Mr. Lawrence W. Chadwick, of Shenandoah Iron Works, Va., has patented an improved sectional steam boiler, composed of several horizontal water and steam chambers set one above the other within a casing or shell closely fitting against their edges and supported and connected by vertical and horizontal water circulating pipes and T's, the chambers having vertical openings through them, that serve as flues for the passage of the products of combustion; and it consists, also, in combination with the chambers and tubes, of a fireplace, water front, and of novel pipe coupling devices.

An improvement in car couplings has been patented by Mr. Samuel A. V. Hartwell, of Valley Center, Kan. The invention consists of the combination of a draw-head having a sliding cap for regulating the size of the coupling entrance, a notched coupling pin for adjusting the link, and a flat link having grooved ends.

Mr. Noah Jacobsohn, of New York city, has patented an underground street, the object of which is to facilitate the removal of street sweepings and refuse garbage, ashes, snow, etc., and to provide a road for the vehicles for removing these sweepings, garbage, etc., whereby the streets can be easily and economically kept clean. The invention consists in an underground road or street occupying a part or the entire width of the street, and having a roof of grating flush with the ordinary street, through which the sweepings, snow, garbage, etc., are swept or dumped into the cars or carts on a track of the underground road.

An improved spark arrester has been patented by Mr. David Wiser, of Plymouth, Ind. This invention is an improvement upon the spark arresters described and claimed in Letters Patent Nos. 165,907 and 210,828, which were granted to the same inventor July 20, 1875, and December 10, 1878, respectively. The improvement renders the device more adaptable to smoke stacks which are straight. The spark arrester will return to the fire box a considerable portion of the smoke and gases, where they will be consumed and utilized as fuel.

Mr. Frederick Shriver, of Grand Rapids, Mich., has patented a steam generator which has the base burning feature embodied in it, and which is designed for low pressure heating purposes and for domestic work, and which has no tube or crown sheet to protect by a fixed water line. The invention consists of an upright boiler of U-shaped cross section, having a double shell inclosing the water space, curved in such a manner that one shell or wall forms the exterior of the boiler and the walls of the interior central fuel reservoir, while the other and concentric shell forms the walls of the interior smoke flue of the boiler, through which pass the heat and products of combustion, thereby forming an interior and an exterior water chamber connected with each other.

An improved car coupling has been patented by Mr. John Cochran, Jr., of Millwood, Mo. The car coupling is constructed with wide bumper heads, with two pairs of links, a pair of pins, slotted sliding bars, connected with a pin of each pair, and pivoted lifting bars connected with the slotted sliding bars and swinging trip blocks, whereby the cars will be coupled automatically as they are run together.

Mr. Frederick A. Fargo, of Pine Woods, N. Y., has patented a hop picker's measure or box that may be easily taken apart for stowing away in small space and for transportation, and easily set up for use.

The Anthracite Product of 1881.

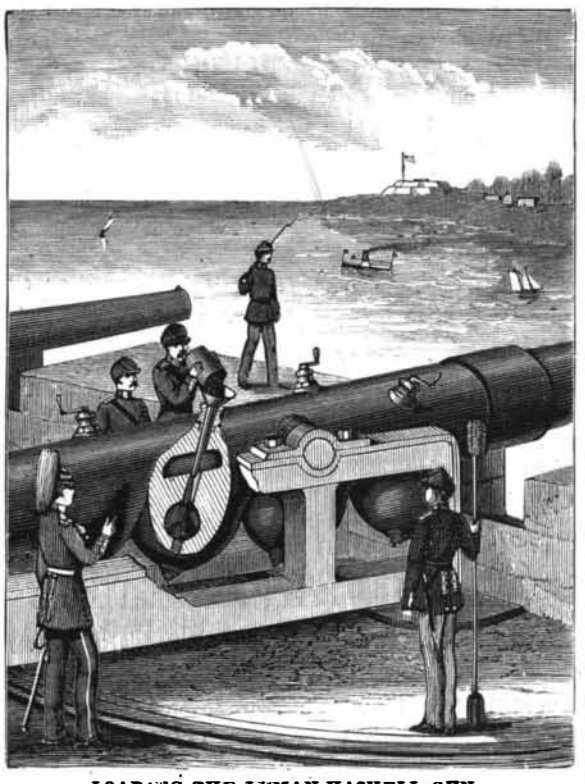
The official report of the anthracite tonnage of the Pennsylvania railroads for the past year shows a traffic of 28,500,016 tons, an increase of 5,032,774 tons as compared with the previous year. Of this amount the Philadelphia and Reading Railroad carried 6,940,823 tons, the Lehigh Valley Railroad 5,721,869 tons, the Central Railroad of New Jersey 4,085,423 tons, the Delaware, Lackawanna and Western Railroad 4,338,968 tons, the Delaware and Hudson Canal Company 3,211,496 tons, the Pennsylvania Railroad 2,211,363 tons, the Pennsylvania Coal Company 1,475,385 tons, the New York, Lake Erie and Western Railroad 465,230 tons. Of the total production, 48·96 per cent was from the Wyoming region, 18·58 per cent from the Lehigh region, and 32·46 per cent from the Schuylkill region. The stock of coal on hand at tide water shipping points was 497,024 tons.

A Characteristic of American Life.

In the summer of 1836 a barefooted boy was on his way to Honesdale, Pa., walking the tow-path of the Delaware and Hudson Canal. When four miles from Port Jervis, and still forty miles from his destination, he was overtaken by a canal boat. He was asked to jump aboard the boat and ride, which he did. On the boat was a Scotch family, just landed in America, who were on their way to the Pennsylvania coal fields. One of its members was a boy the same age of the young pedestrian, eleven years. A strong friendship grew up between the two boys by the time they reached Honesdale. The Scotch family went on to Carbondale, the center of the Lackawanna coal field. The boy who had been given the ride in the boat obtained employment on the canal. His friend, the Scotch boy, worked in the mines for a short time as mule boy. Both he and the former barefoot boy rose in the company's service. The Scotch boy of forty-six years ago is Thomas Dickson, President of the Delaware and Hudson Canal Company. His friend, the other boy, is Col. F. Young, General Manager of the company, and President of its Albany and Susquehanna Railroad system.—*Sun.*

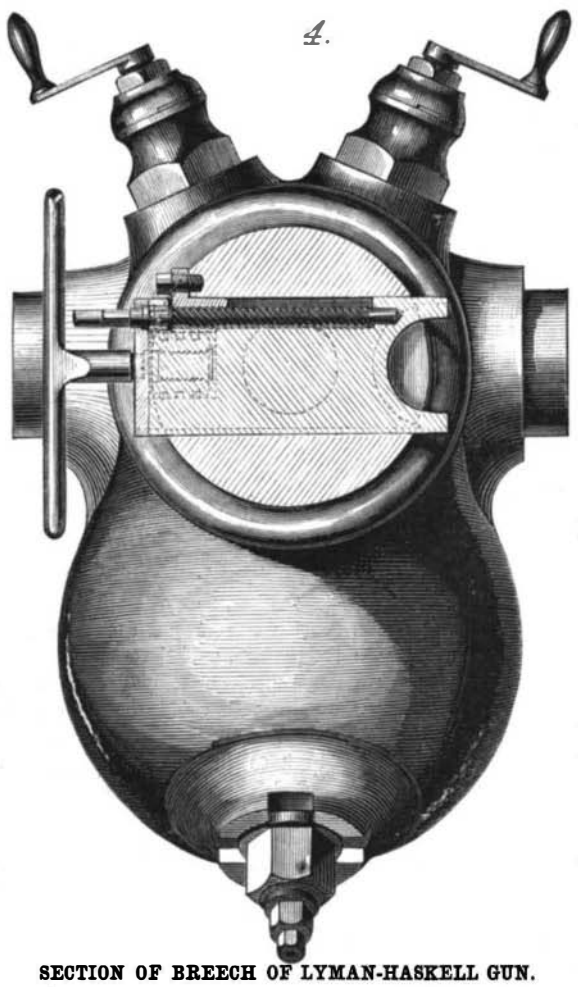
THE MULTICHARGE CANNON FOR COAST AND HARBOR DEFENSE.

It would seem to be the rule in military as well as in other arts, that radical improvements are more apt to be made by non-professionals than by those whose lives are devoted to the particular art or service improved. The latter perfect the means and methods which they are educated to use; they do not revolutionize them. It is the outside inventor who sees where radically novel changes can be advantageously made. Freedom from professional bias is often, indeed, a prerequisite for successful effort in invention. And it may be that the professional prejudice which the inventor of striking boldness and originality is sure to encounter is one of the conditions of a thoroughly practical development of his ideas.



LOADING THE LYMAN-HASKELL GUN.

When the stress of war was upon the country, twenty years ago, the attention of our inventive minds was largely directed to the production and development of military and naval devices, some of which, like the revolving turret, the breech loading rifle, and the magazine gun, had been dormant, so to speak, for years. Other ideas, equally revolutionary in character, were suggested by the needs of the time, but the war was happily ended before they could be developed. Among these was the idea of increasing the efficiency of firearms, particularly heavy guns, by what is now known as the accelerating principle. Since then the original idea of Mr. Lyman has been developed and practically applied by Mr. Haskell, in the multicharge cannon, the construction and mounting of which are illustrated in the accompanying engravings; an invention which promises to work as radical changes and improvements in military and naval operations as were effected by those other American inventions—magazine guns, torpedoes, revolving forts, ironclads, and the rest.



SECTION OF BREECH OF LYMAN-HASKELL GUN.

In the contest between the increasing weight and power of cannon and the resisting strength of more and more heavily armored defenses, two radically different lines of effort have been followed. Within the profession, capacity in guns to hurl heavy projectiles at great velocity has been sought for by increasing the size and strength of the gun; by chambering the breech to make room for a large volume of powder to be exploded, and by moulding the powder to secure accelerating combustion, slow at first to start the projectile, then more and more rapid to burn all the powder and attain the maximum pressure while the projectile was passing through the gun. By these improvements it has been found possible to increase the charge of powder to one-fifth the weight of the projectile, enabling a properly constructed gun to deliver a shot with such force and velocity as to cause it to penetrate somewhat more than as many inches of iron as the diameter of the bore of the gun measures. Under the most favorable conditions the heaviest armstrong gun (100-tons) has penetrated nearly one and a half calibers, or about two feet of wrought iron, with a caliber of seventeen inches. Increase of efficiency is secured on the accelerating principle by devices for firing successive charges of powder behind the ball while the ball is passing through the gun. In this way the projectile is thrown by the explosive force of more than its weight of powder, or five to ten times as much as can be burnt behind a ball by the conventional method.

The inventors claim that, notwithstanding the greatly increased charge of powder under the new principle, the maximum pressure within the gun is not increased. By the old method almost all the strain is upon the metal about the breech of the gun, while by the new the strain is distributed along the entire length of the gun. As a natural consequence of the increased charge a longer and heavier projectile can be employed, and the increased velocity with which it leaves the gun enables it to penetrate iron armor to a depth from four to ten times the caliber of the gun, according to the number of accelerating charges.

Two official tests of the efficiency of multicharge guns have been made before boards of officers of the army and navy, some of the experiments being made for range, others for penetration, and still others for initial velocity. On every point the reports show a decided superiority in favor of the multicharge guns, compared with other guns of equal or greater weight. So marked is the superiority of the accelerating principle that General John W. Newton, U. S. A., calculates that a 10-inch accelerating gun would be as efficient as the 81 ton (16-inch) Armstrong gun, and nearly as efficient as the 100-ton (17-inch) Armstrong, while the latter would be surpassed in inefficiency by a 12-inch Lyman-Haskell gun. In the matter of cost and the expedition with which guns of a required penetration could be furnished the advantage seems to be as markedly on the side of the multicharge guns.

A still further advantage is promised by the new system in the relatively smaller cost of mounting, whether on land or water. The cost of a Duilio, carrying a 100-ton gun—the most powerful vessel afloat—would suffice for the building and arming of several small swift steamers armed with cheaper and lighter but equally efficient accelerating guns, while the larger craft would present a much better mark to hit than her smaller adversaries. In like manner a few properly mounted accelerating guns of ten or twelve miles range, commanding any of our harbors, would make them practically inaccessible to the most powerful war ships that could be floated.

In the SCIENTIFIC AMERICAN, of November 12, 1881, was described the casting of a 6-inch Lyman and Haskell gun at the foundry of the Reading Iron Company. The gun will be finished next spring. It will be twenty-five feet long, and will throw a shot weighing 150 pounds, with a total charge of 130 pounds of powder, or more than four times the weight of powder used with a shot of the same weight in the best guns now in use. A longitudinal section of this gun, showing the supplementary powder pockets, appears in Fig. 2.

The gun will be loaded with 18 pounds of hexagonal powder in the breech, and 28 pounds of finer powder in each of the pockets. The breech charge is intended to overcome the inertia of the ball without straining the gun. As the ball passes the openings to the several pockets the heated gases fire the supplementary charges, increasing the velocity of the projectile to 4,000 feet a second when it leaves the muzzle of the gun, or more than double the velocity attainable by guns of ordinary construction, a velocity sufficient, it is calculated, to carry the projectile twelve miles, or to enable it to penetrate two feet of wrought iron at a distance of 200 yards. The explosion takes place in tough steel backed by strong cast iron. The manner of charging the breech chamber and the several pockets is shown in the smaller cuts.

Touching the practicability of the methods of loading and firing guns on this principle, as developed by Messrs. Lyman & Haskell, we have the testimony of General Newton to the effect that no doubts are entertained by experts that the gas check can be made perfectly efficient, while, in his opinion, the loading of the pockets can be made as expeditious as the loading of the breech.

The contractors for the construction of the gun we have illustrated are Messrs. Pancoast & Tarr, agents in this city for the Reading Iron Company.

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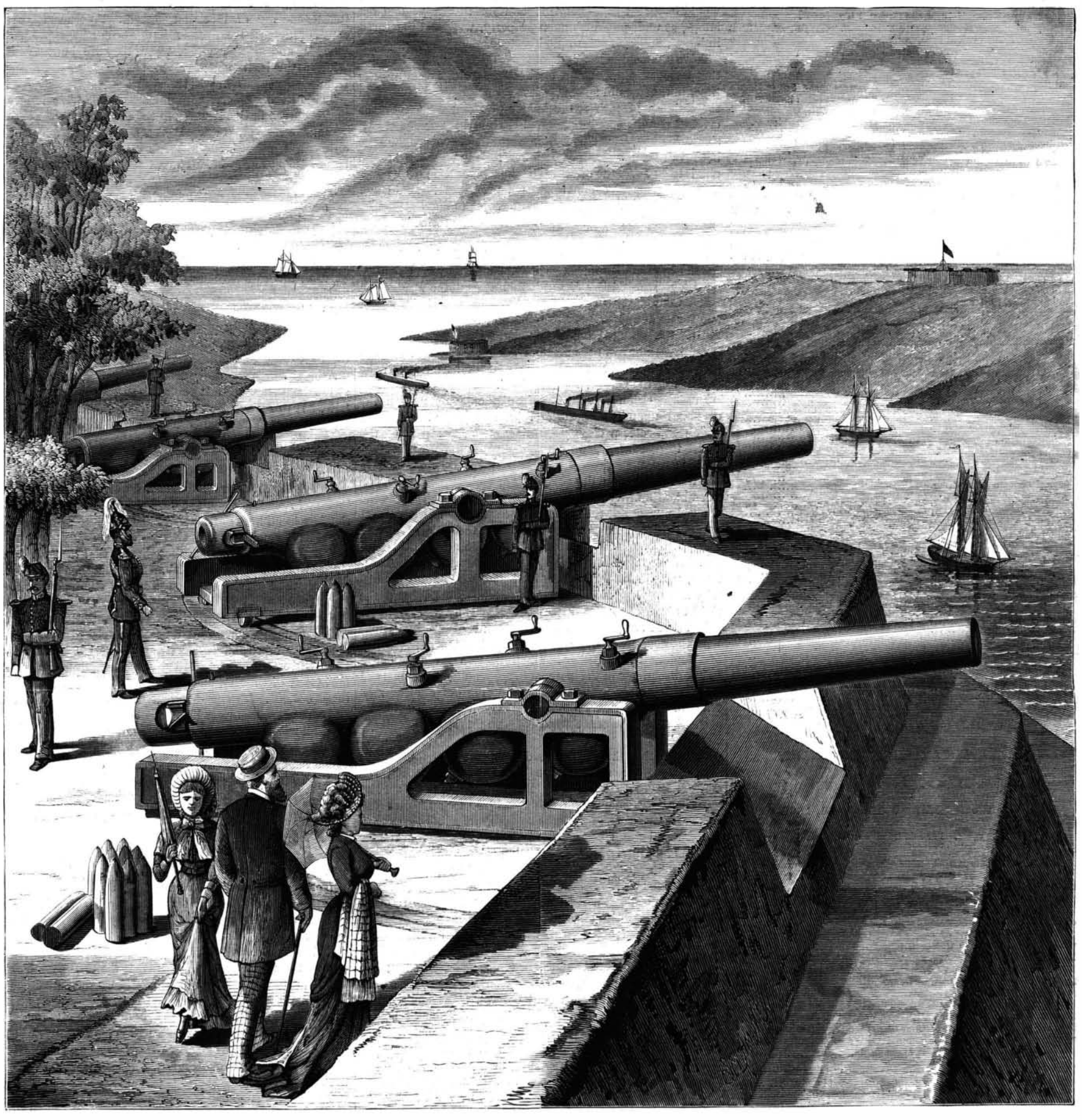

Fig. 2.

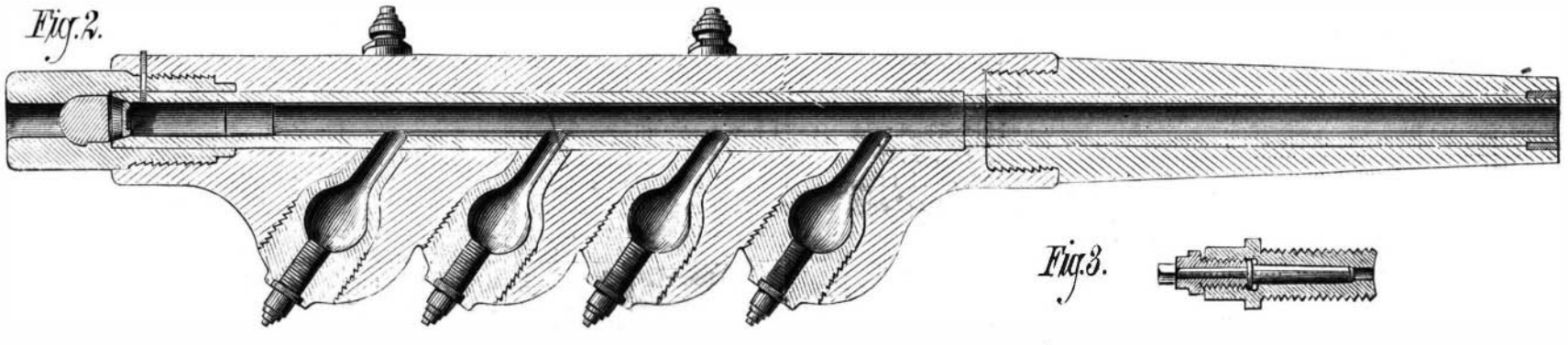

Fig. 3.

THE LYMAN-HASKELL MULTIPLE CHARGE ACCELERATING GUN.—[See page 51.]