SIR HARRY JOHNSTON'S EXPLORATIONS IN UGANDA AND CENTRAL AFRICA.

BY THE LONDON CORRESPONDENT OF THE SCIENTIFIC AMERICAN.

The feature of the opening meeting in London of the winter's session of the Royal Geographical Society of Great Britain was Sir Harry Johnston's lecture on "The Uganda Protectorate, Ruwenzori, and the Semliki Forest." Sir Harry Johnston is the residential Commissioner for the British government in Uganda, and in the course of his official duties he thoroughly explored the Protectorate and the surrounding country, gained some valuable information, and made several important discoveries of scientific interest. Since his return to England, Sir Harry Johnston has refrained from divulging any information regarding his researches, with the exception of the okapi, until the results of his work had been thoroughly investigated by the leading scientists and explorers. Consequently, special interest was evinced in his address to the Royal Geographical Society.

Sir Harry Johnston, in his lecture, took the Uganda Protectorate province by province, and gave original information about each province in turn. The provinces are six in number—Eastern, Rudolph, Central, Nile, Kingdom of Uganda, and Western. The traveler from Mombasa, before reaching the frontier of Uganda, passes through the country of Kikuyu, which is well forested and thickly clothed with vegetation. As he descends into the Rift Valley, the Kikuyu vegetation decreases in luxuriance. In the vicinity of Lake Naivasha there is a short sweet grass, which is probably kept low by the browsing of innumerable antelopes and the herds of Masai cattle. The Masai of the Naivasha district belong to the essentially cattle-keeping, semi-nomad division of that race. Quite recently, for political reasons, it had been thought advisable to make the Masai dwelling within the eastern province of the Uganda Protectorate independent of any political connection with those of the adjoining East Africa Protectorate or of German East Africa. Unfortunately, at the present moment, the Masai race is on the road toward extinction, either by dying out or by fusion with other tribes. During the last year or so, however, there has been a marked increase in prosperity among the Masai of Naivasha, and it is hoped that in this region they will increase, multiply, and preserve the purity of race. From the northeastern buttresses of Mount Elgon, and the headwaters of the Weiwei River on the north, to the frontier of German East Africa on the south—a distance of about 240 miles—extends, at altitudes ranging between 5,000 feet and 10,000 feet, one of the most beautiful and healthful districts to be found anywhere in the Dark Continent. This lofty region Sir Harry Johnston has styled the Nandi plateau, as it is mainly inhabited, at present, by races of the Nandi stock. This beautiful land has not in it a single ugly or unfriendly spot, and as it is almost entirely without native inhabitants, it seems to be waiting the advent of another race to make it a wonderland of wealth and comfort. It is situated exactly under the equator, at an average altitude of 4,000 feet above the Victoria Nyanza.

Sir Harry Johnston traveled completely round Mount Elgon. On its southern as on its northern side, the awful mountain cliffs which mark one of the lower terraces of this tremendous crater are honeycombed with deep recesses or caverns. These are the well-known caves of Elgon, the caves which were first discovered by Joseph Thomson. Sir Harry Johnston visited several caverns, including the one which was the first cave reached and discovered by Joseph Thomson, whose visit the natives still remembered vividly. This cave is marked by a splendid waterfall. It was the descent of the Sasuru River, and he named it the Thomson Falls. Joseph Thomson left behind him here, as wherever else he passed in Central Africa, the most pleasing memories. As if by fate, Sir Harry Johnston often traveled in Thomson's footsteps, and he always noted that where Thomson had been, the first white pioneer, his admirable treatment of the natives had insured a kindly welcome to those who followed. The native inhabitants of West Elgon were of the greatest interest. They were of rather a mixed stock, but all were of very low and ape-like appearance. The greatest interest they possessed lay in the fact that they spoke a Bantu language, which, of all those discovered, possibly came nearest to the original form of the Bantu mother tongue.

From the Sabei country, he was obliged to travel for sixteen days to the ravine station without a road, simply guiding his caravan by the map and eye. From the northeast of Elgon to within sight of the ravine station, he passed through a land whose only human inhabitants were a few wandering and fugitive Andorobo—a land simply swarming with big game. The caravan saw large herds of elephants first, then many rhinoceroses, then literally countless hartbeests, water buck, reed buck, Cobus antelopes, bustard hartbeests, and orobi. Herds of zebras would follow the caravan, snorting and kicking up their heels. There were lions, leopards, warthogs, jackals, and many ostriches. Last of all, in the middle of the Gwas Ngishu plateau, where forests of acacia still lingered, the expedition encountered giraffes, some with five horns appearing to be a new species of that remarkable animal, and seemingly the common form of giraffe between Elgon on the west and Lake Baringo on the east. Seen from a distance, these giraffe, when full grown, appeared to be black, but to have white bellies and limbs. Here and there monsters stood on the tops of large anthills or small hillocks, sentries posted to warn the feeding herds of the approach of the giraffe's only enemies, man and the lion. Yet so little had man harassed these creatures during recent years, since the plateau was divested of its human inhabitants, the Gwas'Ngishu Masai, by civil wars, that these sentinels took little or no notice of the caravan. Four specimens were secured—two males and two females—for the British Museum. Sir Harry Johnston crossed the Semliki River opposite Fort Mbeni, and traveled for three days in the dense Congo forest. He fully indorsed all that Stanley had said about the awesome nature of these appalling woods. He employed his time in this forest by visiting the Pygmies at home, and seeing their little settlements of tiny huts constructed of withes and leaves. He also encountered the strange, prognathous, ape-like people, who seemed to be a race of pariahs dwelling on the fringe of other tribes; and he ascertained that the real gorilla comes pretty near to the Semliki in its distribution. He was of the opinion that other remarkable discoveries of hitherto unknown mammals were to be made in this huge forest, besides that of the okapi. As it was, skins of several other beasts new to science were obtained. The natives everywhere were found to be on friendly terms with the Belgian authorities, and the excellent roads and well-built stations, together with abundant supplies of the comforts and necessaries of existence from Antwerp merchants, introduced a strange element of civilization into these otherwise trackless wilds.

The southwestern part of the Uganda Protectorate consists of the district of Ankole. A portion of this noble country rises to heights of 8,000 feet and 9,000 feet, and here reappears the Alpine vegetation of Ruwenzori, Elgon, and the Nandi plateau. Among these mountains are scattered almost innumerable crater-lakes, which provide landscapes of exquisite beauty. They nearly all contain fish. The scenery round these crater-lakes is so extravagantly beautiful that, coupled with the fact that they were in a country possessing a very healthy climate and few inhabitants, they might some time become the seats of small European settlements. The northern part of Ankole is somewhat drier and less equatorial in climate. It has a more parched appearance, at any rate during the dry season, and is of lower altitude. Here there is a certain amount of big game, including buffalo, rhinoceros, and eland. The people of Ankole consist of a race of sturdy negroes—the Ba-iro—and an aristocracy of Ba-hima, who are obviously descended from a Gala, Somali, or other Hamitic stock. As regards features and complexion, men and women were often seen among the Ba-hima who were more like Egyptians than was the case with the Galas and the Somalis. But strange to say, the hair of the head is much more wooly and negro-like than is the case with Galas and Somalis. Some men and women were so light in complexion that Sir Harry Johnston thought they were some of Emin Pashas refugee Egyptians, until it was proved to him that they had been born and bred in Ankole. These people, no doubt, were the origin of many of the legends of a white race dwelling in equatorial Africa. Among other points they were remarkable for their domestic cattle, which had more or less straight backs, were of large size, and had enormous horns. On the whole, the breed agreed remarkably closely with the long-horned cattle depicted in the Egyptian frescoes, and the explorer believed that this race was the stock from which the long-horned South African cattle were derived. Sir Harry Johnston also described his explorations of the Ruwenzori range of snow mountains, which remain still the most mysterious and least known mountains in Africa. In his opinion this is, certainly, of all African mountains of his acquaintance, that which is the most constantly cloud-covered. The explorer is convinced that the highest point of Ruwenzori is not under 20,000 feet in altitude, and that it would therefore be found to be the highest mountain on the continent of Africa. When, after the most arduous climb he had ever experienced, his highest point was reached on the flanks of the snow range—14,800 feet—the mountain above him seemed a thing he had only begun to climb, and towered, as far as he could estimate, another 6,000 feet, into the dark blue heavens. Perpetual snow, however, lay as low as 13,000 feet. To effect a complete and successful ascent of the highest points of Ruwenzori required as elaborate a preparation as the exploration of the Andes or the Himalayas. An enormous deal remained to be done in the exploration of this, the most important range of Africa.

In the course of his lecture Sir Harry Johnston reproduced, by means of the phonograph, records of many of the native songs of Uganda, utilized in their war dances, festivals, and orgies, as well as many of the dialects of the various tribes he met in the course of his journeys.

SCIENCE NOTES.

George K. Cherrie, curator of the Brooklyn Museum, sailed early in September on an expedition into South America in search of specimens of butterflies and mammals. He was accompanied by Benjamin Gault of Chicago, who will scan the same country in the interest of the Field Columbian Museum for relics of the prehistoric ages.

The largest pair of animal tusks ever found in the frozen North have arrived in Seattle from Keenwalik, a mining camp 300 miles northwest of Nome, well within the Arctic circle. The remains of the animal were found by M. F. Moran, the postmaster of Keenwalik, and will be forwarded to the Smithsonian Institution. The tusks are twelve feet from end to end. One weighs 168 and the other 172 pounds. Both are in an excellent state of preservation, the ivory being perfectly sound and of fine quality.

In order to give the British Association a free trip to Central Africa, the British South Africa Company will spend $35,000. The next meeting of the Association will, therefore, be held in 1905 at the Victoria Falls on the Zambesi River. Not far from Victoria Falls, Livingstone found the only indication of coal so far discovered in tropical Africa. Day by day the railway from Capetown and Bulawayo is drawing nearer to Victoria Falls, where the South Africa Company will soon turn the enormous water power available, into electricity. A hotel is to be built for the accommodation of the British scientists.

Before the British Association, Dr. W. E. Wilson, F. R. S., briefly described a new bolometer of his which would be very valuable for cloud observations. The bolometer is not simple. It consists of two coiled and blackened platinum wires, contained in a tube from which air is exhausted. The tube is driven by a clock-train which runs for a week. The one coil is exposed to the sunlight, the other kept in the shade. The new instrument is reported superior to others of the Callendar type, previously employed. The calibration of the instrument is effected with the aid of an electric current which heats one of the bolometer strips.

Dr. G. H. Bryan has raised the question of the escape of light gases from planetary atmospheres. The question was suggested by the apparent absence of helium and also of hydrogen from our atmosphere, and the apparent want of a lunar atmosphere, and is exceedingly difficult to deal with; many assumptions have to be made, for instance, as to the temperature of the outer layer of our atmosphere. Prof. Bryan now comes to the conclusion that helium and hydrogen might escape at negligible rates if the mean probable velocity were ten times as large as we assume it to be at ordinary temperatures. In reality there is probably only diffusion of the light gases into the higher strata. Prof. Bryan offered figures as to the amount of hydrogen we should have to generate to keep the quantity of atmospheric hydrogen constant, supposing that it were one of its constituents. Asked whether these two gases would still be in our atmosphere if they had been there when the earth was at high temperature, Prof. Bryan replied that that was a far wider and very difficult problem, since mass would in that period have been much more diffused than now.

THE RAISING OF A BIG RAILWAY BRIDGE.

On January 5 the huge Pennsylvania Railway bridge crossing the Passaic River at Newark was raised. The steel structure was divided into three parts, two of which were first lifted 13 feet above their former level, whereupon the raising of the third part began. The work was accomplished by nightfall of the same day. The reason for the lifting of the bridge is to be found in the fact that the tracks through Newark are elevated. A second bridge crossing the Passaic, and used by local and freight trains ordinarily, is now in use for all traffic until the main bridge is raised to the height of the track elevation and is made safe for travel.

An electric dynamo which had been installed in the Yale & Towne Works at Stamford, Conn., burst on January 3, while it was being tested. At the time of the accident the machine was making 3,600 revolutions per minute and had been running at top speed for ten minutes. Although there were six or eight men in the dynamo room at the time, and huge fragments weighing from 200 to 300 pounds were scattered about, no one was injured. The windows and woodwork, however, were badly damaged.

The New York Automobile Show.

The third annual automobile show to be held in this city will be open from January 17 to 24. As usual, the exhibition will be held in Madison Square Garden, which, on account of the great increase in the industry the past year, is not large enough to accommodate all who wish to make exhibits, even with the utilization of every available inch of space in the basement and restaurant. The general lines of improvement to be noted are longer wheel base, wooden wheels all of the same size, and three-speed gears on the gasoline cars.

EUROPEAN FIRE ENGINES.

In the general arrangement of the German fire engine, a horizontal motor is built in over the rear axle, so as to be easily controlled from the engineer's platform at the back. Both the driving and the pumping gear are actuated by means of independent friction clutches situated upon the elongated crank-shaft. The arrangement is such that either clutch may be used without regard to the other, so that, while the engine is running to the fire, the pumping mechanism is at rest; but as soon as it arrives upon the scene of action, the pump may be started at once. About the center of the wagon frame, and easily accessible from either side, is placed the pump. Over the forward wheels are carried the requisites, such as the hose, tools, a tank for benzine, and seats for the accommodation of four men composing the crew.

The wagon frame is made of wrought iron, and rests upon heavy elliptical springs mounted on the axles. The motor is a horizontal two-cylinder, Deutzer benzine motor, of 15 brake horse power, the ignition being by a magneto, which assures the motor's starting without delay.

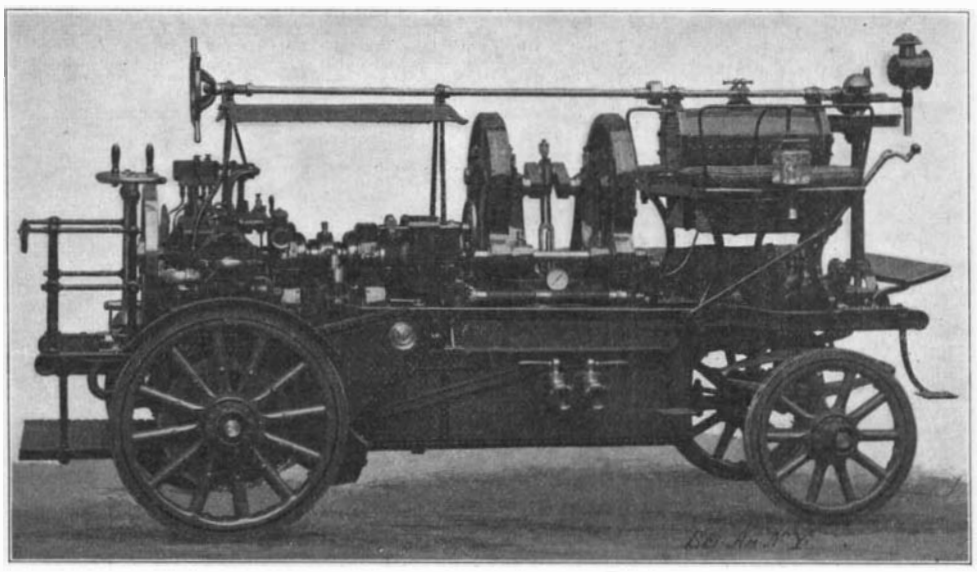
In its readiness to start this motor possesses a great advantage over a steam engine, which requires from 10 to 20 minutes to get up steam, or, to save this delay at the critical moment, incurs the expense of keeping up steam continuously in a separate boiler. Benzine is fed automatically to the engine from an air-tight tank provided with an automatic valve. Enough benzine is contained in the tank to insure a 10 hour run, using the fluid at the rate of 5 liters per hour. The water for cooling the gas engine cylinders is supplied by a separate pump, from a tank attached to the main 132-gallon pumping reservoir* under the center of the wagon. The two tanks are so connected that the cooling water may be obtained from the main one if a larger supply is needed.

An automatic lubricating device conducts oil from a centrally located reservoir to all necessary points. The control on the motor and speed clutches is easily effected from the engineer's platform at the back. The hand wheel seen operates the clutches, giving two speeds ahead of from 6 to 7½ and 9 to 12 miles per hour respectively, and a slow reverse.

The gears for furnishing these speeds consist of rawhide pinions meshing with iron or bronze gears. A chain drive is employed from the countershaft to the rear wheels.

During the run the steering is done from the driver's seat on the left side of the wagon, but it may also be done from the engineer's station at the rear. The two brakes, operating independently of each other, may also be worked from either place. All the gears are inclosed and run in oil.

The pump consists of three perpendicular brass cylinders having phosphor-bronze plungers ground to an air-tight fit. A valve chest, cast of solid brass, connects the cylinders, and contains a pair of valves for each cylinder, which open into the common suction and pressure chamber. The valves may be removed separately without the use of a tool, and returned to their proper seats or renewed in a few seconds. The suction pipe is provided with one, and the pressure pipes with two connections outside the reservoir. These connections have suitable valves and both the suction and pressure pipes have sufficiently large air chambers. In the pressure pipes of the pump are located safety and discharge valves, by means of which all surplus water may be returned to the reservoir, and the pressure at the same time be maintained constant. The safety valve is automatic and may be set for any desired pressure; the discharge valve is worked by hand, and is designed to return the water from the hose to the water tank. The pump is securely bolted to a support which lies upon the water tank and, like the latter, is firmly fastened to the wagon frame. The pump is driven by an intermediate gear, which, by means of a friction clutch, worked by a hand-wheel, engages the motor shaft. A three-cylinder pump working on cranks set at 120 deg., driven by a two-cylinder, four-cycle motor, accomplishes the greatest possible amount of work and throws a steady stream of water. With 90 revolutions of the pump shaft per minute, from 190 to 200 gallons, under a pressure of between six and seven atmospheres, may be thrown a distance of from 147 to 164 feet in the same time. In constructing the wagon frame, care has been taken to make it as light as is consistent with the requirements. The water reservoir and the cooling water tank add much to the stability of the construction. The system of steering is the same as that used on most automobiles. Two brakes engage the rear wheels; one is worked from the driver's seat, and the other is a band brake applied by a foot lever on the engineer's platform. Four seats are provided in front, under which are a receptacle for tools and a hose reel, while the suction pipes are placed along the sides. Three lanterns serve to light the road. These, when the machine is at rest, may be removed and used elsewhere.



A GERMAN SELF-PROPELLED FIRE ENGINE DRIVEN BY A BENZINE MOTOR.

LONDON'S FIRST MOTOR FIRE ENGINE.

Speed, 30 miles per hour; horse power, 25; water tank, 25 gallons capacity.

The English fire engine, propelled by steam, is giving satisfaction. It is located at the Battersea fire station, and, when running to a fire, is capable of speeding up to 30 miles per hour. Because of its short wheel base, it can turn in less than 20 feet. The steering pivots are in the center of the hubs, in order to make the machine steer easily. A single boiler, of the vertical fire tube type, supplies steam for both the propelling and pumping engines, the former of which is of 25 horse power. The general arrangement and method of control can be seen at a glance from the illustration. The controlling levers are at the front, and the engineer simply attends to the boiler, which is fired by petroleum instead of coal. The machine was built at the headquarters of the Brigade at Southwark, and will doubtless be followed by other vehicles after it has had a sufficiently thorough testing to have shown its abilities.

* A tank carried upon the engine, from which to supply the pumps, may be a revelation to those not conversant with European methods. A peculiarity of the above fire engine, which seems to be common to most appliances of this kind built on the other side, especially among the conservative Germans, is a water tank or reservoir, built under the wagon frame, from which the pumps take the water through suction pipes resting upon the bottom of the tank. The latter is intermittently supplied with water brought to it either in large casks on trucks or by means of a short hose, if a hydrant is within convenient reach. As yet the idea of connecting the pumps direct with a hydrant, and thereby affording a continuous supply of water with considerable initial pressure behind it, has not seemed to dawn upon their fire engineers. Some years ago, while at a fire in Vienna, where perhaps the greatest water supply system in the world exists, with a pressure of 75 pounds to the square inch, the writer remembers seeing several tenders, each consisting of a huge tun upon a four-wheeled truck drawn by two horses, running as fast as possible to and fro between a hydrant and a working engine which sucked its supply from an enormous tub or vat deposited on the ground beside it. A few seconds only were required to empty the tub, and a halt was called until more water should arrive. With a great commotion the cask-bearing truck pulled up beside the vat, a fireman, or properly speaking a waterman, deftly knocked out a huge bung or stopper, and with a gush the cask delivered its charge, and the engine was set to work for another minute to quench the fire.

Eating Ice.

The following thermodynamical problem is stated and solved by the Engineer: "A boy eats two ounces of ice. Let us see what is the approximately thermodynamic equivalent of the work he has made his interior do, assuming he takes five minutes to eat it. In melting the ice he will require 18 units to reduce it to water. To raise it in temperature to that of his inside he will require seven more units, or a total of 25 British thermal units. Taking the mechanical equivalent as 777 foot pounds, this will be equal to 19,425 foot pounds. If the boy weighs 100 pounds, he will have called upon his stomach to do as much heat work as would, with a machine having unit efficiency, raise him 194 feet high, or a rate of heat extraction equal to nearly an eighth of a horse power."

An Improved Automobile Steam Engine.

A new compound oscillating steam engine for automobiles is being perfected by Mr. Paul L. Crowe of this city. The improvements in this new engine consist in the reduction to a minimum of the number of bearings and other frictional surfaces; the use of very short ports, thus obtaining the minimum clearance; and the changeability of the engine from compound to simple or *vice versa*, by the simple manipulation of a valve. Engines of this type have been in successful operation for the past two or three years; and the inventor, in making some improvements to adapt it to steam carriages, has so constructed it as to make it readily adaptable to launches, hoisting outfits, or any other kind of work where a light, simple, and compact engine is desired.

Commissioner of Patents Allen will give a course of lectures during the winter on patent law and practice.