

THE BUFFINGTON-CROZIER DISAPPEARING BARBETTE CARRIAGE FOR THE EIGHT INCH B. L. RIFLE.

The views which we herewith present of the standard disappearing gun mount for coast defense batteries will possess especial interest at the present time. Our recent diplomatic deadlock with a first-class naval power has again raised the question of adequate sea-coast defense; and has riveted the public attention upon it more strongly than ever before. That this nation has a large portion of its wealth located along its 3,000 miles of seaboard is no doubt generally understood, and also that in the event of naval attack by a hostile power it is practically defenseless; but just how vast the total value of this property is, and just how utterly exposed to the possibility of speedy destruction, the great mass of the people at large, and especially those of the inland States, have never fully realized.

Elaborate plans of defense have been drawn up and are only awaiting the sanction of Congress for their execution. At the present writing the bill reported by the Senate Committee on Fortifications proposes an appropriation of \$80,000,000, of which \$10,000,000 should be available during the rest of this fiscal year and the whole of the next one, and \$10,000,000 a year should be available thereafter for seven years. The report further says: "It has been estimated that in the cities of New York, Brooklyn, and Jersey City alone there is property of the value of \$4,000,000,000 which a hostile fleet, lying in the upper bay of New York, would have within reach of its guns. Not one-tenth of the necessary defenses has yet been provided for that port, although its harbor is at present better defended than any other in the United States."

We have a navy which has received the favorable criticism of every foreign power, and it is rapidly approaching the front rank. In building up a system of coast fortifications we shall be providing the necessary counterpart of an effective navy. The committee says that its very existence would be imperiled in case of war with any great power, without the support which would be afforded it by land defenses.

The Buffington-Crozier disappearing carriage, which will be the standard type for coast fortifications, is shown in the loading position, where it is entirely below the parapet of the barbette; also in the elevated position for firing.

The carriage is of the front pintle form, and consists of the following principal parts, viz.: The levers, the top carriage, the cheek plates or chassis, the elevating gear, the racer, the live rollers, the base ring, the transoms, the traverse wheels, the traverse circle, the traversing gear, and the projectile crane.

The trunnions of the gun rest in bearings bushed with bronze, on the upper end of the levers. The levers are made of cast steel, and are pivoted near their middle points upon an axle of forged steel. The axle rests in bearings bushed with bronze in the top carriage, which is formed with the two hydraulic cylinders in one piece of gun iron. In each cylinder are two throttling bars of steel, which pass through notches in the piston and serve to regulate the size of the orifices for the flow of the liquid past the pistons, being of variable cross section. The hydraulic cylinders are connected by a pipe at their forward ends to equalize the pressure in them during recoil.

The piston rods with the pistons formed on them are made of forged steel, and are fastened by means of nuts to projections on the front end of the chassis. They are produced through the rear cylinder heads.

The top carriage rests upon rollers of forged steel, which are placed in recesses in the cheek plates. The axles of the rollers are of forged steel, and the rollers are bushed with bronze where the axles pass through them. The cheek plates are made of cast steel, and are united by three transoms, also of cast steel, the rear one being for the traverse wheels. The cheek plates are bolted at their forward ends to the racer, and have guides bolted to them for the elevating rack. Their upper surfaces have a slope of 2° to the front to facilitate the return of the piece to battery, and to reduce the preponderance of the counterweight.

The elevating rods are of forged steel, the journal bearings, at their upper and lower ends, being bushed with bronze. The lower ends of the rods are attached to elevating racks of bronze. The elevating hand-wheels are of wrought iron and are mounted on a through shaft, upon which are pinions of bronze gearing into spur wheels of cast steel. On the shaft with these are pinions of bronze, gearing into the elevating racks.

The action of the system in recoiling is such that, no matter what elevation the gun may have when fired, it will have practically the same inclination to the horizontal—about 7°—in loading position.

The racer is of cast steel, and the base ring of gun iron. Their inner parts form a pivot or pintle, which has a spiral groove cut in one of its surfaces to facilitate lubrication. The base ring is fastened to the platform with sixteen 1¼ inch holding-down bolts. The rollers are conical and of forged steel.

The counterweight is of lead, and weighs 32,000 pounds. It is suspended by two rods from a shaft joining the lower ends of the levers. This shaft is of

forged steel, and passes through the lower ends of the levers into two clips forming a crosshead, and the holes in the levers being bushed with bronze. It is pinned to the clips, with which it forms the crosshead. The crosshead clips are of cast steel and lined on their bearing surfaces with bronze strips. They are given additional support, when in the lowest position, against a projection of the chassis.

The crosshead guides are formed on the inner sides of the chassis. A vertical ratchet is made on one face of each crosshead clip to be caught by a pawl on the chassis and thus to hold up the counterweight. This pawl is mounted upon a short crank actuated by a long lever at the side of the carriage, and the arrangement is used for lowering the piece, should the recoil not be sufficient.

The rear traverse wheels and their transom are of cast steel, and the axes of the wheels rest on roller bearings.

The traversing chain lies around the traverse circle and is fastened to the parapet. It is provided with an arrangement for taking up the slack. The circle is of gun iron, and is cast in segments and fastened to the platform by 1½ inch holding-down bolts.

The action of the carriage is as follows: Upon firing the piece the central pivot of the levers moves horizontally to the rear, carrying the top carriage with it. The lower end moves vertically upward, being constrained by the crosshead guides. The gun moves downward and to the rear in the arc of an ellipse. The energy of recoil is absorbed partly by raising the counterweight and partly by the resistance of the hydraulic cylinders. After loading, the pawls are tripped and the greater moment of the counterweight enables it to raise the piece into battery. The return to battery is softened by hydraulic counter-recoil buffers in the cylinders, forming a sort of dashpot.

The piece is hauled down in the loading position by hand for drill and cleaning by a windlass arrangement, the rope leading through sheaves on the levers and chassis.

Three fulcrum pins are inserted in each chassis near the forward end of the top carriage to serve as points of support for pinching levers held vertically, and engaging in ratchets bolted to the under sides of the top carriage clips, for heaving the top carriage forward in case it should not return to the firing position. A spring prevents the loading crane from swinging to a position under the breech of the gun, where it might be struck by the latter upon recoil.

This carriage is capable of great rapidity of fire. Ten shots from an 8 inch gun have been fired from it in twelve minutes and twenty-one seconds. In the loading position the gun is completely covered from a shot arriving at an angle of 7 degrees. The field of fire is 127 degrees, and the pointing of the gun can be varied from 12 degrees elevation to 5 degrees depression.

The project for the defense of New York harbor contemplates for the present, among other guns, fifteen 10 inch and nine 8 inch guns on disappearing carriages. Probably ten 12 inch guns on the same carriages will be added to these.

The exact distribution of these guns at the various strategic points in the harbor, for obvious reasons, is not disclosed to the public. An attacking fleet would be practically at the mercy of such a battery of disappearing guns. At the outset it would be ignorant of the location of the fort; and the use of smokeless powder would render the detection of the guns, during the few seconds that they showed above the parapet, a difficult matter. The only possible chance to place a shell inside the fort would be by making use of high angle fire; and this is impracticable in the modern war ship as at present constructed, for two reasons: first, that the existing gun carriages will not allow the breech to be sufficiently depressed to admit of such fire; and, secondly, that the existing decks are not strong enough to withstand the heavy vertical strain of the recoil. The aiming of the gun is all done under shelter. By means of a "range finder" and the "converter board" the gunner can lay the piece with perfect accuracy while it is yet below the level of the parapet. Gun for gun, such a battery has an enormous advantage over the floating fortress, for it would have in its favor: 1. Invisibility. 2. Absolute protection from gun fire. 3. Absolutely steady platform. 4. Absolute determination of the range and bearing of the enemy. To this must be added the moral effect upon the courage and endurance of the gun crews, resulting from their superior protection.

Electrical Progress in China.

The China Gazette, speaking of the growth of electric lighting in Shanghai, says: "A couple of years ago there were only about seven miles of streets lighted by electricity, for which 60 arc lamps were quite sufficient, and there was not a single incandescent lamp in or around Shanghai. Now the electrical department of the Municipal Council runs 140 arc lamps, lighting some 15 miles of streets, and there are about 43 miles of line wire laid, in addition to 6,100 incandescent lamps

of 8 candle power each, for domestic purposes. The customers for incandescent lighting have increased from 1 to 55 in number since the Council took charge of the department."

Rubber Shoes Sixty Years Ago.*

To make a satisfactory purchase of a pair of rubber shoes, sixty or more years ago, was an undertaking requiring the accredited keenness of a "Philadelphia lawyer."

Boston, Mass., was then headquarters of the rubber trade, the largest importers being found there, where, besides supplying the regular trade, the commission merchants held rubber auctions at stated seasons.

Notices sent abroad secured a full attendance of boot and shoe dealers from New York, Philadelphia, Baltimore and all around, for "runners" were not thought of in those days of slow coaches.

Most of the rubber, and the best, came then, as now, from Para, South America, or along the Amazon River where natives procured it by tapping the trees. Clay and wooden lasts of various sizes were dipped in the cream-like liquid, the coating being dried by a dense smoke exactly as is done to-day.

When the several dippings were over, the shoes were stamped on the toes in fancy designs, more or less elaborate, taken off the lasts and stuffed full of rice hulls and hay; the tops were then sewed together with twine, or coarse thread.

Two of about the same size were tied together, and these ill-assorted pairs were packed in wooden boxes of all sizes and shapes, mostly sugar boxes, and shipped to foreign ports.

A boot and shoe dealer receiving a box would immediately consign it to the cellar of his store, where, on being opened, the stitches would be cut, the hulls and grass emptied out, together with a few scorpions and other live stock such as frequently took passage in the shoes.

The shoes were then turned wrong side out and after a thorough washing inside and out to free them of all adhering clay and dirt, were left to dry.

Then followed the tedious process of trimming and shaping them. Each shoe was turned over a wooden last—the one that seemed to be about the right size. If it was not sufficiently large, another would take its place. If too large, the shoe was heated and by extra exertion was often made to work down to the required capacity. Then with sharp scissors the edge was neatly trimmed and after being sponged with Japan blacking, the shoe was ready for sale. Only about enough for one or two days' sales were made ready at one time, the boys working evenings preparing them.

A customer desiring to purchase a pair of No. 4's was shown a pair that were stretched over that size of last. They may have had originally, the one a round toe, the other a pointed toe; one may have had a thin, the other a thick top—but so long as they could be made to cover a certain last that fixed the size. If one of them shrunk on being removed from the last, it was heated and put on again, and possibly heated a trifle before trying it over a customer's boot. It was a common occurrence to have a customer return with a shoe, or a pair of them, that drew the feet so badly they proved worthless to him or her. If the shoes had been worn, they were generally taken back in exchange for a less expensive pair, and on being heated some the indentations were easily worked out, so the pair was just as good as new.

Repairing and resoling rubbers was a very nice operation, requiring great skill and cleverness. The shoe was again put on a last, when the sole or part to be mended was shaved with a sharp knife until it was all fresh and adhesive, and then a similarly prepared piece of rubber was put over it, the fresh surfaces pounded together and then trimmed neatly around. The shoes being soft and easily injured, had to be frequently mended.

They tore readily; stones and sticks penetrated the soles, heat softened them, cold stiffened them, and the sun discolored them; but notwithstanding all that, every woman and child, and many a man, was obliged to wear them through the muddy, sloshy, and snowy seasons: so the sales were proportionally great.

Rubber overshoes sold at wholesale from 25 cents a pair upward, retailing from 50 cents to \$1.25 a pair, according to their evenness of texture, their shapeliness and the elaborateness of their stamping; for the latter was a point of beauty not to be overlooked.

The dealer himself could not be sure of his goods and the purchaser could only be guided by the dealer, as he or she knew nothing of the extra stretchings, or of the mysteries of the trade, usually carried on below stairs by the apprentices, or boys, who were early taught to stretch their consciences with their goods.

Here and there may occasionally be found a man whose hand even now bears the marks of trimmings done on "gums" during the days of his youth, but there are comparatively few people living who remember the old time rubber shoes, with their stamped toes—which were considered a valuable improvement over wool socks and Indian moccasins.

* By C. A. Lynde, in the Christmas Boot and Shoe Recorder.

SCIENTIFIC AMERICAN

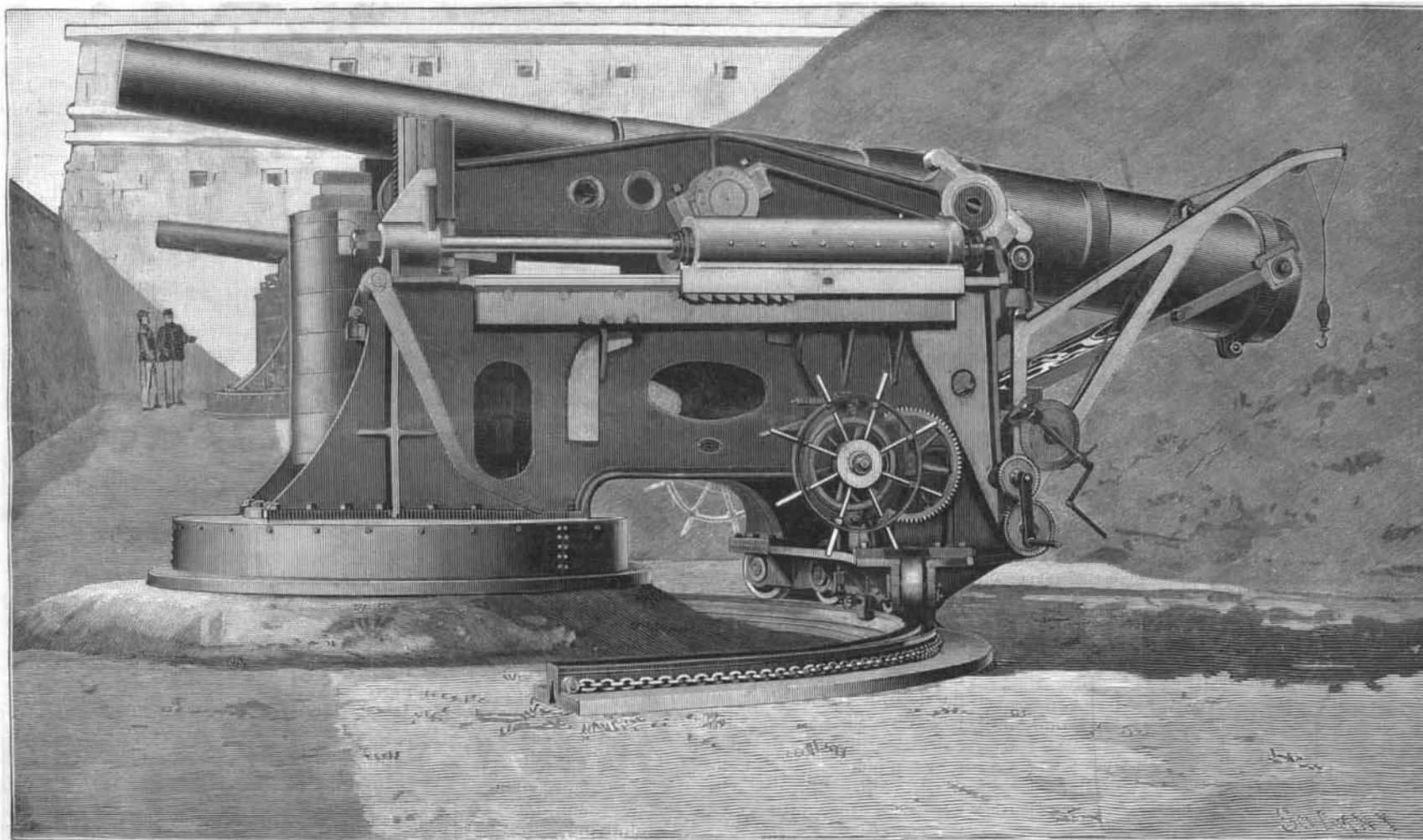
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A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

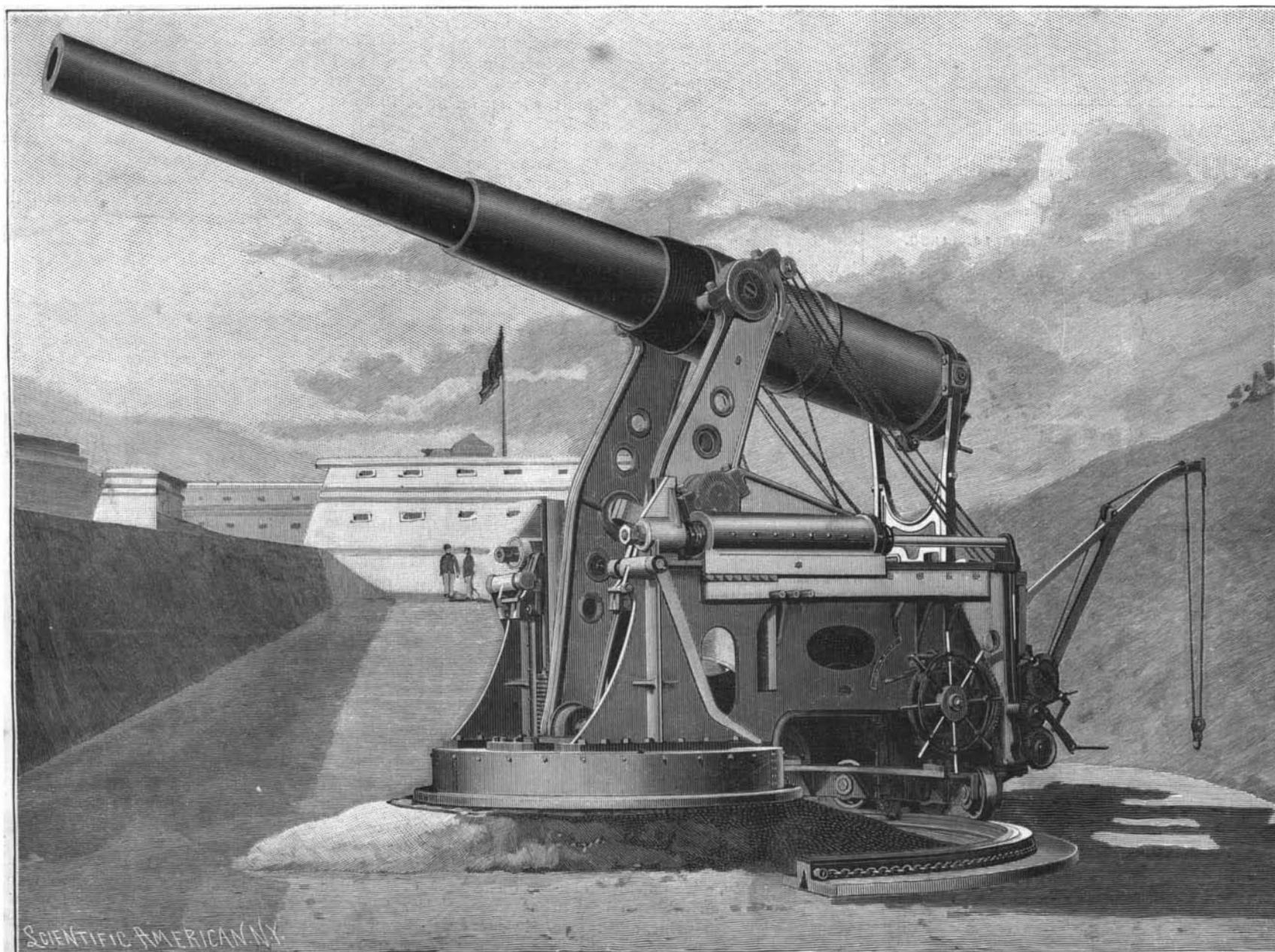
Vol. LXXIV.—No. 11.
ESTABLISHED 1845.

NEW YORK, MARCH 14, 1896

[\$3.00 A YEAR.
WEEKLY.]



THE BUFFINGTON-CROZIER BARBETTE DISAPPEARING CARRIAGE LOWERED.



THE DEFENSE OF NEW YORK HARBOR—EIGHT INCH GUN MOUNTED ON BUFFINGTON-CROZIER DISAPPEARING CARRIAGE AT FORT WADSWORTH.—[See p. 167.]

Slides Without Mat Covers or Binding.

Rev. W. M. H. Young, Ph.D., says: Of course, no one objects to elegantly mounted slides; but there are hundreds of clerical and other lanternists, like myself, who cannot afford all they would like. Those of us who exhibit weekly to the same people year by year have to prepare numberless new slides, many of which are to be used but once only. To mount them in regulation style, with cover glass, mat, binding strips and printed titles, would be a waste of time and money under the circumstances. Any yet we do not wish our views to present a slovenly appearance on the screen.

I prepare my negatives so that the result upon the screen is the same as the best mounted slide. The process consists in cutting off the film of the negative with a very keen chisel, leaving that portion of the picture that would usually be shown through a mat.

Draw upon the film of the negative with a pencil the exact size and shape you wish the "mat opening" to be. Of course, some sort of a guide must be used for the corner of the chisel, and keep at it until the film is cut entirely away outside that part of the view to be copied upon the transparency. The clear glass thus exposed will make a dense border around the picture upon the transparency, which will take the place of any mat. This method works equally well for contact or camera transparencies.

If irregular designs are desired instead of the ordinary rectangular mat openings, it is easy to make them—and highly artistic too—by holding the chisel at an angle while cutting the outline. In this way the film is pared off beveled, giving a peculiar gradation of tone to a scalloped design.—The Optical Magic Lantern Journal.

THE ECCENTRICITIES OF A RAILROAD COLLISION.

We have been favored by Messrs. Clayton A. Smith and Dell Vaughn, of Waverly, New York, with a photograph of what the local railroad fraternity describe as one of the most curious wrecks in the history of railroading. It occurred in the Towanda station yard of the Barclay Railroad, where three cars, which had been left standing on the main track, were run into by a regular train under full steam. The car next to the engine, which is usually in such a case smashed into the proverbial kindling wood, was lifted up and forced over onto the top of the locomotive. With the exception of the injury done to the smoke box and stack, and to the roof of the cab, the locomotive was not damaged. It remained on the track, and was able to carry its strange burden into the village of Waverly, where the photograph was taken. Mr. Smith writes that the local railroadmen say that the cause of the car taking this position was that the swing bumpers on the engine, which were down at the time of the collision, were thrown upward, and lifted the front end of the car.

We think it is probable that the drawbar and timbers, which can be seen embedded in the front end of the smoke box, contributed to the result by pivoting against the boiler tube plate, and lifting the car still further, as they were torn from their fastenings.

That this Erie box car should have kept its shape so

well under such rough handling speaks volumes for the excellence of the material and workmanship.

PRINTS OF SCARS.

BY FRANCIS GALTON, IN NATURE.

The accompanying print is sent with a twofold object. First, for its intrinsic interest in showing how thoroughly and definitely a grafted slice of skin and flesh has established itself under its new conditions, retaining its original characteristics unchanged during thirty years. Secondly, because of its probable interest to surgeons in illustrating the ease and complete-



ENLARGED PRINT OF A MISPLACED GRAFT OF FLESH ON A THUMB, THIRTY YEARS AFTER IT WAS MADE.

ness with which a record can be kept of the process and results of the cicatrization of wounds.

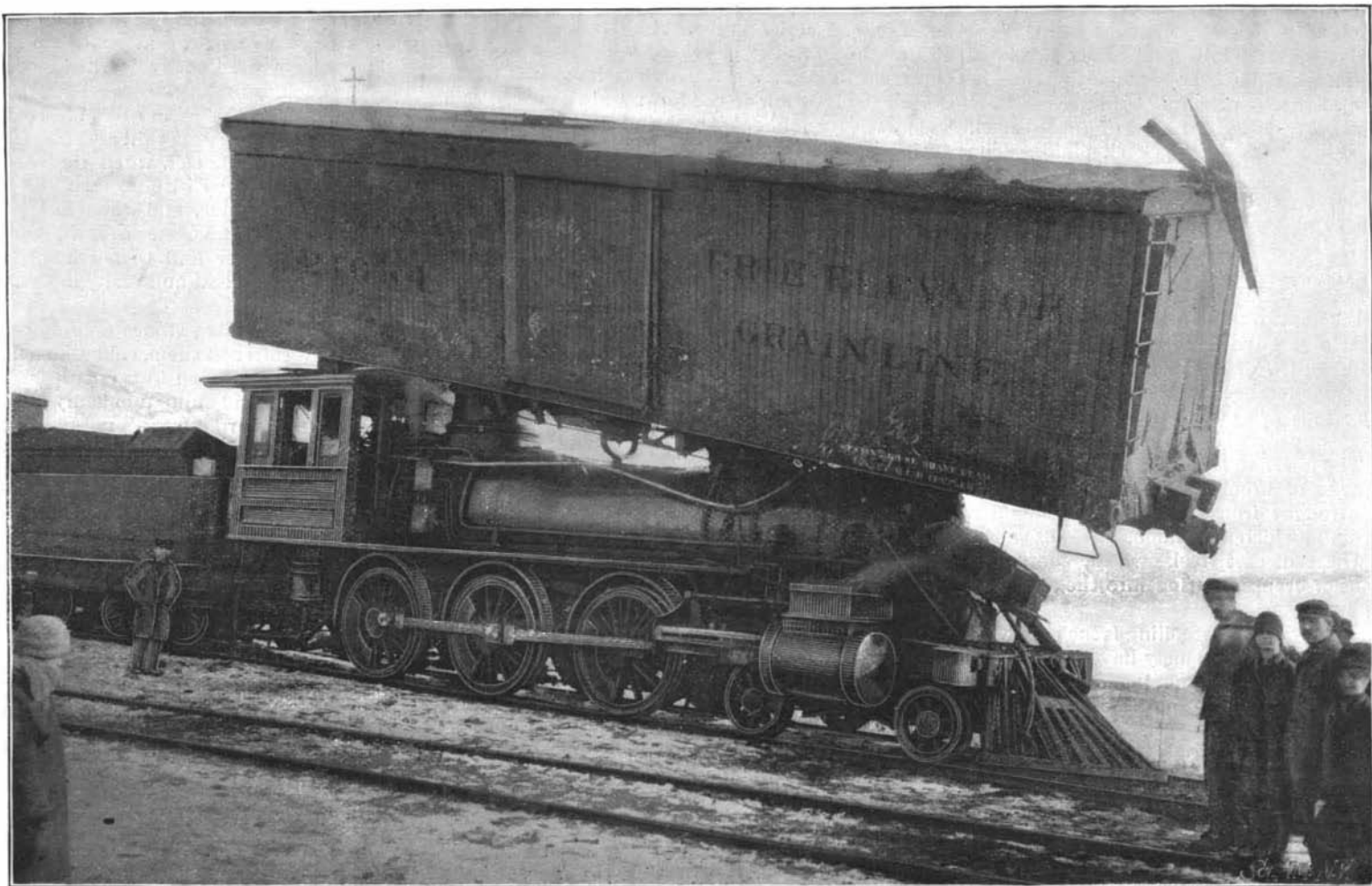
Prints are more clear, more cheap, and more trustworthy than photographs. They are not distorted through perspective, nor blurred owing to differences of focus; they can be taken in any light, and their scale is absolutely correct. They are made by rolling the scarred part on a porcelain pallet or metal slab, that has been covered evenly and very thinly with printer's ink; or, conversely, the pallet and paper are rolled upon the scar. As many duplicate prints can be taken as desired. I have written at so much length about these and alternative methods of printing in my book, "Finger Prints," and elsewhere, that I need say no more about them now. The print sent herewith is a photographic enlargement, being more suitable for rough process printing than the somewhat minute originals; but one of these is also inclosed. The history of the graft is as follows: J. R. H., who is a solicitor in large practice, when he was twenty-five years old, sliced a piece clean off the thumb of his left hand. He was cutting cardboard with a sharp knife guided by a rule, upon which the thumb pressed and which it slightly overlapped. The piece that was cut off fell on the table; it was at once picked up, clapped upon the wound, and the thumb was tightly bandaged. After a few days reunion had taken place, and the wound was healed. It then proved that the

graft had not been replaced in its original position, but crossways to it, as seen by the papillary ridges in the accompanying print, taken in 1895, thirty years after the accident.

Art Pottery.

Mr. Holman Hunt, in the course of a paper on the future of the "Della Robbia" and artistically decorative pottery work, given at a recent reception at the Della Robbia Pottery Works, Birkenhead, England, called attention to certain experience which the history of ornamental design had established as an irrevocable and eternal fact. He went on to say: Art schools are producing artists who are not artists by nature, and who can never do anything but create confusion as painters of pictures or sculptors of human and animal form. It is important to dwell upon this truth in considering the needs of the pottery work whose fate we have to decide at this juncture. It was founded to redirect art energy toward industrial forms of daily need and use. I cannot pretend to express opinions about the very important financial questions, and these are most important in my eyes, because I don't like charitable feelings toward art. It must be recognized to be worth the money it costs. Art must be self-supporting. I will, however, express my opinion that the aim of this enterprise from the beginning was to bring back vitality to domestic art. We cannot review the past without recognizing that no art grows in a day. We in modern England are too impatient. We sustain a class of active writers ever on the watch to find or to imagine flaws in sincere attempts of the true artist, whatever his department may be. My comment upon this tendency is to say that I could find numberless faults in the Madonna de San Sisto, in Raffaele's Cartoons, in Michael Angelo's Sistine Chapel, in Tintoretto's Crucifixion, while in a Murillo picture of the Holy Family in our National Gallery I could find no fault. There are many other great attempts equally without flaw, but the first set named are the godlike works of the heroes of art, the second set are the products of the measured rule and the paint pot. Well, perhaps the work done by the pottery works may be open to criticism. For the time of its attempt to get its feet, some crudity and awkwardness in its struggles should be a welcome sign of life. It does artistically show signs of vigor and health. It must be business men alone who can start it in life. Palissy ware was in the same straits in its early days. You all know the story of the inventor begging his wife's wedding ring to put into the crucible. If help can be gained and this industry can be saved and perfected, it will be an aid not to itself alone, it will shame painting and sculpture out of mere mockery of antiquated art and out of the mummy-like representation, more or less disastrous or impudent, of the outside skin of the discolored corpse of nature.

ALUMINUM has not proved to be of very much value for surgical instruments, as it is deficient in elasticity and will stay bent. The instruments are also so light that the surgeon actually feels the want of the accustomed weight of his regular instruments of steel.



CURIOUS RAILROAD WRECK AT TOWANDA PA.