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SEABURY BREECH MECHANISM FOR RAPID FIRING AND OTHER GUNS.

For the past few years foreign military nations have been carrying on extensive experiments with quick firing guns of various calibers, from one inch to six inches, and their conclusions point to the adoption of a gun having a caliber between four and five inches as the one giving the most satisfactory results. In this country we have pinned our faith for the present, or

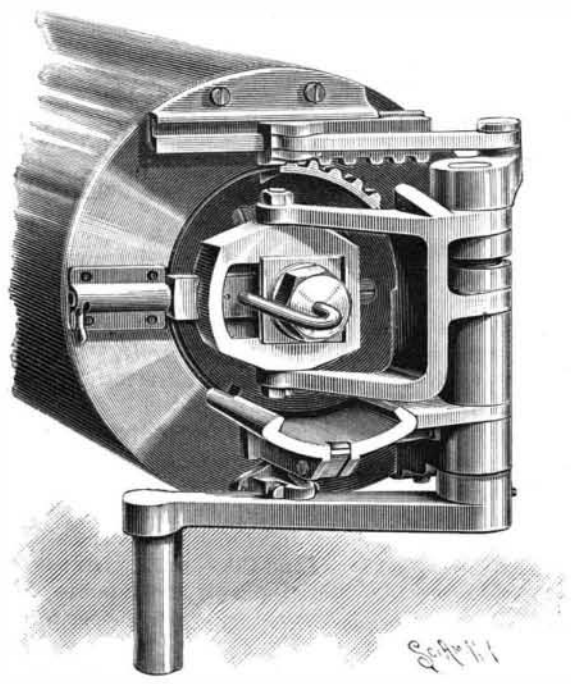

Fig. 1.—ORIGINAL DESIGN—REAR VIEW, MECHANISM CLOSED.

perhaps restricted our orders would be the better expression, at least as far as the naval branch of the service is concerned, to the four inch caliber as the extreme size of rapid fire gun, and several of that class of weapon are now in course of construction, and will be completed before the expiration of the present year. Facility for loading is, of course, a prime requisite of the quick fire type of guns, and in order to contribute to this result the projectile and powder should be contained in one cartridge, and be as light as is consistent with the necessary ballistic power. Metallic cartridges are used, and experiment has proved that the fixed ammunition cannot conveniently be handled when the caliber exceeds four inches. The cartridge then becomes so long and the weight so great that one man can no longer handle it with alacrity. The struggle, therefore, at present seems to have centered itself about the breech of the four inch gun, and with a view toward introducing mechanism at once strong, light, safe, and simple, Lieutenant Samuel Seabury, of the United States Navy, turned his attention, some two years since, to the subject, with the result as illustrated on these pages.

Figs. 1 and 2 represent in perspective the closed and open positions of the breech mechanism as originally designed. Figs. 3, 4, 5, and 6 are sections, etc., of the modified mechanism of the same type. Fig. 7 is rear view of modified type, having the handle and wiper combined, and Fig. 8 shows the method of handling by gearing the heavier calibers. Simple and ingenious as the original design, Figs. 1 and 2, appears in the modified form, Fig. 7, there is even greater simplicity, with a lessening of weight, increased strength, and a reduction in the number of parts. The breech plug is on the slotted screw system, that has already stood for many years the test of actual service, and which is, mechanically considered, the best known method for closing the breech of the gun. The points of resistance applied at three evenly divided parts of a circle, as in the slotted screw, are much nearer mechanical perfection than is attained by the side systems of closing the breech; besides which, the work of cutting the screw box is very much simpler. Greater length of bore is obtained for guns having the same external length, and hence greater power for the same weight of metal.

The feature of quick loading is also enhanced by the fact that it is not necessary to push the cartridge away forward to its seat before closing the breech. As much as seven inches of the cartridge can remain protruding from the seat, in the case of the four inch caliber, without interfering with the closing of the plug, which, upon being closed, shoves the cartridge forward to the firing position. The cartridge case extractors, as originally designed, consisted of a pair of spring-actuated hooks, as appears in Fig. 2, which, on closing the block, grasped the head of the cartridge, as is usually done in small arm systems.

A great improvement over this method has been made by the adoption of the extractors, as shown in Figs. 3, 5, and 6. This extractor consists of a plate sliding longitudinally in a recess at the bottom of the screw box, and having at its inner or forward end an upturned plate, so formed as to embrace a portion of the head of the cartridge, while a lug near this upturned portion, Figs. 5 and 6, serves to engage a corresponding recess at the forward end of the breech block, Figs. 4, 5, and 6. At the rear end of the extractor plate is a transverse slot engaging the upturned pin of the long arm of the extractor lever. The advantage of this method lies in the great power produced by the unscrewing of the breech block to loosen the empty cartridge case in the bore, while the rapid rearward motion imparted by the subsequent impingement of the mechanism against the short arm of this lever serves to eject the case effectively, as is done in the smaller types of rapid fire guns.

In the latest modifications of this mechanism the firing pin is made in one piece, and the coil spring around the firing pin, as shown in the illustrations, is replaced by a leaf spring secured to the retractor box. This renders unnecessary having so large a hole drilled in the center of the block for the firing pin.

Another improvement which will, no doubt, commend itself to ordnance men consists in changing the locking device from the handle of the mechanism to the rack which turns the block, thus reducing the number of parts through which the tendency to unlock on discharge acts. The new device consists of a strong pawl pivoted on the rear face of the gun, which by gravity drops into a recess on top of the rack when in the locked position.

To operate the mechanism as illustrated, grasp the handle, squeeze the movable plate in the handle so as to release the catch to unlock from the gun, and pull the breech plug around to the position indicated

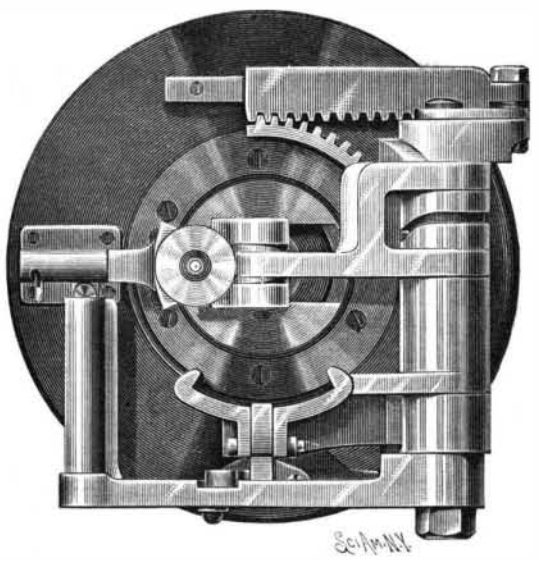

Fig. 3.—MODIFIED MECHANISM—REAR VIEW OF BREECH CLOSED.

in Fig. 5, where it stands clear of the bore of the gun, ready for the insertion of the cartridge. The various operations of unlocking the block, A, withdrawing it into the tray, N, and swinging the whole clear of the bore, are performed in this *one movement*, and herein lies one of the strongest points of the Seabury system, and one in which it possesses great advantages over the other metods in use with the slotted screw, as they require two and three motions to accomplish the same thing, sacrificing thereby some of that greatest of essentials in rapid firing systems, the element of time.

During the first 75° of the revolution of the handle, the wiper, E, acts upon a projection on the slide bar, D, Fig. 4, which, through the pin, M, pushes the rack, F, to the left on its guide, thereby turning the circular rack rigidly secured to the block, A, through an arc of 60°, unlocking it from the threads in the screw box of the gun. As soon as this is done, the shoulder on the wiper, E, comes in contact with the projection, H, on the retractor, G, and movement is imparted to it, thereby pulling the block to the rear into the tray, N, through the slipper guide acting in the horizontal slot cut in the retractor box, B, secured to the rear of the

(*Continued on page* 328.)

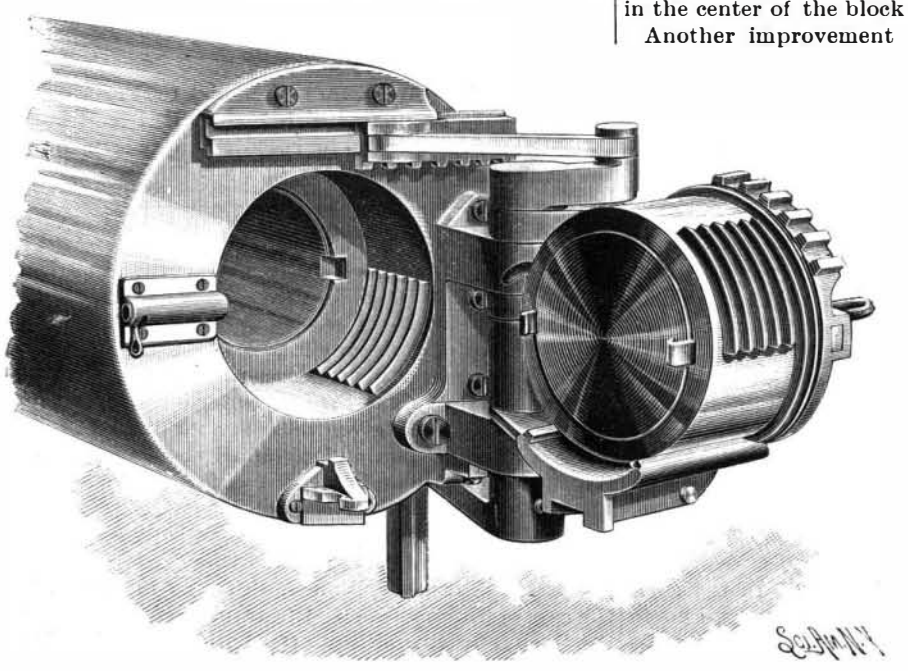

Fig. 2.—ORIGINAL DESIGN, BREECH OPEN.

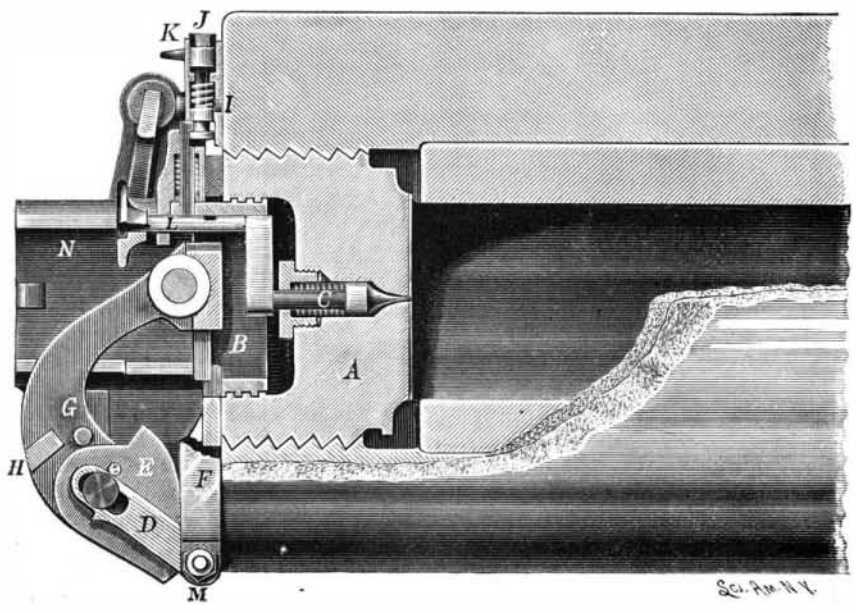

Fig. 4.—HORIZONTAL SECTION OF MODIFIED MECHANISM ON AXIS OF GUN.

SEABURY BREECH MECHANISM FOR RAPID FIRING AND OTHER GUNS.

(*Continued from first page.*)

block with free turning movement. When the block is brought up by the shoulders of the tray, it has tripped the catch from the hook on the gun, and the whole mechanism swings around on the pivot clear of the bore. Meantime, during the turning of the block to unlock, the firing pin has been drawn or pushed back against its spring by a cam secured against the inner face of the rear recess in the block (not shown

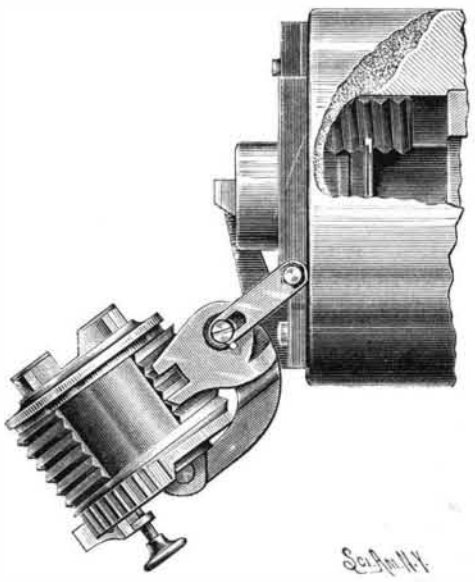

Fig. 5.—GENERAL PLAN OF BREECH, SHOWING BLOCK WITHDRAWN AND SWUNG ASIDE.

in the illustrations), and is caught in this position by a spring-actuated pin or trigger bolt. At the same time the projection or ring turned on the front end of the block has withdrawn the empty cartridge case from its seat by an amount equal to the pitch of the screw for that portion of a revolution—60°—about 0·1 inch, thus loosening it. When the mechanism has been swung clear of the line of the bore, the handle near the pivot strikes the short arm of the extractor lever, causing it to pull the extractor quickly to the rear and eject the empty case. At the termination of the operation of unlocking the block, the retractor bolt (shown on the side of the retractor near the letter G) is brought fairly under a hole in the wiper, E, and as the circular movement continues, this bolt is drawn upward into this hole by means of a pin working in a cam slot in the upper bearing (see Fig. 3), thus locking the retractor and wiper together. Obviously this locking together is of no service during the retraction of the block, but upon reversing the operation and closing the breech, it forms the connection whereby the movement of the handle, and consequently that of the wiper, is communicated to the retractor, and through it to the remainder of the mechanism. The trigger, J, on the rear face of the gun cannot be moved by the lock string, at K, until the return of the handle to the locked position, when the pin, I, is pushed in, and thereby the bolt released.

Another safety appliance is found in the cam which

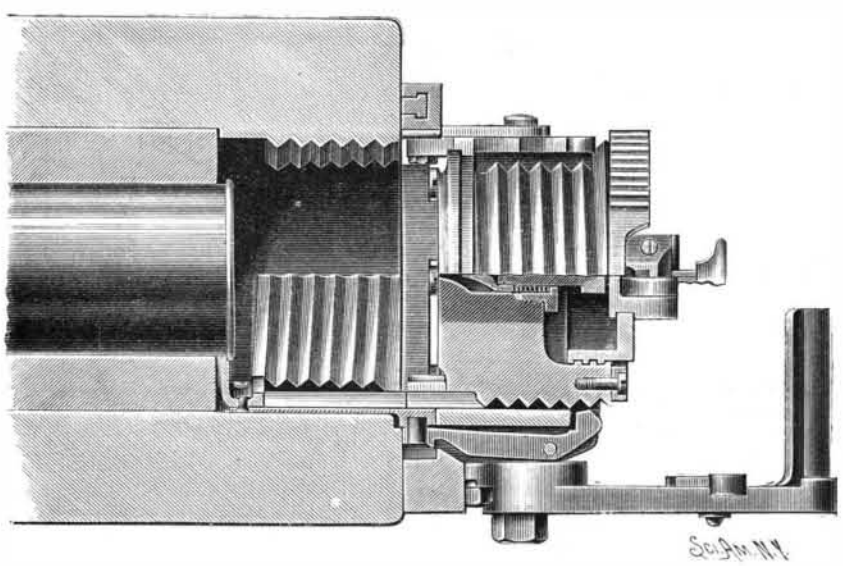

Fig. 6.—VERTICAL SECTION, SHOWING BLOCK WITHDRAWN AND CARTRIDGE CASE STARTED FROM SEAT—UPPER PORTION OF BLOCK IN FULL.

moves the firing pin to the rear, for until the block is locked the cam remains under the arm and shoulder of the firing pin, and even could the latter get adrift, the cam would prevent it from striking the cartridge primer.

Should it be desired to change from spring firing to an electric firing device, it can very readily be brought about without material alteration of the parts in connection with the firing device. Such a change would, in fact, be a move in the direction of simplicity, which is one of the points aimed at in this system. The chief difficulties that have heretofore prevented the introduction of rapid-fire guns on the slotted screw principle were met with in the comparative slowness of movement and the difficulty of providing a reliable and efficient extractor. Both of these objections have been overcome in the Seabury system, as has already been explained, and loading can be accomplished as rapidly as the cartridges can be brought to the gun, with the assurance that there will never be a doubt about the old cartridge case being removed upon the opening of the breech block. The advantages of this system are that all parts are easily made, and their number is comparatively small.

While the entire mechanism is simple in character, the mechanism is equally efficient for guns of larger caliber than those now embraced in the term rapid fire guns, since the reduction to one motion in opening and closing the breech block enables the simplest gearing for power to be employed. All parts are readily accessible for repair or cleaning. The parts are easily uncoupled by simply removing the main pivot. This advantage becomes more apparent in field use when it is desirable to disable guns hurriedly before abandoning. As against side systems it permits the use of the strongest known breech closure, embodying simplicity of manufacture, avoiding cutting through the side of the gun, with its attendant weakness, and smaller space occupied in the breech.

We are indebted to the representative owner of the system, Mr. J. W. Wilson, of 319 Broadway, New York, for the particulars from which the above article was written. The engravings were prepared from detail drawings and from a working model of the gun.

Injury to the New Cruiser Baltimore.

A report was received at the Navy Department recently from the civil engineer of the Norfolk Navy Yard, stating that the Baltimore was considerably strained when she was placed in the new timber dock there, causing quite a leakage before the water was all pumped out of the dock. A hasty examination showed that one or two seams in the amidship bulkhead had started, and calking was necessary in order to allow the vessel to go to sea.

A question immediately arose as to the cause of this, and a rapid survey of the dock was made. The civil engineer reports that, in his opinion, the bottom of the dock had settled about nine-tenths of an inch, while the Simpson Company, the builders of the dock, say they do not believe the dock has settled at all, and that if the ship was strained it was due to bad docking. This is most generally believed, for it is thought to be absurd that the settlement of a fraction of an inch, or even of two or three inches, in a dock 500 feet long would affect a vessel over 300 feet in length. A board will be ordered at once to investigate the condition of affairs. The dock was built last year and completed in September.—*Phila. North American.*

Utilization of the Power of Niagara Falls.

A scheme has been organized and work begun to generate electricity, by the aid of Niagara, sufficient to drive all the machinery in the mills and factories, propel every horse car, light up every street, avenue, and road in and around the village of Niagara Falls, the city of Buffalo, and the neighboring towns and villages. The present plans contemplate the production of 120,000 horse power, but there is no limit to the amount of power which may be produced.

The plan is to construct a subterranean tunnel from the water level below the falls about 214 feet under the high bank of the river, extending through the rock to the upper river at a point about a mile above the falls, where a head of 120 feet is obtained. The tunnel will thence extend parallel with the shore of the river one and a half miles at an average depth of 160 feet below ground and about 400 feet distant from the navigable waters of the river, with which it will be connected by transverse surface conduits. The fall of the water from these conduits into the tunnel —simply a tail race—produces the power, and the plans adopted will furnish 120,000 horse power.

The mill sites where this great power will be put to use are above the village, stretching along the level ground which bounds the river to the south, and from one to two and a half miles from the falls. Here a block of land has been acquired sufficient for mills which would employ the horse power mentioned and for mercantile and other needs of a large manufacturing town.

The Niagara Falls Power Company was organized on March 31, 1886, under the authority of the Niagara River Hydraulic Tunnel Power and Sewer Company, of Niagara Falls; capital, $2,000,000; president, Chas. B. Gaskill; treasurer, Francis R. Delano; secretary, Alexander J. Porter; attorneys, W. Caryl Ely, W. B. Rankin; resident engineer, Albert H. Porter.

A contract has been signed between the Niagara Falls Power Company and the Cataract Construction Company, of New York, for the construction of the main and cross tunnels, raceways, etc., the price being $3,500,000. This contract calls for the completion of the work by January 1, 1892.

The company has purchased about 1,300 acres for mill sites on the river front and on the line of the proposed tunnel, with ample streets and dockage, affording facilities for approach by rail or water, to accommodate 238 mills of 500 horse power each, or 119,000 horse power in all, which is the engineers' estimate of the capacity of the tunnel proposed to be built. Some idea of the magnitude and value of this power may be formed when it is stated that it far exceeds the combined available power in use at Holyoke, Lowell, Minneapolis, Cohoes, Lewiston, and Lawrence, and that it can be constructed at an expense not to exceed one-tenth of the outlay for the development of the power at the places designated.

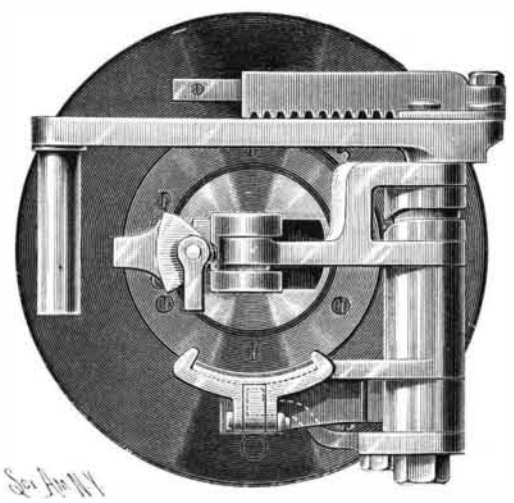

Fig. 7.—MODIFICATION—HANDLE AND WIPER COMBINED. CAN BE USED TO WORK EXTRACTOR.

The Accidents on the Eiffel Tower and Forth Bridge.

The great monsters of mechanical skill and genius call for the sacrifice of a great deal of life and limb in their construction. The greater the engineering feat, the more extensive is the loss of life.

In the construction of the Eiffel Tower, for instance, twenty-six lives were lost, according to the official returns of the French government, but it is said that this number would be largely augmented if the names were given of men who died from injuries received during the construction of the tower and of others who were killed and whose deaths were not reported, owing to the hue-and-cry which was raised after the first two dozen lives had been sacrificed on the great structure. The number of men who were injured during the construction of the Eiffel Tower has been placed at 6,000. This enormous showing is accounted for by the fact that every injury was reported and registered which received treatment from the official surgeons. When a man bruised his finger, he went to a government surgeon to have it dressed, and a clumsy workman thus got on the list a dozen or two times a year. Serious injuries were a very small proportion of the whole. On the great Forth Bridge in Scotland, a list of forty lives lost has been published, but there is no record of injuries.—*New York Sun.*

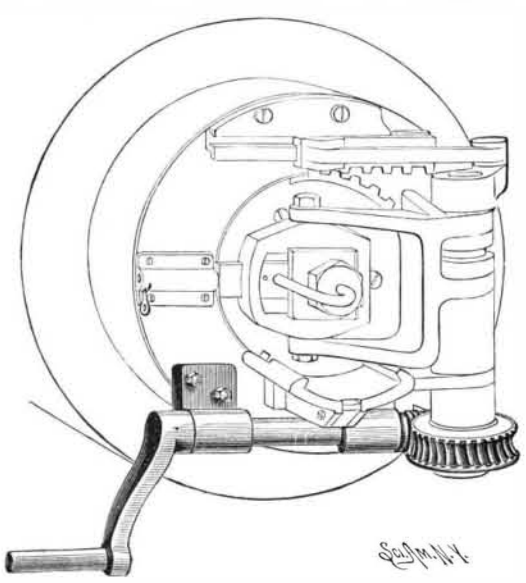

Fig. 8.—GEARING USED ON GUNS OF LARGE CALIBER TO WORK MECHANISM.