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SUBTERRANEAN EROSION IN CLAY

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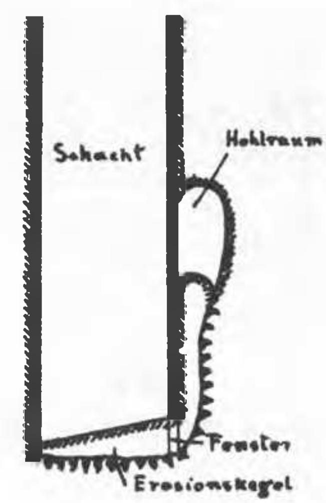
The mechanics of subterranean erosion in quicksand are well-known and have already been described, 2) whereby it was shown that in the case of underground water springs the individual grains of sand are washed away so that subterranean cavities are formed in retrogressive direction. However, analogous effects take place occasionally in clay, i.e. whenever the clay by nature contains fissures or this becomes the case as the result of some previous influence as e.g. lowering of the ground in mining sites, landslides, or building work. In such cases the originally coherent clay layers may dissolve into a mass of small clay cubes without any coherence, within which erosion is possible, which takes place in a manner similar to that in the case of quicksand.

When sinking a shaft in the coal district of Moravska Ostrava a layer of meagre clay 380 m thick was to be penetrated, within which there were very thin layers of sand and "mo". As soon as a depth of about 80 m was reached, the ring of the shaft was not closed but a crevasse was left open in order to house a pump. When the next ring was being excavated, the walling of the shaft gave way towards the interior, and a pulpy mass of clay oozed slowly from the window, until the bottom of the shaft was filled up to the upper edge of the window. In the course of this process the individual clay cubes were severed from the wall and after they had fallen to the ground it was possible to see the reflection of the water on the walls, which slowly trickled down the walls. The hollow formed behind the walling of the shaft began to move in an upward direction along the walling, after the process had been completed by filling up the window, so that when closed by injection of cement it was located by means of drilling apertures through the walling and was located in a height of 15 to 20 m above the upper edge of the window. (See illustration).



Such erosions are found also at the foot of clay layers formed as the result of a slide, in which case mostly springs emerge having considerable hydraulic gradients, which may lead to the formation of hollows if the deposits of eroded material is continually removed as e.g. by a river.

REFERENCES

1) Bernatzik: Baugrund und Physik, Zürich 1947
2) Bernatzik: Beitrag zut Frage der unterirdischen Erosion im Sand Deutsche Wasserw. 1938 H. 4.

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FILTER WELLS AND DUPUIT'S FORMULA

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SUMMARY OF THE FRENCH REPORT

The calculation of the flow of a filter-well is very easy if Dupuit's formula is used. The latter gives very precise results in the case of captive groundwater; in the case of ordinary groundwater however, the results are only approximate. As this approximation is not very well known, several authors like MUSKAT, VIBERT and JAEGER have written against the use of this formula.

The methods they advocate are much more complicated and this prevents them from being used in the calculations aimed at lowering the water table by means of several filter-wells, whereas Dupuit's method remains still easily applicable. There only remains to determine the conditions under which it can be applied, taking as starting point pumping from a single well-point.

It is possible to establish this latter formula, assuming the free surface of the water-table to be horizontal, that is to say a groundwater with no run-off.

The potential theory gives us a definite right to apply this formula when the water-