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THE GREAT FRENCH GUN.

De Bange's new gun, which we are about to give a short description of, is of steel, and of 13-inch caliber. It weighs 37½ tons, and is 36¾ feet in length. Its external diameter is 3·4 feet at the breech, and its internal diameter 10 inches at the powder chamber. The trunnions are, as usual, of a diameter equal to the caliber. From this it will be seen that the gun is of quite respectable dimensions. Of the mode of closing the breech we have nothing to say, seeing that it is in all respects conformable to the type adopted for campaign guns (Fig. 1).

The projectile varies in weight from 922 to 1,320 pounds, according to its internal organization. It is capable of holding as many as 88 pounds of compressed power. Its length is 3·74 calibers, that is, 4·16 feet. Its ogive is greatly elongated, and, by very reason of this form, always falls upon its point, even at falling angles of nearly 60 degrees.

The charge used varies from 396 to 440 pounds, according to the nature of the powder. As regards the ballistic properties of the piece, it is allowable to call them remarkable. The initial velocity is 2,130 feet. The maximum range is from 10 to 11 miles, say the distance from Paris to Montgeron, or from Paris to Versailles. As well known, the accuracy of any gun is, generally speaking, a function of its caliber, and increases with the weight per unit of the projectile's section. Now, the De Bange 9-inch gun is so accurate that none of its projectiles could miss a vessel under sail, and the one under consideration must be still more accurate, inasmuch as its elongated projectile is of relatively great weight per unit of section.

The tube and hoops were made at Saint Chamond, the finishing was performed at Paris, in the shops of the Coil establishment, and the work in general required a year for its performance.

Upon coming from the forge, the tube had an internal diameter of but about 12 inches. In order to bring it to the desired caliber, it had to be submitted to a drilling that took twenty days and twenty-one nights of uninterrupted work. This was done by means of a new machine of Col. De Bange's invention, and the principle of which is kept a secret. All that can be said is that, during the process of drilling, the piece remains immovable and the tool advances as it revolves.

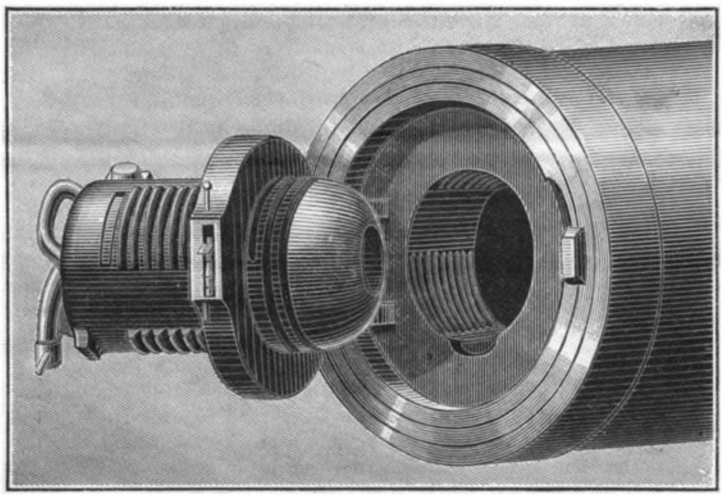

Fig. 1.—DETAILS OF THE BREECH PLUG.

The apparatus is automatic in its operation. The workman in charge has but one thing to do, and that is to ascertain at every pass whether the drill is in a bad or good state.

Every one knows that the tube of any cannon is obliged to resist bursting stresses that occur at one and the same time in the direction of the axis and in a direction at right angles thereto; and also that, in order to increase the tube's power of resistance in the last-named direction, recourse is had to hoops. Now, working thus transversely, the hoop furnishes no increase of strength in a longitudinal direction. As regards pieces of small caliber, this inconvenience is not a very grave one, seeing that by properly hammering the tube it is given a strength that suffices to withstand the pressure that tends to blow out the breech. Pieces of great caliber are placed under very different conditions, since, being necessarily of great thickness, the tubes can be but imperfectly hammered. For this reason, such tubes are wanting in resistance in a longitudinal direction; and, in order not to compromise economy, high pressures, which are the only ones that permit of giving heavy projectiles a proper initial velocity —that is to say, one greater than 1,600 feet—have had to be dispensed with.

The English have endeavored to remedy this trouble by the use of a jacket designed to compress the tube longitudinally; but this process has given results of but middling value, seeing that, practically, it is quite difficult to give a jacket of several yards a length that is *exact* to one one-hundredth and fiftieth of an inch. The longitudinal compression thus obtained is, therefore, illusory, whence it follows that, up to the present, the problem had never been solved. Now, however, we have a rational solution of it in the system of biconical hooping invented by Col. De Bange, which renders the tube and hoops absolutely interdependent in a transverse and longitudinal direction. To this end, the exterior of the chamber and the hoop that covers it present a succession of slightly truncato-conical forms, so arranged as to secure an intimate connection of them. The interdependence thus obtained is such that a transverse bursting of the chamber would necessarily tend to bring about a breakage of the hoops designed to strengthen it. Consequently, each of the hoops taken isolatedly has a biconical form, which obliges it to work, at the same time that the chamber

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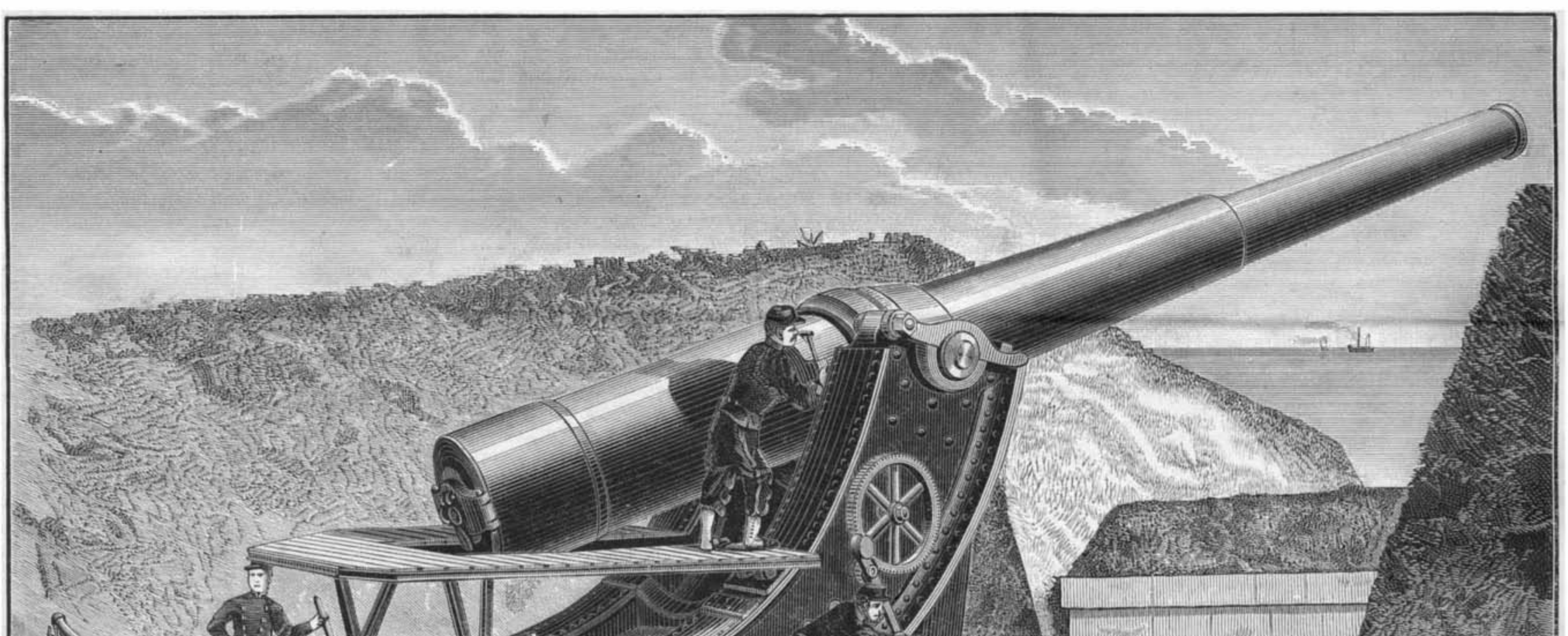

Fig. 2.—THE GREAT FRENCH BANGE GUN—THIRTY-SIX FEET LONG, TEN MILES RANGE.

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THE GREAT FRENCH GUN.

(Continued from first page).

does, in a longitudinal direction. In the usual method of hooping it is friction alone that unites the tube and the different superposed series of hoops longitudinally. Now, it is easy to see that such friction is not sufficient to prevent unbreeching. A few slight errors in construction would, in fact, prove of a nature to diminish or even locally suppress the tightness, so that, upon bursting, the tube would slide in the hoops that encircle it.

This grave trouble is done away with in the system of biconical hooping. Col. De Bange has applied his new system to the gun under consideration. The tube of this is strengthened by four series of hoops, which, by reason of their shape, fit into each other, while their joints overlap, after the manner of brickwork. The putting of these in place is very simple. It suffices to heat them to a blue heat, that is to 300 or 400 degrees C., in order to obtain the necessary tightness. The hoops once put on, the constructor had to proceed to the turning. This operation was performed in a machine tool whose cutter moves forward in order to remove the steel shaving, while the tube revolves round its axis. The chamber of the piece was afterward provided with 144 grooves, 0·06 of an inch deep, that had an initial pitch of 30 minutes and a final one of 7 degrees. This rifling was effected by means of another machine tool, which also is very remarkable. In this apparatus the piece is stationary, while the tool moves in order to cut the spirals.

We shall now say a few words about the platform, frame, and carriage, the dimensions and weight of which are in keeping with those of the tube (Fig. 2).

The platform consists of three courses of superposed timbers, of 12 inches section, buried in ballast which rests upon a bed of beton. The great frame weighs 20 tons, and the carriage, inclusive of brake, 22 tons. These two apparatus present a few original and extremely ingenious arrangements. In the first place, we remark an inclined crank, which connects the carriage with the pumps, and moderates the lifting of it. Next, we would call attention to an eccentric roller that operates automatically in the rear, and the importance of which will be at once seen. It is necessary, in fact, that, during its recoil, the carriage shall *slide* over the frame by its back part, and, on the contrary, that when it is put in battery again, it shall *roll* over the said frame. This condition is fulfilled by the eccentric roller placed under the butt end of the carriage, and which a Belleville spring acts upon at the right moment.

Behind the carriage there is an inclined chain, which is connected through other Belleville springs with the hind crosspiece of the frame. When a gun is being put in battery, the velocity of the forward motion is great, despite the play of the pumps, and so it is usual to deaden the shock by means of buffers affixed to the front of the carriage. This arrangement, which has hitherto been everywhere employed, does not prevent the whole from undergoing violent shocks, seeing that the action of the buffers is exerted very low down with respect to the center of gravity. The chain under consideration has the effect of slowing up the forward motion, and of consequently reducing the shock. In the rear of the frame there are buffers also, for use in cases where, through some breakage, the hydraulic brake might not act.

Finally, we would call attention to the bolster, which is very wide, and the axis of which passes through the center of gravity of the entire affair. The reason for this new arrangement is as follows: The majority of the large frames now in use rest upon the platform through the intermedium of a bolster and wheels or rollers. Now, experience has shown that these latter are subject to get out of true, and, indeed, often do so. The arrangement here adopted permits of suppressing these, seeing that the entire system is in equilibrium upon it, and easily adapts itself to every change of direction. As the bolster bolt passes through the center of gravity of the system, the piece's firing field is 360 degrees.

The carriage includes a platform for loading, situated about 8 feet above ground. As for the trunnions, they are 11½ feet above ground. A crane, maneuvered by a sort of pump, serves to lift the projectile to the level of the breech. For aiming, the piece carries at its lower point, below the trunnions, a toothed arc, which is acted upon by means of gearings maneuvered from the exterior.

The axis of the piece may be inclined 30 degrees above and 15 below the horizon. Once loaded, the gun is in perfect equilibrium upon its trunnions.

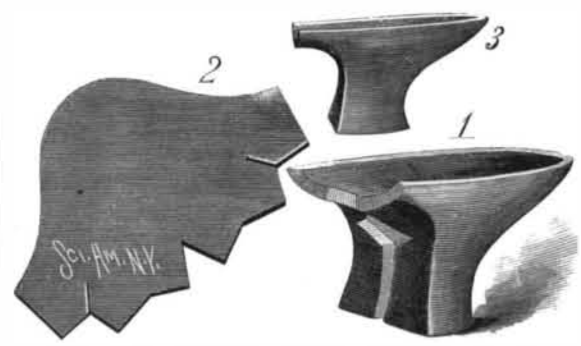
The largest gun that the Krupp works have as yet turned out is of 17 inches caliber, and has an initial velocity of but about 1,500 feet. It is worth $300,000. De Bange's new piece will cost notably less, and its velocity, as we have stated, is 2,130 feet. Owing to the system of hooping, which constitutes its principal original feature, it fulfills all the conditions of security, lightness, and economy that could be required.

This gun is, above all things, a marine one, that is to say, it is capable of being mounted in battery aboard a ship of war, or concur effectively in the defense of the most valuable points of our coast. It may also be used as a siege gun. In a siege, especially, excellent service may be expected from it, seeing that the limit of range of all pieces known up to the present is but 6 miles, while that of the one under consideration is, as we have said, from 10 to 11.—*La Nature.*

MACHINE FOR FORMING HEELS FOR LADIES' SHOES.

To make the high, curved heels, with small bottoms, so commonly used on ladies' shoes, and generally designated in the shoe trade as the "Louis Quinze" style, was one of the most troublesome tasks of the old-time shoemaker, and is so now where the heel is built up by hand from separate "lifts" of sole leather. The latter method is now seldom followed in this country, though it is to a much greater extent in European hand-made shoes; but our manufacturers largely use a wood or other formed heel, covered with some thin leather, and making a light heel, which, especially in goods of moderate cost, will not stand much service and look well. The invention herewith illustrated indicates a new way of making this class of heels, in which good, solid sole leather can be perfectly shaped into the desired form, and made the covering and protector of the wood or other filling used in the body of the heel.

In our engraving, Fig. 2 shows the sole leather blank used for such form of heel, as given in the different views in Figs. 1 and 3, Fig. 1 indicating the shape in which the blank comes from the former. The invention consists in a die with a recess or cavity shaped the same as the heel to be made, and with its front end open, to be closed by a U-shaped crosspiece with dowels passed into apertures in the front end of the die. The top plate of the die is made of the shape it is desired to have the heel seat, and the bottom plate may be set at



SHOE HEEL FORMED FROM LEATHER BLANK.

such angle as required to give an inclination to the bottom of the heel from front to rear. With the sole leather properly wetted, it is not a minute's work to press the blank into shape in the die, adjust the different parts, and pass the die into a press, where it is allowed to remain a few minutes, the operator being supposed to have several sets of dies, so that when the last has been thus put into the press the first will be ready to come out, and the work will thus be continuous. This die, can, of course, be used with lighter leathers, and, there being no opening in it except at the front, the entire surface is certain to have a smooth, unbroken finish; but it leaves nothing to be desired in the forming of a good, solid, sole leather covered heel, which cannot get out of shape, which may be brilliantly burnished, and which cannot fail to have excellent wearing qualities.

This invention has been patented by Mr. Friederich Ortlepp; all further information can be obtained from Mr. Joseph S. Kaliske, 79 Reade Street, New York city.

A Good Idea.

According to our English contemporaries, the practice of litigants conducting their cases in person is one that seems to be daily gaining ground in England. Occasionally a jury will make strange blunders, says a writer, but, as a rule, what they want is to have the facts brought fairly before them. This a counsel often does not do. He is thinking of the rules of evidence, or he fancies that it would be politic to suppress this particular fact or to avoid that particular circumstance, or in some other way to finesse the evidence. This is what a jury dislike. They can get on much better with a litigant in person who blurts everything out with a supreme contempt for all established rules, and who, if a thing is not evidence, will somehow make it so.

A Steam Canal Boat.

A canal steamer on a new principle is to be built at Albion, N. Y. This novel boat will be 98 feet long and 17 feet 8 inches in width; her boiler will be 10 feet long, 5 foot shell, with the fire box in the center of the boiler. The boiler will be horizontal instead of upright, and run athwartship instead of fore and aft, with an engine of full capacity. There will also be built three consorts for this steamer, with a capacity of 25,000 bushels of wheat, while the steamer's capacity will be 6,000 bushels, making an entire capacity of 31,000 bushels. The steamer, when on the river, will have one consort ahead of her and one on each side, and on the canal one ahead and two behind.

New England Spruce.

The lumber used in the construction of a building in the Eastern States, is totally different from that used in any other locality. To the Pennsylvania man there is no wood for framing purposes equal to hemlock; the Michigan man is equally as firm in his opinion of white pine; but let either of these men advance his theories to the New England builder, and he would find he had met an equally strong adherent to the use of spruce. For framing purposes spruce is used almost exclusively. For boarding in, it is the custom to use hemlock or matched white pine, according to the quality of the work desired. Hemlock is generally used for under and spruce for upper floors, and in many instances a preference is shown for spruce ceiling over white pine.

The most extensive spruce forests are in Maine, and most of the lumber cut in that State is shipped by water to the various distributing points. The mills in New Hampshire and Vermont supply the interior points and deliver necessarily by rail. The mills which make a specialty of flooring are generally equipped with the best of machinery for dressing, and not a few have first class dry kilns. Undoubtedly the manufacturers of dressed spruce realize that to sustain the demand much depends upon the quality of the mill work, and the result has been that in the past few years especial attention has been paid to that branch of the business. Dealers whose yards are located at points along the eastern coast generally purchase of the manufacturers, who ship from the Kennebec or Penobscot rivers. It is customary to make up cargoes of random sizes and rough boards, which of course are sorted for sizes at their destination. Schedules of special sizes are also shipped in this way. Floor boards, if dressed, are generally shipped in box cars. In the matter of dressing, some prefer flooring dressed one side and jointed; others will use it dressed one side and matched. The latter method, in case the boards are not thoroughly dry, is undoubtedly the better.

Some idea of the spruce business of the Boston market can be obtained from the returns to the Inspector General's office for the first three months of the present year. During that time there was inspected 848,294 ft. of spruce boards and 1,171,167 ft. of plank and timber. In addition to this amount, there were many car loads of boards which arrived from mills in Vermont and New Hampshire which were sold from the car and no returns made. The present quotation on random cargoes—by that is meant ordinary sizes of framing timber—is from $12.50 to $13.50; special schedules by rail, $13.50 to $14.50. First clear spruce floor boards sell in eastern Massachusetts at $18 to $18.50, and second clear at $2 a thousand less.—*N. W. Lumberman.*

Piping Blackbirds.

When reared by hand from the nest, the blackbird is capable of forming strong attachments, and from his wonderful imitative powers will make himself a great favorite. He will, if trained when young, learn to whistle almost any tune that may be taught him. The best, and perhaps the quickest, way is to take him, when about six weeks or not later than two months old, to a quiet room away from any other bird, and in the evening and the first thing in the morning give him his lesson. The tune may be played on a flute or other wind instrument. It is advisable to feed him *before* commencing operations; and some bribe or other, as, for instance, a lively worm, should be placed in his sight. Play over a portion of the tune you wish him to learn, and he will evidently pay particular attention to it. Repeat it, with precisely the same time and expression, say twenty times; then give the bird a little quiet, so that he may, if he will, have an opportunity of imitating it. If he should make any attempt, instantly give him his reward, coaxing and caressing him meanwhile. Being, for a bird, possessed of strong reasoning powers, he will soon discover why the worm or other bribe is given him, and before long will understand how to earn it. When once learnt, the tune or tunes will never be forgotten, but pass, as it were, into its song. It is rather a tedious undertaking, but the result is invariably satisfactory. A blackbird will also imitate other birds very minutely, and though there is little variety in his natural song, it is made up for by its pure, flute-like tone and full volume. It most readily imitates the thrush, but it will catch many notes from the nightingale, to which bird its tone has most resemblance, were it not for the introduction of several harsh notes. When kept in confinement, it is always advisable to bring it up when young near to some good singing bird, as it will thereby learn its neighbor's song, and, intermixing the notes with its own, make a most agreeable songster.—*Canaries and Cagebirds.*

IT may be of interest to those who preserve and bind the SCIENTIFIC AMERICAN to know what the law considers this paper to be worth per page. We take the following from the N. Y. *Sun:* "John Fallon, a well dressed, intelligent looking young man, who refused to say where he lived, was held in $100 bail yesterday for tearing a leaf from a copy of the SCIENTIFIC AMERICAN in the Astor Library.

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