

directions by compass bearings. The trouble thus taken was amply repaid when the more complete survey was made, as it afforded great facilities in recognizing the different features of the country.

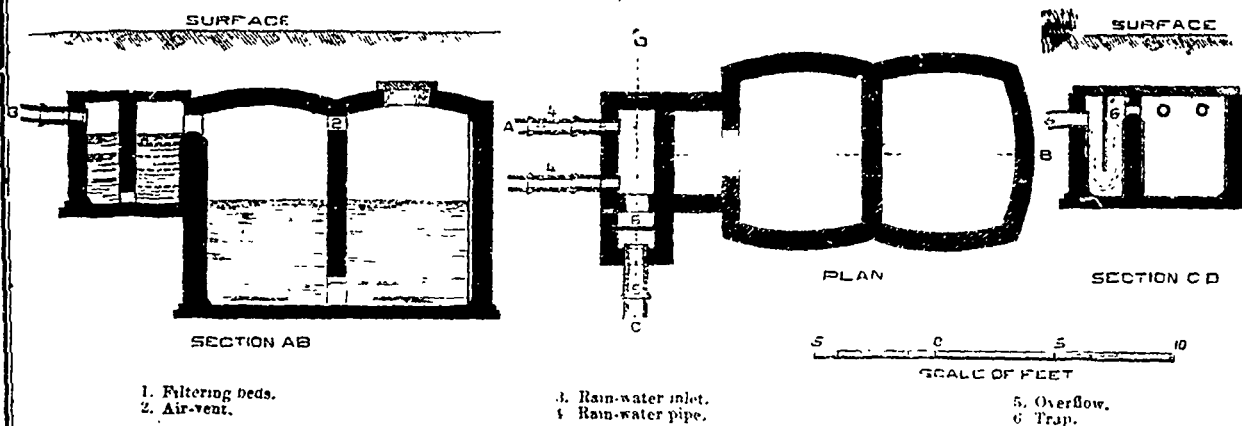
At the oasis of Abou-Halfa, in mid-desert the third division was left behind, whilst the fourth and last division proceeded onwards towards the extreme end of the line at Metemneh on the river Nile.

We may now indicate briefly the proposed direction of the route to be taken by the Soudan Railway after it has crossed the Nile at Kohé. The river at the place as we have seen, takes a very remarkable bend and as there are no obstacles in the way the line quits the river after crossing it, and goes direct across the desert to Fakir Bender, saving a length of at least 25 miles as compared with the alternative of following the river bank. After crossing at Kohé the line passes over an alluvial plain about five-eighths of a mile in breadth, and then for a distance of three miles and three quarters, follows the course of a Wady. This differs from the camel track, which by reason of its rough and frequent ascents and descents over the broken ground between the Nile valley and the desert plateau, is rendered unsuited for railway purposes. After arriving at the level of the plains, about 147 feet above the river bank at Kohé, a series of flat sandy plains are crossed until the 284th mile from Wady Halfa is reached. After this point the ground becomes more difficult, and broken up with basaltic rocks, and occasional detours are advisable to avoid costly cutting before the line reaches Fakir Bender, where there will be a small station. The line then skirts the river

Old Dongola, at one time the capital of the district of Dongola, and now containing 1000 inhabitants. Between Handak and Old Dongola there are thirteen villages with a total population of 2700. For the next 7 or 8 miles the soil is alluvial and thickly covered with desert vegetation, through which the line passes, then crossing to the town of Abou Goosi (1000 inhabitants), it strikes into the desert. At Dubbe a station will be provided, Dubbe being a place of some little importance, as it is one of the chief points of departure for caravans going to Khartoum, Khordofan, and other districts. The navigation between Halfa and Dubbe is practicable throughout the year.

Through a distance of 40 miles beyond Dubbe the line passes over an alluvial tract covered in many places with desert shrubs and coarse grass, and goes forward to Ambukol, an intermediate station being provided for the accommodation of five villages, having a population of 3500. At Ambukol the second section of the line terminates. This length is one-third longer than that between Wady Halfa and Kohé but the works are much less extensive, the embankment containing little more than one half, and the cuttings less than one-third of those on the preceding section. Of the cuttings 79 per cent are in light material, 10 per cent in soft rock, 2 per cent in hard rock and 9 per cent in rock of a medium quality. The culverts, too, are insignificant in number and extent. The curves and gradients are favourable throughout, for although the ruling gradient is occasionally necessary, it occurs only in short lengths.

(To be continued.)



RAIN-WATER TANKS.

bank as far as the village of Sarr, 193 miles from Wady Halfa, the works being easy with the exception of three large Wadys which have to be crossed.

Shortly after the railway leaves the river bank, and crosses the desert direct to Hamby a village on the Nile, where the series of rapids extending up the river from Wady Halfa, and the granite rocks on the western bank terminate. The railway will then proceed at an average distance of about five-eighths of a mile from the bank in order to avoid the cultivated ground, of which there is a considerable extent, passing twelve villages whose aggregate population is about 3000. For the accommodation of these villages a station is to be erected. At about the 350th mile from Wady Halfa, New Dongola is reached, but in order to avoid interference with the bank of the river the line is carried to the west side of the town where a flat plain offers a favourable site for a station. Seventeen miles further the village of Satali is reached; a market is held at this place, and its ruins indicate that at some previous time it must have been a town of considerable importance. A present, however, it has only a population of 300. For another 30 miles the line follows the river bank, leaving it only to avoid the strips of alluvial soil which overlie the lower Nubian sandstone; it then leaves the Nile, passing through an open desert, and near two villages containing about 750 inhabitants. A station will be provided at the important town of Handak, of which sketches are given on page 134. And about 35 miles further there will be a station at

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The above sketch of rain-water tanks, which explains itself is by a correspondent of *The Builder*. We reproduce it, thinking it may be of service to some of our readers.

FIRE DETECTORS—An experimental display of some of Professor Grechi's instruments for signalling the commencement of fires in any room, or in interspaces difficult of access, has been made in one of the corridors adjoining the Machinery Court at the International Exhibition at South Kensington. Small straw fires, inflamed with petroleum, were ignited, when the instruments caused the alarm-bells to ring, and notified the particular locality by the fall of a numbered disc. A lantern was also lighted in one compartment by the falling of a small weight upon glass globules of sulphuric acid. The principle of the apparatus is this: a double spiral of zinc and platinum is soldered to a disc carrying an index and a small wire contact-maker. When the spiral expands by the heat the contact-maker is turned by the motion of the spiral, thus putting in action a current from an electrical battery, by which the alarm-bells and signal apparatus are put in action. The instruments are very roughly made, and cost about 2s a piece.