve T, and air-cushioning reservoirs R and R′, substantially as shown.

12. The combination, with a steam-pump and its throttle-valve T, of the hydraulic cylinder A, valve-chamber O, suitable pipes connecting said valve-chamber with the ports of said cylinder and with the supply and discharge passages of said pump, and mechanism for operating said valves V and T, consisting of a slotted loose pulley, E, and pin H, projecting from pulley K, for operating the latter valve, whereby the former is always opened before the latter, substantially as specified.

13. The combination of car C, counter-weight W, cylinder A, piston P, provided with sheave N, pulleys X, X′, X^2, and X^3, cord W^2, leading from said weight W over pulleys X X′ X^2 and around sheave N, and secured at *z*, cord W′, leading from the car over pulleys on the same axis with X′ X^2 and around pulley X^3 and sheave N, and secured at *z*′, substantially as specified.

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