Fig. 7.—Case II; biliary cirrhosis; *a*, remains of lobule replaced by connective tissue; *b*, lobules infiltrated with fine connective tissue and cells becoming atrophied; *c*, more healthy lobule, but even in this one there is fine connective tissue between the cells; *d*, vessel compressed by contracting new growth. A Zeiss oc. 3.

REFERENCES.

¹ American Edition. ² Vol. xxxviii, p. 124. ³ See again Cornil and Ranvier, p. 545; and cases by Dr. Symonds (*Path. Soc. Trans.*, vol. xxxvii), and Dr. Penrose, *ibid.*, vol. xxxix. ⁴ Wilks and Moxon, *Lectures on Pathological Anatomy*, Third Edition. ⁵ *Transactions of Pathological Society*, vol. xi, p. 137. ⁶ *Atlas of Pathology*, New Syd. Soc., Fasc. iv, pp. 18, 19. ⁷ Saundby, *Path. Soc. Trans.*, vol. xxx. ⁸ *Lectures on Children's Diseases*, New Syd. Soc. Trans., vol. ii, p. 114. ⁹ *BRITISH MEDICAL JOURNAL*, 1890, vol. i, p. 1090. ¹⁰ *Leçons sur les auto-intoxications dans les maladies.*

HAGAR'S WELL AT MECCA.

By E. H. HANKIN,

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[From the Government Laboratory, Agra.]

IN view of the widespread attention that has been conferred on Mr. Ernest Hart's recent articles on waterborne cholera, and the great importance of the Meccan infection as a source of the extension of cholera, I think the following analysis of water from the holy well at Mecca may be of interest to the readers of the *BRITISH MEDICAL JOURNAL*.

I was enabled to make this analysis by the kindness of Dr. George Ranking, the well-known Arabic scholar, who placed a sample of this water at my disposal. It had been given him by a "hadji" of repute and position, who brought it himself from Mecca. The water was contained in a vessel made of tin known as a "dibia," and was hermetically soldered up. The vessel was shaped like a watch, and held about 200 c.c. of water. Owing to the small quantity of the water at my disposal, the analysis was only carried out with difficulty, and the results are no doubt somewhat inaccurate. They are as follows:—

Total solids in grains per gallon	...	...	259
Chlorine grains per gallon	...	...	51.24
Free ammonia parts per million	...	...	0.93
Albuminoid ammonia parts per million	...	...	0.45

The figures for ammonia are no doubt without value owing to the very good reason that at least eight months elapsed between the collection of the sample and its coming into my possession. The amount of chlorides is not necessarily an indication of pollution, as it would generally be regarded in

England. In India, at all events, chlorides in well water are I believe more often an indication of the presence of saline matter in the soil than of contamination with organic matter. The quantity of total solids is, however, far greater than I have ever found in any well water reputed to be fit for potable purposes.

I learn that it is a universal custom for the pilgrims to bring away with them these tin vessels, or dibias, of Zem-Zem water. Rich pilgrims may bring away one or two hundred of these dibias to distribute to their friends on their return to their native country. Poor pilgrims are, however, content with one or two. The Zem-Zem water is put into the dibias by the Mecca traders during the time of the year when no, or few, pilgrims are present; and it is very probable that the Zem-Zem water is often diluted, as this does not diminish its sanctity, and the supply of water in the well is by no means equal to the demand.

RESEARCHES ON VACCINIA AND VARIOLA.

By M. ARMAND RUFFER, M.D.,

AND

H. G. PLIMMER, M.R.C.S.

THE literature of research which has appeared during the last ten years contains numerous references to the etiology of vaccinia and variola. Many observers have thought that the two diseases were caused by a micro-organism belonging to the vegetable kingdom, whilst others—Renault, Pfeiffer, Van der Loeff, Guarneri, Monti, Ruffer and Plimmer—have described protozoa in vaccinia and variola pustules. It is not to be denied, however, that many of these so-called protozoa were nothing but anatomical elements more and less altered, and Renault was the first to show that the epithelium cells, covering the vaccinia and variola pustules, often contained a peculiar body which he regarded as parasitic, whilst Guarneri demonstrated the fact that, when vaccinia was inoculated, this body again appeared in the fresh pustules. Thus, on inoculating vaccinia on the cornea, these protozoa appeared in the epithelium cells covering the cornea. Monti, as well as Ruffer and Plimmer, confirmed some of Guarneri's results, and at the International Medical Congress at Rome one of us compared some of our specimens with some kindly exhibited by Professors Guarneri and Monti, and established the identity of the bodies described as protozoa by Guarneri, Monti, and ourselves.

During the last year we have studied a fair number of vaccinia pustules taken from man, the cow, monkey, and rabbit; and in all, provided the disease was not too far advanced, we found this peculiar parasitic structure. The fresh tissue was placed in a saturated solution of sublimate and then hardened in 30 per cent., 60 per cent., 90 per cent., and absolute alcohol. After embedding in paraffin, the sections were passed through tincture of iodine, in order to remove the excess of sublimate, and stained with hæmatoxylin or with carmine and lichtgrün, or with the Biondi-Ehrlich mixture, or with some other staining reagents.

The parasite in question is a small round body, which sometimes appears to have a more darkly-staining centre. It is about four times the size of an ordinary staphylococcus and generally lies in a clear vacuole in the protoplasm of the epithelial cell. It occasionally indents the nucleus, though we have never seen it enclosed in the latter structure. It appears to multiply by simple division into two or multiples of two, but we have not yet satisfied ourselves as to the formation of spores.

When examined fresh it shows slight amoeboid movements, and may be observed in tissues which have been kept for several days or weeks, even though no antiseptic precautions have been taken.

It stains easily with both nuclear and protoplasmic dyes, but it appears to have a preference for the latter class, as it retains them after the nuclei of the cells of the body have yielded them to alcohol or other reagents. With Biondi's reagent, for instance, it stains red with the acid fuchsine, often exhibiting a central green part. Carmine stains it intensely, but if lichtgrün or indulin be used as a counter stain it retains these stains after all traces of them have left the