

Science & Mechanics.

THE WHITWORTH GUN.

We condense from *Engineering*, to which we are indebted for our illustrations of this formidable weapon, an account of Sir Joseph Whitworth's 9-pounder homogeneous steel field gun.

The weapon was made from a solid ingot of Whitworth metal, and is mounted on a carriage constructed of the same material. The gun is 6 ft. 2 in. long, weighs 8½ cwt., its carriage weighing 10 cwt., and its ordinary charge being 2½ lb. of R. L. G. powder. It is constructed with an enlarged powder chamber 6.8 in. long by 3.4 in. diameter, beyond which is a shot chamber 3-10 of an inch larger than the hexagonal bore of the piece, which measures 2.72 in. in the major, and 2.47 in. in the minor axis. The gun is 4½ in. in diameter externally at the muzzle, and 10½ in. at the breech. The rifling has a twist of 1 in 55 calibres, and the ordinary projectiles are 3½ diameters in length, and are fired as cast, without being trimmed up. The breech end of the piece is slotted longitudinally, leaving an upper and lower jaw. The opposite surfaces of these jaws are grooved diagonally by fine ridges 1 in. in width, and having ¼ of an inch rise. The breech block is a mass of metal 9 in. wide by 4½ in. high and 6 in. deep, is similarly grooved, and is moved along the grooves in the jaws from side to side by a handle actuating a pinion working on a rack behind the grooves, and by this means the breech chamber is opened and closed. The gun carriage is fitted with Madras wheels 4 ft. 6 in. in diameter, with two ammunition boxes for three rounds, each fitted over the axle, and serving as seats for gunners. The trail is formed of two solid deep plates of Whitworth steel, tapering from 9 in. deep and ½ in. near the axle to 4 in. deep, and ¼ in. thick at the ground end. At the upper end is a strong hollow cylindrical stay, and at the lower end the cheeks are rivetted to the iron shoe. There are two similar hollow stays at intermediate distances, the first of which affords the bearing for the elevating screw which passes through it. The support of the gun is midway of the lever, and the fulcrum immediately under the axle. There are also several pivot holes, to permit the shifting of the fulcrum, for high elevations.

One of the principal novelties in the arrangement consists in closing the breech with a sliding block, working between two portions of the breech end of the gun. The faces of the block guides are grooved with a number of parallel grooves, and the upper and lower surfaces of the block are similarly formed. The grooves in the block guides are nearly, but not quite, perpendicular to the bore, so that when the block is moved along the block guides into the position where it closes the breech, it is drawn up to the breech face by the grooves, which, for convenience, may be called a straight line screw. The threads of the screw are angular, and both sides of the threads on the block guides are inclined towards the muzzle, their sides nearest to the muzzle being undercut, so that when the heavy strain resulting from firing the charge comes upon the block there may be no tendency to force the block guides apart, but on the contrary, they are tightly held, so that they cannot separate; when the breech of the barrel tube is hooped, the block guides are formed by cutting away the sides of the projecting end of the hoop. This form of construction allows of the strain resulting from the discharge of the gun, and tending to force out the breech block, being distributed over so large an area of resisting surface on the faces of the screw threads that there is no risk of the metal being locally overstrained, and by closing the breech by a single massive sliding block, moving along grooves as above described, great simplicity and solidity are attained. The powder chamber of the gun should be made considerably larger in diameter than the bore, so large that, although the powder charge be much heavier than is usual, its length may be only about two calibres. The shortness of the powder chamber facilitates the loading, and the gun can consequently be more rapidly served, and, what is of more importance, the powder is better consumed. The vent is at the top, and the sliding breech block is shaped at the side so as to form a tube, or part of a tube, of the same diameter as the powder chamber, and when the breech is open this tube, or part of a tube, forms a prolongation of the chamber. It is desirable to fit an inner guide corresponding with the bore of the piece, and similarly rifled into this tubular part, and through this rifled shot guide the projectile is inserted into the bore, and its length enables it to enter the bore before it passes clear of the guide. This shot guide is removed before the powder cartridge is inserted. The guide on the block leads the cartridge truly into the chamber of the gun. The breech block is worked by means of a rack and pinion, and a stud is fixed in the back of the breech block, and a weighted hand lever is mounted upon it. On the same stud a pinion is mounted, and it gears with a rack fixed upon the lower guide

of the breech block. The pinion is worked by the hand lever, the handle and pinion having interlocking projections, allowing, however, the handle some freedom of motion, so that it may be used with a hammer-like action to start the breech block. A pawl on the block prevents the pinion running off the track.

Fig. 1 is a plan, Fig. 2 a vertical section, and Fig. 3 a horizontal section of a field piece of the construction described. Fig. 4 is a view of the breech end with the breech closed, and Fig. 5 is a similar view with the breech open.

The main tube or barrel of the gun is shown at *a, a*, and *b* is the breech hoop, which carries the trunnions. In guns of a larger size additional hoops may be used to obtain greater strength. The guides for the breech block are shown at *b1 b1*. They are formed by cutting away the sides of the breech hoop where it projects beyond the breech face, *a'*, at the end of the barrel or tube, *a*; *c* is the breech block with the straight line screw upon it interlocking the corresponding internal straight line screw on the block guides, *b1*. This screw is shown to a larger scale in Fig. 6. The dimensions of the thread are such that they should be for a bolt of a diameter equal to the distance between the block guides. The incline of the screw thread to the axis of the gun is about three degrees; *c1* is a stud projecting from the back of the breech block, and *d* a pinion upon it gearing with a rack, *e*, on the block guide, *b1*; *f* is a weighted lever handle on the same stud and held thereon by the nut, *e'*. The interlocking projections on the pinion, *d*, and lever handle, *f*, are marked, *d'* and *f'*. As already stated they allow the lever to be used with a hammer-like action to turn the pinion; *e2* is a pawl on the breech block, which by taking into a notch, *d1*, in the pinion prevents it running off the rack, *e*, except when the pawl is intentionally lifted; *g* is the vent entering the top of the enlarged powder chamber, *a1*; *a2* is a steel packing ring known as the gas check; *a3* is the part of the bore into which the projectile is introduced in loading; it is very slightly larger than the remainder of the bore in order that the projectile may enter it easily; *a4* is the cartridge guide formed on the breech block. In the drawing it is shown somewhat more than a semi-cylinder, but it may be a complete tube; *h* is the shot guide, held within the cartridge guide, as is seen in Fig. 5, and shown separately in Fig. 7. In loading, the projectile is inserted through this guide, and is led by into the part *a3* of the bore, the parallel part of the projectile being long enough for the projectile to enter accurately into the bore before it leaves the guide. The projectile having been inserted, the guide, *h*, is removed to leave a clear passage for the cartridge, and the breech is then closed; *i* is part of the link (see Fig. 2) by which the gun is elevated.

ARTIFICIAL BUTTER.—In an extract from the *Revue Hebdomadaire de Chimie*, given in the *Chemical News*, it appears that Monsieur Mège-Mouriès, some years ago, was requested by the Veterinary Department of the French Navy to try to find a wholesome substitute for butter, which would not become rancid by keeping. Experiments made with cows submitted to a very severe and scanty diet, led to the discovery that these animals continued to give milk, although in very much smaller quantity, and that this milk always contained butter; the author surmised that this butter was due to the absorption of the fat contained in the animal tissues, which was converted into butter under the influence of the milk-secreting glands. This led to experiments on the splitting up of animal fats, and further, to the following process for making butter artificially. First, fresh beef suet is first mechanically cut up, by means of circular saws fitted to a cylinder, and is next placed in a vessel containing water, carbonate of potassa, and fresh sheep's stomachs previously cut up into small fragments; the temperature of this mixture having been raised to 45°, the joint influence of the pepsine of the stomachs and heat causes the fat to be separated from the cellular tissue; the fatty matter floating on the top is decanted, and, after cooling, submitted to very powerful hydraulic pressure; the stearine is used in candle making, and the semi-fluid oleomargarine is used for making the artificial butter in the following manner:—Fifty kilos. of the fat are poured, along with 25 litres of milk and 2½ litres of water, into a churn, while there is added 100 grms. of the soluble matter obtained by soaking for some hours in milk from cows' udders and milk-glands; a small quantity of ammonia is also added, and the operation of churning then proceeded with. The butter thus obtained is well washed with cold water, and, if required to be kept for a long time, melted by a gentle heat, to eliminate all the water. According to reports of sanitary committees, as well as of the authorities of the Veterinary Department of the French Navy, this artificial butter is really an excellent substitute for genuine butter, and can be exposed for sale if the vessels are marked to distinguish the artificial from the genuine butter.

Loss of memory is ever the first indication of a disorder or degeneration of Nervous element. The rapidity with which the mind is restored by the use of Fellows' Compound Syrup of Hypophosphites is perhaps the best proof of its power in re-establishing the strength of the nervous system.

Courrier des Dames.

FANCY DRESSES.

As the season for skating carnivals, fancy dress balls, etc., is now fast drawing near, a few hints as to fancy dresses will be found acceptable. We append several characters with appropriate costumes:

Spanish Gitan.—A skirt with a square, low bodice of a dark silk; sash and low jacket of scarlet velvet, with as many gold spangles as possible, the sash ends terminating with gold fringe, also the edge of short sleeves of jacket, which have also velvet bows. Head-dress, wide ribbon bows and long pins and gold ornaments; tambourine fastened to waistband. The bracelets and ear-rings are easily made of imitation pearls and small gilt chains. Or the following: Short red skirt, trimmed with black and gold or white, and low loose cambric body worn under a black velvet jacket, trimmed with gold, and showing below it all round; sash at the waist loosely knotted and falling on the skirt; the hair broad, with gold cord and sequins.

Undine.—Long under-skirt of white silk or tulle, with several skirts of pale green tulle over it, caught up here and there by water-lilies with dewdrops on them, coral, and long grasses made of the green foil; the bodice trimmed with long grass, with a water-lily on each shoulder, and grass falling over the arm. The hair very slightly curled in front, and falling over the shoulders at the back, with a wreath of water-lilies, grasses, and coral, the grasses falling among the hair. Suitable ornaments would be diamonds, coral, or aquamarine.

Winter and Summer. (for sisters).—Winter to wear a dress of silvered tulle, with flakes or borders of swansdown, real ivy and holly wreaths, and holly berries mounted into necklet, bracelets, &c.; Summer, a similar dress of white, blue, and rose-coloured tulle, shot with gold, and trimmed with a profusion of roses. Each to wear a long veil of tulle and a broad plait of gold or silver wire, easily made of cheap material, arranged on the head to resemble a small basket; and for Winter, glass icicles, frosted leaves, and a Christmas rose or two. For Summer, any brightly-tinted flowers and leaves, so arranged in the hair as to appear contained in the basket. The brunette of course to be Winter, the blonde Summer.

Greek Girl.—An underskirt of white and silver, or a green satin skirt braided in gold and bordered with red, or two skirts of alternate red and green, confined at the waist with a white and gold scarf, or a white silk skirt trimmed with bands of blue and rose-coloured satin; no crinoline, but the skirt should be very full; the skirt should be made to fall as low as the top of the boots. It is optional whether a veil is worn or not.

Norwegian Peasant.—A short skirt of neutral tint, the body black velvet, high, opening in front to display Norwegian jewellery cross; the national head-dress of plaited linen, confined at forehead with a band. All peasant dresses can be made of very inexpensive materials, and they look more correct.

Sabrina.—Dress of white spangled tulle over light green spangled tulle, looped with silver and wreaths of aquatic leaves; head-dress large water-lily, and silver spotted veil.

Welsh Girl.—Striped woollen petticoat of a bright colour, velvet bodice, cap, and high hat.

Ceres.—Short white silk skirt, trimmed with scarlet, caught up with wheat; head-dress white tulle, scarlet velvet, and gold wheat-ears.

Aurora.—Skirts of alternate blue and pink net or tulle over pink tulle, vierge body; chatelaine, and bouquet of pink roses and dewdrops, pearl frosted leaves; girdle round waist; pink and blue veil, spangled.

Baron de Peasant.—Petticoat blue and white, trimmed with black and silver; black velvet bodice; apron and kerchief, pink and white; Tyrolean hat, with gold braid and tassels; silver ornaments.

Marchioness de Balais is very pretty, but might be too expensive. Cerise satin petticoat, broad border of black velvet, edged with gold lace; green and white upper skirt of Japanese silk, edged with gold fringe, caught up with wide black velvet; bodice cerise silk, cut square, with short sleeves and basques trimmed with gold fringe; gipsy hat and coquettish apron; two small brooms in hand.

Queen of the Roses.—Ordinary white evening dress, covered with roses; wreath of roses, and white veil sprinkled with rose leaves.

ON SCOLDING SERVANTS.

Ladies who are troubled with servants that will not stand scolding will find the following remarks from the *Queen* worthy of perusal. The writer gives an insight into a peculiar characteristic of many servants.

There are some people on whom words make quite a superstitious effect. It is not necessary that they should be really bad, or that those to whom they are spoken should fully understand them, to be painfully and powerfully impressed. To call a vituperative

old woman an Isosceles Triangle, or to tell her she ought to be ashamed of herself for a scroobious old Chronophotologos, has been found quite enough to tame her into submission or rouse her to anger, according as she is imaginative in fear or desperate in courage. It is difficult, in finding fault angrily with uneducated people, to avoid wounding them more than is intended. For one thing, they are exceedingly sensitive to words; and for the other, they do not accept ours in the sense in which we utter them. They give a mystical breadth of interpretation to epithets that mean something only very plain and simple with us. Accustomed as they are to the evident meaning of a few coarse broad words, and unable to understand the finer shades with which we are familiar, they give what is to us only a conventional epithet, that has little or no poison in its point, the worst possible interpretation. They add to it vague possibilities of insult never included in the original meaning, which exaggerate it out of all proportion, and make it a real offence. A mistress scolding her maid for some slight neglect of duty would not be unlikely to say, "It is disgraceful!" And the maid would probably understand her words as meaning something absolutely shameful and dishonouring, as bad as theft or impropriety. "You have said I disgraced myself," she will say if she is of the kind to remonstrate, or on the terms which allow of remonstrate; "I have never been told that before, and I will not submit to be told it again." Women who scold their servants and use harsh epithets to them, perhaps not intending anything very serious, then wonder at an indignant "notice to quit" born of a dirty plate or an ill-dressed dinner, would wonder no longer if they would once fully realise the effect of their own wild words on their maids' minds. They mean only to say "You have not done your duty, and I don't like to see what you have done," by the term "It is disgraceful." The maid, however, accepts the phrase as personally dishonouring, and her friends back up her interpretation, and keep her to her decision of leaving, as the only one to which she can come with self-respect. Many a good place has been lost, and many a good servant parted with, because of the wild words of the mistress, which the defective education of the maid misinterpreted, and her imagination weighted with a significance not intended.

The Empress Elizabeth of Austria has written to the Woman's Rights club in Vienna: "Ladies, take my advice and keep away from politics. There is nothing but misery in it."

The Woman's Rights Movement is becoming singularly prominent in Italy, and Milan intends to establish a commercial institute for girls, to fit them for clerks in offices and shops.

ANOTHER HAIR STORY.—A tale of human hair, according to the *Chart Journal*, has been lately abstracted at a railway station of Hamburg, en route for "Albion." The hair, ponderable dross, weighed no less than 141 lb., and it came out that the capillary produce was chiefly derived from lunatic and other asylums, reformatories, penitentiaries, &c., and even some of the prisons of the highest class, as far as generally goes. What a theme for a spirited chat with the ladies in the drawing-room!

An accurate, painstaking statistician in the *New York World*, in an article on "Stage Dressing," states that "Mrs. Agnes Ethel, whose wardrobe in 'Agnes' is the most elaborate as yet exhibited by any one actress in one play in New York, paid for one dress worn in her new piece the sum of \$3,152." Her dress in the first scene alone cost \$1,428. Her costumes were designed by Worth. It may also be mentioned that in Mr. Daly's play of "Article 47," the dresses worn by the ladies acting in the piece cost \$7,362.

A recipe for cleaning grebe so as to make it look like new, without in any way spoiling the feathers, is sure to be acceptable. If it is wished that the grebe when cleaned should appear bright as new, it must be treated in the way French furriers do: rub it the way of the feathers, with a clean piece of flannel dipped in turpentine, and entirely cover the article with plaster of Paris, so as to exclude the air; let it lie for a week, and then shake it well to get all the dust out. The same plaster of Paris may be used several times by keeping it free from dust.

THE PREPARATION OF TEA.—The definite effects sought from tea drinking over and above the more comfort given by the hot liquid, are produced by two ingredients of the leaf—the alkaloid *theine* and the aromatic matter. The latter is what is chiefly valued by the refined connoisseur of tea; and accordingly he (or she) makes tea by pouring perfectly boiling water on a pretty large allowance of leaf, drinking off the first infusion and rejecting the rest. Made in this manner tea is, no doubt, not only a very pleasant beverage, but also a most useful restorative; but, unfortunately, so far from being cheap, it is a costly beverage and the poor cannot afford to drink it. The plan which they adopt is that of slow stewing, the teapot standing for hours together upon the hob. The result of this kind of cooking is that a very high percentage of *theine* (and also of the astringent substances which are ruinous to the fine flavour) is extracted; and the tea, though poor enough as regards any qualities which a refined taste would value, is, says the *Lancet*, decidedly a potent physiological agent.

Do you use Jacobus' Liquid? If not, buy a bottle, and you will never again be without it.