

(No Model.)

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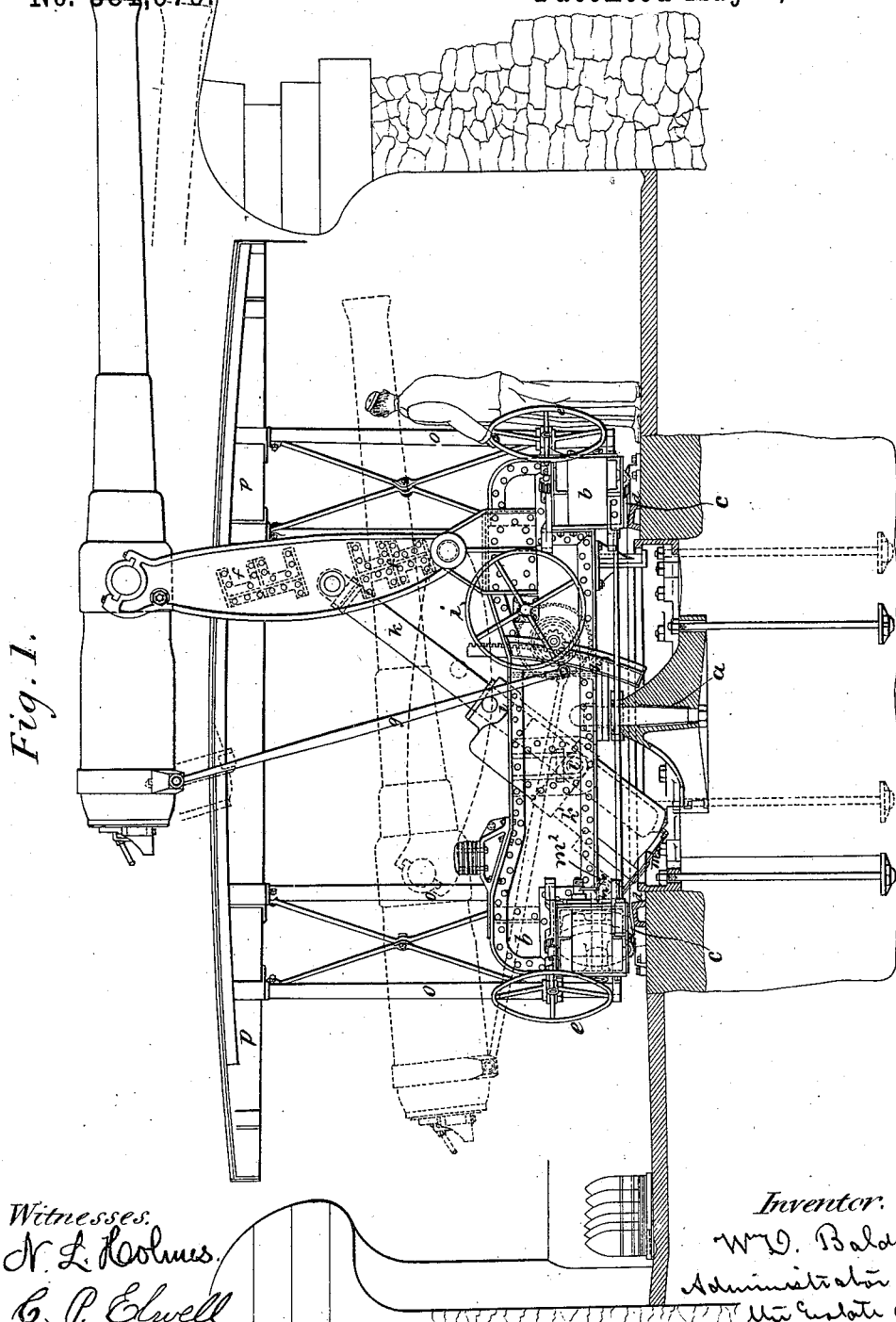
W. J. HOYLE, Dec'd.

W. D. BALDWIN, Administrator.

## CARRIAGE FOR HEAVY ORDNANCE FOR LAND DEFENSES.

No. ~~381,979.~~

Patented May 1, 1888.



*Witnesses:*

N. L. Holmes

C. P. Edwell

*Inventor:*

W.D. Baldwin

Administration of  
the Estate of

Wm. J. Doyle

(No Model.)

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W. J. HOYLE, Dec'd.

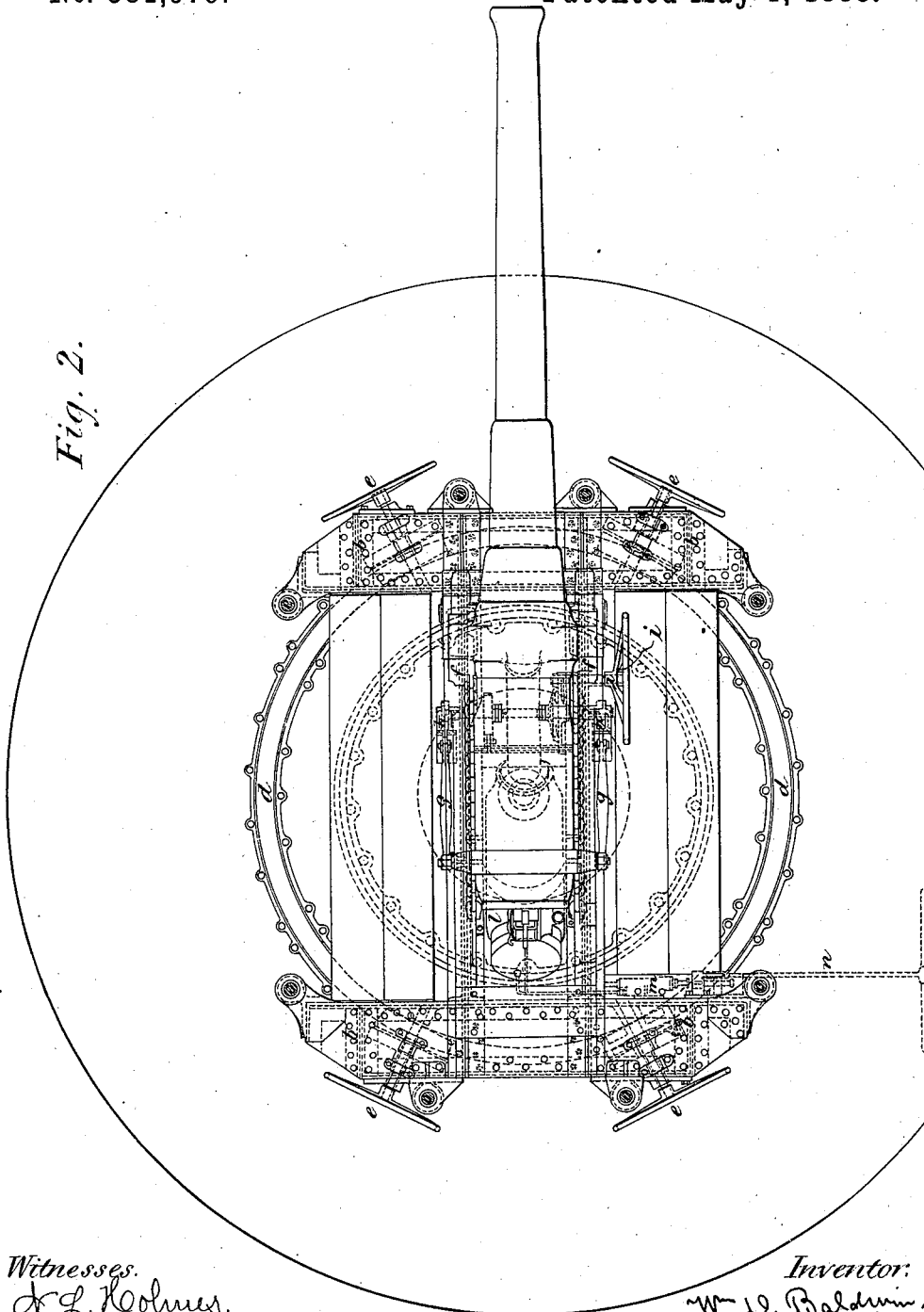
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CARRIAGE FOR HEAVY ORDNANCE FOR LAND DEFENSES.

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Fig. 2.



Witnesses.

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(No Model.)

3 Sheets—Sheet 3.

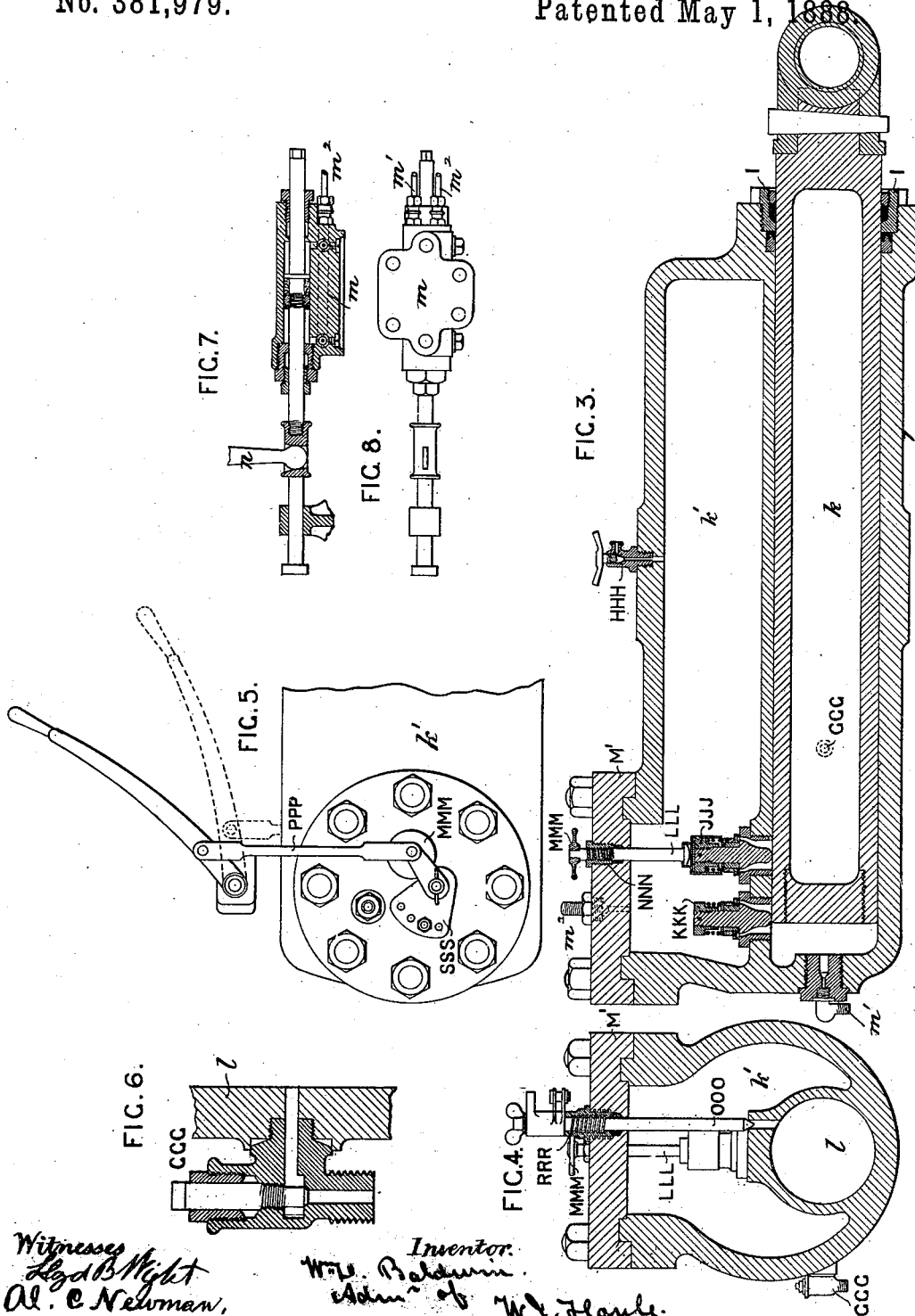
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Witnesses  
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# UNITED STATES PATENT OFFICE.

WILLIAM D. BALDWIN, OF WASHINGTON, DISTRICT OF COLUMBIA,  
ADMINISTRATOR OF WILLIAM J. HOYLE, DECEASED.

## CARRIAGE FOR HEAVY ORDNANCE FOR LAND DEFENSES.

SPECIFICATION forming part of Letters Patent No. 381,979, dated May 1, 1888.

Application filed July 18, 1887. Serial No. 244,656. (No model.) Patented in England January 6, 1885, No. 206, and in Italy March 31, 1885, No. 18,020.

*To all whom it may concern:*

Be it known that WILLIAM JENNINGS HOYLE, a subject of the Queen of Great Britain, formerly of Newcastle-upon-Tyne, England, engineer, did invent certain new and useful Improvements in Carriages for Heavy Ordnance for Land Defenses, for which patents have been granted to him in Great Britain, dated January 6, 1885, No. 206, and in Italy, dated March 31, 1885, No. 18,020,) of which improvements the following is a specification.

This invention has for its object improvements in carriages for heavy ordnance for land defenses.

With heavy ordnance mounted on the disappearing principle when the gun is raised to the firing position by a spring formed of compressed air or otherwise, and is brought down to the loading position, or nearly so, by the recoil for facility of loading, it is important to get the gun to the lowest position, especially when an overhead shield for protection of the gun's crew is employed. Inasmuch as two or more charges of different weights are used for the gun there is difficulty in getting the full recoil in all cases. This invention provides for this being overcome. The disappearing carriage is fitted with an air-reservoir in which is compressed air and at the lower part a liquid. The reservoir surrounds a cylinder in which a plunger works. The plunger is coupled with the upper portion of the gun-carriage and moves into the cylinder when the gun is fired. Two or more passages connect the cylinder to the reservoir, and these are covered by valves with annular opening and controlled lift. The cylinder is also filled with liquid. When the gun is fired, the plunger forces the liquid into the reservoir from the cylinder and further compresses the air, thereby storing up sufficient force to return the gun to loading position when required. Naturally the pressure of the air is much greater toward the end of the stroke than at the beginning and the pressure in the cylinder is unequal. This is compensated for by the valves with the controlled lift, which cause a great additional pressure at first when the speed of recoil is great and much less toward the end when the

speed reduces to *nil*. A new passage of communication is opened between the reservoir and the cylinder when it is desired to let the gun go up to firing position. This is worked by hand-gear. To provide for full recoil with different charges, the pressure of air and lift of valves are so designed and arranged that the smallest charge used in practice will just bring the gun down the full amount, and when it is desired to fire a larger charge means are provided for cutting off the action of one of the valves by screwing a stop down on it from the outside. The small additional force necessary to pass the liquid through only the remaining valve is sufficient to regulate the recoil to be no greater in length than when the small charge is used; or to get the gun to the lowest position I provide a small hand-pump attached to a convenient part of the carriage, a suction-pipe is led to the bottom of the cylinder, and a delivery-pipe is led to the bottom of the reservoir. In this case the valves are permanently adjusted so as to control the recoil when the heavy charge is used, so that the full recoil will only then be obtained. With the light charge the recoil would be about two-thirds full, and the gun is then brought down by working the pump, the liquid being drawn from the cylinder and passed into the reservoir, the gun assisting the action by its own weight. This work is easily performed by two men in a reasonable time during the time the breech of the gun is being opened. The pump is always in connection with the cylinder and reservoir, no stop valve or cock having to be opened or closed previous to or after the pumping. For purposes of drill and inspection of the mounting the pump is of great service, as the gun can be allowed to go into firing position and be pumped down as often as desired. The valves of the pump are constructed to bear the sudden shock caused by the firing. For the better protection of the gunners the carriage is provided with a flat overhead shield almost on a level with the parapet and nearly inclosing the gun-pit, with the exception of the opening through which the gun rises. The shield is carried from the under carriage by eight columns or supports, four on either side of the gun, symmetrically arranged, two at

the front and two at the rear part of the under carriage.

In order that the said invention may be most fully understood and readily carried into effect, I will proceed to describe the drawings hereunto annexed.

In the drawings, Figure 1 is a sectional elevation of a heavy gun on a disappearing carriage. It is arranged and controlled in accordance with my invention. Fig. 2 is a plan of the same gun and carriage with some of the parts removed. Fig. 3 is a longitudinal section of the recoil-cylinder and adjacent parts; Fig. 4, a transverse section thereof taken near the rear end of the cylinder between its two outlet-valves. Fig. 5 is a side view of the rear end of the recoil-cylinder and air-vessel. Fig. 6 is a section showing details of the filling-cock. Fig. 7 is a section of the pump exposing the valves and valve-seats; and Fig. 8 is a plan of the same. The pump, however, presents no new feature.

*a* is a pivot secured to a sufficient foundation and forming a center around which the turn-table frame *b* is able to rotate. It is supported by wheels *c*, which run upon the ring-rail *d*.

*e e* are hand-wheels having pinions on their axes, which gear with toothed wheels which are fast with the supporting-wheels. By turning these wheels the turn-table is moved around its pivot, and the gun which it carries is brought to bear upon the object.

*f* is a double lever or frame, which at its lower end is jointed to the turn-table *b*, and at its upper end it carries the gun by its trunnions. The lever-frame rocks vertically about its jointed connection with the turn-table.

The elevation of the gun is controlled by long links *g g*, jointed to it beneath the breech on either side and passing down to lugs on a pair of curved racks, *h h*, which gear with pinions which by intermediate gear are connected with the hand-wheel *i*. By turning this hand-wheel any desired elevation can be given to the muzzle of the gun.

*k* is a ram, which at its upper end is jointed to the frame *f*. The ram is received through the gland *l* into a cylinder *l*, which is provided with the filling-cock *G* and carried by the turn-table, and can rock upon trunnions at *l*. In the same casting with the cylinder there is an air-vessel *k'*, in which air under pressure is contained. A detachable cover, *M'*, is provided at the side of the lower end of the recoil-cylinder and air-vessel. The cylinder *l* and a portion of the capacity of the air-vessel are filled with water or other liquid. The pressure in the air-vessel is sufficient to maintain the gun in the firing position and to offer a suitable resistance to the recoil. The lower part of the cylinder is connected with the air-vessel by two passages provided with their respective outlet-valves *J* and *K*, and the valve in each case is prevented by a stop-screw from rising from its seat for more than a short regulated distance. One of these valves, when desired, can

be set down onto its seat, so as to remain entirely out of action. This is done when the gun is to be fired with a heavy charge.

*L* is the screw-spindle of the first or uppermost valve; *J*, serving to hold it to its seat when heavy charges are fired.

*M* is the handle of the spindle and *N* its gland.

On the recoil taking place it will be seen that the ram *k* is driven into the cylinder, forcing the water or liquid before it into the air-vessel through the narrow passage or passages which the valves allow. The recoil of the gun is in part absorbed by the resistance the liquid experiences in the passages. A portion of the force of the recoil, however, sufficient to bring the gun back to the firing position, is expended in compressing the air in the air-vessel. The gun after recoil remains down in the loading position, as the valves prevent the return of the liquid from the air-vessel into the cylinder. A small by-pass valve, *O*, of a passage communicating with the cylinder and air-vessel is opened by hand when the gun is to come up to be again fired. The by-pass valve is worked by a handle and a rod, *P*.

*R* is the gland of the spindle of the by-pass valve, and *S* the securing-plate for the same.

If the gun is fired with a low charge, both of the controlled valves are allowed to lift when the recoil takes place. The resistance offered to the transfer of liquid from the cylinder to the air-vessel is then less than before, and consequently, although the force of the recoil is less, the gun is still able to come fully down to the loading position. The gun may, however, be fired with a light charge with one valve only in operation, or one valve only may be provided, and this so set that the gun on recoil will not come fully down to the loading position. In this case the hand-pump *m* is employed to bring it down. Its suction-pipe *m'* is connected with the lower end of the cylinder *l*, and its delivery-pipe *m''* is connected with the air-vessel.

*n* is the lever-handle, by which the pump is worked by manual labor. The pump then draws liquid out of the cylinder and delivers it into the air-vessel. The gun can thus always be brought completely down altogether independently of the recoil.

*H* is a valve for regulating the water-level in the air-vessel.

The turn-table *b* carries eight columns, *o o*, and these support a horizontal armor-plate shield, *p*, which closes the upper part of the gun-pit, with the exception of an opening through which the gun rises for firing, and descends on recoil.

Having now particularly described and ascertained the nature of the said invention and in what manner the same is to be performed, I declare that what I claim is—

1. The combination of the horizontal-turning turn-table, the frame connecting by a joint at its lower end to the turn-table and rocking vertically about said joint, the gun carried at

the opposite end of the frame, and the overhead shield supported by and moving with the turn-table and provided with the aperture through which the gun rises and descends, substantially as and for the purpose set forth.

2. The combination of the frame having the pivotal support at its lower end and rocking vertically about such support, the gun at the upper end of the frame, the hydraulic cylinder, the air-vessel adjacent thereto, the ram working in the cylinder and connected with the pivoted frame for raising and lowering the gun, and the pump having its suction and delivery pipes connected with the cylinder and air-vessel, substantially as and for the purpose set forth.

3. The combination, in a gun-carriage, of the hydraulic cylinder, the air-vessel adjacent thereto, the ram working in the cylinder and connected with the support by which the gun is raised and lowered, two or more passages communicating with the cylinder at or near its lower end and with the corresponding end of the air-vessel, and the controlled valves of said passages, substantially as and for the purpose set forth.

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*Administrator of William J. Hoyle.*

Witnesses:

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NELLIE L. HOLMES.