38236

CO533/498
KENYA

38236

WATER BORING

Previous

1935

Subsequent

297 [illegible]/38

309 13/4

Mr Parkin 18/4

Sir F. Stockdale 23/5

Mr Parkin [illegible]

297 7/7

Sir F Stockdale 9/7

Mr Parkin 11/7

303 /

R498. 20/7

R.297. ✓

9

WATER BORING

suggests that the boring plants [illegible]
put back into commission.
(Orig.regd.on 46503/39/37 R.A.)

The corres. regarding the disposal of Kenya's Waterboring equipment is on 38236/35 Kenya. I don't think that there is anything to be done.

(SGD.) C.A.GROSSMITH.
5.4.38.

This might be brought up to Sir Frank Stockdale for any observations he may wish to offer when he gets back next month.

(SGD.) H.TEMPANY.
6.4.38.

It seems a pity to leave £10,000 worth of waterboring material lying wasting in Kenya when Kenya is very short of water. It is none of my business but I hope that it may be possible to say something to Kenya on the point. Sir Frank Stockdale will no doubt know the facts.

(SGD.) E.E.EASTWOOD.
7.4.38

I have not been able to find out very much about the Waterboring equipment. In the enclosure to No 4 on 23246/34, which gives a full account of the waterboring operations between 1926 - 1932, the value of the plant at the time that operations ceased was assessed at £30,639 "on a basis of 10% pa. depreciation". Depreciation at the same rate for the subsequent six years amounts to £18,374 (about), leaving £12,265 representing the present value of the

much, however, since the 60% depreciation was probably based on the assumption that the plant was in full use (i.e. the figure covered wear and tear as well as mere obsolescence) which it has not been in the past six years. Some of the boring units were hired out to farmers (see Mr Grosvenor's minute of 12/12/35 on 38236/36) and some of the units have also been used, it is to be supposed, in connexion with the C.D.F. scheme for improving native water supplies in native areas (see para 3 of No 1 on 38236/1/36). This scheme is referred to on p 98 of Sir F. Stockdale's Report on his visit to E.A. Further, the whole of the equipment has been up for sale since 1936 (see on 38236/36), and the CA have informed me that part of it has recently been sold, namely two of the 'lots' of tools etc, & the back acting trencher referred to in the ends to (1) on 38236/36. This, however, leaves the ten boring units still on the hands of the Govt, and the CA think, from the inf. in their possession, that the equipment is still virtually complete.

? The file should go to Sir F. Stockdale to await his return.

Clothier Mitchell 18/4

The Govt of Kenya is fully alive to the desirability of increasing water supplies in the colony where possible & D, in para 3 of No 1 on 38236/1/36, mentioned that his plant was lying idle for [illegible] funds. It would therefore seem to be superfluous to draw their attention to the matter. If anything is said, it should, I think be no more than a s.o. letter from Sir F. Stockdale (if he likes it described) to the Director of Agriculture.

J.J. Paris
18/4

I am afraid that I do not know the full particulars about the boring plants in Kenya and I propose to write semi-officially on the lines of the attached draft if you approve.

The comments made by Sir Alan Pim and Mr. Milligan, on pages 67 and 68 in their excellent report on Northern Rhodesia, on the failure of the efforts there to improve water supplies, seem to justify an enquiry as to the position in Kenya. The Northern Rhodesia Commission record some very hard facts in respect of some of the panic decisions taken during the depression period in that dependency. The same may be true in Kenya.

F.R. Stockdale
23.5.38

24/8
2. To H.B. Watkins (Dr.) cons. 26th May, 38.

3 H.B. Waters. s/o. (Kenya) — 28.6.38.
Explains present position regarding water boring plant.

Information is given in the reply from Kenya. The Govt. plant is old and now somewhat out of date and therefore it does not seem to be desirable to ask that the machines now lying idle should be brought into commission again.

I would propose to ask with thanks for their report that the file be put by. Do you agree?

[signature]
9/7.

I agree. (I doubt whether the machines are worth as much as £400 apiece now).

[signature]
11/7/38
at once

To Waters (Band). 28 JUL 1938

JESTROYED UNDER STATUTE

DEPARTMENT OF AGRICULTURE,
P.O. Box 338,
Nairobi,
Kenya.

When Replying Please Quote

No WATER/2/25
28th June, 1958.

Dear Sir Frank,

Stronach, the Director of Public Works, informs me that the £10,000 granted from the Colonial Development Fund is for improvement and investigation of water supplies in Native areas. It is being used not only for dams but also for wells, pipelines, boreholes etc.

The Public Works Department have had 14 water boring plants altogether; one was sold to the Uganda Government, one to Teita Concessions Ltd., leaving 12. Two of these machines are on hire to contractors, one of which is now working on Captain F.O'B.Wilson's farm in the Machakos District and the other is in Tanganyika. This leaves 10 in store, of which one is always ready for immediate issue if needed. As the machines are now ten to twelve years old most of them really want rebuilding in order to put them in commission. As you know, these drills are Star 25 Percussion Drills, 1000 ft. rated capacity and the present worth of the machines is about £400 each. They are still for sale, except for four machines (two steam and two paraffin).

In 1957/58 two boreholes were drilled by the Public Works Department at Eastleigh, Nairobi, for the Royal Airm Force.

The Public Works Department are unable to use any of the machines at present because, since February 1958, they have had no driller available.

A drilling company is operating in East Africa called the Craelius East African Drilling Co., Ltd., and this Company is at present boring under contract for the Public Works Department at Emali in the Masai Reserve. This Company uses a modern handier machine weighing about 2 tons (bare weight) as against 6 tons (bare weight) for a Star 25. I enclose a pamphlet prepared by this Company.

Yours sincerely,

J.B.Waters

Sir Frank Stockdale, K.C.M.G., C.B.E.,
Carlton House (East Block),
Tothill Street,
LONDON. S.W.1.

THE WATER PROBLEMS

of the

KENYA STOCK FARMER

Published by

Craelius East African Drilling Co., Ltd.

Drilling Superintendent,
P.O. Box 53,
KAKAMEGA.

Registered Offices,
The Corner House,
Hardinge Street,
NAIROBI.

THE WATER PROBLEMS OF THE KENYA STOCK FARMER

The Kenya livestock farmer holds large tracts of land at an annual rental which makes an appreciable inroad into his hard-earned profits, if any. The comparatively poor quality of the grazing as compared with countries enjoying a more temperate climate does not allow him to concentrate his cattle to the same extent that is possible, for instance, in England. As every part of this land cannot be expected to be within easy reach of a river or some other water source, his cattle when grazed on the drier portions of the land will have to travel considerable distances every day for water. Other alternatives are to give up such land or leave it unused, which latter course is an obvious waste of money. Quite possibly the cattle will be in good training after such daily exercise. However we do not think the farmer aims merely at maintaining the existence of his animals and the breeding of a strong athletic type, but is more interested in the production of beef and milk. It is unreasonable to expect an animal to put on marketable weight or give a useful supply of milk if it has to tramp over great distances every day, more especially in the heat of the tropical sun.

We take for granted that the cattle farmer wants to make full use of his land and comes to the conclusion that water will have to be provided for the drier portions. As there are no streams, he will look for a likely place to put a dam or dig a well. He will now be thoroughly interested in the possibilities of underground supply and will feel strongly tempted to get hold of a water diviner, preferably free of charge. We should therefore at once like to repeat the words of the Director of Irrigation of South Africa in his report to the Kenya Government after a six months' tour of Kenya: "I cannot leave this "subject without a brief reference to the art of 'dowsing' as in any "part of the world have I found such universal faith in the water diviner "or 'dowser' as in Kenya. Without entering into a long controversy "on this subject, I shall content myself with saying baldly that I have "no faith whatever in the possibilities of locating underground supplies "by means of a divining rod." Truly strong words in an official report to a Government! In this connexion it is of interest to note that the King's English Dictionary defines "diviner" as "one that *pretends* to reveal secret things by supernatural means."

To obtain water, there are several methods at the farmer's disposal:

1. Dams.
2. Wells.
3. Pipe lines from rivers or springs.
4. Bore holes.

DAMS.

Small dams are not expensive to build and may temporarily serve a useful purpose. Large dams are very costly if made with any idea of permanence, whether made of the material to hand or of concrete. The latter course is usually prohibitive and out of the question.

Dams as a whole have certain drawbacks:—

(a) It is not always possible to find a suitable place to build a dam.

(b) If built across streams, whether these are permanent or only flow in the rains, the dams are liable to be washed away by floods in the torrential rains that usually fall in this country. We know of unfortunate farmers who at great sacrifice and with much personal work have constructed dams only to have them washed away almost immediately after completion or even before they have been finished. After such an experience he cannot for a long time afford to think of embarking on further schemes for conserving water, with subsequent detrimental effect to his farming.

(c) If the dam is small it is liable to dry up when most desperately needed, i.e., in a prolonged drought.

(d) Dams are of necessity surrounded by banks, down which the cattle trek, causing soil erosion, which has an unfortunate tendency to spread. In passing, we should mention that this increases the rate at which the dam will silt up.

(e) It is very difficult to prevent the water in the dam, unless exceptionally large, from sooner or later becoming FILTHY, and a spreader of disease among the animals. This again is aggravated by the dam's attraction to game. If the dam conserves water from a stream, and the farmer takes all possible precautions for keeping such a dam clean, he is still left vulnerable to pollution of the water outside his land.

NOW, would any European in his right senses, drink raw water from such a source? DEFINITELY NO! Then why expect his cattle, with more delicate intestines than himself, to thrive on it. What is the use of importing high grade stock, building cattle dips, fencing the land to keep out disease-carrying game and in every other way watching over the health of his livestock, only to expose it to such hazards? A well-known cattle authority writes: "We know that about half of the total liveweight of an ox consists of water, and that it is essential for healthy living that an adequate quantity of water should be taken regularly by cattle not only to aid the processes of mastication, digestion, absorption and assimilation of the food eaten, but also to flush out the intestines and cool down the system by evaporation from the lungs and pores of the skin." In other words, a very intimate action by a large quantity of water every day. Under such conditions impure water is bound to have a noticeable effect.

Even the cattle itself instinctively realizes this. To give an illustration: Villa Franca Dairy Farm, outside Nairobi, recently put down a bore hole, with excellent results. The owner, Mr. Destro, now tells us that after installing suitable drinking arrangements, the cattle will graze on the banks of the river, where before they used to drink, without touching the river water, and will automatically trek to the new watering post without any inducement. Mr. Destro finds that he can already see a great improvement in his animals. In this connexion

we wish to draw attention to a recent statement by His Excellency the Governor to the effect that the future of farming in this country lay in the production of quality produce.

WELLS

If good supplies can be obtained from reasonably deep wells, this is by far the cheapest and best way and thoroughly to be recommended where possible. However the digging of wells meet with certain difficulties:—

(a) In soft material and at depths of over 30 feet, it becomes necessary, if only for the safety of the workers sinking the well, to line the well, and this is a difficult and expensive matter. With bore holes it is an easy matter to sink a casing.

(b) Once water is struck it is very difficult to sink the well deep enough in the water, whereas water in a bore hole gives little difficulty.

(c) If the overburden is deep and of such a nature that water is likely to be present it is probably necessary to dig to the bottom of this before water is obtained and the difficulties under (a) will be met with.

(d) If the overburden is light, rock will be met with at an early stage and there is little hope that water will be met with before penetrating the rock. This means shaft sinking by blasting, an expensive and highly dangerous occupation requiring experts. In such cases a bore hole will be far cheaper.

(e) From the above it appears that the location of a suitable site for digging a well is a very difficult matter and gives promise of much wasted money on unsuccessful attempts. A bore hole on the other hand is capable of going far deeper to penetrate water bearing strata or crossing water bearing cracks in the rock, and when carefully chosen is almost sure of success.

PIPE LINES FROM RIVERS OR SPRINGS

Pipe lines from a permanent river is a safe and sure way of securing water for distant portions of the farm. However, it is not always possible to gravitate the water and a ram or pump will have to be installed. The cost of laying down a pipe line is no small matter, and in the case of portions of the farm where water is wanted, it is bound to be long, often several miles. We can safely say that in these circumstances it will exceed the cost of a bore hole. In addition, pipes do not last for ever. If the river from which the water is obtained is small, trouble is likely to arise over "water rights," and at the end of it all one certainly has water, but is still left with the same problems of Hygiene as with Dams.

Pipe lines from springs, though often expensive, do not meet with many of these objections and may be said to be an ideal solution if the spring is strong enough. Unfortunately springs do not always place themselves where they are wanted and as a rule do not give off such-

cient water. The usual method in Kenya seems to be to open an enormously wide excavation round the spring, without any appreciable increase in the supply. Such foul holes are a danger to the health of human beings and stock. In these cases shallow wells should be sunk, to deepen and strengthen the existing supply. The well should be lined and the lining carried above ground level and be covered in. In addition cattle should not be watered direct from the well but some distance away, so that their droppings will not drain into it.

In our opinion the chief uses of wells are:—

1. To deepen and strengthen existing weak springs,
2. To draw off water running below the surface in the sandy beds of dry rivers. As such rivers sometimes are liable to annual floods, this will in some cases mean redigging the well every year.

So far we have dealt with the water problem on the assumption that part of the farm is served by a river and that this part therefore does not need extra measures for conserving or obtaining water. However most rivers in this country are wholly unsatisfactory for supplying drinking water to high grade stock, even if it is clear and fast running. We have knowledge of one farmer, whose cattle were constantly catching measles—we believe a serious illness in cattle—and he decided to separate his healthy animals and enclose them in a specially disinfected paddock with good grazing. To his great consternation even these animals caught the infection. Through the paddock there ran a stream, from which these animals used to drink, but as neither cattle nor natives were allowed near it on his land, which stretched for a considerable distance up-stream to the edge of a forest, he found it difficult to believe the stream to carry the infection. However as no other cause was apparent he decided to examine the river and followed its course for several miles up stream, where he found some natives living nearby. On examination it was found that the natives had measles and thus were the source of infection. Now how can a farmer protect himself against this sort of thing? To be completely safeguarded then it is necessary that water is obtained from a pure and uncontaminable source and the only method that fulfills these demands is by water from bore holes.

BORE HOLES

We have seen how it is important for the maintenance of high grade stock that pure water is available within a reasonable distance from the grazing ground. Water from dams and rivers is unsafe and the digging of wells meets with certain difficulties. None of these objections apply to bore holes.

Objections are made to bore holes on account of their expense and we will therefore hasten to point out that a properly executed bore hole is permanent and requires no up-keep. The first cost may appear high, but is often less than the cost of a long pipe line or large dam. As a bore hole is permanent it may be depreciated over a number of years and will thus work out cheaper in the long run.

The supply from a bore hole is pure and steady; moreover as it is protected it cannot be polluted. It is not subject to "water rights" and the supply is completely under control and can be prevented from being an attraction to game.

Considering the importance of a good water supply to the general standard of livestock and the prosperity of the country it is regrettable to note that fewer than 200 holes have so far been sunk in Kenya as compared with 16,000 holes in the Union of South Africa, where it is stated "that the occupancy of the vast spaces of South Africa, and their closer settlement have been made possible principally through the agency of the boring machine, and that more has been achieved towards the general development of the country from the comparatively few thousands of pounds spent annually upon State boring than from all the millions expended on large diversions and storage schemes."

There is no doubt that the value of a farm is greatly enhanced by a number of bore holes with a good clean supply of water, and we are sure the farmer will agree that such bore holes are eminently desirable. However as this is a capital expenditure of some consequence, the farmer will naturally look for some assurance that water really will be obtained. We are therefore often asked if we are prepared to bore on the basis of "no water, no pay." Our attitude may best be illustrated by asking: If your neighbour bores for water and is unsuccessful, are you prepared to help him pay the cost? Anybody undertaking contracts on this basis will naturally have to spread his losses over his successes. In effect this means that the farmer who is successful will be paying for his less fortunate neighbour. As this neighbour is not in any way prepared to let him share in his increased prosperity, should he also be successful, this would be a pretty poor bargain.

However every possible care is taken to ensure success, and it must be remembered that as a commercial firm, we have to rely on the confidence of the Public and cannot therefore afford to leave anything to chance. Of the 400,000—500,000 feet of boring done by the organization of which we are a part, only 1% have been failures.

As the land belongs to our Clients and not to us, we do not think it an unreasonable demand to ask him to bear this slight risk, especially in view of the considerable increase in the value of his land which will result, and in which we do not propose to share.

OCCURRENCE OF UNDERGROUND WATER

Procuring of water has been a problem from early times right up to the present day and advanced thinkers have from time to time devoted their attention to the apparent relation between geological structure and the presence of water in rock.

Water quantity and the depths at which it is found vary considerably from hole to hole. A few bore holes have been failures, though whether a hole may be termed a failure or not depends on requirements. The requirements of a cattle farmer with a herd of 500 is about 6,000 gallons per day. To prevent overgrazing a greater concentration of

cattle round one bore hole is not to be recommended. These requirements are comparatively modest and easy to fulfil in a country which, when all is said and done, has a fairly high annual rainfall.

The factor that more than others governs the occurrence of underground water, is the nature of the underlying rock formation.

It has been found that more than half the rainfall over a district evaporates, whereas the rest finds its way by various means to the sea. The greater portion drains off along the surface in streams and rivers, but great quantities make use of the porosity of the ground and travel for longer or shorter distances underground. This water avails itself of every possible passage when travelling underground, such as: the fine space between mineral grains, cavities, cracks in the rock, etc. Underground water, like water travelling on the surface, obeys the laws of gravity and follows a general slope towards the sea.

The underground water table is found at greater or lesser depths from the surface but follows in the main the general slope of the land. Underground water travels slowly and in medium coarse sandstone has a flow of little over three feet per day—that is, about a quarter of a mile per year. In more porous material such as sand and gravel the rate of flow is naturally greater, while in impervious sediments such as clay and in rock like basalt and argillaceous schists (clay slates) it is practically non-existent. This is the main reason for some bore holes and wells being free of water. As a rule, rocks being more compact and tight than loose and not yet compressed alluvial deposits, do not let water through so readily. However cracks will make practically all kinds of rock capable of transmitting water. Such cracks occur commonly in rock and spread in all directions. These cracks are rarely vertical but instead lie more or less at an angle, there is therefore little possibility that they should be missed by a bore hole. It is due to their irregular appearance that underground water is found at such varying depths, as, if one is unfortunate, it is possible to bore to some depth before crossing any cracks. Water obtained from such water bearing cracks at depth will however rise to the general underground water table, as water always finds it own level.

Examination of boring results gives a good idea of the important relation between geological structure and the presence of water in rock, and we have here a useful guide in the carefully compiled records of boring already carried out in this country, and elsewhere. For instance, in some places the originally exposed rock is covered by younger sediments. When these sediments take the form of sandstones it is possible to reckon with a good supply. It has been found that not only the sandstones themselves but to a much greater degree the underlying rock is the prime water carrier and that the quantities are considerable whether the rock is gneiss or granite. This great perviousness to water is due to the original rock having been subjected to erosion in pre-Cambrian time. At that time there was no vegetation to protect the rock against sun, rain and wind and weathering has therefore had full play on the exposed rock surface. Cambrian sediments

unless disturbed by later upheavals, rest almost universally on such weathered rock. As has been seen, water drains very slowly underground, and as in the course of finding its own level it will penetrate, and fill up cracks and crevices, seep through weathered rock, etc., there will be a wide-spread and almost inexhaustible underground reservoir. The rate of flow into the bore hole depends on the size of the cracks and to what extent the underground strata is pervious to water. The object of the geologist looking for water is therefore to avoid places where the rock is unlikely to contain cracks or where one may expect argillaceous sediments and look for contact planes between different formations or strata that are known to be favourable to water conductivity. Much of this may be interpreted by a survey of the land and the correct reading of its geological history from the general topography. It is therefore obvious that the hocus pocus of looking for imaginary water veins by the mysterious power of a twig is utter nonsense. That divining for water often meets with success is due to the simple explanation that water is of such general occurrence underground.

There is, however, one scientific method by which the presence or not of underground water may definitely be determined and that is by Electrical Prospecting. The correct interpretation of the electric impulses under this method requires experienced engineers and it must not be confused with the use of the Galvanometer, which has a very limited usefulness.

It is impossible here to go into details of all the different kinds of formation found in this country and their relation to water, the above will give a general outline of how underground water as a rule occurs. (We are always ready to give advice and welcome all enquiries.)

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NAIROBI.

38234/38 Kenya 2

S.O. for Sir F. Stockdale's signature

C. O.

Mr. Stockdale 23/5
Mr. Perkins (Comm'l) 23/5 24/5
Mr. Stockdale 25/5/38
Sir H. Moore.
Sir G. Tomlinson.
Sir C. Bottomley.
Sir J. Shuckburgh.
Permt. U.S. of S. 1/1/36
Parly. U.S. of S.
Secretary of State.

DRAFT.

H.B.WATERS, ESQ.,
Department of Agriculture,
P.O.Box No.338,
Nairobi,
Kenya.

Caxton House (East Block),
Tothill Street, S.W.1.
26th May 1938.

Dear Waters,

It has been brought to my notice that it might be advisable, in connexion with the improvement of conditions in the Native Reserves in Kenya, to bring back into commission the water boring plants which are possessed by the Kenya Government.

It was recorded in the Kenya despatch of August 14th 1936 when an application was made to the Colonial Development Fund for assistance towards the improvement of water supplies in native areas, that the boring plants were idle on account of lack of funds. The Colonial Development Fund provided funds for the development of dams and this method of providing water in the Reserves is undoubtedly the first which should receive consideration. There are

FURTHER ACTION.

are, however, areas where the construction of dams may not be practicable and where boring might seem to be desirable.

I believe that the Kenya Government decided at one time to sell off its water boring plants, but whether this was done is not known by us here. Could you ascertain the present position from the Public Works Department and let me know how matters stand at the present time? I would also be glad if you could inform me whether there seems to be any case of any of the water-boring plants, assuming that they are still available, being put into recommission in the near future.

Yours sincerely,

(Signed) F. A. STOCKDALE

(Original regd. in 46502/39/37 E.A.)

/12

Kenlawn,
Portmore Park Road,
Weybridge,
Surrey.

23rd Oct. 1937.

My dear Stockdale,

I suppose you will soon be back again from your travels, and I wish sincerely to congratulate you on your E.A. Report.

It is a masterly piece of work full of valuable advice. I think too that it is remarkable that you were able in so short a time to cover so much "ground" and so thoroughly.

Without detracting in the slightest from the comprehensive character of the report may I suggest that in connection with the improvement of water supplies - related also to the question of soil erosion - that the boring plants of the Kenya Government should be put back into commission. There were, I think, 6 or 7 of them, and they were laid aside when the depression arose as funds were not available from Settler sources and Native Funds to keep them going profitably. It is really too much to expect that a service of this kind which confers great benefits of a direct as well as a recurrent nature whose value can hardly be assessed should immediately "pay its way". Boring plants of course take a good deal of management and skilful judgment has to be exercised in the choice of sites for the bore-holes. Their use has contributed greatly to the development of South Africa and Rhodesia and I am of opinion that their use would be of inestimable value to East Africa.

Just

Sir Frank Stockdale, K.C.M.G.,
2, Richmond Terrace,

Just one more point - I had hoped that perhaps you would have recommended the erection of new Agric. Labs. for Kenya - which are badly needed, and the assignment of the Scott Agric. as a Central Coffee Exp. Station. The "Coffee Team" or Coffee Division as it might more appropriately be called should have its own station at which its work could be centred.

With kind regards,

Yours sincerely,

(Sgd.) Alex. Holm.