

Lectures, printed below, were given by Major K. W. Merrylees, O.B.E., R.E., on December 2nd, on "Water Divining on the North-West Frontier," and by Mr. Francis Mapson, on January 20th, on "Experiments in Radiation Diagnosis and Healing."

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WATER DIVINING ON THE NORTH-WEST FRONTIER

(A LECTURE DELIVERED BY MAJOR K W. MERRYLEES, O.B.E., R.E., TO THE BRITISH SOCIETY OF DOWSERS ON DECEMBER 2ND, 1936)

I cannot remember the first occasion on which I found that I had the gift, but on several occasions in the last ten years in India I have tried when official dowsers were working, and obtained indications, but did not consider that mine were sufficiently strong to be of any use.

In 1935 I was transferred to the Khyber Pass as Garrison Engineer, and soon realised that the water supply there, though adequate in quantity, was not satisfactory, as nearly all the daily requirements had to be pumped about 9 miles and against a head of over 1,100 feet.

There was at that time stationed at Shagai Fort, one, Major Falcon, of the 5th Mahrattas, who had had considerable experience at dowsing and some useful results at Agra and elsewhere. I enlisted his aid, and from then onwards we spent some week-ends and all the spare time we could make chasing the underground systems, of which there were many, in spite of the extremely arid appearance of the hills.

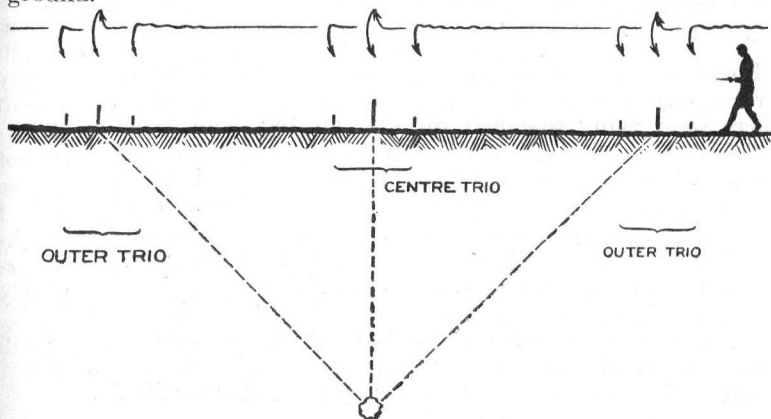
Before I talk about the country and the practical work, I will describe shortly the methods used by us up to the time I left India.

You must remember that the whole of the area consists of limestone and shale hills, often precipitous and much cut by deep valleys filled with boulders, the only exception being the plain on which Landi Kotal stands, and the upper valley of the Pass itself. These areas produced their own problems, which I shall refer to later.

Now to my methods. Both Major Falcon and I worked with natural twigs of any springy wood, willow being the most easily obtainable in this area, and often when natural "V's" were not to be found two straight pieces were cut and tied together with string. Springy wire and, later, whalebone were favoured because of the constancy of springiness, a natural twig becoming too dry and breaking after about three days at over 100° in the shade. Also, in spite of my efforts to prevent the tribesmen from looking on the whole thing as magic, spare twigs had a most curious way of disappearing when being examined and tried out by all and sundry.

Major Falcon is a dowser whose indication is an upward lift of the twig; in fact, he gets exactly the reverse of my movements, which I shall describe now.

I hold my twig in the normal way; horizontal and at waist level. When I get near to a stream or an area holding water below it the twig becomes live. I mean by this that there is no longer the drag of the twig's weight, though it does not actually lift. The next indication is a straight pull down, when I at once stop and take a new grip with the twig, again horizontal. Within a pace or two, the twig still being "live," it will lift to about 45°, and then turn until vertically downwards. This is usually quite a sharp movement. Taking another grip, a yard or two further on there is again a sharp single downward pull. These three indications I have named a "trio," and I have always found three such trios connected with every flow of water below ground.



So far I do not know if this first trio is that belonging to the stream itself, or if it is one of the two symmetrical outer trios, which are connected with the depth of the stream. Also I do not know at what angle I am approaching the stream. I therefore return to the centre indication of the trio, and standing on this I slowly rotate with the twig held normally. When facing in two opposite directions the twig will drop. This is the general direction of the flow of the stream at this point, and it is possible to walk away at right angles to this directional line and so find the shortest way to the next "trio." Still I do not know which "trio" belongs to the stream itself, and one of two tests are now applied. Again standing in the centre of the trio, and facing in either of the found directions I hold the twig with my hands close to the ground. If the twig lifts or drops it is the stream itself, and the direction of flow is from the direction in which I am facing when the twig lifts. Similarly, and this is a better test, if I walk along the indicated direction of the stream and the twig lifts or drops, then it is truly the stream. The outer trios produce no indication with this test.

I do not feel I am yet in a position to say exactly what is the connection between the outer trios and the central stream trio. It is undoubtedly closely related to the depth of the stream, and the trios are usually symmetrical. A theory is that the outer trios are the depth of the stream from the middle stream, but this does not appear wholly consistent, and although I always find the depth by this method I think it advisable to add a considerable factor of safety.

You can imagine that while the application of the above method is easy on a flat field it can be neither simple nor easy among precipitous Khyber hills. There was always another important factor in this area. Although I was privileged as Garrison Engineer and had the friendship and interest of the local maliks, there were areas into which it was inadvisable and often forbidden to go, particularly near the Afghan border.

Fortunately, the areas in which water could be usefully developed for Khyber needs were mainly accessible, though off the road. There were many so-called springs, varying from a patch in a nullah bed, wet at certain times of the year, to some large springs producing about five to seven hundred thousand gallons every 24 hours, but these were situated about 1,500 feet below the Pass and near the Afghan border. One area appeared really hopeful. A side nullah to the south had had a good flow of not less than three hundred thousand gallons per diem in it up to 1920. Then, when preparations had been made to use this fully, as it was only about 300 feet below the camp, an earthquake produced a fall of rock and the flow almost ceased, only about 40,000 gallons per diem being thereafter available.

As I very often found in the limestone hills, this flow was only a leak through faults, and the streams flowed often at right angles to the nullah beds and emerged sometimes many miles away in the Kabul river valley, if they could be traced at all.

Two distinct stream systems from widely spaced collecting areas were found within 100 yards horizontally and within 20 feet vertically in this valley. Efforts were made to dig down to two streams on one system, but after a few feet in the very solid limestone, which had to be blasted with gelignite all the way, faults were struck and water flowed in such quantities that with the pumps available work could not go on. The second system was attempted by a hole in a shelf of rock, clear of the nullah bed. Unfortunately, at about 25 feet, a fault filled with clay was found, which washed out and started a leak from a stream of the first system, making work extremely slow and making each day's work start with the pumping out of thousands of gallons of water, and then continual pumping through the day, so that the charge holes could be drilled. I regret that I have not heard if my successor has found either the time or the funds to continue this experiment. I have no doubt of the result if the job were completed, and the three wells sunk to stream level, but the engineering difficulties and the danger from storm spates are considerable in this very inaccessible spot.

My only other real attempt at well sinking in this area I fear must be classed as a failure, and, had I then known the attitude of dowsers towards clay beds, I think I should not have made the attempt. Water, as you can imagine, is nearly always expensive on the Frontier, and my failure was an attempt to obtain a supply in the camp itself, for use in a swimming bath and for gardens. The camp is on an alluvial valley-filling of a clayey earth called "put." A careful survey by several dowsers led to a well being started on the intersection of two streams and the depth from the outer indications was about 110 feet.

At 130 feet we had trouble with a small leak from a stream about three yards away from the shaft, but the well had been stopped at about 150 feet when I left, without the main streams having been struck, although the strong indication was still there at the bottom of the well, as it had been the whole way down.

My other dowsing in the Khyber area was limited to advice on well sites or improvements to existing wells, but it is undoubtedly an area in which development will take place. The almost complete deforestation, even down to bushes, has meant a continually decreasing supply from springs and wells, and a steadily rising tribal population, whose domestic supply is pumped by the Military, means continually increasing demands.

One other dowsing job I did was to try almost all visitors to the Brigade Mess in Landi Kotal over a small stream below the Fort lawn. I did not keep a record, but about 50 per cent. could feel a pull on their own, and about three were really good straight away. My method of testing is this: The pupil holds one end of the twig in one hand firmly and correctly. I hold the pupil's other hand and with my disengaged outside hand I touch the other end of the twig. I have only met one case where the pupil was able to prevent the drop of the end of the twig when crossing the stream. I can usually tell by the strength of the reaction whether the pupil will get a pull alone.

In September last year an expedition had to be sent against the Upper Mohmands. This is an area which can only be visited if you have a force with you, so there were only the records of 1897, 1908 and 1919 to go on, and on these occasions the force had used local water supplies in their undeveloped state. It is significant that in 1908, when the force entered the country in the spring, there were many nullahs with water flowing in them, while the autumn expeditions had lived on the village ponds. Boiling and chlorination will not remove the full flavour of these stagnant collections of rain water, and as a modern Brigade will require at least 20,000 gallons per day, the level of even the largest tanks falls quickly.

The base camp of the four-Brigade force was sited, as in 1933, at the highest point on the Gundab nullah, where there was a constant flow of water. This nullah at this point was a steep walled cutting in sandstone, and the springs were rivulets of water appearing through the gravel and boulders of the nullah bed. These rivulets when collected produced about 2,000 gallons per hour. Some other springs also in the nullah bed, which had been adequate in 1933, soon dried up, reflecting the lack of rain earlier in the year. A source used by forward troops in '33 consisted of shallow wells in a wide gravel nullah-filling, but I am of opinion that it was only a standing pool and of not very great capacity. As it would have been most difficult to protect a water point there it was never used.

To return to the camp and force supply. As the plant could not be run at night because of sniping, it would be necessary to procure at least 8,000 gallons an hour. Here is where dowsing came in. Instead of trenching deeply all over the nullah bed filling I was able to locate at once enough suitable sources, that is, leaks from the underground streams below the sandstone floor of the nullah, and with the minimum of digging obtain sufficient for the whole force for the two months. The main streams were never reached, it being sufficient to lessen the head limiting the flow from faults, but a much greater and more

reliable supply could, of course, have been obtained by drilling holes down to the streams.

This one source became and remained the chief supply for the force. I searched every nullah and hillside in the forward areas where I could find signs of springs having existed, but although on several occasions we blasted through solid rock for nearly 20 feet the only trace we found was once or twice a cavity with a trickle of water and wet gravel. These must have been the natural pipes for the flowing springs of the early part of each year. The open valleys were most disappointing. The only existing wells were of small output, and none less than 100 yards deep. Eventually the most forward Brigade was given its 20,000 gallons a day through a pipe line nearly 14,000 yards long, and with a total head over the pass of over 1,100 feet. Other dowers visited the area, but gave little encouragement. A peaceful survey of the area might produce some workable source, but except for the initial saving of time and trouble at the base camp, dowsing did not, I am afraid, produce any really startling results.

The third area which I attempted to investigate was Waziristan. I was presented with an unexpected one month's leave, in place of three I lost the year before, with the proviso that I should return to duty at the end of the month before proceeding home. At the request of the Minister for Agriculture, N.W.F.P., Colonel Noel, and accompanied by him, I spent nearly the whole month touring.

June is *not* the month to water-divine in that area, but I found that I could pick up the indications while riding on a country pony, though I then had to dismount to do the detailed exploration. Many of the places visited had already signs of water, and again these so-called springs could be shown to be only leaks from passing underground streams. In many cases I only had to locate the line of the stream, see that it was not too deep, and mark the most suitable place for the well and karez, or tunnel by which the water, at the least hydraulic slope, could be brought to the surface lower down the surface slope.

Often I was asked to find water in an area where the village women had to go upwards of four miles to get their domestic supply, and it was really surprising to find the number of streams, often verging on the uneconomically deep, which were below these scorched hills and valleys. In one or two cases where there were small damp patches from which a gallon or two could be collected in an hour, the tribesmen were too afraid of losing even this little supply to go wholeheartedly for the underlying stream. On the whole they were interested and believing, and I made a point of always showing one or two how the twig worked by my hand-holding test. A few could get a slight pull on their

own, but I never discovered any tribesman who was naturally a sensitive dowser.

I consider I was fortunate among dowsers in that my job, and the help of some of the N.W.F.P. officials in Waziristan enabled my locations to be tried out quickly. I have not yet heard how many attempted developments have been made, but I have heard of more successes than failures. Failures usually will, I think, be through errors in estimates of depth, or the deceptive small trickle in a hole which has been made by and may occasionally carry a large flow.

One failure may offset a dozen successes, and there is always the sceptic who, seeing a success, asks, "What proof have you that anywhere else in this area would not have been equally good?"

A month in an area of 10,000 square miles like Waziristan only touches on the fringe of the problem. Water is beyond price on occasions, and valuable always. A dowser might map the useful streams in a couple of years' hard work. In the small patches in which I gave the meagre total of 39 locations I can only hope for enough successes to enlist the interest and approval of the tribesmen so that they will clamour for more. The political officers will be really responsible for this result because they spared no trouble to ensure success of what I know some of them thought to be a *most* peculiar business.

The Frontier Province, suffering more and more from the evil effects of deforestation, will have to develop its underground sources to compensate, and apart from anything else, an assured water supply, even if it is only enough for domestic purposes, is a pacifying factor of considerable importance.

Elsewhere in India there are water problems of no less importance. The Punjab, partially due to over-irrigation, is suffering from sour areas, and areas in which the well water is too salt even for irrigation.

Many new wells recently sunk, and sometimes within a few hundred yards of a sweet well, have had to be abandoned. The location and mapping of these sweet and salt areas would save many thousands of rupees annually to government and the landowners, and would enable the water table to be lowered by pumping from sweet areas back into the canals. No one but a dowser can help here, as even test bores are an expensive luxury.