

jects and other Outlanders. The British subjects in particular stoutly objected; "No," they said, "as long as we are denied the rights of citizenship, we shall refuse to fight the battles of the Transvaal. Give us the burgher's rights, and we shall gladly fulfil the burgher's duties; but while we are denied the franchise, we are not going out to fight under the status of galley-slaves." This was the only attitude that a self-respecting man could take, yet the Boer Government actually forced a number of British subjects to go to the front and serve without compensation, and the outrage would have been carried to greater lengths if the British Agent had not made an emphatic protest in the name of the Imperial Government. In the face of these facts, the Boer Government has tried to twist this question completely round and to make it appear that the franchise was afterwards refused because British subjects would not fight for the Republic; whereas, it was just because they were denied the burgher rights that they declined to do military service, especially in a war undertaken to despoil an unoffending tribe.

While most of the habitable areas of North and Central Africa are not favorable to Anglo-Saxon colonization, but are only capable of government on the plan of British government in India and Egypt, almost every region of South Africa possesses a climate in which European settlers thrive, as the experience of British and Dutch for over a hundred years has amply shown. There are several varieties of climate in South Africa, but generally speaking, their nearest parallel on the American continent is to be found in Northern and Southern California and Colorado. Along the coast of Natal and the eastern coast of the Cape we have all the sub-tropical products, such as bananas, pineapples, oranges, tea, coffee, cotton, etc., while in the midland regions of Natal and the Cape we find some of these products, with peaches, pears and many of the fruits and grains of the temperate zone; and again, on the plateaus and plains of Upper Natal, the elevated lands of the Cape, the Free State and the Transvaal, we find the fruits, vegetables and grains of England or Canada. Again, in the lowlands of the Transvaal and neighboring states we have a warmer climate, and some tropical products, like the middle and lower districts of the Cape and Natal. Being in the southern hemisphere South Africa has its summer when Canada has its winter, and instead of spending Christmas round the fireside the Natalians and Cape Colonists celebrate that season by picnics and outdoor festivities. Although two or three crops of vegetables and of some kinds of grain can be raised in a year, and vegetation never ceases, except in prolonged droughts, there are properly only two seasons in most parts of South Africa—the rainy and the dry.

—The report of the annual meeting of the Association of Ontario Land Surveyors, containing portraits and biographical sketches of the new officers, has been crowded out of the present issue, but will appear in May.

—The numerous manufacturers, especially those in the machinery line, who have for years had increasing cause of dissatisfaction with the drift of things at the Toronto Exhibition, have all reason to thank J. O. Thorn, of the Metallic Roofing Co., for taking up their complaints and fighting for their interests against that clique in the board of directors who are responsible for the moral degeneration of Canada's great show. Many individual complaints have been made to the "Canadian Engineer" that the circus and peanut departments have received the lion's share of attention, while the reasonable requirements of the manufacturer have been ignored. A large number of foreigners will come over

to Toronto from the Pan-American Exhibition at Buffalo next year, and there is yet time to make the reforms needed for a really good exhibition in 1901. If those of the exhibition directorate who really care for the future of this institution could see the stacks of letters Mr. Thorn has received, they would cease their silly attempts to laugh down these complaints, and would come down from their kopjes at once. We do not suppose there is any general desire to depose Mr. Hill. He is an energetic and capable exhibition man, and with a different set of men to work with would no doubt make the reforms needed to redeem the character of the show. As an example of the feeling of manufacturers in this matter we understand that nearly all the makers of agricultural implements have agreed to withdraw from the exhibition altogether, though we suppose they would reconsider this step if the directors made a "right-about face."

THE USE OF BOILER COMPOUNDS.*

BY ALBERT A. CARY.

(Concluded from last issue).

Next, turning to the sulphates of lime and magnesia, we find them very soluble, dissolving in water direct, without requiring the presence of carbonic acid or any other foreign agent. The amount of sulphate of lime which can be dissolved in one United States gallon of water at different temperatures may be appreciated by examining the following table:

At 32° Fahr. 120 grains per gallon.
At 95° Fahr. 148 grains per gallon.
At 212° Fahr. 127 grains per gallon.
At 250° Fahr. 9 grains per gallon.
At from 260° to 302° Fahr. it is practically insoluble.

This latter temperature (302 degrees) corresponds to 55 pounds gauge pressure, and, therefore, when water is thoroughly boiled at this temperature, practically all of the sulphates will be precipitated. The crystals of sulphate of lime will be found to be long and needle-like, and also very heavy and possessing cement-like qualities, so they fall rapidly, and, mixing with the precipitated carbonates, they bind them together into a hard, resisting mass, difficult to remove with even hammer and chisel, if they form a considerable proportion of the scale. It is here where the active agent in the compound is supposed to take effect, and by referring to the reaction given above—in the formulae (a) and (b)—when the carbonate of soda is used, it will be seen that the sulphates of lime and magnesia are changed into carbonates, which are precipitated and form a scale varying from a more or less porous, friable crust to a "mush" or mud. The sulphate of soda which is also formed by this reaction is extremely soluble, remaining in solution at nearly all boiler temperatures and forming no scale, unless allowed to concentrate, and this is prevented by "blowing off" occasionally.

The tannin matters, referred to above, are obtained from various vegetable sources containing tannic acid, such as certain kinds of sumac, gallnuts, catechu (or cutch) bark, etc. Tannin is generally combined with soda to form the tannate of soda for use with boiler waters to keep the deposit soft or in suspension. Its action is supposed to be as follows: The tannate of soda decomposes the carbonates of lime and magnesia as they enter the boiler, and tannates of lime and magnesia are precipitated in a light, flocculent, amorphous form and are long kept in suspension by the circulating currents of water, until they finally are deposited in a loose, mushy mass in that part of the boiler where the circulating currents are the weakest, or possibly in the mud drum. When the above reaction takes place the carbonate of soda is formed, which reacts with any sulphates that may be present, as has already been described. The use of tannic acid in the boiler cannot be recommended unreservedly, as it will attack the iron as well as the carbonates (although, of

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