THE "EXPRESS" COAL-BAGGING LIGHTER FOR COALING WAR VESSELS IN HARBOR.

BY THE ENGLISH CORRESPONDENT OF THE SCIENTIFIC AMERICAN.

The British naval authorities are experimenting at the Devonport dockyard with a new type of coal-bagging lighter for coaling war vessels when berthed or anchored in harbor.

The purpose of the invention is to provide means for filling bags with coal on board the lighter without any recourse to shoveling, and the automatic transportation of these loaded coal bags directly from the lighter to the bunkers of the warship without any handling whatever at any intermediate points. Rapidity in loading has been the object on the part of the designers, and with this appliance there is assured a coaling capacity of 60 tons an hour from each of the two transporters with which the lighter is equipped.

The hull of the lighter resembles that generally adopted for this class of craft. It is constructed entirely of steel and can carry a maximum load of 1,000 tons of coal. It measures 145 feet in length by 36 feet beam and 19½ feet molded depth, and has a draft of 14 feet when fully loaded. The hull is subdivided by means of three transverse bulkheads into four main compartments. In the forward compartment is accommodation for the crew; that next aft contains the boiler and steam-raising plant for driving the hoisting mechanism, electric-light installation, etc.; the two center compartments contain the coal. In the center of the craft, at the bottom, is a small reserved space where the hoisting engines, pumping engines, condenser, and electric-light plant are placed. Above this area are the air-filtering and ventilating fan chambers. On the deck itself are two vertical towers or elevators fore and aft respectively for conveying the coal from the loading compartments to the warship alongside, while in the center of the deck are two slewing cranes for transshipping the coal from a collier to the lighter itself.

At the bottom of the lighter, extending practically its entire length on each side, and parallel to one another, are two galleries or filling rooms. These are about 7 feet in height, with a sloping crown at either side. On each side of this gangway are ranged benches at a sufficient height from the floor to enable the mouth of the sack when hung up to be just level with them. The crown of the roof slopes over these benches and the coal contained in the compartments above falls by gravity through orifices onto the benches and is raked by the men into the open mouths of the sacks. Along the edges of the benches where the coal bags are suspended are fitted bag holders which hold the mouths of the bags open to their fullest extent while the men are raking in the coal. In order to prevent the coal from falling onto the floor of the filling rooms, fixed and portable screens are provided.

As rapidly as the bags are filled they are mechanically lifted onto an overhead rail along which they travel to the foot of one of the vertical elevators by means of a reciprocating pawl device. These elevators extend to a height of nearly 45 feet above the deck of the lighter and are constructed of steel with a crow's nest at the top from which the operator can easily follow and control the conveying operations upon the deck of the warship. Hinged to each elevator is a radial transporter arm long enough to reach over the deck of the vessel alongside. This arm has a vertical travel of 30 feet up and down the elevator, so it can be easily adjusted to the most suitable height; furthermore, it is so arranged that it can be turned through a considerable angle. When out of use the arm is packed vertically up the side of the elevator tower, completely out of the way. Each elevator is fitted with a Mackrow-Cameron "Express" transporter capable of lifting 120 tons of coal in bags per hour.

At the top and the bottom of each elevator tower is a grooved wheel over which travels an endless chain provided at intervals with hooks. The bag of coal, upon reaching the base of the elevator, is caught up by one of these hooks and lifted off the overhead rail extending through the galleries and is immediately hoisted by the traveling chain up the interior of the tower until it reaches a predetermined point, where the radial arm projects. It is then automatically released from the elevator chain and directed onto the radial arm, along which it is run to the point on the deck of the warship where it is to be delivered. Trunks are provided for returning the empty bags as rapidly as their contents are discharged to the filling galleries, and the cycle of operations is repeated until coaling is completed.

The two slewing cranes are each of 2½ tons capacity and are of the high-speed Cameron type. They have a maximum overhang of 80 feet from the center line of the lighter, which enables them to reach well over the deck of the collier barge or other craft with ease. Their working radius is any distance between 8 feet and 40 feet, between which limits the loads can be lifted and dumped. In the case of a collier with the coal loose in the hold to be discharged into the holds of the lighter itself, there is a grab of one ton capacity, though they can be utilized equally well in transporting bags of coal from a barge to the lighter or *vice versa* as required, and can if the exigencies so demand assist in the coaling of the vessel already being served by the elevators. The coal drawn from the lighter is shot into the hoppers of the lighter through large hatchways in the deck. Thus while the lighter is coaling the warship alongside, the slewing cranes can be simultaneously replenishing the hoppers of the lighter itself from the opposite side. These slewing cranes are each capable of handling from 50 to 60 tons of coal an hour.

Naturally, while coaling operations are in progress the air within the bag-filling galleries becomes heavily impregnated with coal dust. In order to insure a perfect supply of clean, fresh air within this area the dust-laden atmosphere is withdrawn from the galleries by the ventilating fans, passed through the filtering medium, and fresh air supplied in its stead.

The boat is lighted throughout by electricity, there being some sixty incandescent lamps distributed through the loading galleries, engine and boiler rooms, and the crew's quarters. In order to facilitate coaling operations at night large arc lamps are fitted over the crow's nests on the elevator towers, and communication between the various parts of the lighter is afforded by electric bells and speaking tubes.

It will be seen that the transportation of the filled and the empty bags is entirely automatic throughout, the human element entering only in regard to the filling of the bags.

The bags of coal, upon reaching the warship's deck, are dumped down and wheeled away upon trolleys to the bunkers by the coaling crew. The designers recommend, however, that two ports be provided in the sides of the battleships through which the radial transporter arms of the elevators can extend and connect with a system of overhead runners fitted on board and attached to the skid beams so as to form a continuous bar. In this manner the bags of coal would travel from the leading rooms on the lighter direct to the bunkers and the contents be there discharged, by which arrangement intermediate handling would be entirely obviated and coaling considerably facilitated and expedited. Furthermore, the decks would be left quite clear and any necessity of clearing away ship's boats and gear, as is now usually the case when coaling is carried out on war vessels, would be dispensed with.

In the official trials recently carried out by the British Admiralty at Devonport for the purposes of testing the possibilities of this craft both in the coaling of war vessels and also the charging of the lighter itself from barges and colliers moored alongside, eminent success was obtained. In order to test the apparatus to the utmost these trials were extended over a period of four months and in each trial a new crew for operating the lighter was employed, so that it was impossible for exceptional results to be obtained owing to the men becoming expert with the gear and consequently more expert in its manipulation as a result of continual practice. In the first place, the elimination of the preparations heretofore incidental to the coaling of a warship, such as the removal of boats and davits, etc., was emphasized, since in no instance was it found necessary to disturb the vessel's equipment in any way, the transportation bar being projected through any opening in the ship's side capable of admitting a 2-hundred-weight bag. As the coaling crew became expert in the removal of the bags of coal from the outer end of the transporter speed in coaling was accelerated, and the facility and lighter labor involved in the task was rendered very apparent. The most noticeable feature was the speed with which the vessel could be coaled by this system as compared with the other methods in vogue in the dockyard, the capacity of the transporter far exceeding that attainable with the other processes.

In the course of the trials seven vessels of varying types were coaled, the quantity taken on board ranging from 1,000 tons for the "Duke of Edinburgh" to 172 tons for the "Monmouth." In the case of the former vessel the trial extended over six hours, during which time 609 tons were placed on board, the remaining 391 tons being taken on after the trial. The highest coaling speed was attained in shipping 705 tons on board the "Isis," when 41.75 tons an hour were placed on board from each transporter. In the final trial, in coaling the "Victorious" with 720 tons, the task was accomplished in 5 hours 40 minutes actual working time. Coaling was effected entirely by the transporters themselves without any assistance from the independent cranes. Had the crew been fresh the work would have been completed in shorter time; furthermore, the men had had but little experience in handling the apparatus. Trials were also made with the cranes for transshipping coal from barges to the lighter itself. On this occasion 580 tons were lifted onto the lighter in 807 trips, the average load each trip being 14.37 hundredweight or approximately 50 tons an hour. In the official tests of the capacity of the grab 14.84 hundredweight was the average of forty trips.

Cobalt Mining in Canada.

BY ALLAN PORTER.

The new mining region which is being explored in northern Ontario is perhaps as important from a scientific standpoint as from the fact that it is of considerable extent. While the principal output has been silver, it is now known beyond question that the percentage of the cobalt in the ores is so high that this interesting substance will probably be utilized to a far greater degree in industries than ever before. While many reports have been current about the mineral wealth of this region, fortunately its natural formation as well as the mines which have been opened have been investigated by such experts as Prof. William Earl Hidden, of the London Geological Society, Dr. Robert Bell, of the Canadian Geological Survey, and Prof. Nichol, of the Canadian School of Mines. All of these mineralogists concur as to the extent of the ore veins and the percentage of metal which they contain.

It may be needless to say that the small quantity of cobalt utilized in industries has been almost entirely in the form of an oxide. While it is known to form an alloy of a high grade when mixed with copper, iron, or manganese, and is superior to nickel for plating on metal, the difficulty in separating it from the elements with which it is usually combined has caused it to be employed almost entirely as a pigment. Porcelain is glazed with it, while the cobalt fused with borax results in a beautifully tinted glass. In a single year such a small quantity has been produced that less than fifty tons of the oxide are consumed by the various industries in America. The bulk of the oxide is imported, most of it coming from New South Wales, Switzerland, and New Caledonia.

Those who are familiar with the geology of Ontario are not surprised that the ore deposits in the vicinity of the town of Cobalt should prove so extensive. The new mining center is but 90 miles northeast of Sudbury, which, as recently stated in the SCIENTIFIC AMERICAN, has become one of the greatest nickel-producing centers of the world. The rocks of the Lower Huronian age and the Keewatin formation come to the surface for a considerable distance in the vicinity of Cobalt, outcroppings of ore having been found as high as 500 feet above Lake Temiskaming, while workings in the lake itself have also yielded ore of a high grade. Although the principal mining operations at the present time are being conducted immediately around the town of Cobalt, ore containing a large percentage of not only cobalt and silver, but also some gold, has been found at Ingram, 30 miles north of the present field, while a vein has also been located 30 miles south, which gives 9 per cent cobalt, 7 per cent nickel, 23 per cent arsenic, with a mere trace of silver, but averaging nearly $10 worth of gold to the ton. While the entire region about these points has been but partially examined, the experts to whom we have referred believe that the Huronian and Keewatin strata, which contain the ore, extend near enough to the surface to make the ore-bearing region fully 60 miles in length and of unknown width.

As we have stated, the examinations of the veins thus far opened have been sufficiently exhaustive to give an idea of the character and grade of the ores, while a number of the mines has been opened to a sufficient extent to make a conservative estimate of the possibilities of the output. While silver is the principal output, the ores are remarkable for their diversity. They include native silver, smaltite, niccolite, argentite, cobalt bloom, nickel bloom, millerite, dyscrasite, galena, copper and iron pyrites, and zinc blende.

The principal vein stone thus far found is calcite, while considerable quartz is taken out mingled with the ores. Some of the outcrops so closely resemble pure silver that very exaggerated statements have been made as to the richness of the field. It has been claimed that pieces of ore have been taken out that are practically pure silver weighing as much as 150 and 200 pounds, but as a matter of fact no nuggets of pure metal anywhere near these dimensions have been obtained in the opinion of the mineralogists. The analyses of quantities of ore taken from different portions of the field give the clearest idea of the proportions of the various metals. A carload of ores taken at random from a series of five veins at Cobalt showed the following percentages when analyzed: Silver, 11.41; cobalt, 11.27; nickel, 3.78; arsenic, 44.16.

It will be noticed in this carload the percentage of cobalt nearly equaled that of silver. A carload from another portion in the vicinity, however, gave 15.6 per cent of cobalt, merely a trace of silver and 61.74 per cent of arsenic, the percentage of nickel being 7. These figures can be taken as a fair standard of the grade of ores in the district, although some of the mines contain a considerably larger percentage both of silver and cobalt. The bulk of the ores is transported to New Jersey for reduction, the average cost of transportation per carload being $150. The quality of the metal, however, is such that the several mining companies have been sending not only the first-grade but their second-grade ores to be treated, as the second-grade assays from $200 to $300 per ton.

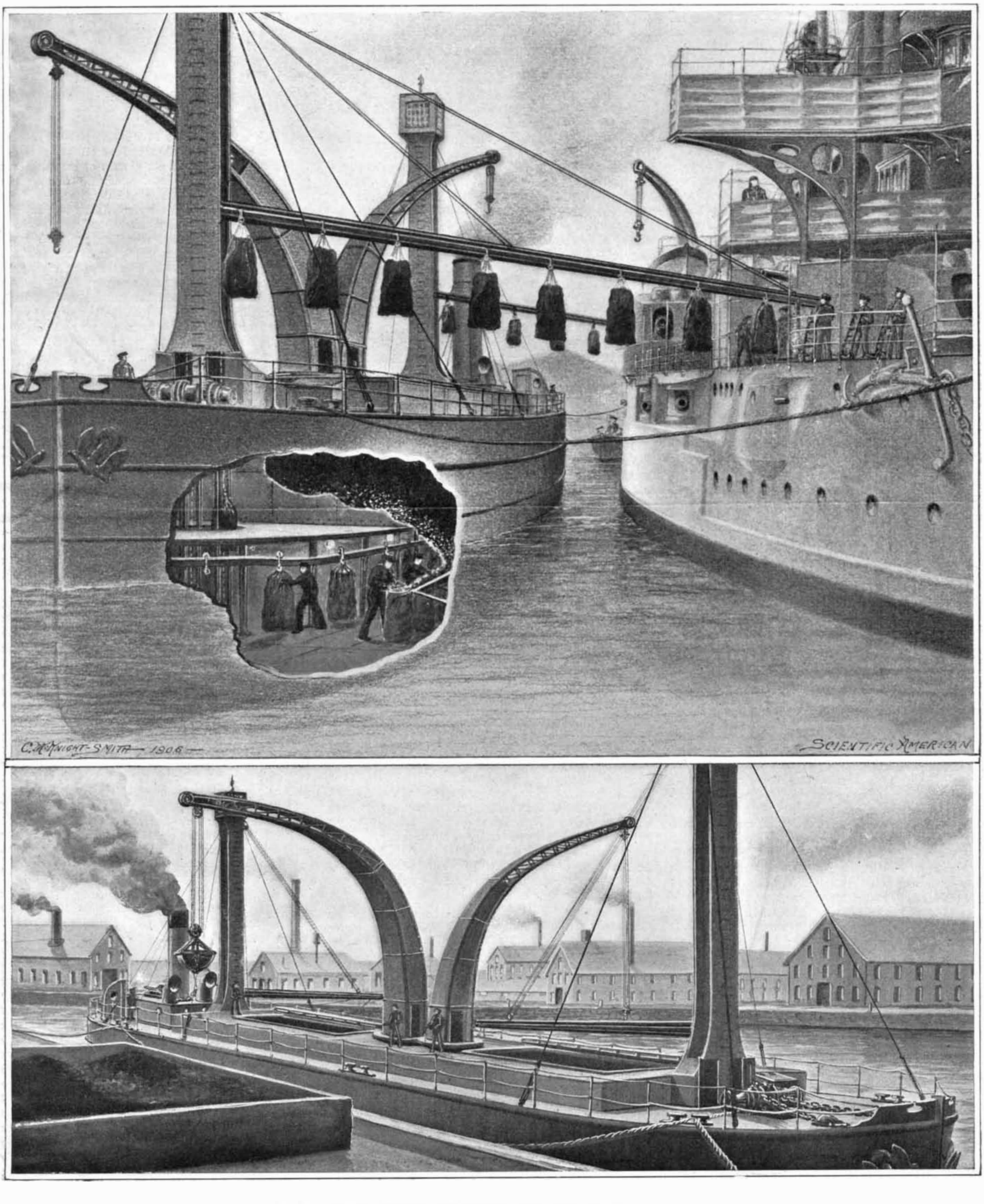
SCIENTIFIC AMERICAN

[Entered at the Post Office of New York, N. Y., as Second Class Matter. Copyright, 1907, by Munn & Co.]

Vol. XCVI.—No. 5
ESTABLISHED 1845.

NEW YORK, FEBRUARY 2, 1907.

10 CENTS A COPY
$3.00 A YEAR.



A COAL-BAGGING LIGHTER FOR COALING WAR VESSELS.—[See page 110.]

La Rose mine, which was the first to be opened and has been worked the most systematically thus far, furnishes at present the best illustration of the extent of the veins. The main shaft at this mine is down to 100 feet and drifts have been made for a distance of over 300 feet at this level. These drifts show that the vein of ore is as extensive and as rich as the portion which was first discovered. The mine was one of the series to be investigated by the mineralogists. Here the diamond drill has bored to a depth of 350 feet, ore being found at the greatest distance from the surface. The Tretheway mine contains ore of such a grade that 50 tons of it have actually yielded 190,000 ounces of silver, in addition to 12 per cent cobalt and 3½ per cent nickel. Like most of the other operations in the district, however, this mine consists of merely an open cut which at the present time is 60 feet in length and 25 feet in depth; the vein of ore averages but 8 inches in width, which will give an idea of the percentage of metal which it carries. The veins thus far located throughout the district are not noted for their size. They average from 10 to 12 inches, in one or two instances widening to 18 inches. The geologists are still in doubt as to the formation of the veins, but believe they were created by the action of highly heated water which permeated the narrow vertical fissures where they are found. These fissures cut through the rocks of the geological ages to which we have referred.

Owing to the presence of so much ore near the surface, mining operations in the Cobalt district are notable for the crude methods employed. As already stated, the majority of workings are practically on the surface, the earth and rock covering being stripped off and open trenches dug to conform to the size and direction of the vein. Some of the largest producers have not been mined to a distance of 25 feet below the surface as yet. The system usually employed in getting out the ore from these workings is to utilize explosives, sometimes the pick, to loosen the formation, when it is loaded into buckets and hoisted by means of a boom derrick to the top. The windlass operated by hand-power is one of the common methods. Sidings of tramways have been laid from some of the larger mines to the Temiskaming and Northern Ontario Railway, a line which the Canadian government has built through this district from Toronto.

At La Rose and a number of the deeper mines where shafts have been sunk, the ore extracted from the chambers on the various levels is carried to the foot of the shaft by wheelbarrows, loaded in the buckets, then hoisted by windlass and cable to the surface, a steam engine of suitable horse-power being installed for this purpose. The buildings at the larger mines consist merely of the shaft house—a frame shed covering the mouth of the shaft and hoisting machinery—and stock house where the ore is broken up into suitable sizes and sacked for shipping to the smelters. Some of the companies have not even provided storage for the ores, and it is a common sight to witness ores containing $2,000 and $3,000 per ton in silver lying in bags in the open air awaiting opportunity to be hauled to the railroad station.

Owing to the difficulty of securing the cobalt and nickel by the process employed at the New Jersey smelters it is understood that a very large proportion of these valuable substances is wasted in the effort to obtain all of the silver which is contained in the ore. A reduction works is now in course of construction at Cobalt in which the German process utilized in treating what is known as Saxon ores will be employed. It is known that by this process ores containing cobalt, arsenic, and silver are so economically treated that nearly all the cobalt and silver are saved. The mining department of the Canadian government has taken up the project and the works are being constructed under the supervision of two German metallurgists who are familiar with the treatment referred to.

Readers of the SCIENTIFIC AMERICAN, however, are aware that Thomas A. Edison has been making an elaborate series of experiments for several years with the view of producing an electric storage battery which will be more economical and durable than the types now used for commercial purposes. From time to time reference has been made to the work which Mr. Edison is doing. It is known that during the last year he has made several examinations of mineral deposits both in the United States and Canada. In a recent interview he made the statement that he had discovered a substitute for lead which would revolutionize the storage battery. The metal which he intends utilizing is cobalt, and it is evident that he has discovered a process by which it can be secured from the ore in such a form that it is available for his purposes. The cobalt contained in the various nickel ores thus far exposed in the United States, however, is insignificant compared with the extent of the ores in the new mining district. As Mr. Edison made the statement referred to after he had visited this section of Canada, it is probable that he will utilize a portion of its output in the new battery which he announces he is about to manufacture. The advantages of this battery over the majority of types in use can be appreciated when his statement is quoted. This is to the effect that for $200 a battery can be constructed and equipped which will supply motive power to propel a vehicle for two passengers a distance of 100,000 miles before another need be substituted. In other words, by the use of cobalt Mr. Edison believes he has found what might be called a permanent battery.

Correspondence.

Esperanto Grammars.

To the Editor of the SCIENTIFIC AMERICAN:

Doubtless you have long ago formed your opinion as to the merits of Esperanto, the international language. I hope that it is favorable; but as there is much irresponsible criticism of Esperanto, I want to offer an opportunity for every thinker to judge for himself. I have had prepared 100,000 brief grammars of the language in pamphlet form, and will send one free to any person who is sufficiently interested to ask for it, inclosing stamp for reply. I think it really due to this great movement for an international auxiliary language, which now embraces thirty nations in its scope, that you publish this letter, so that your readers may have the opportunity of judging for themselves.

ARTHUR BAKER,
Editor L'Amerika Esperantisto
(The American Esperantist).

Oklahoma City, January 15, 1907.

Perhydrase Milk.

To the Editor of the SCIENTIFIC AMERICAN:

In your current issue we find an item relating to perhydrase milk, in which you state that the cost of this milk is about four or five cents higher per liter than that of ordinary milk. However, this is erroneous, since there is an increase of four to five pfennige, or 1 to 1¼ cent, only per liter.

You state further that "perhydrase milk must be kept in a dark place. Exposure to light will give it a bitter taste." This refers not only to perhydrase milk, but to milk in general, as Drs. Römer and Much have ascertained by numerous tests. If *any milk* is exposed to light, even for a short period, it acquires a bitter taste and becomes injurious to health, while if kept in a dark room, it remains sweet. They therefore recommend the use of colored, preferably dark red or dark green, glass bottles for the keeping of milk; while if kept in the ordinary white bottles, or in bottles of blue glass, milk will "turn" after a short time if exposed to light.

These remarks may prove of interest to your readers.

New York, January 17, 1907. C. BISCHOFF & Co.

Supplementary Railroad Signals.

To the Editor of the SCIENTIFIC AMERICAN:

Considering the recent railroad collision accidents in this locality, it has occurred to me the following plan of signaling might be used advantageously.

Place two electric lights, one red, the other white, on each telegraph pole on the line of the railroad between all stations, to be connected at the stations with any electrical plant sufficient to light the signals from one station to the other (when found that it was needed). Should the signal agent find that he had made a mistake, or for any other reason wish to stop the train, touching the button in his office will light all red signals instantly ahead of the train that has passed him. The engineer seeing this will know that he must be cautious, and go slow or stop for further orders. Then, when all things are righted, turn on the white light and permit the train to continue.

I suggest this as an additional safety signal, where there is now in use the block system, and also where there is no block system at all. If there could be electricity used between stations by the engineer, he could connect to these same wires and give signals himself to other trains "fore and aft." This would be essential in cases of wrecks or other delays. I believe, if this plan had been put in use, President Samuel Spencer and party would be alive to-day.

R. MAYS CLEVELAND.

Marietta, Greenville County, S. C.

The Current Supplement.

The opening article of the current SUPPLEMENT, No. 1622, describes a German coal-tipping device. The second installment of the article on the new incandescent metallic filament electric lamps is published. A. Frederick Collins gives full details of the location and erection of a 100-mile wireless telegraph station. This article should be read in connection with that by the same author published in SCIENTIFIC AMERICAN SUPPLEMENT No. 1605, describing in detail the design and construction of a 100-mile telegraph set. F. E. Junge gives some considerations affecting the application of waste gases for power purposes. Jacques Boyer writes on mushroom culture in France. Just as the living organisms of man and animals and plants suffer various changes as the result of disease, so also many of our manufactured products are subject to undesirable changes in their character. Bread is among these. The diseases of bread are accordingly made the subject of a very clear and instructive article. A very good article is published on hard solders, and some excellent formulas are given. Mr. V. E. McCourt writes exhaustively on the origin, occurrence, and chemical composition of peat.

The Automobile Races on the Ormond-Daytona Beach.

The races this year on the Florida beach were by no means as interesting as heretofore. The only cars to compete were a few stock machines and the rebuilt, cigar-shaped, Stanley steam racer that last year covered a mile in 28 1-5 seconds—at the rate of 127.6 miles an hour. A special light-weight racer fitted with an air-cooled, 8-cylinder, V motor, and a Curtiss motor bicycle with the same type of engine, did not succeed in breaking any records.

First of the races to be held on Tuesday, January 22—the first day—was a 5-mile race from a standing start. This was won in 4 minutes and 25 seconds, or at a rate of speed of 67.9 miles an hour, by E. B. Blakely, a young Harvard student, driving a 70-horse-power American Mercedes. A 20-horse-power English Rolls-Royce was second, and a 30-horse-power Stanley steamer third. The 5-mile open championship with flying start was won by F. H. Marriott, driving the special Stanley racer, in 4 minutes and 44¾ seconds—a speed of 80 miles an hour. Capt. C. E. Hutton, on his 20-horse-power Rolls-Royce, was second in 4:52 4-5, while a 30-horse-power Stanley again took third place. A one-mile race with flying start was won by W. Durbin with a Stanley racer in 53 2-5 seconds. The 30-horse-power Rolls-Royce was second and a 30-horse-power Stoddard-Dayton third in this event. The second best time of the day—3 minutes and 51 4-5 seconds—was made by Marriott with the Stanley racer in a 5-mile match race. He beat Blakely, on his 70-horse-power American Mercedes, by but 5 seconds, however. A mile race for stock touring cars was won by Ralph Owen driving the same Oldsmobile touring car with which he recently completed the strenuous journey from New York city to Ormond Beach. His time for the mile was 1:12. Thirty-horse-power Winton and Wayne cars were second and third respectively.

The chief event of the second day was a 10-mile race in which the Stanley freak racer blew out a cylinder head after the first half mile, breaking the rear part of the chassis and damaging the engine beyond repair. Three other Stanleys in this race broke down and had to be towed to the garage. The race was won by the 70-horse-power American Mercedes by less than 10 seconds from F. E. Stanley, who drove one of his own 30-horse-power cars, notwithstanding that the steam machine broke its pump rocker arm just before it finished. A 50-horse-power Welch touring car was third. The time of the winner was 7:42 1-5, which means a speed of 77.8 miles an hour. A 20-mile race with one turn for American touring cars was won by the 50-horse-power Welch in 22:32 4-5, or at a speed of 61½ miles an hour. This is a new record for stock touring cars of but 50 horse-power. An international touring car race (distance, 20 miles) was won by Hutton on his Rolls-Royce in 23:5 2-5. Curtiss, on his 2-cylinder motor bicycle, made a mile in 46 2-5 seconds, and went ahead of W. Ray, who drove a 2-cylinder Simplex, by about 50 feet. On Friday, however, Ray made a new record of 44 2-5 seconds for the mile, which corresponds to a speed of 81 miles an hour.

On the third day of the races, Thursday, the 70-horse-power American Mercedes, driven by Blakely, won the 100-mile race, including seven turns, in 1 hour, 26 minutes, and 10 seconds, at an average speed of nearly 69½ miles an hour. The Rolls-Royce car was second in 2:02:35, and the New York-Florida Oldsmobile third in 2:57:40. The 10-mile open handicap was also won by Blakely in 13:59. The Stanley racer did a mile in 31 4-5 seconds, and F. E. Stanley drove his 30-horse-power machine a mile in 45 2-5 seconds, thus making a new record for steam touring cars. On Friday, January 25, the last day of the races, a special 6-mile match between two 30-horse-power runabouts was won in 7:35 3-5, and the English Rolls-Royce stripped touring car defeated a 30 H. P. Franklin touring car in like condition by running 12 miles in 13:12 2-5. With the repaired Stanley racer, Marriott came within two-fifths of a second of equaling his record of last year. In a second attempt later in the day his machine struck a bump while running very fast. This threw it high in the air, and caused it to overturn and roll over and over when it again struck the ground. Marriott was thrown free of the remains of the racer. He was severely, though not fatally, injured. This accident will no doubt put an end to attempts at attaining tremendous speed with freak machines. One of the other Stanley racers made a mile in 35 seconds, or at a rate of 102.8 miles an hour.