been reconstructed, refitted, and rearmed, the changes making them thoroughly up-to-date vessels; and the improved plans of the new "Maine," "Ohio," and "Missouri" have been passed and the contracts let. The opening of the year finds us with eight first-class battleships, aggregating 95,125 tons, under construction for the navy, and it is gratifying to know that the whole of this work is being done in private yards. Our latest battleships of the "Maine" class will be or rather are now the most powerfully armed vessels of their class, and their speed of 18 knots is up to the present standard of other navies.

The most notable fact in connection with our ordnance is the decision to use smokeless powder exclusively in our future guns, and the proposal to make 3,000 feet per second the standard velocity for all the large rifles. Great interest also attaches to the Hobbs single-forging gun and the Gatling cast steel gun, both of which have shown good results in tests at the government proving grounds. Krupp armor still continues to hold the first place against all competitors. The government has wisely decided to adopt the Krupp system in the manufacture of its plates, and both Carnegie and the Bethlehem companies have produced plates of phenomenal endurance, the latter plate, 6 inches in thickness, having resisted the attack of six 8-inch armor-piercing projectiles without failure.

Science has again been enriched by the discoveries of Prof. Ramsay. In June of last year Ramsay was able to announce the discovery of "krypton" as one of the gaseous elements of air, the new gas being recovered from some liquid air which was being made the subject of experiment. Shortly afterward the same brilliant experimentalist, with the help of his assistant, Maurice Travers, discovered two other elements of the atmosphere, which were named respectively "neon" and "metargon." This result was made possible by the discovery, jointly, by Lord Rayleigh and Prof. Ramsay last year of argon, the new elements being obtained from a quantity of liquefied argon. Prof. Dewar, whose name is associated with the liquefaction of air, also succeeded in liquefying hydrogen at a temperature of —205 degrees Centigrade. M. and Mme. Curie report the discovery of an element which they call "polonium." It resembles bismuth, but is of far greater radiating power than uranium. Mr. Charles F. Brush announced at the Boston meeting of the American Association for the Advancement of Science that he had succeeded in eliminating from the atmosphere a gas which he calls "etherion." Its conductivity of heat is a hundred times as great as hydrogen. Sir William Crookes, in examining some rare earths used in the manufacture of the Welsbach mantle, discovered a new element, which he named "monium." It is heavier than "yttrium," but lighter than "lanthanum," its atomic weight being estimated at 118.

A notable event of the year was the production of liquid air in commercial quantities by Mr. C. E. Tripler, of New York. This is done by the development of the method of expansion in an ingeniously devised apparatus. The liquefaction is produced by the "self-intensification of cold," produced by the expansion of compressed and cooled air, no other substance being used to bring about the result. The boiling point at atmospheric pressure is —191° Centigrade, and the value of such a liquid, produced in commercial quantities, for laboratory purposes is obvious. Just how much commercial value liquid air will possess has got to be decided. Attempts are already being made to produce a liquid air motor.

In connection with our mention of Boston as the meeting place of the American Association for the Advancement of Science, it should be recorded that the past year was the golden anniversary of this well known institution, which at present boasts of a roll of 1,610 members.

The obituary of the year contains many names that will be sadly missed from the various fields of science and art in which they labored. Sir Henry Bessemer, who has had more to do with the industrial development of the nineteenth century than any other man, died on March 14. At the time the fiftieth anniversary number of the SCIENTIFIC AMERICAN was published, the readers of our journal put themselves on record as considering that the Bessemer process was the greatest invention of the last fifty years.

Dr. John Hopkinson was another Englishman whose death leaves a considerable gap in the front ranks of science. There is scarcely a branch of electrical work that does not owe something to his thought and labors. His improvement of the Edison dynamo, and his three-wire patent, which he disposed of to the Westinghouse Company for $100,000, are among his well-known achievements.

The death of Colonel George E. Waring, Jr., is lamented, not alone in the United States, his native land, but in every part of the civilized world where his writings have made him known. This soldier-engineer was distinguished by his work in many fields of industry and occupation; but his most brilliant success was achieved in recovering New York city from the disreputable state of filth in which Tammany corruption had permitted it to lie, and systematizing a street cleaning force which was a model of system and efficiency. He is to be reckoned as one of the martyrs of the war, having contracted yellow fever during his inspection of Havana with a view to its sanitation.

The death of Latimer Clark has reduced the number of those who are connected with the earlier development of land and submarine telegraphy. Together with his partner, Sir Charles Bright, he acted as engineer in the making and laying of the second and third Atlantic cables, and in all his firm was connected with the laying of 60,000 miles of submarine cables.

Prof. James Hall was a scientist whose death was noted with regret, not only in his native land, but in the many foreign countries where he was honorably known. He was the State Geologist of New York for sixty-one years, and one of the most industrious men in an industrious age. Although he died at the age of eighty-seven, he was able during the last ten years of his life to write 250 papers on scientific subjects. His life work was paleontological study.

In the lamented death of Joshua Rose, who was one of the editors of Appleton's "Cyclopedia of Applied Mechanics," "Modern Steam Engines," "Modern Machine Shop Practice," and numerous other well known works, the SCIENTIFIC AMERICAN lost one of its early contributors. Mr. Rose was an accomplished writer and a voluminous contributor to the technical press.

We close our review of the year with mention of another distinguished engineer among those we have mentioned as having passed away—Sir John Fowler, perhaps best known for his work as the designer of the great Forth Bridge in Scotland. His work covered almost every branch of engineering, for much of it was done in the earlier half of the century when specialization had not been carried to the extent which characterizes the present day.

## REMARKABLE USES OF PEAT.

BY OLIVER C. FARRINGTON.

One of the most interesting and attractive exhibits at the Vienna Exposition of last year was a building containing the most diverse articles made from peat. Everything in the building, from the carpets on the floor to the curtains at the windows and the paper on the wall, had been made from peat. These were but representatives of what will undoubtedly soon become a great industry and give to the peat bogs of the world a value never before dreamed of.

Credit for the discovery of the possibilities of peat belongs chiefly to a Vienna gentleman, Herr Karl A. Zschörner. His investigations into its nature began some twelve years ago with a study by means of the microscope of what is called in Austria "torfstreu." This is the layer of moss which covers the surface of most peat bogs. It has hitherto, by those who have made use of the peat for fuel, been at considerable expense removed and thrown away. Herr Zschörner's examination showed that the plant remains which make up this layer abound in hollow, spiral cells. These absorb water and other fluids with great avidity. While ordinary straw cannot absorb over four times its weight of fluids, this peat straw will absorb ten times its weight. The peat straw, moreover, possesses the antiseptic and disinfectant qualities of peat, qualities which have long been known, but of which little use has been made. Herr Zschörner accordingly hit upon the idea of drying the straw and using it as an absorbent in stables, breweries, and various manufactories. For such purposes it proved most admirably adapted, and the demand for the product soon grew large. Having greater absorptive power than ordinary straw, the peat straw can be used much longer in any given place and yet will have proportionally greater manurial value. It gives a healthy, resilient footing also for animals. For packing of both perishable and breakable articles it is also better than ordinary straw, since it is more elastic and less easily penetrated by heat and cold. Another form of peat which was found to be a better absorbent for some places was the peat itself, dried and ground to a powder. This is especially adapted for use in earth closets and about sinks and drains, its absorbent power and disinfectant properties making it admirably adapted for these uses.

Herr Zschörner did not rest his investigations here. A further study of the peat itself showed that it was very largely made up of fibers. These fibers come from the remains of reeds and grasses, which, growing and dying in successive generations, form the peat. In their submergence the reeds and grasses suffered no anatomical change, but their physical and chemical character became entirely different. The organic substance of the plant became inorganic, so that nothing capable of fermentation or decay was left, while the fibrous structure remained intact. These fibers then were found to have unusual physical properties. They were found to be very durable, very elastic, to be non-conductors of heat and non-combustible.

If a fabric could be woven from them, it would be one possessing unique properties. To the toughness of linen it would add the warmth of wool, an absorbent power greater than that of cotton, and the indestructibility of asbestos. It must, however, be woven without the aid of oils or water, or much of its value would be lost.

After twelve years of experimenting, Herr Zschörner succeeded in making the peat fibers weavable. There is now, therefore, scarcely any textile article which cannot be made from peat. Coats, hats, carpets, rugs, ropes, matting, and pillows are some of the articles which have been made, and have been found useful. What superiority these will prove to have in practice over fabrics made from other fibers, only time will tell. Some of them have, however, already been proved to be immensely superior to any other fabrics. This is especially true of the blankets and other coverings used for horses and cattle, for they greatly excel in warmth, absorbent power, cleanliness, and durability. The unspun fiber promises to be a valuable substitute for absorbent cotton, since it will not only absorb a much greater quantity of blood and other fluids than cotton, but it possesses powerful antiseptic properties as well. The coarser fiber it is expected will come into favor for use in upholstery work, its extraordinary elasticity making it most valuable for this purpose.

The latest achievement of the discoverer of the uses of peat has been the making of paper from its fiber. This has been carried to such an extent that paper of almost every variety of weight and quality can be made, while the toughness and durability of each is equal to that of paper from any kind of vegetable pulp. The above are but a few of the uses to which this remarkable fiber can be put, but they indicate possibilities which may yet rank peat bogs among the most valuable of the world's resources.

## AUTOMOBILES FOR FIFTH AVENUE.

For many years the last relic in the way of stage lines in New York has been the Fifth Avenue line, but the service has not been very satisfactory to the public and the franchise has now been acquired by the Third Avenue Railway Company. This line will be equipped in a short time with automobile carriages of some kind. If this is done, the line will be a valuable feeder to the various crosstown lines owned or leased by the Third Avenue Railway Company. The present service is slow and irregular, and for a long time the stage company had been examining various methods of traction. It is not probable that tracks can ever be laid in any part of Fifth Avenue, as public opinion as well as property holders are entirely opposed to it.

There is no objection, however, to the noiseless and cleanly horseless omnibus or stage, which will leave the street in a good sanitary condition. Of course, the Fifth Avenue line of stages must necessarily compete with the Madison and Fourth Avenue electric lines, and for a long distance it runs parallel with them; but while automobile vehicles cannot be operated as cheaply as the underground trolley, still the margin of difference is not so great as to prohibit their use, and, as we have already stated, the line would be valuable as a feeder to the various crosstown lines. There are many people who have used the stage line for years and who will probably continue to do so, and from a scenic point of view nothing can be finer than a ride up Fifth Avenue in a modern omnibus. There is no crush of travel as there is on many of the adjacent streets, so that the trip is more enjoyable, and the line will certainly come in for a considerable percentage of the "short haul" business, which pays very well and it is admirably adapted for this kind of transportation.

During the storm on November 26, the electric automobile vehicles behaved remarkably well. They ran throughout the entire night, and the last one only came in about six o'clock in the morning, when the snow must have been from eight to ten inches deep, and the carriages had no difficulty whatever in forcing their way through drifts which were much deeper than this. Horse cab companies turned over orders to the electric company rather than fill them themselves. Of course, the mileage per charge of battery was reduced. The motors and batteries acted admirably. One reason of their success was undoubtedly due to the large pneumatic tube tires, which are five inches in diameter and give a large and resilient bearing surface.

A BURNISHED finish on the journals of axles for railway carriages and locomotives has given good service, and has been used on many roads for a long time, says The American Engineer. The advantage of it is to smooth the surface of the journal after the finishing cut, and to shorten the period of breaking in. The burnishing is done by three rollers carried on a tool rest and bearing against the journal, considerable pressure being obtained by a screw. The rest is fed along so that the finishing cut and the burnishing are done at the same time. Mr. Atkinson, of the Canadian Pacific, uses the burnisher on piston rods, and intends to use it on valve rods, as well as on journals. He stated, at the recent Master Mechanics' Convention, that it gave the best finish that he knew of for piston rods.