within the range of vision. On firing, the shell left the gun without exploding and struck the water at a distance of about two miles from the shore, where, after richocheting twice without any explosion, it sank. The result was extremely satisfactory, showing that one of the most powerful of modern high explosives may be used in a modern rifle of the ordinary service type.

The next test was carried out with a new explosive known as thorite, the invention of Dr. Tuttle, of Tacoma, Washington. An ordinary 8-inch service shell, charged with 13 pounds of thorite, was fired out to sea with a charge of brown powder, and failed to explode. In another test an armor-piercing shell, loaded with thorite, was fired at a 4½-inch steel armor plate, and passed through without bursting. The significance of these experiments can hardly be overestimated. All that is now needed to allow the explosives to exert their full theoretical destructive effect is a projectile which will be burst into fragments of a proper size for penetrating and wrecking the interior structure of a vessel. Hitherto, the disadvantage of high explosives when used in projectiles has been their tendency to burst the shell into fragments too small to do effective work within the vessel.

BRITISH PATENTS IN 1898.

The report of the Comptroller-General of Patents for the year 1898 has been issued. For the first time since the 1884 Act came into force there has been a falling off in the number of applications for patents. In 1898 they numbered 27,659, while in the preceding year there were 30,952 applications, showing a decrease of 3,293 or more than 10 per cent. The comptroller is of the opinion that the rapid growth in the number of applications which took place in 1896-97 was to be attributed to the activity in the cycle industry. Still, out of 6,000 applications made in 1897 in connection with cycles, only 2,300 were completed, much less than the average. In the total number of applications, naturally the major part came from England and Wales, 17,389 coming from the two countries. There were only 1,395 applications from Scotland and 502 from Ireland. The three foreign countries from which the largest number of applications came were the United States with 2,629, Germany with 2,599, and France with 1,133. This shows that American inventors fully appreciate the great advantages of a British patent. There were only eight other countries from which as many as a hundred applications came. There has been an increase among certain chemical classes, notably those which are connected with the acetylene industry.

Since the passing of the "Workmen's Compensation Act," the number of applications relating to guards for the prevention of accidents with machinery has been very largely increased. A single death or injury will often make considerable difference in the number of applications. For instance, after a railway accident caused by a luggage truck falling on to the line in front of an express train, there was a great increase in inventions for railway platform luggage trucks. As showing the relations between passing events and the course of invention, it might be mentioned that the publication in a London morning paper of a letter relating to the waste of horse-feed in London was followed within five weeks by no less than 34 applications for patents for nose-bags for horses, while the average number up to this time had been only 12 annually. This is an excellent example of the advantages which accrue to the inventor by the publicity which is given to legitimate wants. There is little doubt that many of our important inventions have been suggested by chance statements which have appeared in various papers as to the actual need for machines or processes.

LIQUID AIR IN MEDICINE AND SURGERY.

The subject of liquid air in its application in medicine and surgery has been treated in a dispassionate manner by Dr. A. Campbell White in The Medical Record. The general properties of liquid air have already been described in the columns of the SCIENTIFIC AMERICAN at considerable length, so that it is not necessary to dwell upon this phase of the subject.

In applying liquid to the tissues of the body, Dr. White has used it in the form of a spray and by means of a swab dipped into the fluid. If a spray of liquid air is applied to the skin, the part at once becomes anæmic and perfectly colorless. If the application is made only for a few seconds, the color as quickly returns and the skin is congested for some minutes thereafter. Within much less than a minute's time, by means of a spray, the part is frozen as hard as ice, but strange to say, in a few minutes circulation returns without any injury to the tissue, provided the part is not in the end of some extremity. There is no pain in the application excepting at the very beginning, but there is a slight burning or tingling. It also completely anæsthetizes the part to which it is applied without freezing it solid. Dr. White has tried liquid air as a local anæsthetic in a number of cases with invariable success. It has one important advantage; that is the absence of hemorrhages during the operation, enabling the operator to apply the dressing before any hemorrhage sets in, the dressing then being sufficient to stop any oozing. Dr. White has found the use of liquid air beneficial in the local treatment of ulcers, etc. He states that an abscess, boil or carbuncle in the early stages is aborted absolutely with one thorough treatment. If it is more advanced several applications at intervals of twenty-four hours are necessary. Liquid air has also been used with advantage in cases of sciatica, neuralgia, etc.

An interesting experiment was tried in a case of ivy poisoning, involving the entire left forearm and hand. A band around the forearm about three inches wide was slightly frozen by the spray, and then the usual treatment was applied to the entire poisoned area, including the part which had been treated with the liquid air. At the next dressing the part which had been treated with the air was very distinct, and this portion was greatly improved, the inflammatory process having subsided. A number of other diseases have also been treated with liquid air with marked success. Where no loss of tissue is desirable, liquid air should be applied by the spray and not by the swab. Dr. White takes issue with Mr. Hampson, whose article appeared in the SUPPLEMENT, No. 1226, entitled "Liquid Air." Dr. White is undoubtedly correct in advising the greatest possible care in using the new substance which science has placed at the disposal of the surgeon. Even such cooling agents as the ether-spray should be used with great caution, and liquid air should be applied only by those who have had some experience in its use.

In conclusion, Dr. White considers that we have reason to hope that we have in liquid air a therapeutic agent which will remove many otherwise obstinate superficial lesions of the body and cure some lesions which have hitherto resisted all treatment at our disposal, including the knife. He is of the opinion that in the use of liquid air in medicine, that is to say, in pulmonary diseases, in the reduction of fever, etc., a large field is open which presents many obstacles at the very start, and possibly holds out much hope in the future.

ACTIVITY OF AMERICAN CONSULS.

Only a few years ago it was a common experience to hear a good deal of fun poked at our consular service. This was due, no doubt, to the lax system of political appointments which formerly prevailed. A great change, however, has taken place in regard to our foreign service, and there is no doubt that recent administrations, especially the present one, have done much toward bettering the service and raising the standard of our representatives abroad. The political hack who is out of a job will no longer do, and the modern requirements of the office demand that our consular representatives should be men of character; the obtaining of information concerning trade and commercial conditions and the preparation of reports required by the government renders the office no longer a sinecure. That the work that is being accomplished by our consuls is beginning to be appreciated by our people is evinced by the interest that is taken in their Reports* by the public, and especially by the commercial classes. That this work is regarded with some misgivings by foreigners is shown by the rather suspicious attitude that was exhibited toward our consuls in some parts of Germany during the past year. A most interesting article appeared in a recent issue of London Engineering, and we take pleasure in publishing it entire, under the title there given it:

"The great industrial and commercial activity which at present prevails in the United States is due to many causes, some of which we have noted from time to time. No doubt the immediate cause was the war with Spain, which called into action so many of the forces which were lying latent, but the general economic and industrial conditions were favorable. A new spirit seemed to seize the Americans. The Monroe doctrine was forgotten, and they determined to become a world power. That spirit has entered their consuls stationed in the various countries of the world, and they have become active agents for pushing American industry and commerce. This is clearly shown by a document which was recently published by the State Department at Washington. To a superficial observer, it does not appear to be a publication of much importance, as it only professes to be an index to the consular reports; but when it is closely examined and taken in conjunction with the instructions to United States Consuls issued by the State Department in August, 1897, it throws some interesting light on the new activity of American Consuls, and on the efforts which the State Department is making through the consular service to enhance the position of the United States as a country exporting manufactured goods. As we some time ago explained, the State Department has now a very complete system for the publication of consular reports. From the beginning of 1898 they have been issued daily, instead of monthly as was formerly the case. The information is thus always fresh. The consuls were instructed to be prompt in furnishing their reports, and their notice was directed to a wide range of subjects on which information was required. They were, in short, constituted advertising and information collecting agents for the United States in all parts of the world. Their reports took the shape of a daily bulletin, which reviewed the condition of the world's trade, and gave information which was intended to help the United States to obtain as large a share of it as possible. This bulletin is sent to all the newspapers for publication, and to all the Chambers of Commerce for the use of their members, and otherwise is made as public as possible. In fact, it can be obtained free of all cost by any manufacturer or exporter who cares to take the trouble to get the Congressman from his electoral district to enter his name on the State Department list. The index which was recently published covers the first year of the new series, and is contained in a book of 78 pages, and includes in round numbers 4,600 entries. This, however, only means about 1,550 reports, for each report is thrice entered: under the name of the consul forwarding it, under the subject of the report, and under the country from which it comes.

A study of a few of the reports written by American Consuls shows that they have a most intense belief in their own country and in everything which comes from it. They are most optimistic in their views regarding the future of American trade in all parts of the world, and have little hesitation in expressing the opinion that American goods have only to be known in order that they may obtain a pre-eminent position in the district they represent. It must be admitted that they display wonderful alertness in pointing out any likely opening. No important contract is open without its being made known to American manufacturers; and if a strike takes place, those who are engaged in the industry concerned are immediately notified, and advantage is taken to push their goods, a fact which should be carefully kept in mind both by employers and workers when they are inclined to quarrel about wages or conditions. Many of the American Consuls are men who have had experience on newspapers, and they have often obtained their posts as rewards for party services. These men, as a rule, are trained observers and are able to present their case in the most favorable light; and it is quite evident that their newspaper experience has been of use to them, for both the matter and the arrangement of their reports are superior to the average of those published by the British Foreign Office. Although a great improvement has taken place in these latter in recent years, still many are evidently the work of men who have no practical experience in the department on which they are writing, or in making reports which are likely to be useful to manufacturers or merchants. The new duties which have been placed on American Consuls are rapidly revolutionizing the service. It is no longer the refuge of the partisan who has been able to influence an election; the public scrutiny which is now given to their work demands a high standard of efficiency, which is only possible by men who have the requisite knowledge and experience."

* See weekly issues of the SCIENTIFIC AMERICAN SUPPLEMENT.

STEEL DREDGES FOR NEW YORK HARBOR.

The Maryland Steel Company has just closed a contract with the contractor who has undertaken to dredge out the east channel of New York Harbor for two great ocean-going dredges somewhat similar to the ones used on the Mersey in England. They will be built throughout of steel and will cost about $450,000 each. They will take up the mud, clay and gravel on the bottom of the bay by a suction pipe and this material will be deposited in its own hold instead of on a barge and when full will steam out to sea and dump it. The dredges will be 320 feet long, 48 feet beam and the depth of the hold will be 26 feet. The twin screws will be driven by two triple-expansion, four-cylinder engines. The hydraulic pumping and suction apparatus will be operated by independent tandem compound steam engines. The dredges can make 12 miles per hour when loaded and they move at the rate of 3 miles per hour while gathering up material. The hoppers will hold 3,500 tons. When once started they will stay out night and day, ample accommodations being provided for officers and the crew. The first dredge will be delivered about May 1, 1900, and the second a short time after.

A PRIZE FOR A LIFE-SAVING APPLIANCE.

It has recently been announced that a prize of $20,000 will be given for a life-saving device to be known as the "Pollok Life-Saving Appliance." The American Security and Trust Company, of Washington, D. C., is the custodian of the fund, which is offered by relatives of Mr. and Mrs. Anthony Pollok, who perished in the ill-fated steamer "La Bourgogne." Particulars of the nature of the appliance have not yet been made public, but our readers who are of an inventive turn of mind will be informed of all the requirements as soon as the conditions governing the competition are definitely formulated.