

Eton army jacket and a silk hat. Others prefer white duck trousers and a woman's bonnet. As for the women, they are content with whatever their lords and masters may allot to them.

The accompanying reproductions of photographs represent the best type of the Kafirs. One peculiarity that will interest bachelors is that, as shown in the pictures, the married men have a band drawn around their hair, while those still in single misery are without this emblem.

One word more; the black question in South Africa will yet prove a far more serious question than the black question in the South. And the white man must shoulder the blame, it is his burden.

THE DIAMOND MINES OF KIMBERLEY.

The attack on Kimberley by the Boer forces has caused considerable public interest in the great diamond mines which now produce about ninety-five per cent of the annual output of the world. The story of these mines is a most fascinating one, and is even more interesting than our own California gold fever of '49.

In 1750, a missionary marked a map of Africa at the point where Kimberley now is with the words "Here be diamonds;" but it was not until the year 1867 that this source of wealth was discovered, and the great elevated desert of Colesberg Kopje, just outside the western border of the Orange Free State, began to teem with life. The wilderness had been given over to the Griquas, a tribe or nation of mixed Dutch and Kafir origin. In 1867, John O'Reilly obtained of a Dutch farmer, named Van Niekirk, a stone which the latter had bought of a little Griqua boy. O'Reilly sold the stone and divided the \$2,500 with Van Niekirk, who bought another one from a little Hottentot boy, and it was sold in Cape Town for \$50,000. This was the famous "Star of South Africa," weighing 83½ carats. Prospectors began to flock to the region, and in 1869 Kimberley was formally founded. The territory was ceded to the British authorities and became "Griqualand West," a territory of Cape Colony, comprising 15,197 square miles, and a total population of 83,375. Kimberley itself had, in 1891, a population of 28,718. The rush to the diamond fields was usually made by means of ox-trains, and the prospectors suffered many privations, which were more than compensated for by the rich harvest. The pioneer miners simply dug and sifted, each man for himself, or for self and partner. The methods employed were the crudest imaginable, rough cradles being used. The results were phenomenal, and some men became rich in an hour. The first diamonds were discovered along the Vaal River, some 20 miles from Kimberley, but in 1871

diamonds were discovered at Dutoit's Pan, a short distance from that place. The crowds rushed to the new fields, or the "dry diggings" as they were called. The discovery of the stones was soon made at "New Rush," or Kimberley, which shortly became the supreme center of the mining industry.

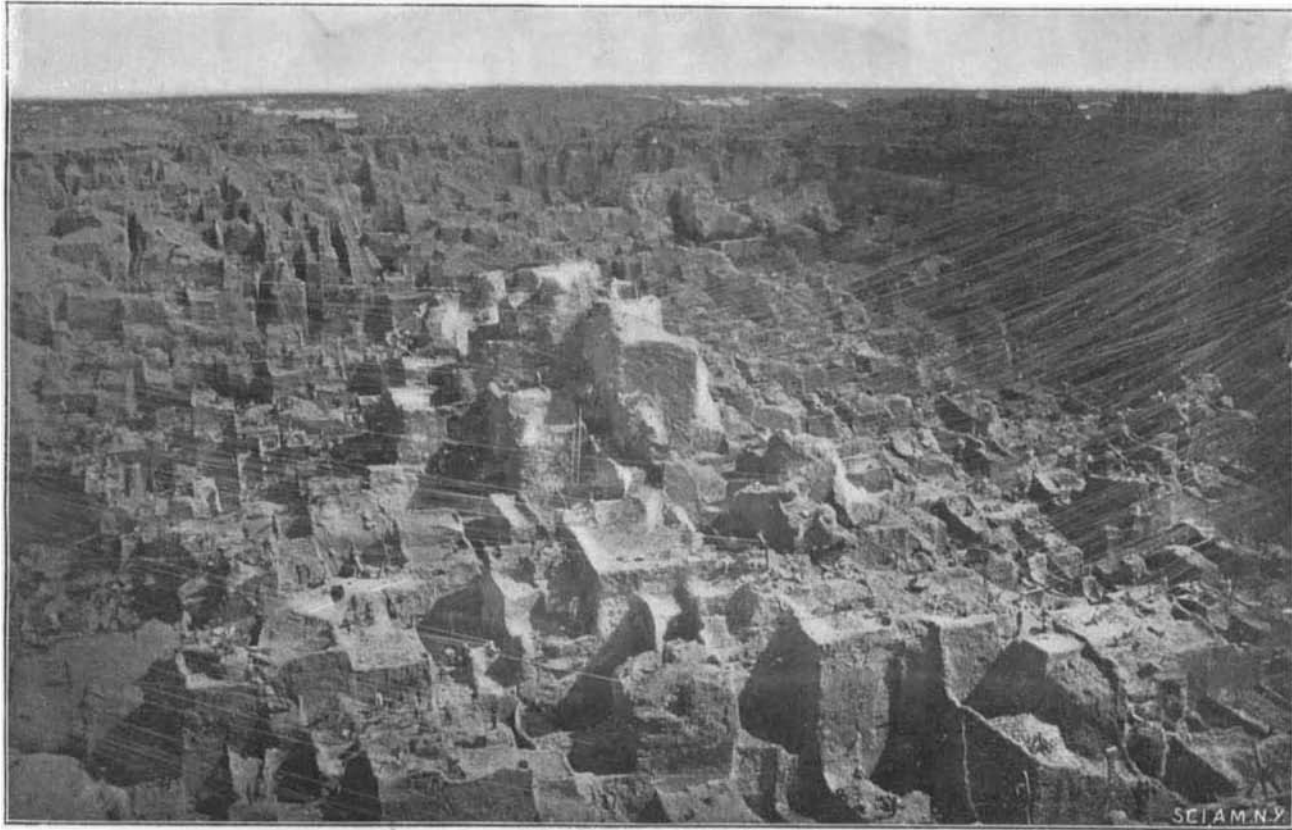
The original Kimberley mine had an area of 13 acres, and this was soon converted into an enormous hole, which has been extended until now it is about 1,100 feet deep. The diamonds come in what are known as "pipes," which run down through the layers of shale,

men. The ropes ran at all angles, some of them being almost vertical, where they served the claims almost under the staging. Each wire rope was secured to a post which was driven in the claim. The bucket ran on the wire rope. At first the buckets were made of ox hide, and when it was filled with the blue earth which contained the diamonds, it was hauled up by the stalwart Kafirs, so that each claim was to all intents and purposes a separate mine. The soil proved to be remarkably valuable, and the great open shaft was sunk rapidly. The claims were very largely subdivided, and even a small section of one proved to be of great value.

The miners were greatly hindered in their work by water which invaded the diamond field. The reef had to be constantly pared to prevent it from sliding into the mine proper. Some of the diamonds were, of course, picked out during the digging, but a large part of the work was done at the surface. At first the dry process was employed, but finally washing machines were introduced which enabled them to work abandoned piles and tailings. The Kafirs were, of course, constantly watched to prevent them secreting any diamonds, and they were kept in what was termed a "compound" for three, six, nine or twelve months, de-

pending upon the agreement which they made. During this time they were virtually prisoners. They were not allowed to leave the stockade.

In time, methods began to change in the mines, and small capitalists were crowded from the field. The expense of raising the earth constantly increased, the depth necessitating the use of horse whims instead of the old method of using Kafir labor. The reef was constantly crumbling, and the expense of working caused by the influx of water forced many owners of claims to sell out to larger miners. The result was that in time the methods of diamond mining became entirely changed; and while the operation was more rapid and thorough and was less expensive, it could be



THE DIAMOND MINE AT KIMBERLEY, SHOWING INDIVIDUAL CLAIMS, TWENTY YEARS AGO.

which are stratified. Twenty years ago the mine presented a most remarkable appearance, and we have been fortunate enough to secure photographs taken about this time, which was before the days of consolidation, and the mine was all divided up into small claims. The edge of the rock which surrounded the mine was termed the "reef," and from it could be obtained an excellent view of the mine itself, which seemed at first to be a collection of houses of cliff dwellers. It was perhaps 1,000 feet across, and the whole surface was covered by hundreds of wire ropes which ran up to staging at the top, which consisted of a framework carrying three sets of sheaves superimposed. It should be said that each of the newcomers to the mine staked out a claim 31 feet square. It was staked out by a surveyor, and when this was done the owners could dig out all that section of the earth as far as they could go. There was a small tax of \$2.50 a month on each claim. Some of these claims proved to be much better than others, and some were worked much more rapidly than others, the result being that no two adjacent claims seemed to be of the same altitude, and it made a most picturesque appearance; but the accidents from falling earth were of great frequency and were very serious. Each claim was connected with the staging by a wire rope which ran over wheels about four feet in diameter, the wheels being turned with the aid of cranks by four careful work-



MAKING A ZULU TOILET.



GROUP OF UNMARRIED ZULUS.

conducted only on a very large scale. The mines today are nothing like as picturesque as they were when the photographs we show were taken, as it was found that open mining, that is, cutting ground away in great bits like stone quarries, was impracticable on a large scale, so that at the present time deep covered shafts and galleries have been substituted. With all the resources of modern diamond-mining machinery, the final work of picking out diamonds from a mass of pebbles calls for skill, responsible, and, of course, proportionately highly paid labor. Ever since the mines were first opened, great attention was paid to the native diamond thief and to the white man whose business it was to buy stolen diamonds from the native workmen. The latter were known as the "I.D.B.s," illicit diamond buyers. To prevent the natives from yielding to their blandishments, the latter are kept in the compounds, or stockades, and even high wire nettings crown the fence to prevent them from throwing over packages containing diamonds. The laws are so strict that if a person should find a diamond on the street, he would at once have to take it to the police to be registered before he could legally have any claim to its possession. When the individual claims were being worked, some miners would dig into their neighbors' claims in such a way that the blue ground which was so much desired would tumble into their own workings. This was one of the evils which was naturally incidental to the existence of 3,143 separate claims within an area of $1\frac{1}{2}$ square miles. Now matters are entirely changed. Great companies, like the De Beers, have consolidated, with a capital of \$18,500,000. Of course, the possession of the mines by one or two corporations has given them an enormous power over the diamond market, and now it is said that there are many millions of dollars' worth of diamonds lying in the vaults at Kimberley, which are not intended to be put on the market until the conditions are ripe to obtain the highest possible price. It is needless to say that the mines pay handsome dividends, and there have been many enormous fortunes made in them.

The Trans-Siberian Railway.

A Russian newspaper has recently published some interesting particulars regarding the Trans-Siberian Railroad, which our commercial agent at Vladivostok, Mr. R. T. Greener, has supplemented by some facts of his own. In the haste of construction and the anxiety to get everything cheap, a special kind of light rails weighing 12 pounds to the foot was used on both the Siberian and Trans-Baikal lines. Wooden bridges were built wherever possible, and the crossings were made far apart. Under such conditions quick traveling on the road will be almost an impossibility, and it is doubtful if more than 20 miles an hour can be made. Only one passenger and two freight trains a day are run. To add to the danger, they put on the line a very heavy engine. The light weight of the rails and the steep gradients combine to make traveling very risky. On steep inclines the train drawn by the powerful locomotive already referred to runs 33 miles an hour, which has seriously injured the rails, and eleven cars were destroyed at one station. The engineers have come to the conclusion that a great deal of the road must be reconstructed. On the Trans-Baikal line there will have to be spent no less than \$7,725,000, almost 50 per cent of the entire cost of the line; on the whole Siberian railroad, there will have to be spent not less than \$62,750,000. The light-weight rails must be thrown aside, the wooden bridges replaced, and the number of stations increased. In places the engineers laid out the line on marshy ground instead of on the highlands where the ground is solid and firm, and in the near future it will have to be relaid. In some districts the mistake was committed in the choice of the direction of the line. Tomsk, the capital of western Siberia, was left 53 miles on the side and connected with the railroad by a bad road. In order to foster home trade, the rails and other supplies were ordered principally from Russian iron works in the Ural district, and they cost twice as much as if they had been obtained abroad. A considerable quantity of material was prepared in advance, and it became rotted before it could be used. The general cost of the great Siberian railroad is estimated at \$180,250,000, including \$60,770,000 for the construction of the Amur line, which project has been changed by the building of the Manchurian line. The last will cost \$51,500,000.

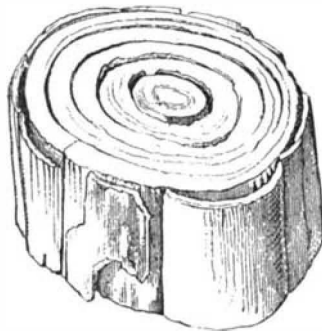
It will be constructed by a joint stock company, but most of the shares are in the government's hands. The cost of a mile of railroad varies from \$18,025 to \$25,750 a mile, depending on the location. When the Manchurian line is completed, the distance from St. Petersburg to Port Arthur will be 5,819 miles, from Berlin 6,331 miles, and from Paris 7,060 miles.

As soon as the road is finished, it will be the shortest route between Europe and the Far East. One will be able to go from Paris to Yokohama in seventeen days. At present it requires twenty-five days going by way of Canada. The fare from London or Paris to the ports of the Far East is about \$367 first-class; while in Russia, thanks to the lowered passenger tariff

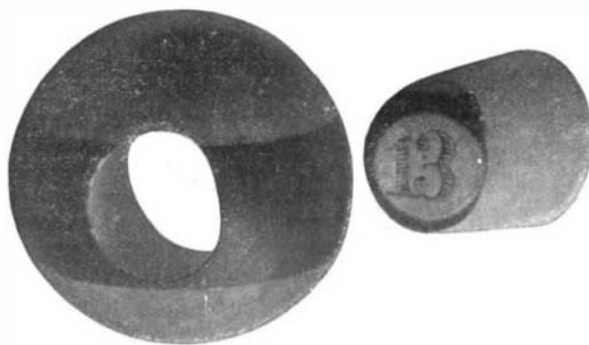
on great distances, one will be able to travel from the German frontier to Port Arthur or Vladivostok for \$57 first-class, or a special train for \$86. The cost of traveling from the west to the furthest point in the east will not be more than \$175. Owing to the enormous distances, everything is being done to make the trip comfortable. Special Siberian trains will leave Paris weekly. There will be library, dining, bath and gymnasium cars, and traveling with such comforts would not be much more tedious and disagreeable than a long voyage by sea, except that a lack of exercise would undoubtedly be felt. The cost of transporting freight will hardly show as much decrease. In 1897, the cost of transporting freight from Shanghai to London, by water, was \$9 per ton, and in February, 1898, it had dropped to \$5.60. The Siberian road will not be able to compete at all with these prices; and while the freight-carrying trade between China and Western Europe will probably not amount to a great deal, the trade which the railroad will develop between China and Russia will be very considerable. The Siberian line will be of great importance as a means of quick and cheap passenger and mail communication between the different points in the two continents, which is alone sufficient to make it play a great rôle in international affairs.

CURIOUS MISHAP TO A BILLIARD BALL.

The mutilated billiard ball shown in the illustration was brought to this office by a friend who thought the subject would be of public interest. At first sight one would naturally suppose that the perforated ball and snugly fitting plug were the work of some deft mechanic, for despite its taper and irregular section, the one fits the other so closely that it is difficult to detect



SECTION OF DISINTEGRATED MAMMOTH TUSK, SHOWING NATURAL LINE OF SEPARATION.



CURIOUS MISHAP TO A BILLIARD BALL.

the joint. As a matter of fact, however, the "trick" was done, involuntarily, during a game of billiards, when this particular ball was struck heavily by another ball on the figure 13, with the result that the heart of the ivory was driven cleanly out, as shown in the illustration.

If a cross-section be taken of an ivory tusk, the center will contain a spot (the remains of the pulp) of darker color than the rest, and concentric with this will be noticed numerous circular contour lines, which are due to minute curved spaces, known as "interglobular spaces." In these spaces there is less of lime salts and more of organic matter than in the rest of the ivory. Hence, the ivory in these rings is less dense, and more likely to decay, and fossil tusks and the tusks of mammoths are frequently found to have separated into a central solid cone, with several superposed hollow cones embracing it, as shown in our engraving.

This billiard ball had evidently been turned from the heart of the ivory, the axis of the tusk coinciding closely with the axis of the ball. The sharp blow must have been delivered fairly in a line with the axis of the heart, and the piece which was driven out gave way at the circular line of cleavage, marking the presence of the "interglobular spaces" above referred to.

The Pollok Memorial Prize.

In response to the request of many of our readers, we publish in the current issue of the SUPPLEMENT the official regulations regarding the competition for the Anthony Pollok \$20,000 prize for life-saving devices, and those of our readers who are considering the advisability of exhibiting devices of this kind are referred

to this issue for full official information. Detailed plans and specifications should be sent to John H. McGibbons, Director of Exploitation of the Paris Exposition Commission, Equitable Building, 120 Broadway, New York, and the exhibits should be marked "Pollok Memorial Prize." Small models may also be sent there.

As Others See Us.

At the close of the year, when many subscriptions to the SCIENTIFIC AMERICAN expire, the publishers often receive, together with the renewals, letters commenting upon the work of the editor during the past year. The publishers believe that it is only fair that readers should know something of the encouragement received, entirely unsolicited, by the editor concerning his work. It is, therefore, with all due modesty, but with a feeling of justifiable pride, that the following extracts from letters recently received should be quoted:

An admiral in the United States navy says:

"The SCIENTIFIC AMERICAN is second to none in this country, either in the scientific ability of its staff, or in its patriotic utterances."

A clergyman writes:

"I find that the SCIENTIFIC AMERICAN is helpful in my ministerial work. It keeps me in touch with the scientific world, thus having before me an object lesson of the wonderful works of God."

A physician writes:

"I have been a constant reader for over thirty years and think the SCIENTIFIC AMERICAN is as useful to the practising physician as a medical journal."

Some members of Congress write:

"It is a great paper and one replete with interesting information."

"There is no paper I read with such profound interest as the SCIENTIFIC AMERICAN."

"It is the most valuable up-to-date scientific publication of its kind published. Its articles are always fresh and reliable, and written in such a popular style as to be easily comprehended by even the layman in scientific matters."

"I regard the SCIENTIFIC AMERICAN as decidedly the best scientific paper published in America."

"No paper which comes to my hands contains more information of a kind that is of practical use to legislators."

"I have been a constant reader of the SCIENTIFIC AMERICAN for many years, and find that it keeps pace with the growth of the country and the development of knowledge and ideas."

Several Senators write:

"It has no equal in the journalistic world."

The following comments have recently been received from some of our old friends:

"I have subscribed for your paper for over forty-eight years and have not missed a copy, and would not be without it."

"Please find renewal of subscription to the SCIENTIFIC AMERICAN for W. A. P., Rutland, Vt., who has been a subscriber for over forty years. Is he the oldest subscriber?"

"I have nearly complete volumes of the SCIENTIFIC AMERICAN for some thirty-five years and consider myself a life member."

"Please renew my subscription to the SCIENTIFIC AMERICAN. I cannot afford to be without it, as it has become a part of my life. A perfect library, up to date every week."

"I have taken the SCIENTIFIC AMERICAN for the last twenty-five years and have every paper up to last Saturday. I would not think I could do without it. I think it is the best paper published in the world."

"For more than twenty-five years I have taken your interesting and valuable paper and probably shall continue as long as I live, and I wish that every young man could be a constant reader of it."

"Your paper is a grand instructor for any young man, and I would not be in want of it and the SUPPLEMENT for \$20 per year, as everything in the papers is good, moral and instructive."

"After being a reader of the SCIENTIFIC AMERICAN for about thirty-six years, and having near forty-five volumes, which I consider is a valuable encyclopedia for mechanics, I would be at a loss to place a value upon them. My boy will subscribe for 1900, and I will close my subscription for the paper, hoping that he will be a reader as long, or longer, than I have been, and receive as much benefit as others have. I take this opportunity to thank you for what knowledge I have received from reading them, and in ceasing to be a subscriber to say if I had the ear of all young mechanics I would urge them to read your paper first of all others."

The late Vice President Hobart wrote some time ago: "I shall derive much profit from the paper."

The United States Commissioner of Education writes: "The SCIENTIFIC AMERICAN is a newspaper that I have always taken a delight in ever since I first began to read it as a boy on a farm in Connecticut. I never let a week's issue of it go by without examining it and finding things of interest in it."