measures approximately 4 x 2½ x 1¼ inches, and weighs 3,032 carats, or 1.7 pounds troy, equivalent to about one pound and six ounces avoirdupois. The stone is almost perfectly pure; a few grains are present, and it contains some flaws or cleavage planes, but fortunately they are so disposed that they can be cut away without appreciably reducing the size of the cut gem. Dr. G. A. F. Molengraaff describes the diamond as a single crystal having no twinning planes or lamellæ. It is perfectly transparent, and looks like a piece of pure ice. He says "it is certainly the purest of all the very big stones known." Its structure shows that the stone was originally much larger. This is proved by the four flat cleavage planes, which have the regular octahedral position. Only a small portion of the natural surface of the stone remains, and the fragments broken off must each have been very large. Whether these fragments will ever be found is a question which introduces the interesting study of the formation of diamonds.

It has long been known that diamonds are crystals of pure carbon, and it is supposed that the crystallization took place under a tremendous pressure and heat. The South African mines particularly bear out this theory. The deposits appear to occupy the chimneys of extinct volcanoes. They form cores of circular or oval cross section, bounded by walls of carboniferous shale. This core, near the surface, where it is subjected to the influence of the weather, is of a yellowish color, but lower down is composed of a bluish rock of igneous character, called by the miners "blue ground." In this the precious crystals are embedded. Their broken condition, and the fact that they are found in rock formation of many different compositions, indicate that the blue ground was not their original matrix, but that the diamonds were cast up by volcanic eruptions from great depths, where the tremendous pressure and intense heat were sufficient to crystallize the carbon. In the case of the Premier diamond, the force of the eruption must have been so great as to cleave the fragments from the stone during its passage up the vent or pipe of the volcano. These fragments may have been blown out at the time of the explosion, or may be still awaiting discovery somewhere in the volcano chimney.

At any rate, the portion found is large enough to satisfy the owners; indeed, it is so large as to prove somewhat of a burden. It seems hardly possible that it will be bought by any private collector. Apparently its only office would be to grace a royal collection, but even a rich government would hesitate to pay the sum a diamond of this size should bring. The value of the stone is, of course, a matter of conjecture. Between the years 1750 and 1870 diamonds were rated according to the square of their weight multiplied by the value of a single carat. Thus, if one carat sold for $100, two carats would sell for $400, three carats for $900, and so on. On the same basis, the value of the great Premier diamond would be 3,032 times 3,032 times 100; or $919,302,400. Of course, no such sum will ever be paid for the stone. In fact, it was because of the large stones discovered in Africa that this system of rating diamonds was abandoned. It is considered possible that the Premier diamond may be sold for from $2,500,000 to $5,000,000; but even these figures may be entirely too high, and the actual value is entirely dependent on the bids received. Possibly the stone may suffer the fate of the large Syndicate or Tiffany diamond dug up in the De Beers mine a few years ago. This stone weighed 969 carats in its rough state; but instead of cutting it as a single large brilliant, it was made more salable by cleaving it into ten smaller stones. However, it seems like a desecration to break so large and perfect a stone as the great Premier diamond, though, as we have just stated, large stones are apt to prove a great burden, and have the reputation, well borne out by past history, of bringing bad luck to their owners. Except for the really modern stones, all of the large stones of the world have histories which are black with crime.

For purposes of comparison, we have shown in the accompanying engraving life-size illustrations of the most famous large stones, glass models of which were kindly placed at our disposal by Dr. George F. Kunz, the famous gem expert. The Syndicate or Tiffany diamond, which previously held the record as the largest stone, is shown in Fig. 18, and the great Premier stone is illustrated in Fig. 17. The huge proportions of the latter, as compared with the rest of the collection, will be readily apparent. Of course, the stone will lose much of its size when cut; but owing to its present good form, and the great skill possessed by the modern lapidary, it is probable that the finished gem, if the stone be cut as a single brilliant, would weigh many times as much as any other cut stone now in existence. The famous Koh-i-noor, which is shown in Figs. 1 and 5, is a remarkable example of the loss by cutting which a stone is apt to sustain. Originally, it is said to have weighed 793⅝ carats. An unskilled Venetian lapidary cut it to the shape shown in Fig. 5, reducing it to a weight of 279 carats. Later it was cut to the more symmetrical shape shown in Fig. 1, which still further reduced its weight to 106 1-16 carats. Many remarkable stories are told of this stone. According to one account, it was worn five thousand years ago by Karna, one of the heroes celebrated in Indian legend. By some it is considered a part, with the famous Orloff stone, Fig. 4, of the Great Mogul. This, however, is now pretty generally discredited. The Orloff stone derives its name from Prince Orloff, who presented the gem to Catherine II. of Russia. It is now mounted in the tip of the Russian scepter. The diamond has a "rose" shape, that is, it is cut with a flat base, whereas the usual cutting is called the brilliant. The Shah, Fig. 14, represents a third type of cutting, called the "table cut."

The Regent or Pitt stone, No. 6, is very beautiful. It weighs 136¾ carats, is pure white, and of almost perfect shape. Before the South African mines were opened, it was considered the finest stone in existence. The Florentine, or Grand Duke of Tuscany, belonging to the Austrian crown collection, is a yellow stone weighing a little over 133 carats. Fig. 8 shows the Star of the South, a remarkably fine stone, picked up along the river Bogageno, Brazil, by a negress in 1853. It is the largest diamond ever discovered in South America, weighing 254½ carats in the rough. Its weight, cut, is 124 carats. The Portuguese crown jewel, Brazil, weighing 900 carats uncut, and once valued at $2,000,000, is now known to be a white topaz and not a genuine diamond. The Tiffany diamond, shown in Fig. 10, remarkable for its yellow color, has a weight of 125 carats; and the Hope diamond, Fig. 11, has a rare blue color, which gives it a value of $250,000, even though its weight is but 44¼ carats.

The Sancy, 53½ carats, shown in Fig. 12, has a remarkable history, which has been traced back to 1477, when it was lost at the battle of Nancy by Charles the Bold. Then it came finally through private hands to Sancy, a Huguenot nobleman. While Sancy was an ambassador in Solothurn, the diamond was sent to Henry III. as a pledge. The bearer of the gem was attacked on the way and killed; but he swallowed the gem instead of giving it up to his assailants, so that Sancy recovered the stone by opening the body of his faithful servant and taking the precious gem from his stomach. In 1688 it came into the possession of James II., and later was worn by Louis XV. at his coronation. In 1835 the Russian Emperor bought it for half a million rubles. In 1889 it was again in the market, and was finally sold to a collector for $70,000.

It is to be hoped that the mammoth Premier diamond will not enter upon so troublous a career as its famous predecessors.

The Current Supplement.

In the history of all improvements in the arts and sciences, we would have to search long to find a case where such an important forward step was taken as the sweeping change from steam to electric traction which is taking place on the New York Central Railroad over its terminal lines in New York city. The technical importance of that change is fittingly described and illustrated in the article entitled "The Parting of the Ways—From Steam to Electricity," which opens the current SUPPLEMENT, No. 1527. Of technological interest may also be mentioned contributions on "The Manufacture of Inlaid Linoleum," "Celluloid of Reduced Inflammability," the "Fur Supplies and Markets," "Dyeing of Furs," and "Kryptol, a New Substance for Electric Heating." A model steam engine is so thoroughly described and illustrated that any one can make it. Students of electricity will read with interest the articles on electricity at high pressures, the construction of a four-inch spark induction coil, and Mr. Marconi's observations on recent advances in wireless telegraphy. Until within the last few years there has been a very general opinion that the moon is a cold, dead world, or, as it has been sometimes expressed, a burned-out cinder upon which nothing ever happens. Prof. Pickering in a most instructive article disproves that supposition, and describes some changes upon the moon's surface which he has himself observed. Miss Elizabeth A. Reed writes on the "Precious Stone Industry of the United States." Prof. A. Lecroix's new book on Mont Pelé is reviewed. A pleasantly-worded article by G. G. Chatterton describes some idle hours in Cæsar's city. "How Miniature Cameras are Constructed and Used" is very fully explained by Edward F. Chandler. Cocoons that yield colored silk are described. Dr. Witt continues his instructive review of the chemistry of patinas. Commonplace things often become the most interesting when we attempt to investigate their causes. How true this is will be found in an article on rain, one of the most valuable in the SUPPLEMENT.

The term "geology" was first used in the modern geological sense by De Saussure in 1779 in writing on the Alps. De Luc one year earlier had suggested the term geology in a preface; but he actually used the term cosmology. This is stated on the authority of Geikie and Emmons.

Correspondence.

How to Keep Cake Fresh.

To the Editor of the SCIENTIFIC AMERICAN:

I have found that fresh bread in slices about one inch thick (renewed when it gets dry) of bulk about half the cake to be kept "fresh," put in the tin with the cake causes the cake to remain "fresh."

CORTLANDT DE P. FIELD.

New York, March 27, 1905.

Early Breech-loaders.

To the Editor of the SCIENTIFIC AMERICAN:

In the article on "Multi-Repeating Arms" in your issue of the 25th instant, you state that the rifle patented by Hall in 1811 "may be considered as the first successful military breech-loader." It is matter of history that in the time of the American revolutionary war, a corps of sharpshooters in the British service was armed with breech-loading rifles, invented by their commander, Col. Patrick Ferguson, who was afterward killed at King's Mountain. A description of the arm is given in Greener's "Gun and Its Development."

G. A. F.

Montreal, March 29, 1905.

Side Swimming of Fishes.

To the Editor of the SCIENTIFIC AMERICAN:

As is well known, the halibut, flounder, and I believe the skate, and perhaps other fishes swim on their side, and the thought occurred to me whether the same side was always uppermost, and some two years ago I began watching several small markets to try to learn if the rule was universal, and found all to be with the left side up until to-day, when I was rewarded by discovering a fine halibut with the right side up.

I understand it is the theory of naturalists that these fish once swam upright as do other fish, and for some reason nature saw fit to turn them over on one side, in which they have remained permanent to the present time. There must have been some object in view in turning them over, as well as a preference to the left side; if so, why was this one I mention turned the reverse from the general rule? As I take it, its progenitors must have been so turned from the very beginning, which may have been thousands of years ago, and probably was a very gradual process, as one eye was brought around, but no attempt was made to change the mouth or gills, which remain in their natural position. I do not understand how a single individual could have otherwise been so reversed. It is not a case of the "white blackbird" or other albinos.

I would be pleased to hear from naturalists through the columns of your valuable paper on the subject.

Chicago, March 16, 1905. J. E. GARSIDE.

The Death of Alexander Lagerman.

In Jönköping, Sweden, an eminent Swedish inventor and engineer recently died. To him Sweden owes the development of its great match industry. He invented a series of machines which produced the match from the raw log with such rapidity that it enabled that country to compete with other match-producing countries.

His patent rights were sold a few years ago to the American match trust.

Other problems likewise arrested his attention for the greater part of his life, namely, the invention of a typesetting machine for book and newspaper printing, the patent for which he succeeded in selling to England some time ago for $126,000.

Lagerman was born in Sweden in 1838.

The Development of Motor Traffic.

Some interesting remarks were made by Mr. C. S. Rolls in the course of a paper on "The Development of Motor Traffic." After describing older types of vehicles, Mr. Rolls said that it was not until 1894 that the development became rapid. In the Paris-Bordeaux race in 1895, a speed of 15 miles an hour was attained, while in the Paris-Madrid race of last year the rate was nearly 70, and now a maximum speed of 100 miles had been reached. After the passage of the Light Locomotive Act, 1896, the manufacture of motor cars in Great Britain had shown remarkable growth. There are now at least 130 makers, but the trade did not yet equal that of France, where the industry employed 200,000 men, and last year's exports amounted to about $5,000,000. England, however, produced more cars for heavy traffic. Last year 6,133 light vehicles were imported, as against 3,747 in 1904, and the value of cars and parts imported during the year amounted to nearly $10,000,000. He anticipated that the time was approaching when a trustworthy car to carry three persons at a rate of 20 to 25 miles an hour could be purchased at from $500 to $750.

A new use for aluminium is found in making spools and bobbins, particularly for mill work. The aluminium bobbins weigh less than half as much as wooden ones, are less influenced by changes in heat and moisture, and are said to be more durable.