at the base of the grandest cliff of the most majestic mountain of the Alps, but the authorities sent strict injunctions to recover the bodies, and on the 19th of July twenty-one men of Zermatt accomplished this sad and dangerous task. The remains of Hudson, Hadow, and Croz were interred in the little churchyard in Zermatt. So the inaccessibility of the Matterhorn was vanquished, and Mr. Whymper well says that it proved to be a stubborn foe. It resisted long and gave many a blow; it was defeated at last with an ease that none could have anticipated, but like a relentless enemy—conquered, but not crushed—it took terrible vengeance. Thirteen lives in all have been lost on the Matterhorn. In July of this year a party of five tourists, including two ladies and two guides, started to climb the Matterhorn. One of the ladies turned to look at the view, slipped and fell with two companions; the guide held them for a moment, then all three were precipitated a thousand feet. Strange to say, one lady and the guide survived, although the latter was insane when found by the party sent to rescue them.

The various Alpine clubs and guides have minimized the danger by building huts and shelters, and by placing hand supports and ladders in many of the most difficult places. Still, it is a very formidable task to ascend to the summit of the Matterhorn, as will be seen by one of our engravings, which shows a most difficult piece of rock work where the least slip would cause a fall of many thousand feet. Difficult rock work is not confined to either the Matterhorn or Switzerland, as will be seen by our second engraving, which shows mountaineering in Wales where the situation seems fully as alarming.

Start of Motor Bicycles, Tricycles and Electric Vehicles.

Mr. D. W. Bishop with His Panhard Racer and Mr. Foxhall Keene with His Mors Machine.

THE NEWPORT AUTOMOBILE RACES.

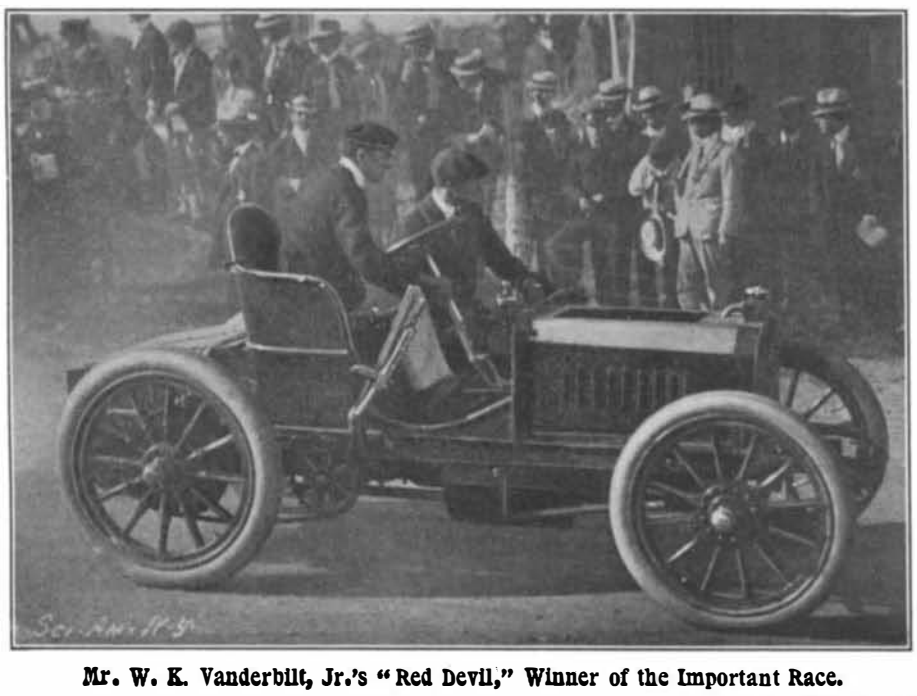
It was at first proposed to hold the automobile races of the National Automobile Association on the famous Ocean Drive, at Newport. Permission was obtained to practically close the Drive during the races, but some of the residents along the route applied to the Supreme Court and obtained an injunction prohibiting the use of the public roadway for the speed contests. As a result the races took place at Aquidneck Park, which was not a desirable place for holding the meeting owing to the fact that the track is only a half mile in length and the curves were not well adapted to attaining high speeds, especially for the high-power machines. There were sixteen heats to decide the six races. The first division was for tricycles, two-wheeled vehicles and electric carriages. One of our engravings gives a view of the start in this event. The course was three miles, for a first prize offered by Mrs. John R. Drexel, and the second prize offered by Mr. W. K. Vanderbilt, Jr., and a prize for the electric carriages was offered by Mr. Alfred Vanderbilt. The race was won in 5.40 minutes by Mr. Kenneth Skinner, who rode the tricycle seen at the left of the first group. This was one of the most exciting events of the afternoon as the speed attained by both the bicycle and tricycle was great. The bicycle led for about one-half the distance but was finally passed by the tricycle.

The second division was composed of steam-propelled vehicles and the race was run in two heats and a final for a first prize offered by Colonel John Jacob Astor; the distance was 3 miles. The first heat was won by Mr. J. McMillan Hamilton, in 6.25½. The second heat was won by Mr. John Powers, time 6.20. The final heat of 5 miles was won by Mr. John Howard, the best time being 11.41.

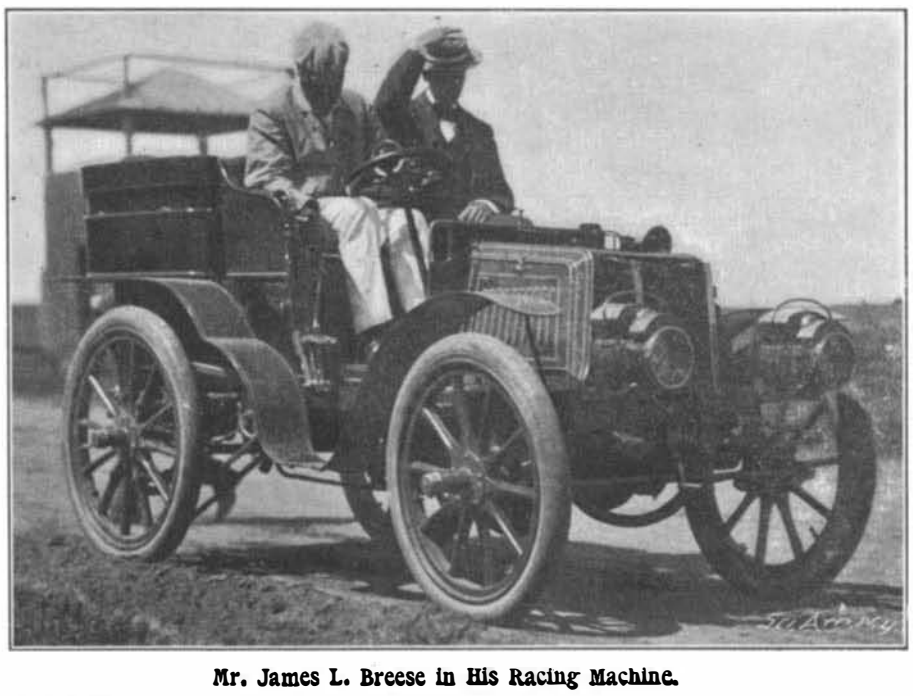
The third division was a special class of DeDion 5 horse power voiturettes, and the race was won in one heat of 3 miles by Mr. O. H. P. Belmont, his time being 7.33¼.

The fourth division was for gasoline vehicles not developing more than 12 horse power and was run in six heats and a final for a first prize offered by Mrs. Herman Oelrichs, and a second prize offered by the National Automobile Racing Association. The first heat of 3 miles was won by Mr. F. Walsh, time 6.06¼. Mr. Alexander Fisher came in first in the second heat, time 6.45; the third heat of 3 miles was won by default by Mr. C. G. Dinsmore. The time was not taken. The fourth heat of 3 miles was won by Mr. C. Macy, the best time being 6.17½. The fifth heat was won by Mr. Kenneth Skinner by default; no time was taken. The sixth heat went to Mr. Alexander Fisher, time 9.46. The final heat of 5 miles was won by Alexander Fisher; the best time was 9.37½.

The fifth division was for gasoline vehicles developing over 12 horse power, the race being in two heats and a final for a first prize offered by Mr. W. K. Vanderbilt, Jr., and a second prize offered by Mr. Joseph Widener. This was the greatest event of the meet and very exciting heats were run. The first was between Mr. Foxhall Keene and Mr. David W. Bishop,



Mr. W. K. Vanderbilt, Jr.'s "Red Devil," Winner of the Important Race.



Mr. James L. Breese in His Racing Machine.

THE NEWPORT AUTOMOBILE RACES.

Mr. Keene driving his 60 horse power Mors car and Mr. Bishop his Panhard racer. Mr. Keene obtained a better start and at the end of the half-mile was 75 yards ahead and he continually increased his lead so that by the time he had covered 3⅞ miles he had lapped his opponent and won the race by over half a mile. In the second heat, which was also 5 miles, the contestants were Mr. W. K. Vanderbilt, Jr., who drove his "Red Devil," a Cannstadt-Daimler vehicle of 35 horse power, and his opponent was Mr. Wm. N. Murray, of Pittsburg, who drove a Winton racer of 40 horse power. It must be said for the credit of the American machine that while the "Red Devil" obtained the lead at the start, the Winton machine being slow in getting under way, but finally gained upon his opponent and it was not until 2½ miles had been covered that the "Red Devil" began to pull away. Mr. Vanderbilt won, making the 5 miles in 7.43½, while his opponent was only 44 4-5 seconds behind him. The final heat of 5 miles was run by Messrs. Vanderbilt and Keene. A terrific speed was developed by the "Red Devil," and at the end of the 5 miles Mr. Vanderbilt was an eighth of a mile in the lead, and from that time on he slowly gained until the finish, when he was a winner by 10 3-5 seconds, the time being 7.36¾.

The sixth and last race was the championship for winners in all classes in one heat of 10 miles, for prizes offered by Mrs. O. H. P. Belmont and the Locomobile Company of America. It was won by Mr. W. K. Vanderbilt, Jr.; the best time was 15.23½. The day was an ideal one for a race and the results attained were considered very satisfactory.

Submarine Oil Beds.

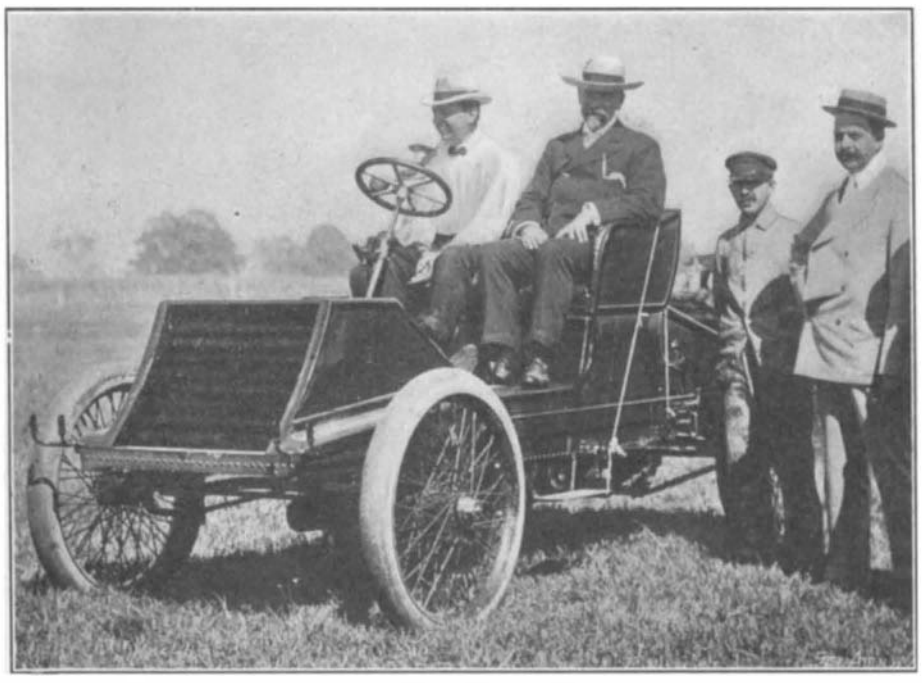
For some time past the Russian authorities have been exploring the petroleum producing country round Baku, and the result of these investigations has substantiated the hypothesis of experts that these naphtha beds are not only to be found at Baku, but that they extend for some distance beneath the sea. An attempt to utilize these submarine resources is seriously contemplated, especially on the coasts of Bibi-Eibat and the island of Swjitoi. The depth of water at the former place ranges from 14 to 50 feet, and at the latter to about 39 feet. The most serious problem that confronts the government is how to tap these submarine deposits without endangering the land supplies and public propertyand life. Theplant, such as reservoirs, pumping stations and power stations, must necessarily be similar to those employed on shore. The difficulty of transporting the naphtha is very complex. Small boats could not be employed owing to the large quantities of sand which the fountains invariably throw up, while the utilization of steam vessels in a naphtha-laden atmosphere would be fraught with considerable danger. The only means of solving the problem is by enclosing the area with a sea wall, but as such a reclamation scheme could be only undertaken at tremendous expense. and as the value of the oil beneath is purely supposititious, both in quantity and quality, the completion of such elaborate works might prove unremunerative. As a tentative effort to discover the value of these submarine deposits, the government suggests that Romany Lake, one of the centers of Baku, should be laid dry and the soil tested. Several petroleum firms have made offers for this concession, but as none of them has been deemed sufficiently high, the government intends to empty the lake at its own expense and to let the area thus recovered, in the usual way. If the experiment should prove successful and the oil sufficiently rich and abundant, the other schemes would then probably be undertaken.

Government Railways in Europe.

Dr. A. von der Leyen, a railroad expert, has published an article in the June number of the German Review, says Science, concerning the management of the government railroads of Prussia, of which Consul-General Günther sends an abstract to the Department of State.

He demonstrates that the example of Prussia in buying the private railroads and running them on government account has contributed to popularize this system in other countries, and states that not only have the other German states followed it, but that almost all other European countries have purchased the existing railroads.

The Austrian government railroad net has to-day a mileage of almost 6,300 miles; that of Hungary, about 8,150 miles. Since 1882 a great change has taken place in Russia; of the then existing 14,000 miles of railroad, only about 40 miles were owned by the government. The total mileage in 1897 was about 24,300 miles, of which 15,780 miles belonged to the government. To this must be added the government railroads in Finland and Asiatic Russia, the Trans-Caspian and the Siberian railroads. The Servian, Roumanian and Bulgarian railroads are owned exclusively by the respective governments. Of the northern European kingdoms, Denmark has a government railroad system of 1,167 miles and 525 miles of private railroads. Norway's railroads belong almost exclusively to the government. Sweden has 2,303 miles of government and 4,387 miles of private railroads. The government has not yet succeeded in acquiring the latter, although efforts have been made to do so. Belgium, in 1898, through the purchase of the Grand Central Belge and some minor private roads, became the possessor of the whole Belgium railroad system. Holland acquired all the remaining private railroads in 1890; they are, however, operated by two private companies. The Italian government purchased all private main railroads of Italy in 1885 and leased them for twenty years to private corporations. Mr. von der Leyen states that both the last countries have had unpleasant experiences with this arrangement. Switzerland, after long discussion, resolved by federal law in October, 1897, to gradually purchase all the private railroads. On January 1, 1901, the first federal railroads were operated by the government. By agreements of 1883, the six large French private railroads had their rights recognized by the government, and no change has been made in the policy in that country. The relatively small government railroad system, located between the Orleans and the Western railroads, has remained intact. As the private railroads, however, have received large subsidies from the government, and as they will revert to the state in the second half of the present century, they can hardly be considered purely private railroads. Of the countries which have a private railroad system exclusively, only England and the United States remain.



Mr. Murray with His Forty Horse Power Winton Racing Machine.

Preservation of an Historical Locomotive.

The famous engine "General," which was used by Capt. James J. Andrews and his party of raiders in an attempt to burn the bridges on the Western and Atlantic Railway on April 12, 1862, has been sent by the Nashville, Chattanooga & St. Louis Railroad to be set up in the Union Depot at Chattanooga as a monument to the heroes of that daring raid, says The Railway Review. It will be remembered that the engine and several box cars were stolen from a passenger train while the crew was at breakfast at Big Shanty. The raiders were closely pursued by the conductor and a party of Confederate soldiers in the switching engine. The "General" was finally abandoned and the bridge-burning scheme had to be given up. All of the party, numbering some twenty-two, were captured and eight were executed as spies. The survivors built a monument in memory of the affair in the National Cemetery at Chattanooga.

When the two Hungarian scientists, Messrs. Pollak and Virag, displayed their new telegraphic apparatus at the Paris Exhibition last year, they were invited by the French government to make experiments with it over the lines between Paris and Lyons. On account of the enormous expense, however, the inventors declined the invitation. Since that time, however, they have established a line of their own extending from Buda-Pesth to Fiume, a distance of 375 miles, and have been carrving out a series of tests with their apparatus. A speed of 40,000 words per hour has been attained.

HOW TO CONSTRUCT AN EFFICIENT WIRELESS TELEGRAPH APPARATUS AT A SMALL COST.

BY A. FREDERICK COLLINS.

Since the practical introduction of wireless telegraphy in 1896, great progress has been made, not only in spanning great distances, but in syntonizing or tuning a certain receiver to respond to a given transmitter.

To follow up the intricacies of wireless telegraphy there can be no better method than to build an apparatus and make the additions from time to time as they are published in the Scientific American. To telegraph a mile or so without wires by what is known as the etheric wave or Hertzian wave system is not difficult; indeed, the apparatus required is but little more complicated than the ordinary Morse telegraph, and is so simple that the reader need have no difficulty in comprehending every detail; if on the other hand, one wishes to work out the theory involved, it becomes such a difficult task that the master physicists have yet to solve it. It is the practical and not the theoretical side of wireless telegraphy we have to deal with here.

The instrument that sends out the waves through space is termed the transmitter, and this I shall first describe. It consists of an ordinary induction or Ruhmkorff coil (see Fig. 1) giving a half inch spark between the secondary terminals or brass balls. Such a coil can be purchased from dealers in electrical supplies for about $6. A larger-sized coil may, of course, be used, and to better advantage, but the cost increases very rapidly as the size of the spark increases; a half-inch spark coil will give very good results for a fourth to half a mile over water, and the writer has transmitted messages a mile over this sized coil.

Having purchased the coil, it will be found necessary to supply the oscillators, as the brass balls are termed, since coils of the smaller size do not include them. The brass balls should be half an inch in diameter and solid; they may be adjusted to the binding posts of the secondary terminals by brass wires, as shown in the diagrammatic view, Fig. 2. It will require two cells of Bunsen battery to operate the coil, or three cells of Grenet or bichromate of potash battery will operate it nicely. An ordinary Morse telegraphic key is connected in series with the battery and induction coil, as shown in the diagram. Now when the key, 4, is pressed down, the circuit will be opened and closed alternately—like an electric bell—by the interrupter, 2, and a miniature flash of lightning breaks through the insulating air-gap between the balls or oscillators, 5, and this spark or disruptive discharge sends out the etheric waves into space in every direction to a very great distance.

The oscillators should be finally adjusted so that not more than an eighth of an inch air-gap separates them. The reason the distance between them is cut down from a half to an eighth of an inch is because in wireless telegraphy it has been found that a "fat" spark emits waves of greater intensity than a long, attenuated one. The balls are termed oscillators, since, when the electric pressure at the balls becomes great enough to break down the air between them, the electric wave oscillates or vibrates very much as a string of a musical instrument oscillates when struck; in other words, it vibrates back and forth, very strongly at first, growing lesser until it ceases altogether.

The coil and key may be mounted on a base of wood 8 inches wide by 17 inches long and ¾ inch thick (Fig. 1). This, with the battery, constitutes the wireless transmitter complete, with the exception of an aerial wire leading upward to a mast 30 or 40 feet high, or the wire may be suspended outside a building. At the upper end of the wire a copper plate 12 inches square should be soldered; this is the radiator, and sends out the waves into space; another wire, 8, leading from the instrument is connected with a second copper plate, 9, buried in the earth. The wires are then connected to the oscillators—one on either side, as shown in Fig. 2, 6,6. The aerial and earth wires may be soldered to a bit of spiral spring, as this forms a good connection and one that can be readily removed if necessary. The transmitter may be set on a table or other stationary place, but for convenience it is well to have the coil and key mounted on a separate base.

To the receiving device there are more parts than to the transmitter, and to simply gaze upon the cut, Fig. 3, it would be almost impossible to obtain a correct idea of the connections. To the layman the most mysterious part of the whole system of wireless telegraphy is the most simple and the easiest understood. I refer to the coherer. Fig. 4 is a diagrammatic view of an