of the departed in the late famine, and refused to make any attempt to exterminate them. This curious apprehension, however, has now to a great extent been overcome and now many thousands of rats have been killed in various sub-divisions, but it is an open question whether anything but the next heavy downpour of rain will bring about any appreciable decrease in numbers. The method adopted by the natives in destroying rats for the reward is somewhat surprising, although simple and apparently efficacious. At night a party goes out with a lantern and armed with bows and arrows. The rats are said to be attracted by the light, and the sportsmen, armed with bows, shoot them as they come within range. It is no difficult matter to discover the animals, since the ground is honeycombed with their burrows, and they teem in their thousands.

Dispensing With Platinum.

The piece of platinum foil which forms part of the outfit of every beginner in chemistry, and of most working chemists, has become so expensive of late that acceptable substitutes are worth considering. Very pure silver is actually superior to platinum for most of the uses to which such pieces of foil are usually put. It must be very pure; the thick sheets used as anodes by electroplaters are pure enough, and of a convenient thickness. Or, any chemist can easily purify his silver and then get a jeweler to melt and roll it.

When used for evaporating solutions to dryness the silver is liable to be attacked by oxidizing acids, but this action can be prevented by the addition of ammonia, which is generally unobjectionable. For fusions, however, the silver is altogether preferable. Being unaffected by alkalies, it can be used with caustic soda, instead of the carbonate, and thus a lower temperature suffices; manganese and chromium fusions are readily performed. The silver is so cheap (a piece an inch square and a sixteenth thick should cost about twenty cents) that thicker, and hence stronger and more durable pieces can be used; with such heavy pieces a strip an eighth of an inch wide may be cut so as to project as a handle, and the assay is thus freed from liability of contamination by material from the tweezers which hold the foil in the flame—generally a great nuisance with platinum.

The platinum wires, also, which are used to hold salts in a flame for spectroscope work, may be replaced by iron—with advantage, for the iron may readily be thrown away if they get mixed or incrusted.—W. P. White, University of Wisconsin.

The Largest Known Tree.

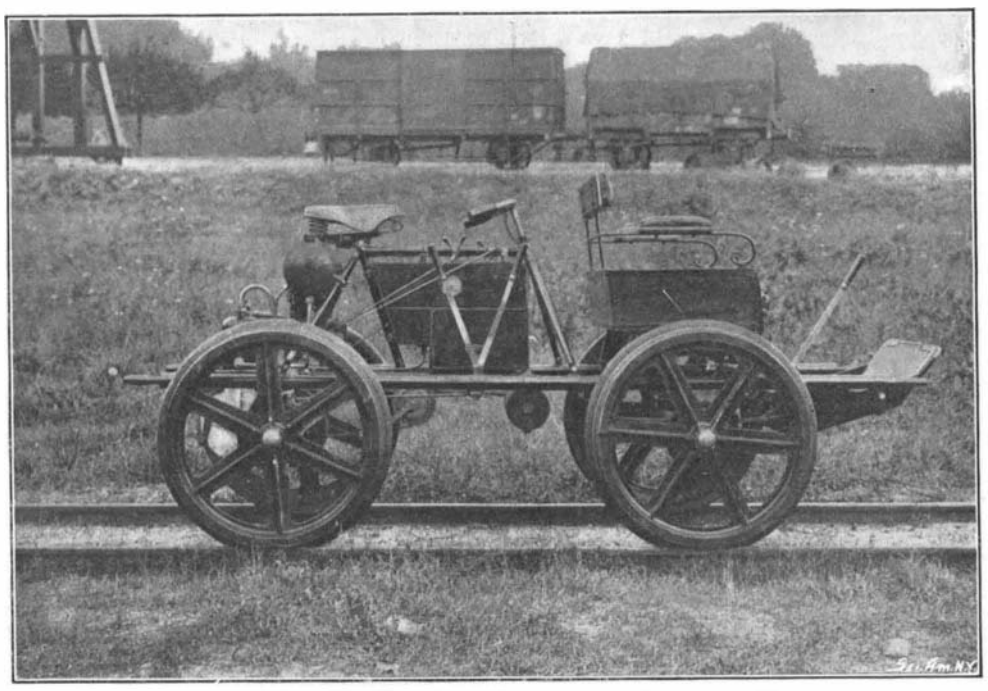
In last week's SCIENTIFIC AMERICAN mention was made, in the article on lumbering in California, of what was considered the largest tree in the world. News now comes from Fresno of the discovery of a tree which probably exceeds in size any that has so far been known. This newly-found tree, measured six feet from the ground, is 154 feet and 8 inches in circumference, from which it follows that it is about 50 feet in diameter. Fortunately the tree stands on the Government Reserve, and will therefore be spared the attack of the insatiable ax.

The Ardennes Automobile Contest.

The great Ardennes automobile race was won by an Englishman, Mr. Jarrot, who covered the distance of 318 miles in five hours and fifty-three minutes, or at the rate of 57 miles an hour. The course, more than fifty miles in circumference, had to be circled six times. There were many accidents, but none resulted fatally. Americans will be pleased to learn that Mr. W. K. Vanderbilt, Jr., in a Mors car, finished third, M. Gabriel finished second.

VARIED MODERN USES OF THE AUTOMOBILE.

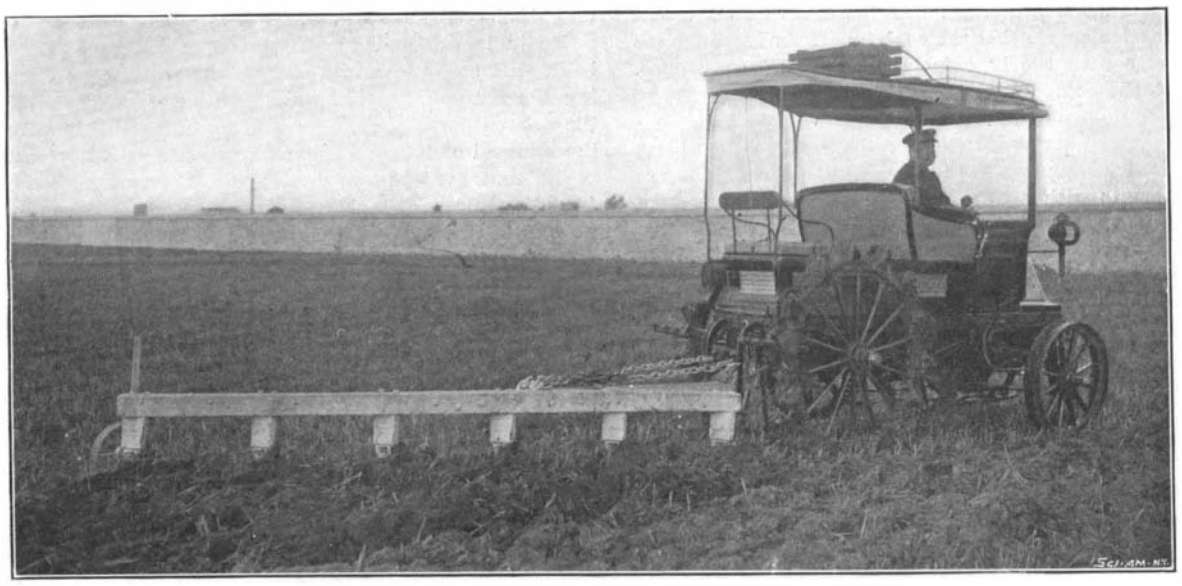
Apart from its employment as a vehicle of pleasure, the automobile is rapidly entering the sphere of usefulness in the most varied classes of work. The advantages of these machines are being increasingly appreciated and it is only a matter of time when the public will largely discard the horse for labor purposes and adopt the motor vehicle in its place. A most striking example of this competition with the horse will be seen in the accompanying illustration, which shows an automobile drawing a field cultivator. The automobile as shown is provided with wheels especially adapted for traveling over a rough field. The front tires are very broad so as to prevent the wheels from sinking into the soft earth; the rear or driving wheels have tread projections, which insure a good hold and prevent them from slipping. This automobile takes the place of a traction engine, and can be attached to any farming machine desired. Aside from its agricultural uses the vehicle may be jacked up and its wheels replaced by rubber-tired wheels, when it will be found a useful and comfortable conveyance for all purposes. In contrast with this peaceful use to which the automobile is put it will be interesting to note the motor built for war service in South Africa. These machines, here illustrated, were recently awarded first prize in a competition instituted by the British War Office. The Thornycroft Standard, which is essentially a motor truck, is capable of carrying three tons and drawing, further, two tons on a trailing vehicle. It is fitted with a patent central-fire water-tube boiler especially arranged for cleaning the internal surfaces—a most important feature, when, as is frequently the case, hard water only can be obtained. This motor, however, differs from the ordinary type only in the wheels,



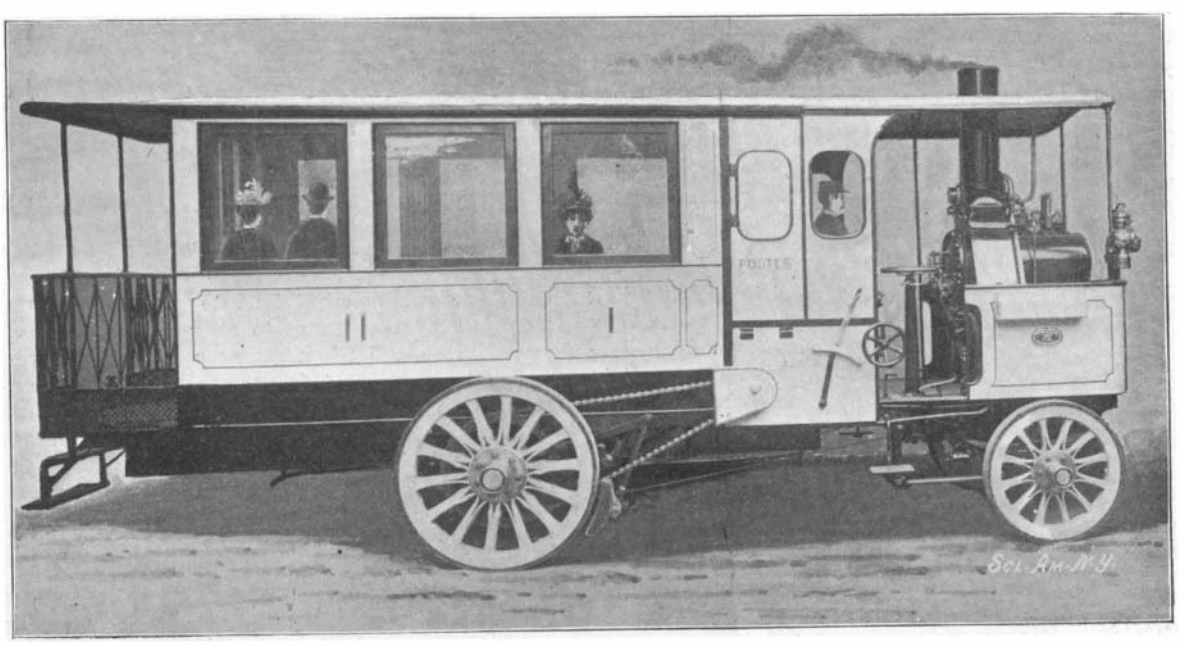
THE AUTOMOBILE AS APPLIED TO RAILROADING.

which are built of solid steel and are somewhat larger in diameter with wider tires. The second vehicle is of an experimental type, especially adapted for use on rough roads and uneven ground, the steering axle being capable of unusually great angle of tilt, while the driving and steering wheels are of a large diameter. The boiler and engine are situated directly over the driving axle, the carrying platform being provided at the fore part of the vehicle. This arrangement gives the wagon great power to get out of holes in soft ground, etc., and enables it to exert its full power as a tractor when it is not itself laden. The boiler and engine are of the same pattern as the Standard motor. It is supplied with a winding drum, and a hundred yards of steel wire. A spring draw-gear is also provided, fitted with the standard military draw hook. The boiler is arranged so that the fire bars can be easily replaced by the liquid fuel burners, which are either of the spraying or vaporizing type, according to the nature of the oil which may be available. A condenser is provided, but it is so arranged that it can be short-circuited or removed without interfering with other parts of the machinery.

Steam vehicles are also being used for passenger service in large cities. We illustrate a steam propelled omnibus of the Turgan-Foy type which is now in use in France. The boiler is placed in front, and the engines, which are horizontal, rest upon the truck-frame under the conductor's bench. Two compound engines are used, and each drives one of the rear wheels directly by chain gearing and the differential is suppressed, giving a decided advantage. The boiler has about 12 square yards of heating surface, with a feed-water heater in the stack and a special superheater in the fire-box, giving a great vaporization and a considerable economy of water. The boiler and its accessories and valves is light, weighing only 1400 pounds. The engines have cylinder diameter of 3.6 and 7 inches, with 6.2-inch stroke, and 600 revolutions per minute. Each will give 20 horse power. A good test of a Turgan-Foy hauling wagon was made at the late military maneuvers in the eastern part of France, where it



THE AUTOMOBILE AS USED FOR FIELD CULTIVATION.



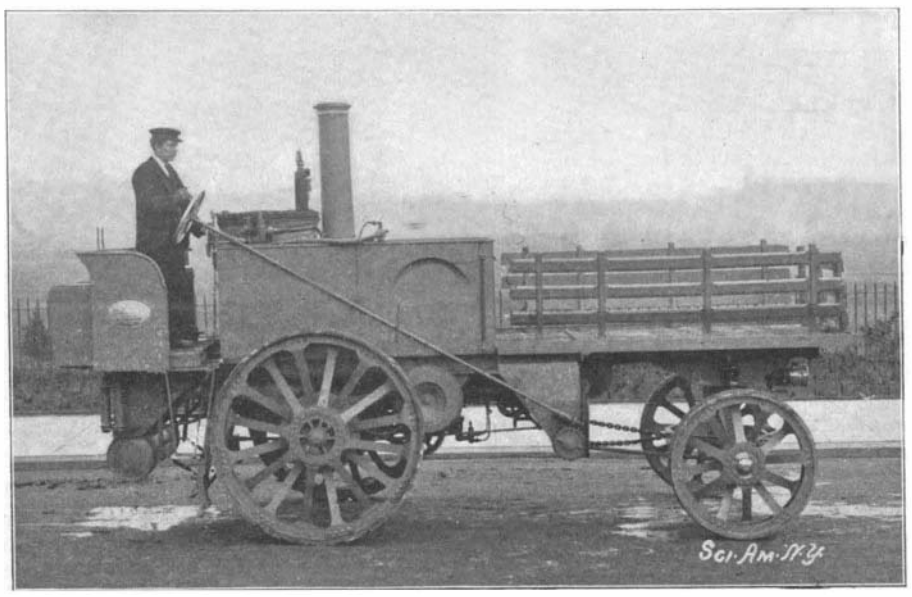
TURGAN-FOY STEAM CARRIAGE FOR PASSENGER SERVICE IN CITIES.

did excellent service during 21 days with scarcely a stop. The military commission, directed by Commandant Ferrus, had an interesting series of trials made, and it was shown that the tractor, carrying itself a load of 2 tons, could easily draw 5 artillery wagons forming a train 90 feet long, at the rate of 6 miles an hour. These wagons weighed 4 tons in all, which with the 2 tons carried, gave a total of 6 tons. During the trials it was found easy to start the tractor on grades of 7½ per cent.

The automobile for railroad inspection represents another very novel use to which these machines are put. This automobile, which is of De Dion make, will carry two or three persons along a railroad for inspection purposes, or in roads that have but small traffic it will be found useful for postal services. The frame, which is of steel tubes, is exceedingly simple. At each of the two extremities there are two handles for lifting it and putting it on or taking it off the rails. This operation may be performed by one person. The motor, which is of 3½ horse power, is of the same type as that of the Nouse's voiturettes. It is provided with the firm's new carbureter.

The transmission is effected by gearings, with the interposition of a friction clutch fixed upon the driving axle and controlled by a lever placed to the right upon the frame and within easy reach of the hand. After the apparatus has been thrown into gear, the starting is effected by means of pedals. The four wheels, which are of the same size, are 24 inches in diameter. They are of aluminium shod with iron, and are provided with six spokes. Two lever brakes, one of them of great energy, act respectively upon each of the hubs, and can be operated, according to circumstances, by one or two persons. Their power is such that it is possible totally to block the wheels, which then slide a distance that varies with the speed at which the vehicle is running. The driver is seated in the same way as upon an ordinary tricycle. His hands rest upon a stationary handle bar designed to serve simply as a support, since the steering gear is done away with, as is also the differential, which is absolutely useless in view of the wide radii of the curves of the railway tracks.

The front of the apparatus is provided with a very comfortable seat capable of accommodating two persons, or with a large box. The total weight of the apparatus is 660 pounds. It can be furnished with various gearings to permit of varying the speed from 24 to 36 miles an hour. The experiments made upon the Valmondois Line have given very satisfactory results. —We are indebted to our English and French correspondents for some of the above information.



THE AUTOMOBILE AS APPLIED TO ROAD TRANSPORTATION.

A New Artificial Fuel.

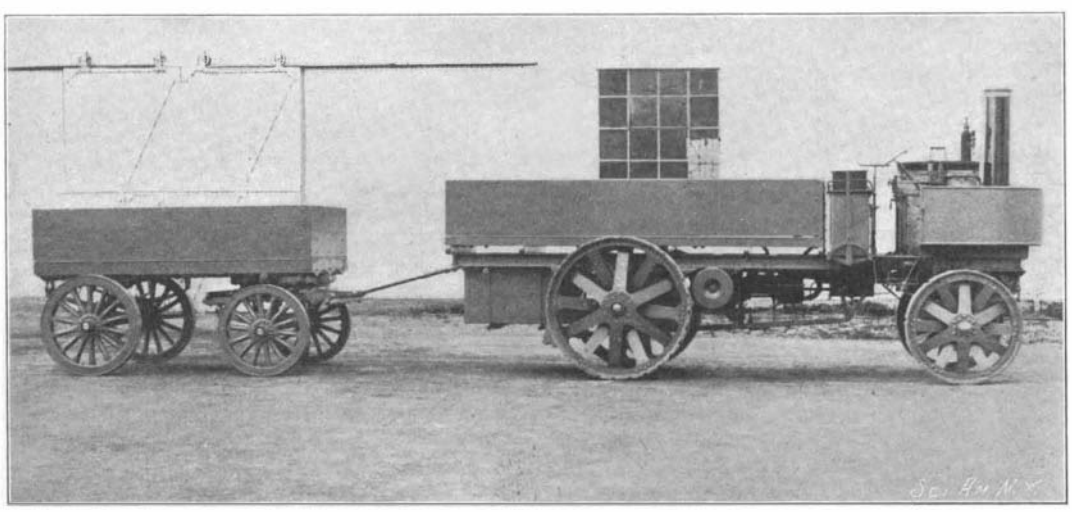
It is gradually dawning upon engineers the world over that the world's coal supply is not likely to last forever, and that the time is not very far distant when artificial fuel must be resorted to. At the present time the need of an efficient artificial fuel has been brought home to us, not because of any fear of the world's supply of coal giving out, but because of the prohibitive prices of anthracite, due to the strike of the coal miners. Inventors innumerable have drawn upon their chemical knowledge in the endeavor to produce a fuel which could compete with coal in efficiency, if not in price. Not so many years ago a prize was offered for a method of solidifying petroleum, or reducing petroleum to such form that it could be carried about readily and used for fuel in fire-boxes. The research thus stimulated resulted in the patenting of several fuels, among which was one invented by Mr. G. M. Randall and introduced by the Randall Synthetical Coal Company, of Boston, Mass. The fuel in question is a combination of peat and petroleum.

The peat is raised from the bog by a clam-shell digger or dredger. It is then conveyed to a disintegrator which separates all coarse material such as roots. From this disintegrator it is conveyed to a press where it is reduced from 80 per cent of water to 40 per cent. After leaving the press it passes through another disintegrator. Lime is then added, which tends further to dry the peat. The resulting mixture is conveyed to a drier, which is a steel cylinder, varying in length according to the capacity required. Petroleum in which bituminous pitch is dissolved is then added in a pug-mill or mixing-mill. After the thorough mixture to which the oil, lime and peat are subjected in this mill, the final briquetting process is all that is necessary to produce the finished product.

The addition of lime results in almost a total combustion of smoke. During the burning of the fuel acetylene gas is formed. The intensity of the flame is such that it insures almost complete combustion of gases, which, under ordinary circumstances, escape in the form of thick black smoke.

The calorific value of the synthetical coal made by this process is represented by 1300 degrees British thermal units. The very best anthracite coal has a value of only 14,000 degrees thermal units, while bituminous coal has a calorific value of 12,500 degrees British thermal units. It will therefore be seen that this particular synthetical coal in efficiency compares favorably with the best fuels at present in existence. In cost the comparison is equally favorable.

Messrs. Thornycroft, the well-known shipbuilders of Chiswick, London, have been carrying out elaborate experiments with a new oil engine, the invention of a Swiss engineer named Berthan, the patents of which they have purchased outright. The motor is specially adapted for small craft. In the ordinary oil engine the machinery has to be set in motion by outside means, generally by the application of manual power. In the Berthan engine reservoirs are placed beneath the seats of the launch, and while the engine is at work a proportion of the gas or vapor generated passes into them, where it is stored ready to start the engine the next time the boat is required. Another notable feature is the reversing gear. At present the system of reversing, where oil motors are used, is not to reverse the engine, but to shift the power from a cogwheel on the crankshaft to one beveled another way, and by this means to alter the direction of the screw. In the Berthan engine a simple movement of a handle is all that is necessary, as this operation causes the propelling vapor to enter another set of valves, and in ten seconds the engine is working full speed in the opposite direction. The new oil motor occupies half the space of the steam engine. Power can be developed in ten minutes, as compared with half an hour which is required in the case of steam.



SPECIAL THORNYCROFT MOTOR BUILT FOR WAR SERVICE IN SOUTH AFRICA.

Congress has appropriated $15,000 for the purchase of additional buffalo for the Yellowstone Park. There are now in the Park about twenty buffalo. Originally there were twenty-two, but two escaped.

The New Ship Canal at Oakland Bay, California.

BY J. M. BALTIMORE.

For a great many years Congress has been making appropriations for the ship channel along Oakland bay, in California. This bay is a long, narrow arm extending eastward for some miles from the main San Francisco harbor. In a maritime and commercial sense the bay is of great importance. A large number of both steam and sailing craft lie at anchor in its waters, and extensive shipbuilding is also carried on along its shores. To keep the channel open for the passage of vessels has been and is of the greatest importance. Dredging has been carried on almost constantly along the channel, and especially at the head of the bay. Here inflowing tides ceaselessly deposit mud which the ebbing waters fail to sweep away. Filth, garbage and sewage of every description accumulate, and the water having no outlet is rendered foul and pestilential. Also many tons of small fish are annually cast up along the tide flats, where they perish and decay.

For the purpose of obviating these annoying conditions, it was recently decided to build a canal from the head of Oakland bay to the lower end of San Leandro bay. This work is now in progress under the supervision of the United States Engineer of the District of California, and is one of the most extensive harbor improvements yet made on the Pacific coast. The canal will afford an outlet for Oakland bay, through which the tides can sweep. As both Oakland and San Leandro bays open out into the main San Francisco harbor, a complete circuit will thus be established, and powerful tide-currents will thoroughly flush out all the wide expanse of bay which has heretofore had no suitable outlet. The following dimensions will help us to form a clearer idea of the magnitude of the work. The canal will be over two miles in length and 400 feet wide at the top. Each bank will slope inwardly and downwardly, thus leaving the bottom 300 feet wide. The average depth of the cut will be about 25 feet, and the work will involve the removal of 1,400,000 cubic yards of earth and stone.

The contract was awarded by the government to the Atlantic Gulf and Pacific Company. Eighteen months were allowed in which to complete the task, but, at the present rate at which the work is progressing, it is confidently expected that the canal will be completed within fifteen months. Operations were commenced early last September and have been pushed forward night and day ever since. A large force of men are employed, supplemented by powerful steam shovels and a large dredge. About 100,000 cubic yards are removed each month. The excavated earth and stone are hauled away by trains and dumped on marshy tide flats, and on this made ground very extensive railroad shops are soon to be built. After the steam shovels have completed the work of excavation, the canal will be opened and the water allowed to flow in, when some general dredging will be done to deepen the canal a little and to level off the bottom. At extreme low tide the canal will be 8 feet deep; at high tide, 16 feet. This latter depth will admit of the passage of all ordinary-sized steam and sailing vessels. The total cost of the improvement to the government will be about $600,000. It is hoped that the new canal will be thrown open for the free passage of all vessels by the first of next year.

A shipping curiosity has been broken up at Teneriffe, Canary Islands, in the Italian ship "Anita," of Genoa, which was the oldest vessel in the world. The "Anita" resembled Christopher Columbus' ship, the "Santa Maria," and was built in Genoa in 1548. She completed her last voyage at the end of March last, when she ran from Naples to Teneriffe. The "Anita" was of tremendously stout build, and had weathered countless storms and tornadoes in all parts of the world. She was also the slowest ship afloat, taking 205 days on one voyage from Baltimore, Md., to Rio de Janeiro.

Estimated Number of Draft Animals.

A French authority estimates the number of horses in the world at 74,600,000, and the number of mules and asses at 12,100,000. Despite the inroads of the automobile, there is an unusual demand for draft animals and the prices are high.