Evening Meeting.

Monday, May 5th, 1862.

CAPTAIN E. G. FISHBOURNE, R.N., C.B., in the Chair.

Names of Members who joined the Institution between the 7th April and 5th May.

Life.

Evans, T. W., Dept. Lieut. Derbyshire, 9*l.*
Vernon, Lord, Major, Derbyshire Rifle Vols., 9*l.*

Annual.

Adams, C., Lt. Col. 49th Regiment, 1*l.*
Arthur, W., Comr. R.N. 1*l.*
Allardice, G. J. C., Ens. 50th Regt. 1*l.*
Baynes, G. E., Major, 1st Bat. 8th King's, 1*l.*
Benyon, W. H., Ens. 2nd Bat. 23rd R. W. Fus.
Cockran, T., Capt. R. N. 1*l.*
Crofton, H. A., Captain, Adj. Monaghan Mil. 1*l.*
Currie, A. D., Ens. 41st Regt. 1*l.*
Doveton, J. E. C., Ens. 50th Regt. 1*l.*
Dunn, J., Ens. 41st Regt. 1*l.*
Gage, Hon. E. T., Lt. Col. R. A. 1*l.*
Garratt, F., Capt. late 3rd Dn. Gds. 1*l.*
Hardy, F., Capt. 84th Regt. 1*l.*
Johnson, E., Lieut. Rifle Brigade, 1*l.*
Maunsell, F. R., Major Roy. Bengal Eng. 1*l.*
Moore, R. C., Col. Royal Madras Art. 1*l.*
Nepean, E. C., Esq., Clerk at War Office.
Pinder, G., Col. Retd. Full Pay, 1*l.*
Scrymgour, W., Capt. R. N. 1*l.*
Skipton, S. S., Asst. Sur. 78th Highrs. 1*l.*
Smith, F. H., Com. R. N. 1*l.*
Smith, J. W., Ens. 2nd Bat. 1st Royals, 1*l.*
Symonds, C. E. H., Lieut. R. A.
Tupper, D. W., Capt. 50th Regt. 1*l.*
Turner, G. Esq., Master Shipwright, 1*l.*
Williamson, R. F., Ens. 2nd Bat. 23d R. W. Fus.

THE SHAPE OF SWORD BLADES.

By Mr. JOHN LATHAM, firm of Messrs. Wilkinson and Son.

In the course of an experience of nearly twenty years in the manufacture of swords, I have frequently noticed in examining any pattern, or model, which I have not met with before, how instinctively the shape seems to suggest the best method of using the weapon; and I have almost invariably found upon inquiry that the method of swordsmanship adopted was the same that I had supposed.

A moment's reflection is sufficient to show that there is nothing extraordinary in this. A swordsman selects or constructs his weapon on exactly the same principles as a carpenter chooses his tools, and if you show a workman a chisel from any part of the world, though he may never have seen the pattern before, he will tell you at once the use to which it should be applied. He will know, for instance, that it is not intended to drive nails, or bore holes; that its office is to cut wood or some soft substance, and not iron or steel. He recognises these points at once from the shape, the angle of edge, its temper, weight, &c.; and in the same way, by examining a sword of whatever country, we can form a pretty correct estimate of the method of swordsmanship adopted there. Having noted a great number of peculiarities of this kind, some of which seem to me very curious, I have arranged them in a short paper, in the hope that they may prove as interesting to you as they have been to myself.

We may very fairly surmise that the origin of the sword as a weapon of attack was the idea of some ingenious savage, who fashioned his wooden club to a rude approach to a cutting edge, probably from noticing the effect of a knot, or some accidental projection upon it. The wooden swords with which the Mexicans were armed when first discovered by the Spaniards, and those of the South Sea Islanders, of which there are many specimens in the Museum of this Institution, are instances of this, being hardly more than sharpened clubs.

In nations more civilised, swords were made in the hardest metal procurable. Copper swords have been found in Ireland; iron among the Britons and Gauls; bronze was used by the Romans, and probably by the Egyptians; and steel of varying degrees of hardness is now the only metal employed.

Upon the questions of the material, temper, or manufacture of swords, I do not propose to touch, but only upon their shape, which is, as I have said, determined by the way in which they are to be used. There are three ways in which a sword may be used, viz. in cutting, thrusting, and guarding. The first of these, cutting, I have assumed to be the earliest use which would suggest itself; but the man who first employed the sword for thrusting made a discovery which more than doubled the effective force of the weapon; and, still later, the one who first used it to defend himself from the attack of his adversary, as well as to return his blows, completed the idea of the sword, as it is now understood in Europe. It is in this triple character, as a weapon for cutting, thrusting, and guarding, that I propose to consider it. If these three qualifications could be combined in their fullest extent, there would be no difficulty in deciding upon the best form for a sword; but, unfortunately, each interferes with the other to a great degree, and therefore it will be best to consider them separately, which will also enable us to understand more clearly the various modifications of shape in use in different parts of the world.

The most simple and effective form of a cutting instrument, to be used by the hand, is the American axe. This is the same form as the early headsman's, or executioner's, axe, but is generally known in this country as the American, from its being the form used by the settlers for clearing the forests in the backwoods of America. It consists merely, as you see, of a heavy wedge of steel, fixed on a stout wooden handle of convenient length.

The first thing we notice in this weapon is, that there is no uncertainty where you shall strike with it. It has a light handle and a very heavy head, and, all the force being concentrated in the head, you strike instinctively with that part of it; but, if you take up a sword, you have the whole length of the blade to choose where you shall cut with it. Suppose you make a cut at a branch of a tree with the point of the sword, the probability is that your cut will produce very little effect, and you will feel a considerable jar upon the wrist and elbow. The same result will follow if you cut close to the hilt of the sword. In either case you waste a great deal of force, as is evident from the vibration you perceive in the blade, which represents so much force lost in the cut. If you go on cutting inch by inch along the whole length of the blade, you will at last come to a point where there is no vibration (Plate I. fig. 1, C. P.). This point is called the "centre of percussion," and that is the point where the whole force of your blow will be effective, and where the greatest result will be produced on the body struck. This model on the table illustrates the position and effect of the centre of percussion. It consists of a straight wooden blade jointed in the middle so as to bend freely in either direction, and the centre of percussion is marked, as you will see, at about 10 inches from the point. If I set the blade straight and cut with it, so long as the blow strikes exactly upon the centre of percussion no effect is produced upon the blade; but, if I shift the cut either an inch above or below that point, the vibration produced causes the blade to bend at the jointed part; if I strike above the centre of percussion, the blade bends backward; and, if I strike below it, the vibration is in the opposite direction, and is sufficient to bend it forwards considerably. As I have explained, the centre of percussion can be experimentally ascertained by cutting inch by inch along the blade, and comparing the effect; but it is obviously of importance to have some means of ascertaining this point mathematically without the tedious process of experiment with every sword. This can be done by a formula, first proposed by Mr. Henry Wilkinson, and which is based upon the consideration of the properties of the pendulum. I have here a pendulum vibrating seconds in the latitude of London. Its exact length is 39·2 inches, and it consists of a very light wooden rod, terminated by a heavy leaden ball. In one respect it resembles the axe, as nearly the whole weight is concentrated in this one point. When I cause it to swing upon a fixed centre, I find it makes sixty vibrations in one minute; and I know that the centres of oscillation, of percussion, and of gravity are all concentrated within this leaden ball. If this were what is termed a mathematical pendulum, in which the connecting rod is supposed to have no weight at all, these three points would lie precisely in the centre of the ball, and from this point to the point of suspension is exactly 39·2 inches. Now, I hang up this regulation Infantry sword, fastening it as nearly as possible at the same point on which it would turn in making a cut, and I set it swinging upon this point, converting, in fact, the sword into a pendulum. You observe that the vibrations are very much quicker; if you count them, you will find that while the pendulum is making sixty vibrations the sword will have made eighty. Having obtained this point of comparison, our object is next to determine the length of a pendulum which will make the same number of vibrations which the sword has made, viz. eighty in a minute. By a very simple formula, I can calculate that the length of such a pendulum would be 22 inches. I measure this distance, therefore, from the point at which the sword was

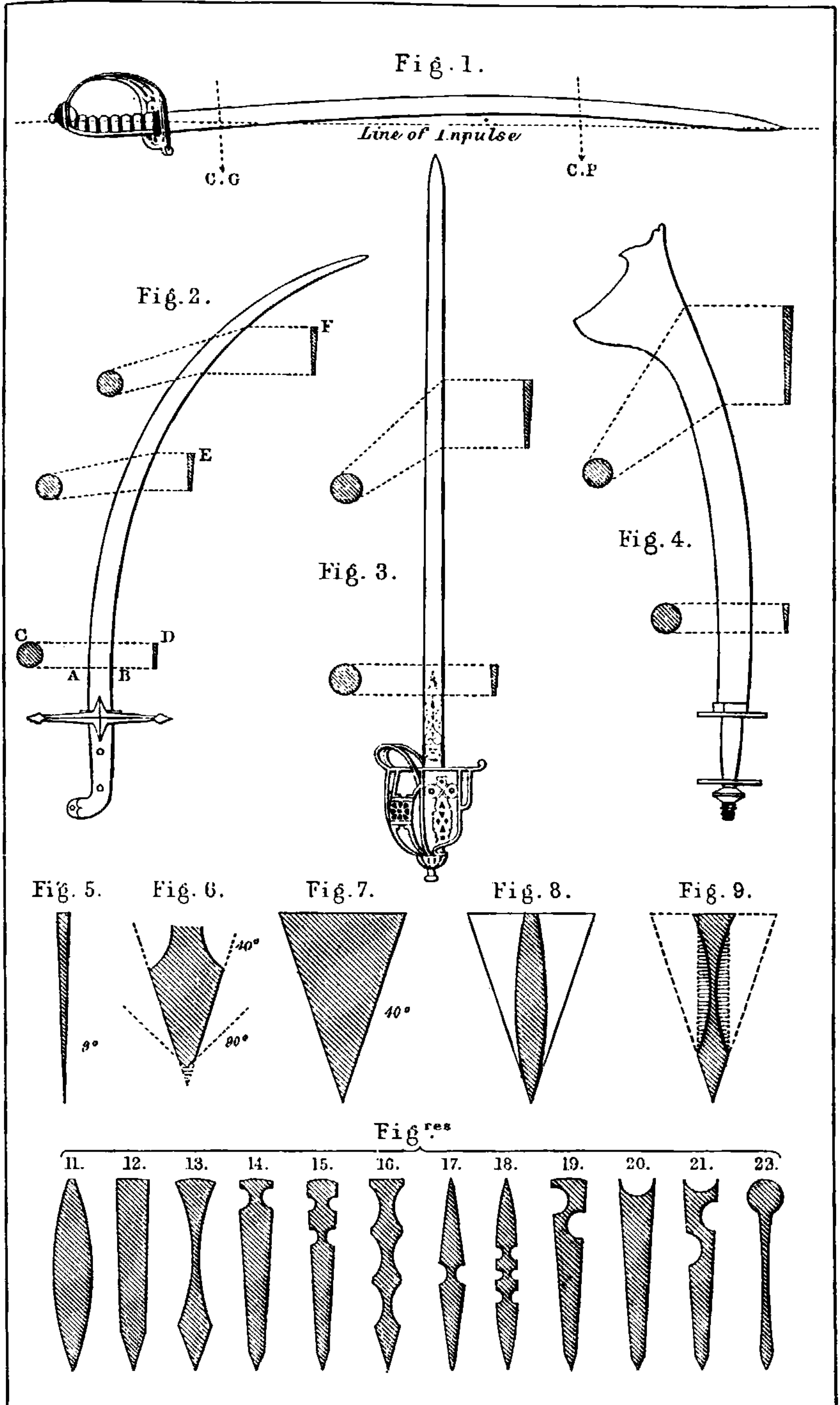


Fig. 1.
Line of Impulse
C. G
C. P
Fig. 2.
F
E
C
D
A
B
Fig. 3.
Fig. 4.
Fig. 5.
9°
Fig. 6.
40°
90°
Fig. 7.
40°
Fig. 8.
Fig. 9.
Figres
11.
12.
13.
14.
15.
16.
17.
18.
19.
20.
21.
22.

J.R. Jobbins.

suspended and mark it on the back of the blade, and I shall find on cutting with it that this mark is the centre of percussion, where there is no vibration, and where I can cut the hardest with this sword.

Another point which we notice in examining the axe is this, that the cutting edge is considerably in advance of the wrist or hand. The effect of this is to carry the edge forward in the direction you wish it to take in making a cut with it. If the cutting edge were placed at the back, the tendency of the whole weapon would be to fall backwards, or away from the line of your cut; and in making a blow you would have to exert and waste a certain amount of force to overcome this tendency. Instead of this, the edge of the axe, being placed in advance of the wrist, moves naturally in the direction of the blow struck with it.

In nearly all cutting swords some contrivance is made use of to produce a similar effect. If we examine any of these curved swords we shall see that the line of the hilt is thrown forward so as to form an angle with the line of prolongation of the blade, and this angle is more or less as the blade is more or less curved. If you endeavour to balance the sword upon the pommel or rivet, you will see that the effect of this is to cause the edge to fall forward precisely as the axe does. This gives the feeling which we express when we say of a sword "the edge leads forward well;" and I have nearly always found this point has been studied in the swords used by nations who make cutting a part of their system of swordsmanship.

But the curved blade which is so universal among these swords has another and very important effect, which you will understand from this diagram.

In making a cut with a curved blade, the edge meets the object at a considerable angle, and the portion of the blade which penetrates is therefore a wedge, not accurately at right angles with the sword, but of an angle more or less oblique according to the curvature, and consequently cutting with a more acute edge. In this diagram (fig. 2), if the sword-blade move in a straight line, A B, to cut any object, C, it will merely cut in the same way that a wedge, D, of the same breadth as the blade would do. But the effect of the curve is to throw the edge more forward, so that it cuts as a wedge, E, which you will see is longer and consequently more acute, the extreme thickness (that of the back) being fixed. In the same way in cutting nearer the point the increased curve gives, as you see, the effect of a still more acute wedge, F. In order to explain this more clearly I have made a small model similar to the diagram. If you compare these three pieces, which are parts cut out of the same blade, differing only in the angle at which they are supposed to meet with any obstacle, you will see the enormous cutting power which is produced by this oblique motion of the sword. We may say that the effect of the curve in this Indian tulwar, as compared with a straight blade, is, that it cuts as though it were four times as broad and only one-fourth the thickness. I have selected the tulwar as an illustration, because we have all heard of the extraordinary effects produced by the natives of India in cutting with this weapon. Men inferior in stature and bodily strength to our own countrymen can use this weapon so as to produce effects which strike us with astonishment:—heads taken off—both hands severed at the wrist—arm and shoulder cut through—legs taken off at one blow. Such are the sword-cuts of which our soldiers had too fearful experience during the Sikh war and later campaigns in India.

To understand more clearly how such effects can be produced, we must distinguish the different methods of cutting. In the first place I may take up a sword, and, keeping the elbow and wrist stiff, may make a sweeping cut with it, throwing the whole force of the body into the blow. To use as simple terms as possible, I will distinguish this as the "slicing" cut. In the next place I may take the sword, and, as an Englishman generally does, make a downright blow from the shoulder and fore-arm. This appears to be the instinctive method of cutting with a sword, as we find that most people who take up a sword for the first time use it in this way. We may distinguish this as the "chopping" cut. Or we may use a light sword in the way the German students use the "schläger" in their duels, keeping the elbow and arm stiff and making a quick cut from the wrist. This we will call the "whip" cut.

Now very different muscles are brought into play in these three methods of cutting. With the Indian tulwar, the first, or slicing cut, is used, and in this the cut is really given from the strong muscles of the back and shoulder, and, as these have nearly ten times the extent of the muscles of the arm, and the whole weight of the body is also thrown into the cut, you can easily understand the force with which such a blow is given. The second kind of cut, which is the one usually employed in Europe, is made with a movement of the shoulder and forearm. As a rule it cannot be compared in its effect, especially upon soft bodies, with the slicing cut given by the natives of India, and the large hilt, necessary to afford sufficient play to the wrist, lessens the cutting force still further. The small hilt of the tulwar, by confining the hand and preventing any play of the wrist, increases the force of the slicing or body cut. It is customary to say that these swords have such small hilts because the natives have small hands. My own hand is not a very small one, but I find no difficulty in using any of these Indian swords in the way in which they are intended to be used. The hand being confined in the hilt gives a stiffness to the wrist, so that the whole force is thrown into the blow. The wrist-cut can also be used with great effect, from the high velocity which can be given to a light sword by using it in this way. The German students who use this cut in their duels with the schläger are frequently fearfully cut about the face, and even the quilted leather pads with which they protect the body are sometimes cut through. It takes very little weight to cut flesh, or any soft substance, if sufficient velocity be given. The cut from the shoulder and fore-arm is most effective upon any hard substance, such as iron, wood, or lead.

To estimate the effect of a sword-cut we will take the formula generally in use for expressing the *vis viva* or force of a moving body, which is, the weight multiplied by the square of the velocity. Assuming this formula (which, however, requires considerable qualification), we will suppose a strong man, cutting with a sword of 4 lbs. in weight, to which he is able to give a velocity which we will call 1. The effect produced we will therefore call 4. We next suppose a weaker man who takes a sword 2 lbs. in weight and able to give it a velocity double that of the first, the effect produced will be equal to 8, or *twice* that which can be exerted by the stronger man using the heavier sword. But let us suppose that the strong man takes the lighter sword; he will be able to give it a higher velocity, which we will assume to be equal to 3, in which case the effect produced, squaring the velocity, will be 18, or *three* times the effect that is produced by the same sword in the hands of the weaker man, and more than *four* times the effect which he himself could produce with the heavier sword. I merely take this illustration as showing that the force of a blow is enormously increased by increased velocity, but much less by increased weight in the moving body. The nature of the body cut at, however, affects the result very much, but the common error is, that a very strong and powerful man chooses a heavy sword and fancies that he can do more with it than he can with a light one. Because he feels that it requires a greater exertion of strength on his part to put it into motion, he naturally fancies the effect produced will be greater; whereas by taking a lighter sword, to which he can give a higher velocity, he will do better. Of course I do not mean to say that the lighter the sword a man uses the greater the effect he will produce with it, but merely that there is a limit as to weight, which is generally exceeded.

The weight a man can move with the greatest velocity is that with which he will produce the greatest effect, but the lightest sword is not necessarily the one he can move the quickest. It is possible for a sword to be so light that we feel the resistance of the air in making a cut with it, and this is what we express when we say a sword feels "whippy" in the hand. Such a sword is worse than one too heavy.

Another point in a sword is the position of the centre of gravity (fig. 1, C G.) This is not what we generally mean when we speak of the "balance" of a sword, which term is applied to a feeling of the weapon in the hand which results from the relative positions of the centre of gravity and the centre of percussion. The considerations as to the position of these two points would take too long for me to explain to you now. It may be sufficient to say that in light swords these points may be further apart than in heavier ones, that they should be closer in a straight than in a curved blade, and nearer in a thrusting than in a cutting weapon.

We will next examine the sections of weapons used for cutting. These are of course all modifications of the wedge. I have here an illustration consisting of a series of wedges, representing sections of different sword-blades. The first form (fig. 5) is the wedge which would be produced by taking the thickness of the back of an ordinary sword and continuing it in an even line down to the edge. This forms an angle of 9°, which is very much too thin for any practical purpose. We find that a certain thickness is necessary for the edge of any cutting tool. For a very soft substance, as flesh or food, it may be from 10° to 20°, and this is the angle we find in dinner knives, &c. For wood an angle of 25° to 35° is the best, and this is the angle of a carpenter's chisel or plane. For cutting metals or bone the angle required is from 40° to 90°; and, as a sword-blade may meet with substances as hard as these, the least angle which we can give it with safety is 40°. Even this angle will fail against a hard substance if the cut is not a very true one, and we therefore put on a still more obtuse angle, viz., 90° at the extreme edge, as shown in fig. 6, where these two angles are distinguished as the entering angle 90°, and the angle of resistance 40°. You will also see by the outline (figs. 7, 8, 9,) that a true wedge of 40° would be of such enormous thickness and weight as to be useless for a sword, and we have to find some method of lightening the blade, while preserving the necessary angle of resistance. The following sections of blades show the principal methods of effecting this object. In figs. 9 and 12 the two sides are cut away to a flat surface—this is the general form of the Mahratta or Hindustan tulwar. In figs. 8 and 11, the angle is carried in a curved line to the back, which is made very thin, giving the section a bi-convex form. This is the shape of the celebrated Khorassan, Persian, and Damascus blades generally. Both of these plans give a very strong but heavy blade. The third form Nos. 9 and 13, in which the blade is hollowed into two broad grooves from the angle of resistance, making the section bi-concave, is that adopted in the English regulation sword blade. These drawings being made to scale, you can readily estimate the relative amount of metal in each of them, and you will see that this form gives the lightest blade for a given breadth and thickness. I believe it was this consideration which determined its adoption in the service; but it is not by any means the strongest form, and there are other technical objections to it which I will not enter into.

Nearly all the other forms of blade are also grooved, as you will see, though in a different manner, and I should here explain a peculiar function of the groove which renders it of great use to us. One of the most important requisites in a sword-blade for real service is *stiffness*. There is no possible use of a sword in cutting, thrusting, or guarding, in which too great flexibility would not be a disadvantage. It is a singular illustration of the little attention paid to this subject in England, that this very *defect*, flexibility, is frequently assumed as the criterion or test of a good blade. The blade which springs the most easily, is called the best; whereas nothing is easier, by making the blade thin enough, and useless enough, than to produce a sword which shall bend twice round the hilt and go into a hat-box, or clasp hilt to point and form a waist-belt—both of which wonderful swords I have myself made. The error arises from confounding flexibility of the blade with elasticity of the steel—the latter is necessary, the former useless and always injurious. But to resume: a blade which has been ground thin to lighten it, will frequently be too flexible and whippy. In this case by putting a groove on each side (see figs. 13, 14, 17,) we not only make it still lighter, but we also make it *stiffer;* for if we apply any force to bend a grooved blade sidewise we meet with the greatest amount of resistance which any mechanical form can supply. We are, in fact, bending an arch inwards upon its crown, and of course the deeper the arch the greater the resistance, which explains why the narrow groove in figs. 14 and 17 is preferable to the broader groove of the same depth in fig. 13.

The blade fig. 14, with a narrow groove on each side near the back, is a very old form and a very good one; the weak point of it, that is, the part between the two grooves where the metal is thinnest, is in the best place, viz., near the back, where strength and thickness are of the least importance; in this respect it is superior to the regulation form No. 13. The next blade, No. 15, is rather lighter, but is open to the objection that it has two of these weak places instead of one. The blade No. 16 is better in this respect, it has three grooves, which are much shallower, and the blade is consequently thicker between them. The same remarks will apply to Nos. 17 and 18, which are sections of the single-grooved and three-grooved claymore blades.

An ingenious method of obviating the weakness caused by deep grooves in a blade is shown in fig. 19, which is the section of a very curious blade made at Klingenthal, the sword manufactory established by the first Napoléon on the banks of the Rhine. In this two very deep grooves are cut in the blade, but not opposite to each other, so that the groove can be made even deeper than the line of axis of the blade. This gives very great stiffness; but I found, on testing it, that it was deficient in cutting power. I may have been erroneous in my judgment, for I was not able to make any very careful comparative trial, but such was my impression, and I could only attribute it to the depth of the groove passing beyond the axis, which might cause loss of power by vibration. Nos. 20 and 21 are experimental blades; the groove in No. 20 is placed at the back so as to preserve the sides of the wedge intact: there was great difficulty in grinding this sword, and the groove being in the back it hardly stiffened the blade at all. The resistance of the crown of the arch was wanting, and the blade sprung almost as readily as a straight sword. No. 21 is another combination which I tried, but, although having some good points, it was on the whole a failure. No. 22 is the old ramrod-back regulation blade, and I believe it to be the worst form of any; the very sudden change from the thick round back to the thin edge, renders it hardly possible to get a blade of equal temper, and the back acts as a check or stop in cutting with it.

There is another curious form of cutting-blade in which the curve is the reverse way to the usual form. Instances of this form are seen in the Khora, and Kookree knife of the Ghoorkas. In tools we have a familiar illustration the billhook used to lop off small branches of trees, and in some forms of pruning-knives. The Kookree knife is the best known weapon of this kind, and the stories related of its cutting power are very marvellous. If you examine it you will find that the weight is well forward, and in advance of the wrist, and in fig. 4 you will see that the effect of the inward curve is to increase the cutting power by rendering the angle more acute. It acts, in fact, in precisely the same way, but in an inverse direction, to the outward curve in the blade, fig. 2.

Straight cutting swords, of which we have many examples—for instance, the claymore and the old fox-blades of Cromwell's time—are all of them necessarily inferior to curved blades in their power of cutting. They may be made to cut better by the simple expedient of making a drawing or slicing cut with them; this produces in some degree the oblique action of the wedge, which is produced naturally by the curve of the cimeter blade (see fig. 3).

There is another method of using the curved blade, which is in fact a combination of the cut and thrust, by thrusting the edge forwards and along the body aimed at obliquely from point to hilt. It is hardly possible to apply much force in this way on foot, but on horseback, where the horse is moving forwards and supplies the necessary force, it is very effective and difficult to guard.

There is another very curious sword, the Dyak sword, from Borneo; the tassels ornamenting the hilt, which are said to be tufts of human hair, corresponding in number with the heads which have been taken off by the blade. This sword is broadest at the centre of percussion; the edge leads well forward in advance of the wrist, and, combined with the inward curve (though this is very slight), gives great cutting power to the weapon. In this Mahratta straight sword you will notice how very marked is the throwing forward of the edge of which I have spoken; it bends away in advance of the hilt to an extent of two or three inches. The old light cavalry sword of George III. is an excellent weapon for cutting; light, thin, and very much curved, and with the hilt thrown well forward. In fact this position of the hilt, of which I have endeavoured to explain the reason, may be traced to a greater or less extent in every cutting-sword with which I am acquainted, with only one exception. This single exception is the Japanese sword-blade, in which, as you will see by this specimen, the line of the hilt corresponds with and is a continuation of the curve of the blade. I have not been able to learn any particulars of the way in which these swords are used, but I cannot conceive any method of cutting in which this position of the hilt would be advantageous. Here is another curious illustration of the analogies between the weapons of very remote nations. This wooden club or sword is selected from one of the South Sea Island trophies in the Museum of the Institution, and if I place it side by side with this elaborate steel weapon, the Khora of Northern India (fig. 4), you will see how perfect is the resemblance in shape. The coincidence in every point is too close to be accidental; it is evident that the same principles were present in the minds of the designer of each of these weapons.

I come now to consider the sword as a weapon for thrusting; models of hand-thrusting tools are so numerous that it is difficult to choose from them. The bradawl, the gimlet, the needle, the dinner-fork; any of these will serve for illustration; with regard to the method of their progression they may be considered as a very acute wedge entering obliquely.

The thrust has always been considered in swordsmanship as infinitely preferable to the cut, and the reason is as old as one of the first definitions of Euclid—that "a straight line is the shortest way between any two points." In making a thrust the sword moves in a straight line, and in making a cut it moves in a circle, and of course the thrust is much quicker. You will see in the sketch representing two men in the position of guard, Plate II. fig. 23, that the distance which the figure A with the straight sword has to traverse in making a thrust is less by two-thirds than the distance which the figure B must traverse in making a cut; therefore, if they move with equal velocity, the thrust will reach its mark in one-third of the time, because the one traverses the diameter and the other the circumference of a similar circle.

In figs. 24 to 30 you have various sections of thrusting blades. Fig. 24 is the oldest form, known as the Saxon, or among workmen as the "latchen" blade. You see this form in many of the Toledo and early rapier blades; it consists of two obtuse angled wedges joined at the back, and is sufficiently strong and stiff, but very heavy. Two methods of lightening it by grooving are shown in the next two figures, Nos. 25 and 26. The third (No. 27) is the Biscayan form, with three deep grooves, better known as the French duelling rapier. Technically, either of the former forms is superior to this, as there is very great difficulty in getting these blades straight and of even temper; so much so, that I have never

Fig. 23.

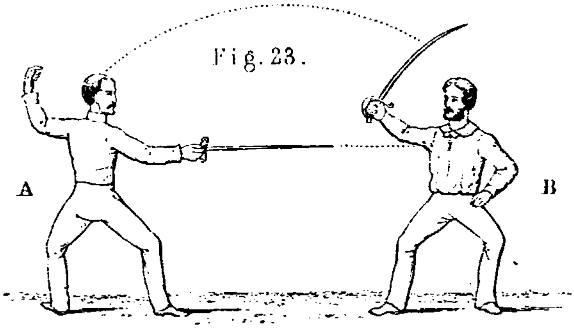


Fig. 24.

Fig. 25.

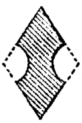


Fig. 26.

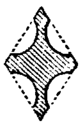


Fig. 27.

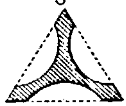


Fig. 28.

Fig. 29.

Fig. 30.

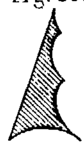


Fig. 31.

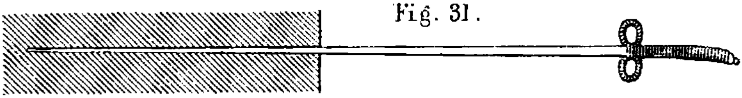


Fig. 32.

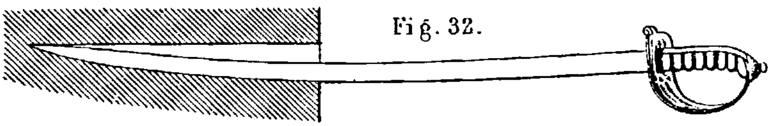


Fig. 33.

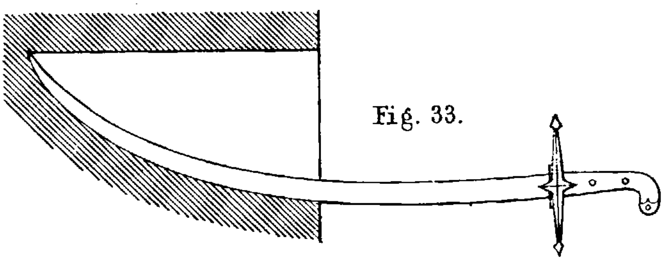
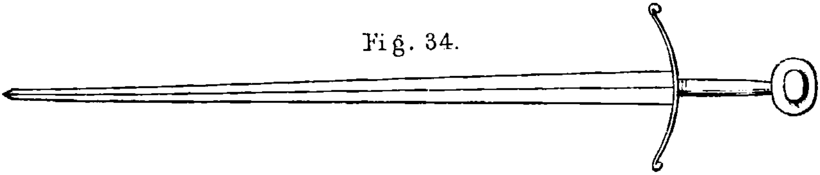


Fig. 34.



J.R.Jobbins.

seen one of these three-cornered rapier blades which was not either soft or crooked. Theoretically, however, the shape is a very good one. Fig. 29 is a section of a very curious thrusting blade. It is probably an experimental sword of the date of 1810 to 1814, and is from the manufactory of Klingenthal. I have seen a great number of these experimental blades, many of which are very curious and suggestive. Here, for instance (fig. 29), is an attempt to give cutting power to a rapier blade, but these angles being very obtuse, have scarcely any effect in a cut. The next, fig. 30, is an improvement on the same form; it cuts much better; but the defect in both these swords is, that they have a tendency to turn over in the hand and to spring at the flat side on the point meeting with the least resistance.

Of course the proper shape for a thrusting sword is pre-eminently straight. As an illustration of the difference in this respect I have a diagram (figs. 31 to 33) showing the effect of a straight thrust into a block of wood with a straight sword, with a slightly curved (regulation) blade, and with a sword of the tulwar or cimeter curve. You see the straight sword moving in a straight line makes a hole exactly the size of the blade; the slightly-curved sword moving in a straight line cuts a hole of about double the width of the blade; but the cimeter blade thrust into the same depth makes a hole five or six times the width of the blade itself, and of course meets with six times the resistance to its penetration. You see, therefore, how difficult it is to use one of these curved blades for the straight thrust. This difficulty probably suggested a method of thrusting which is styled the curved thrust, in which the blade is propelled, not in a straight line, but in an arc of a circle more or less curved to correspond with the blade. The arm makes this curvilinear or cycloidal movement very readily, and it is doubtless the best way of using a curved blade for thrusting at all, but it is open to the objection that the space traversed (as in the cut) is longer than is necessary to reach the object, and that it cannot be used with the "lunge," so as to throw the force of the body into the attack. Like the "thrusting cut," this attack is better suited for horseback than for foot, and in any case it is inferior to the straight thrust. However, this idea of the curved thrust was at one time considered very valuable, and Colonel Marey, of the French army, in an elaborate and excellent work on swords, published at Strasbourg in 1841, went so far as to suggest that the shape of the yataghan, which is excellent as a cutting weapon, and for thrusting can be used with considerable effect in this way, should be adopted as the regulation Infantry sword. It was adopted and tried to a certain extent in the French service, and finally, just as the French were beginning to abandon it, it was adopted partially in England. It is the parent of the present short Enfield sword bayonet, and, as you will see by comparing the two, it has been cleverly modified so as to lose all the distinctive excellences of its original. The beautiful curved line of the yataghan, so accurately coinciding with the motion of the wrist in cutting, is completely lost, and it is applied to the worst possible use in being placed at the end of the gun, where the weight forward, which is so valuable in cutting by the hand, renders it, when placed upon the gun-top, heavy and unmanageable. It is very much inferior to the ordinary bayonet, and it has frequently caused surprise how it came to be adopted here. The reason is simply that it had been tried in France. It has now been abandoned there, and I imagine that we shall soon have to abandon it in the same way, as it is vastly inferior as a thrusting weapon to the ordinary bayonet, and the power of making a cut is poorly purchased by the loss of all manageability in the arm.

The only other point we have to consider is the sword in its use for guarding. In considering this point we must recollect that guarding is very rarely practised in Eastern swordsmanship. The Eastern soldier is taught to use his sword as a weapon of attack only, and is well provided with steel gauntlets, helmet, and shield to resist a cut. He is therefore contented with a very small guard to his sword, and prefers what we consider a very top-heavy "balance." But we have to contrive a sword that shall be useful in guarding as well as in cutting or thrusting, and to do this we must modify it considerably. The best cutting sword, if it were not necessary to "recover" to guard with it, would be the axe, and the only reason why we want it modified into the form of a sword at all is, that we may be able to use it to defend ourselves as well as to attack our adversary.

The "balance" of a sword, of which I have spoken, is essential for guarding, and for guarding only. The stiffer and heavier a blade is, the better is it adapted for both cutting and thrusting, and it is only when you want to "recover to guard" that it becomes necessary to have it light or elastic. In the old Highland claymore you will find the hand so cramped that it is not possible to form a guard with it truly and readily; this is explained by the fact that the claymore was not used for guarding. The defence of the Highlander was entrusted to the dirk and target on the left arm.

The principal requisite for a good hilt is that it should have as much guard as possible without cramping the hand. The claymore, as I have said, is deficient in this respect. In the Eastern cimeter, which is not intended for guarding, the only protection to the hand is a simple crutch. Most modern swords are defective in the hilt. The Light Cavalry regulation sword has a very bad guard indeed. There is no protection against a thrust, and the whole inner line of the wrist is exposed. The whole weight being on one side of the blade, it has a tendency to turn over in that direction, and in using it you have to exert and waste a certain amount of force to overcome that tendency. The regulation Infantry sword has a much better guard, but it is defective on account of the metal of which it is made, which is liable to be cut through or broken by a fall. The Engineers' is a very good guard, as is also the heavy Cavalry, but both have the defect of being over-balanced, *i.e.* heavier on one side than on the other. A sword I have lately made for India is free from this defect, as the sword will really balance along the edge, the guard being equal on each side. It is only fair to say that this hilt was suggested to me by the straight Mahratta sword I have so often referred to. You will doubtless be amused at me when I say that this sword shows more thought in the contriver than any other with which I am acquainted, and the swordsman may obtain many useful hints from it. Here is an officer's regulation Infantry sword of twenty or twenty-five years' ago. It is a specimen, I believe, of the worst possible arrangement of hilt, blade, and shape, that could possibly be contrived. It is crooked, but has no regular curve; is wrongly mounted for thrusting and wrongly shaped for cutting. The hilt is so flimsy as to be no protection for the hand, and it is made of bad metal badly tempered. If you ask me how such a model came to be adopted, I can only answer by a supposition. At that time the three principal purveyors of swords to the British army were a tailor, a gold-laceman, and a hatter. I can only suppose that the tailor was the first consulted; if his production was unsatisfactory, the pattern was referred to the laceman; and finally the hatter was called in, who put the crowning touch to the whole.

There are some very curious old swords, both European and Eastern, which I dare say most of my hearers have met with, in which the back of the blade is made hollow, and mercury, placed in the hilt, is carried towards the point in cutting, thus adding to the force of the cut. You will see at once that, though this added to the force of the blow, the additional weight rendered the sword topheavy, and told against the swordsman, if his cut were parried and he had to recover to guard himself. In the same way some of the German headsmen's swords were made with a ball of steel to slide down the blade and add increased force to the cut. Here is a curious instance of what I mentioned to you with regard to the effect of over-weighting. It is a sword weighing 6½ lbs.; it originally weighed 9 lbs., but has been considerably lightened. It was made for an officer in a cavalry regiment, who thought it would strengthen his wrist to use it in post practice. The result is that no living man can cut with it. You can lift it up, and let it drop on any object you please, but beyond this you cannot go. The weight is so great that it is impossible to give it any velocity, and its cutting power is therefore nil. A very simple test shows this. It is easy enough to cut a copper penny in half by a quick blow with a bowie or hunting knife. I have tried to do the same thing with this sword, and hack and hammer as I may, I cannot get it to go through the penny. With the knife I can give a high velocity; with the sword I can give none at all, and so I can do nothing with it.

I think these are the only points to which I have to call your attention, and, as I have already detained you beyond the allotted time, I will conclude by thanking you for the kind attention with which you have listened to me.

The CHAIRMAN.—I am sure we are very much obliged, Mr. Latham, for the interesting and instructive lesson which you have given us. I thought it was a very dry subject, and was not at all prepared for anything so interesting or instructive as this. It shows that you have thoroughly studied the subject, and have made yourself completely conversant with it.

CAPTAIN BURGESS.—Will you kindly make a few remarks upon that curious sword of the time of Edward III.? (Plate II. fig. 34).*

The CHAIRMAN.—You might tell us what was the effect of that heavy sword upon the wielder's wrist.

Mr. LATHAM.—I believe he found he could not use it; in fact, that he could hardly lift it, or make a cut with it. I ought to have made a few remarks upon this curious old sword. You will see from its tremendous weight that it was intended for a time when swordsmen had to deal with iron-plated men, as we have with iron-plated vessels, and you see how they solved the very question we are debating now. They got the heaviest weight they could, and they put as much force behind it as they could

* Bequeathed to the Institution by the late Walter Hawkins, Esq., F.S.A.—Ed.

possibly give—exactly the same thing we are now doing in our experiments with artillery against iron-plated ships.

Captain SELWYN, R.N.—There are one or two questions I wish to ask Mr. Latham, for the benefit of the naval branch of the profession. One is, whether it has occurred to him that the use of the heavy knob on the guard in that antique sword, which we have just been looking at, has anything to do with the old term of pommelling one's enemy? As Jack has often been known, in a press of men, after having got up his sword-arm and being unable to get it down again, to use the hilt of his cutlass, and knock his enemy's teeth down his throat; so may not the ancient knight have used that sword to pommel his enemies, after using the sword to cut him down? I would also ask whether his attention has been drawn to the peculiarity of Lord Cochrane's mode of arming his seamen for boarding? He fastened bayonets to their left arms, with the points projecting beyond the hand, and then armed them only with cutlasses, telling them to go and take the enemy. Of course, the bayonet formed a perfect guard, tied as it was along the outside of the arm, with the points projecting about 6 inches. It enabled Lord Cochrane to take the Spanish frigate in the way he did, from under the batteries of Callao. The last thing I beg to ask is, if, by any effort of art, Mr. Latham can give us a weapon which will enable the seaman to feel a little more secure. Seamen begin to feel that they have lost their confidence now that plated ships have come into action. We are in that state, that, with the very hard shells ships have now got, it will be utterly impossible to hope that swords will ever come into play; and, if Mr. Latham can only suggest some means of offence, I think we should be delighted. For the ancients and for cavalry, swords may be possible, but not for seamen.

Mr. LATHAM.—With regard to Captain Selwyn's remark about the pommel of this sword suggesting the use of the term "pommelling," I think it is very likely. It is a happy idea, and there are many etymological derivations much more far-fetched. The idea of strapping the bayonet to the arm was perhaps suggested to Lord Dundonald, who was a Scotchman, by the method of using the dirk with the target. The thumb being placed on the hilt of the dirk, the point projected about an inch beyond the elbow; the target was used for parrying, and the return given with the dirk. I am not sufficiently acquainted with the construction of the new iron ships to give an exact reply to the third question. But, from the accounts we have, it seems to me that the only way to encounter an enemy of this description is to attack him as you would a wasp's nest; smother him by stopping up his funnel and hatches. I am aware that a lecture of this kind on the use of swords may seem to have more of an antiquarian than of a practical interest in the present day. At the same time the sword is the *ultima ratio*—the best weapon for hand-to-hand encounter, and to hand-to-hand encounter it must come at last. If we go on improving our armour at such a rate that we cannot hurt each other while we keep within our vessels, the only means of deciding the question will be to come out of them; and this may lead to the old system of man to man being revived, and the shape and use of the sword become again a subject of some importance even in naval warfare.