

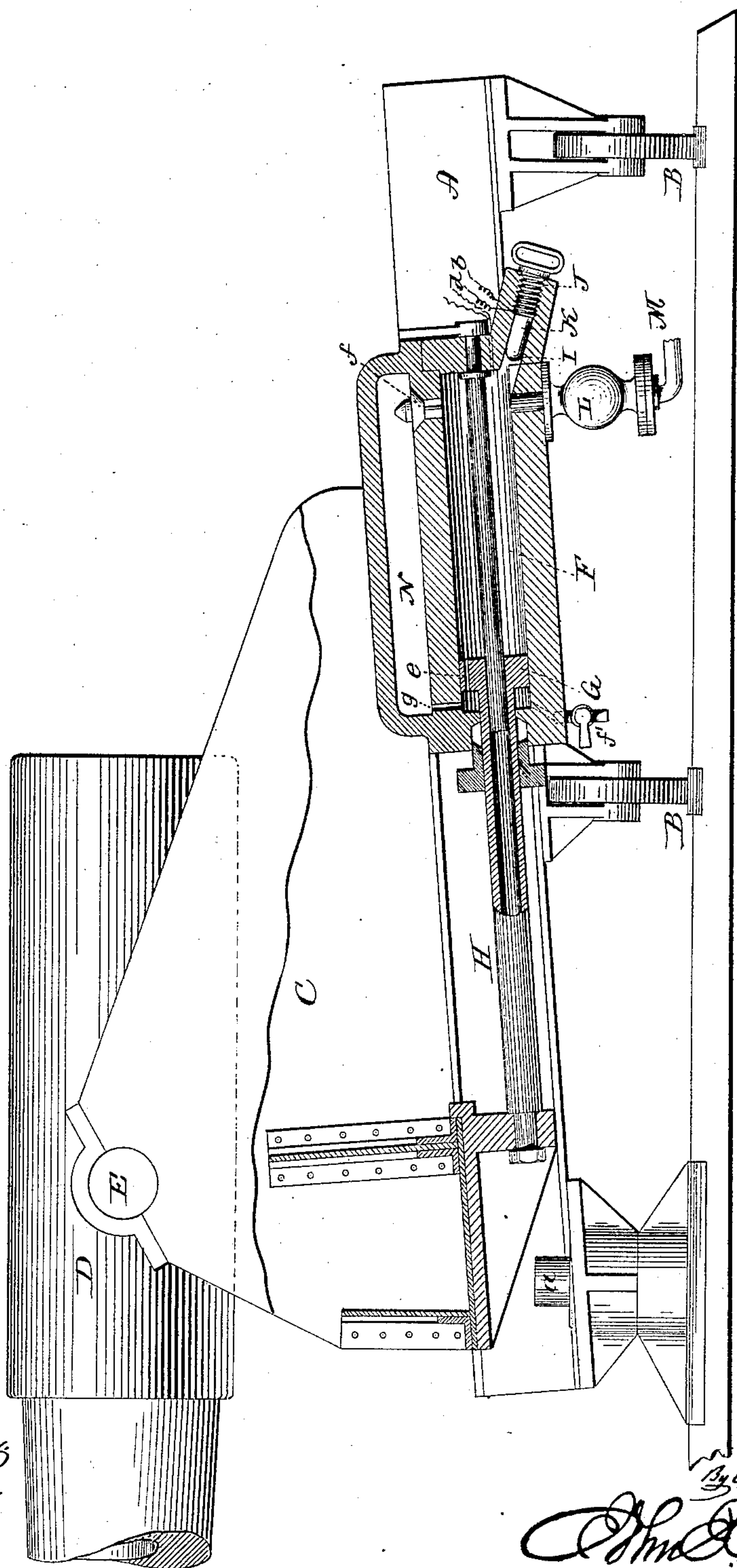
(No Model.)

E. HILL.

RECOIL CUSHION FOR GUN CARRIAGES.

No. 379,783.

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Witnessed
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UNITED STATES PATENT OFFICE.

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RECOIL-CUSHION FOR GUN-CARRIAGES.

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To all whom it may concern:

Be it known that I, EBENEZER HILL, of South Norwalk, in the county of Fairfield and State of Connecticut, have invented a new Improvement in Recoil-Cushions for Gun-Carriages; and I do hereby declare the following, when taken in connection with accompanying drawing and the letters of reference marked thereon, to be a full, clear, and exact description of the same, and which said drawing constitutes part of this specification, and represents a longitudinal sectional side view of a gun-carriage, the section being centrally through the cushion-cylinder.

This invention relates to an improvement in the cushions which are arranged to resist the recoil of guns in the larger class. Under the usual construction of this class of gun-carriages a portion of the carriage is hung upon a pivot at one end and supported upon concentric tracks. This first part of the carriage forms guides upon which the second or upper part of the carriage is arranged, and so that the said second part may move toward and from the center of motion of the first part, the gun being supported on the said second or upper part of the carriage. This is a common construction of carriage represented in the drawing.

A represents the lower portion of the carriage, which is hung upon a pivot, *a*, at one end, and supported on tracks B B, so that it may oscillate in a horizontal plane with the said pivot *a* as its center of motion. Upon the part B of the carriage the upper or gun-supporting part, C, is arranged, and so as to slide on the carriage toward or from its pivot. The second or upper part, C, of the carriage carries the gun D, supported thereon by trunnions E, in the usual manner. To resist the recoil in this class of carriages, a cylinder, F, has been arranged on one part—say the part A—of the carriage, with a piston, G, therein, from which a rod, H, extends forward and is secured to the other—say the upper—part, C, of the carriage, the piston and rod being in a plane parallel with the plane of motion of the said second part C. The cylinder F, being supplied with compressed air, forms a cushion to aid in resisting the recoil upon the discharge of the gun.

The object of my invention is to increase

the power of the cushion; and it consists in combining with the cushion-cylinder a chamber opening into the said cylinder, adapted to be charged with an explosive material, and so that an explosion may be produced, the force of which will enter the cylinder to form a resistance or an increased resistance for the movement of the piston in the cylinder under the recoil action.

The cylinder F is constructed with a cartridge-chamber, I, opening into the cylinder, the rear or breech end of the chamber being closed by a plug, J. Any breech-closing mechanism may, however, be employed for closing the breech end of the said chamber.

The breech of the chamber I being opened, a cartridge, K, is introduced therein and the breech closed. The cylinder is then charged with compressed air in the usual manner. As a means for exploding the cartridge, electrical wires *b d* connect with the cartridge-chamber, so that an electric spark may be communicated to the cartridge in the chamber. At the instant of discharging the gun the cartridge K is exploded, delivering its force into the cylinder and against the piston simultaneously (or substantially so) with the discharge of the gun. By this explosion the pressure in the cylinder becomes instantly increased to a very great extent, and to that extent the resisting-power of the cushion is increased.

The cartridge may be prepared with varying grades of explosives in a common and well-known manner, so as to make the complete explosion of the cartridge K instantaneous or prolonged, as may be desirable.

The recoil-resisting explosion may be produced by applying to the cylinder a chamber, L, with which the tube M, through which air communicates, will pass through the said chamber. The chamber L may be charged with suitable hydrocarbon or other suitable material, which the air passing into the cylinder will take up, and so that the cylinder will be charged with a highly-inflammable gas.

The spark for explosion may be communicated directly to the cylinder, say, by wires, (indicated in broken lines,) and so as to cause the gas to explode. Such explosion of the gas will greatly increase the resisting-power of the cushion.

Both the gas-supply and the cartridge may

be employed to good advantage, the cylinder being first charged with explosive gas, and then the cartridge, being exploded, will ignite the gas. By the combined force of the exploded gas and cartridge the resistance is brought to its highest possible limit.

Either the explosive cartridge or the explosive gas may be omitted, the same result being accomplished in either case; but the resisting-power is increased by the combined action of the two.

The cushion thus formed and highly compressed under the recoil of the gun-carriage will possess a very strong reactive force, the tendency of which is to force the carriage forward with a greater power than would in some cases be desirable. To produce a resistance or cushion for such forward return of the carriage, I provide an auxiliary chamber, N, preferably formed as a part of the cylinder, and through the piston G, I form a small aperture, *e*, and at the rear end of the cylinder I provide a valve, *f*, which opens from the cylinder into said chamber N, and at the opposite end of the cylinder I form a small aperture, *g*, which opens into the cylinder on the forward side of the piston.

Immediately upon explosion in the cylinder, as before described, a small portion of the gas will escape from the recoil side of the piston through the passage *e* to the opposite side of the piston, and the valve *f* will open and permit gas to enter and fill the chamber N at substantially the same pressure as that of the cylinder, so that the amount of gas is increased by substantially the capacity of the chamber N; but a portion of the gas through this chamber N will also escape to the forward side of the piston through the passage *g*, it being understood that these passages *e* *g* are so small as not to materially interfere with the efficacy of the cushion.

As soon as the recoil of the carriage is arrested and the piston G stops, the reactive force of the cushion acts upon the piston and serves to throw it, with the carriage it supports, forward with great force; but a cushion has been formed by the gas which has escaped to the reverse side of the piston, to resist to some extent such forward or advance movement of the piston, so that the carriage will gradually approach its forward position or place of rest against the cushion formed on the forward side of the piston. The force on the recoil side gradually diminishes as the gas expands. Thus the gun-carriage will return to its place of rest with an easy and gradually-decreasing movement.

On the return of the piston toward its forward position the valve *f* closes and prevents the return of the gas from the chamber N into the cylinder through the valve. Consequently the expansion of the gas in the chamber N and through the passage *g* aids in increasing the force of the cushion forward of the piston after recoil.

It will be understood that the auxiliary chamber N may be omitted, as also the aperture *e* through the piston; but I prefer to provide some means for utilizing the recoil-cushion as a resistance to the return of the carriage.

The auxiliary chamber may be omitted and the aperture *e* through the piston relied upon as a means for forming the cushion upon the forward side of the piston, or the passage *e* may be omitted entirely, and the chamber with its passages serve to produce the required cushion upon the forward side of the piston, it only being essential, so far as this forward cushion is desirable, that there shall be a passage of small area leading from the cylinder on the recoil side of the piston to the cylinder on the forward side of the piston.

It is possible that the cushion formed forward of the piston on the return of the gun may at times be too strong to permit the gun to return to its extreme forward position. To relieve the cushion, and thereby obviate this difficulty, a cock may be provided as an outlet forward of the piston—say as indicated at *f'*.

I claim—

1. A gun-carriage consisting of two parts, one of which is hung upon a pivot to swing in a horizontal plane, and which supports the second part, the said second part arranged upon said first part free to slide longitudinally thereon, the gun hung upon said second part, an air-cylinder in the one part, with a piston in said cylinder in connection with the other part to form a recoil-cushion for the gun, and a chamber opening into said cylinder upon the recoil side of the piston, the said chamber adapted to be charged with an explosive material, and provided with means for firing said explosive, substantially as and for the purpose described.

2. A gun-carriage consisting of two parts, one of which is hung upon a pivot to swing in a horizontal plane, and which supports the second part, the said second part arranged upon the said first part free to slide longitudinally thereon, the gun hung upon said second part, an air-cylinder in one part, with a piston in said cylinder in connection with the other part to form a recoil-cushion for the gun, and a chamber opening into said cylinder upon the recoil side of the piston, the said chamber adapted to be charged with an explosive material, and provided with means for firing said explosive, the said cylinder also constructed with an auxiliary chamber, with an opening from the recoil side of the piston into said chamber, and also with an aperture opening from said auxiliary chamber into the cylinder upon the reverse side of the piston, with a valve in the opening on the recoil side of the piston, the said valve adapted to open from the cylinder into said auxiliary chamber, substantially as described.

3. A gun-carriage consisting of two parts, one of which is hung upon a pivot to swing in a horizontal plane, and which supports the

second part, the said second part arranged upon the said first part free to slide longitudinally thereon, the gun hung upon said second part, an air-cylinder in the one part, with a
5 piston in said cylinder in connection with the other part to form a recoil-cushion for the gun, and a chamber opening into said cylinder upon the recoil side of the piston, the said chamber adapted to be charged with an explosive material, and provided with means for firing said
10 explosive, an aperture or passage of small area from the cylinder on the recoil side of the piston to the cylinder forward of the piston, substantially as and for the purpose described.

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Witnesses:

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