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### Some features of the ruined temples of Mashonaland

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The iron skin-scraper commonly used by the Kaffirs in lieu of a pocket handkerchief, is in shape and utility the counterpart of the ancient strigil, having exactly the same curve as those that have come down to us from Greek and Roman days. All these iron things they make for themselves, and they also manufacture their assegais, battle-axes, and the iron sceptre, which is the insignia of every Makalanga chief, out of the ore found in their own mountains. This art is undoubtedly a heritage from some higher state of civilisation.

Finally, as to type of countenance, the Makalanga is far the most refined of any of the Kaffir races I have seen; the thick lips, snub nose, and large nostrils, so characteristic of the Bechuana, the Zulu, and other South African races, is the exception and not the rule amongst the Makalanga. Many of them have thin lips, aquiline noses, and delicate features; their manners are courteous in the extreme; some of the chiefs whom we visited received us with the grace and dignity of an Arab sheikh; when we gave a present, however small, the recipient would touch the dust before taking it into his hands. If he is a cowed and cowardly man, the Makalanga is refined, and gives ample evidence of his once having been in a superior state of civilisation, and having had intercourse with more civilised races.

Of course this country has been so lately opened out that at present the data we have to go upon are limited. The Makalanga are extremely reserved about their customs and their religious observances; few, if any, have as yet mastered their language. But in the immediate future there is here open to the anthropologist a most interesting and profitable field for research.

### SOME FEATURES OF THE RUINED TEMPLES OF MASHONALAND.

*(Read at Meeting of British Association, 1892.)*

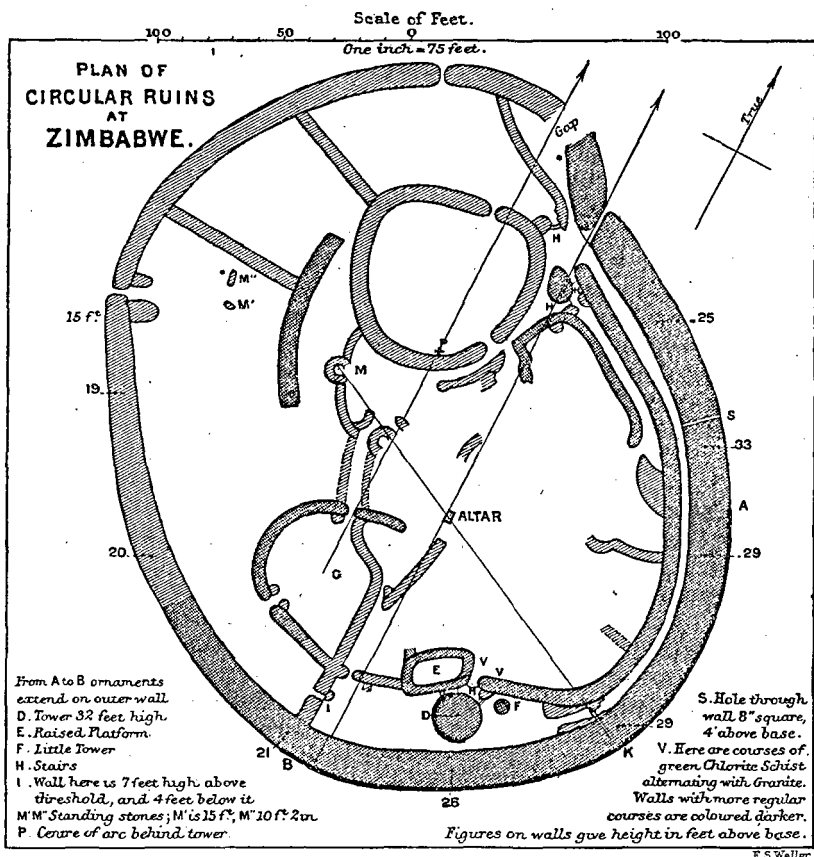
BY ROBERT M. W. SWAN.

A GLANCE at the plan of the great temple at Zimbabwe suggests that the builders had carelessly drawn an ellipse on the ground and built round it; but when one observes the very careful nature of the masonry of the best-built walls, and the great accuracy with which the comparatively rough stones have been laid in regular courses and fitted together, then one expects to find that the form of the temple has been carefully designed; and when a plan of the whole has been made it is seen that the well-built portion of the outer wall and some of the inner walls are built on a series of carefully constructed curves. These curves are all arcs of circles, and their radii all have a peculiar relation to the diameter of the most important feature in the great temple—the round tower itself.

I must premise that what I have to say will only apply to the well-built walls in the temples—that is, to those which have been darkly shaded on the drawings. These are all made with carefully levelled courses, and are well built throughout, while in the poorly built walls the courses are much less regular and often do not exist at all, and the interior of those

walls is composed of carelessly filled-in stones. Those walls are much inferior in every way to the others, and were probably built at a different period and by a different race; so it is not surprising that they do not show evidence of a similar design.

The forms and relative proportions of the two towers are remarkable, and seem to offer an explanation of the forms of the curves of the walls; in fact, the diameter of the great tower at the base seems to be the unit of measure used in the construction of these curves. This diameter is 17·17



feet—that is, equal to 10 cubits of 20·62 inches; and this is also exactly the circumference of the little tower at its base, so that the diameter of the great tower divided by the ratio of circumference to diameter—3·14—gives the diameter of the little tower. This ratio of circumference to diameter and the above measure of 10 cubits seem together to have determined the length of either the radius or diameter (or halves of these) of all the circular curves of which the walls are composed. For instance, the radius of the curve of the part of outer wall behind the great tower is 169·3 feet, and this is exactly equal to the diameter of the great tower multiplied by the square of 3·14. The well-built, partly

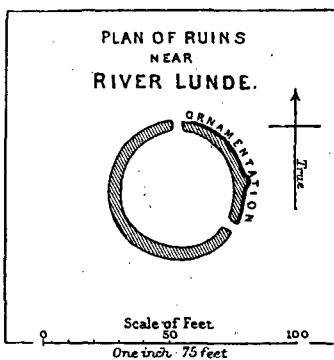
circular, enclosure to the NW. of the tower has a diameter of 54 feet, and this is equal to the diameter of the great tower,  $17\cdot17 \times 3\cdot14$ . The curve of the outer wall from the eastern end of the sacred enclosure to A has its centre at the altar, and its radius is  $107\frac{3}{4}$  feet. This is equal to twice the diameter of the great tower,  $17\cdot17 \times 3\cdot14$ . The curve of the wall from A to the doorway seems to have the same length of radius as the part of the wall behind the tower, namely  $169\frac{1}{3}$  feet; but in our measurements there are hardly sufficient points fixed in the line of the curve to make quite sure of this. The inner long wall is parallel to the outer one until it reaches the sacred enclosure, so it may be considered as combined with the outer wall for our present purpose. Besides these there are no other well-built curved walls of any importance in the temple except the piece of wall near the monoliths, and it is too short to allow us to fix with certainty the position of the centre of its curve. It does not, however, seem to belie this system of measurement.

We can hardly expect to find this same system of measurement always applying to the buildings on the hill, for the form of these buildings is often controlled by the nature of the ground on which they are built. Still, it does apply in a manner; and the diameter of the curve of the wall at the eastern temple is  $84\frac{1}{2}$  feet, which is equal to the semi-diameter of the great tower  $\times 3\cdot14^2$ . Of the two curved walls on the left hand when entering this temple from the south the diameter of the curve of one is 54 feet, equal to  $17\cdot17 \times 3\cdot14$ ; and of the other curve the radius is 17·17 feet. The only other regularly curved wall on the hill is the great wall with monoliths and towers, and the diameter of the circle of which its curve forms a part is 254 feet. This does not agree with our system of measurement, but this wall and its towers are not well built, and there is good reason to suppose that its outer face at least is not of the original period, but is a more recent reconstruction—in fact, we discovered the foundations of another parallel wall about 6 feet NW. of this, as is partly shown in the plan. If this were the original wall it would give a diameter of 266 feet for the circle, which equals the semi-diameter of the great tower  $\times 3\cdot14^3$ .

At Matindela the only regularly curved piece of wall is that around the principal doorway; but it is so rough in its construction that one hesitates to deal with it, and we can only say that it seems to be a rebuilding on an old foundation which had a radius of  $107\frac{3}{4}$  feet—that is, equal to twice the diameter of the great tower multiplied by 3·14.

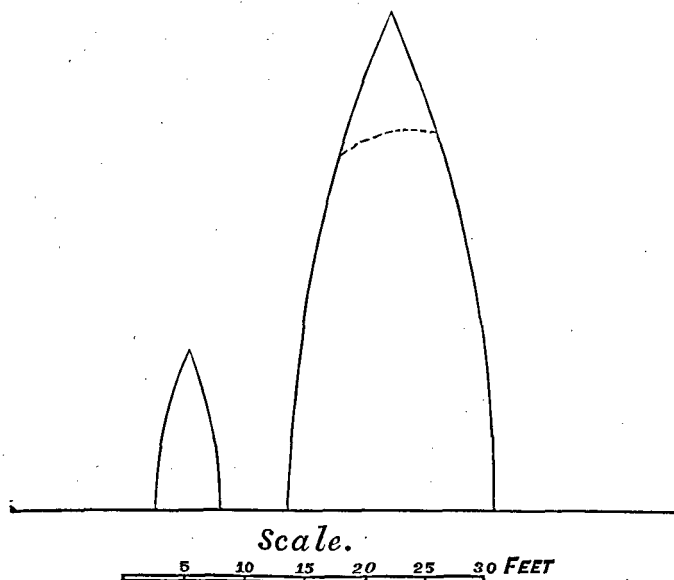
The little ruin at the Lunde river is circular in form and very well built, and its diameter is 54 feet, which is equal to the diameter of the great tower multiplied by 3·14.

The above-described twelve walls are the only regularly curved and well-built walls which we saw in



Mashonaland, so that every curved wall made by the original builders of Zimbabwe seems to have been constructed on this system.

To return to the towers, the same principle of measurement applies to the curves which determine their forms. If a curve with a radius equal to twice the circumference of the great tower (that is,  $107\frac{3}{4}$  feet) be described with its centre on a level with the base of the tower, it will correspond exactly with the outline of the tower. The height of a tower bounded by such curves will be 42·3 feet, and this is equal to half the semi-diameter of the tower multiplied by the square of 3·14. The form of



THE TWO TOWERS.

[The broken line shows the present top of the great Tower.]

the little tower seems to have been determined in the same way by curves with a radius of 34·3 feet = twice its circumference. The height of this tower would be originally  $13\frac{1}{2}$  feet, or half its semi-diameter  $\times 3\cdot14^2$ , so that the height of the little tower  $\times 3\cdot14$  is equal to the height of the great tower.

The great tower is placed in the middle of the sacred enclosure, which is entered by a doorway at either end. These doorways are placed at the ends of the arc of  $169\frac{1}{2}$  feet radius, and the ends of the arc are indirectly determined by the position of the sun when rising at the summer solstice. We are unable to adequately explain the reason for the position of the little tower, but its centre is 17·17 from the centre of the great tower, and about the same distance from the inner side of the great wall.

Solar worship was evidently practised at Zimbabwe, and we have evidence of this cult in the only remaining decorative features of the

temples, and in the little images of the solar disc which we found in considerable numbers.

Around the outside of the wall of the great temple, near its top, between the points marked A and B on plan, there extend two bands of a kind of chevron pattern. This pattern seems to have been symbolical of fertility, and it extends along the part of the wall which receives directly the rays of the sun when it is rising at the summer solstice. It reminds one of the Egyptian hieroglyphic symbol for water, and it also resembles the time-honoured symbol for the zodiacal sign of Aquarius. A worshipper of the sun would very naturally think of moisture being as essential to fertility as solar energy itself, for the heat and light of the sun are powerless to make plants grow when moisture is absent.

107½ feet from A, and the same distance from K and B, is the centre of the arc A K; and at this point there is some ruined masonry, which seems once to have formed an altar. Zimbabwe is in 20° 16' 30" South latitude, and consequently the sun would rise there about East 25° South at the summer solstice were the horizon level. But Mount Varoma interposes itself between the temple and the rising sun at this time, so that the sun attains an altitude of 5° before its rays reach the temple. Then its amplitude will be more nearly 24°, and a line produced in this direction from the altar will pass across the doorway of the sacred enclosure, where the curve of the wall changes its radius, and, roughly, through the middle of the chevron pattern. Produced in an opposite direction for 73 feet, the same line would fall on a tall monolith which we there found lying by its well-built foundation. Where the pattern ends at A and B, the rays of the sun are nearly tangential to the curve of the wall; so that all parts of the wall, and those parts only, which receive the direct rays of the sun when rising at the summer solstice are decorated by this pattern. The sun's rays would not fall on the altar at this time, and it seems strange to have an altar devoted to solar worship under the shadow of a wall; but the same objection applies to every part of the interior of the temple, and we can hardly suppose that the priests performed their ceremonies of worship outside the temple as some tribes of Arabs do with some stone circles at the present day. The monolith 73 feet distant from the altar was sufficiently tall to receive the rays of the sun when it rose over Mount Varoma; and the shadow of a monolith erected on the wall at K would fall on it at the same time, and thus mark with great accuracy the occurrence of the solstice. Monoliths had been erected along the top of the decorated part of the wall, and may have served to mark the position of the rising sun at other periods of the year.

There are other instances of similar orientation to the sun on the horizon at the solstices. At the temple at the eastern end of the fortress on the hill there is a wall decorated with a dentelle pattern. We discovered the altar here, and a line drawn from it to the rising sun at the summer solstice will pass through the middle of this pattern. The great curved wall at the western end of the fortress, which is decorated with round towers and monoliths, has an aspect towards the setting sun at the winter solstice; and a line drawn

from the centre of the arc (where we may suppose the altar was) towards the setting sun at this solstice would pass through the middle of the row of towers and monoliths. At this western end of the fortress we have parts of two walls which faced the setting sun at the winter solstice decorated with dentelle pattern. As we have before remarked, Matindela is evidently a rather inaccurate reconstruction of an older temple, and the orientation of the patterns here is not so true as in the older temples. There are four oriented patterns in this temple; one faces the rising sun at the summer solstice, two the setting sun at this solstice, and one the setting sun at the winter solstice.

The motions of the stars were also observed at Zimbabwe, and we found three instances of means being provided for observing the culminations or meridian transits of stars from the centres of the arcs or from the altars. The stars so observed were invariably stars of the northern hemisphere, and those having a declination of between about  $45^\circ$  and  $60^\circ$ .

There is a curious and most prominent great stone poised on the summit of a cliff which rises perpendicularly for 50 feet, just behind the eastern temple in the fortress. This stone is true north of the altar, at the centre of the decorated arc in the great temple, and is 680 yards distant from it. The sides of the very narrow doorway in the 16 feet thick wall of the great temple have been made parallel to this line. The line of sight from the altar to the stone is inclined  $8\frac{1}{2}^\circ$ , and the latitude of Zimbabwe is  $20^\circ 16' 30''$  South, so that stars having a north declination of  $61^\circ$  would, when crossing the meridian, appear to pass just over the stone, and the time of their meridian passage could be ascertained easily to within two minutes of time. Stars with a less declination, say as far south as  $45^\circ$ , could also have their meridian passages observed with considerable accuracy, and the line of the high doorway would help to direct the sight in the meridian line.

The altar in the eastern temple has been placed 10 feet from its proper place, at the centre of the arc, in order that stars might be observed crossing the meridian through a break in the wall of rock behind it, or perhaps in order that certain stars at that time might throw their rays on the altar.

True north of the centre of the curve on which the great wall with the towers and monoliths has been built, a great monolith stands on an eminence. This was probably used in conjunction with an altar at the centre of the arc to mark out the meridian, and enable the culminations of stars to be observed.

These observations of stars may have had a religious meaning, or they may have merely supplemented the solstitial observations in regulating the calendar.

It is hoped that the above-described mode of orientation of the temples, and the mathematical peculiarities involved in their construction, will yet provide a clue which will enable us to trace the builders of these interesting temples to their home. When it becomes possible to thoroughly explore the interior of Southern Arabia, similar ruins may be found there; or, when we have accurate plans of the elliptic temples at Marib and Sirwah, we may find that they embody the same peculiar system of measurements.