

and during this time water was obtained mainly from cisterns, as before. But the animals were dependent on only one well, which was so crowded before we installed a petrol-driven pump and storage, that it required sometimes a whole day to make the trip to water the transport animals. Then the well very suddenly ceased to yield at its former rate, and it was foreseen that before long all these smaller supplies would be exhausted, so it was decided that we should turn to the large springs. Moreover, it was important that the cisterns should be sealed up to prevent the breeding of malarial mosquitoes.

Accordingly, it was decided to utilize Ain Zerka as a supply for practically the whole division, the water to be delivered to the high ground in the rear areas where the transport lines were situated. Levels were taken and it was



INTAKE, AIN ED DILBE AND WADI REIYA SPRINGS
WATER SUPPLY

found that the lowest point on the pipe line would be 224 ft. below Ain Zerka, the highest point 57 ft. above, and the main delivery point 2 ft. below, so 4-in. pipe was ordered, also two pumps and two engines. The pumps were capable of delivering 3,000 gallons per hour to a height of 300 ft.

The pipe was delivered by motor lorry from railhead to suitable points as near as possible to the proposed line. It was then carried by infantry working parties to position and was laid by parties of sappers. In order to complete the work as rapidly as possible, pipe-laying was carried on simultaneously by several parties. When parties working towards each other met, in order to connect up an expansion joint would be put in. Allowance was made at the summit for the escape of air which might collect in the pipe, also provision was made at two points where it was thought branch lines might possibly be required later.

Yield of Springs Decreased

Measurements of the springs were taken from time to time, and the yield began to decrease at an alarming rate, though there still remained enough of the original 30,000 gallons per hour to supply the pumps, which delivered 3,410 gallons per hour to Lubban. However, levels and measurements of quantities of the springs in Wadi Reiya were taken, and it was found the main group of springs could be collected at a point 123 ft. above Ain Zerka, or 125 ft. above the Lubban water point. Theoretically, more water would be delivered by gravity from these springs than the 3,410 gallons per hour being delivered by the pumps. When, later, this was put in operation, it was found that 3,750 gallons per hour were supplied by gravity.

The Wadi Reiya springs were some distance from Ain Zerka; they also seemed at first sight very difficult to collect into a pipe line, as they consisted of a great number of small springs coming from a considerable length of the high bank of the wadi. They were, however, divisible into four main groups, called Ain El Liktan, Ain Ed Dilbe, Ain Alam and an unnamed group situated so much lower down that it was decided not to utilize same until necessary.

At considerable distances—in other wadis, etc.—there were fourteen other small springs of which weekly measurements were made so that data would be obtainable if it had been necessary to extend the pipe line at a later date.

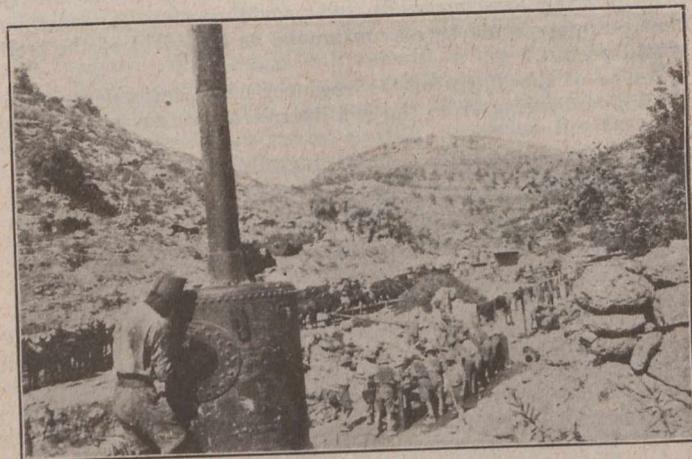
Ain El Liktan, a separate spring giving about 450 gallons per hour, was easily collected from the small cave in which it formed a pool, by damming up the outlet of the cave and installing a 2-in. pipe. This 2-in. pipe line supplied a fanati filling point and the camp of my half company of Indian sappers and miners; after the manner of all engineers I was not bashful about having the luxury of a tapped water supply in the camp. The 2-in. line then joined the end of the 4-in. main at the point where it took off at right angles from the wadi bottom up to Ain Ed Dilbe.

Ain Ed Dilbe was the collection of the water from hundreds of trickling springs from a high wall of rock. The water was collected by a long concrete trough built along the base of the rock wall, and was run by three pipes into a large intake in the form of a concrete tank about 4 ft. 6 ins. square and 3 ft. deep, which acted as a surge tank and was provided with an overflow.

Construction of Plunge Pool

Near at hand was Ain Alam, where the water was collected into a shallow V-shaped concrete basin. The overflow at Ain Ed Dilbe was made about 1 ft. lower than the pipe taking off from Ain Alam, and was also lower than Ain El Liktan, so that all the overflow of surplus water was at Ain Ed Dilbe. This overflow was used to fill to plunge pool in the wadi bottom. This pool was formed by building a stone and mud dam, faced with cement mortar, across the water course in the wadi bottom. At this point the water course was about 30 ft. wide, with vertical banks 9 ft. high. We thus had a splendid swimming pool, with about 7 ft. of water at the deep end, and 120 ft. long. The pool was provided with an overflow and could also be drained from the bottom into another pool, about 4 ft. deep, for non-swimmers.

Alongside the plunge pool was a row of twelve shower baths, having a concrete floor, the water being supplied



AIN ZERKA—IN FOREGROUND, DELOUSING BOILER; IN REAR,
AT LEFT, TROUGHS FOR MULES; AT RIGHT,
WASH TABLES FOR TROOPS

through a 2-in. pipe taken off the 4-in. main. For the concrete work, cement was brought up by mules. Good deposits of sand and gravel were found close at hand, further up the wadi bed. Bathing hours were allotted to units, certain days being set aside for British troops and certain days for Indian troops. Every man was required to hand in his soiled clothing and to bathe under the showers before using the plunge pool. After bathing he was issued clean clothing. The soiled clothes were sent to Ludd to be laundered by Arab washwomen.

A short distance down the wadi, there were other springs, the largest of which was used as a supply for a 2-in. pipe line which delivered water to wash tables and tubs for