mony of colors of these plants, always freshened by frequent showers, enhance the other natural beauties of this region, and give to the quiet depths of the forests a peculiar attractiveness, contrasting strongly with the rugged cañons and serrated crests of the higher Andes.

The most conspicuous animals of the forest region are a small deer, not quite so large as our Virginia deer, the male with usually only two points on either horn. The puma, or mountain lion, is abundant both on the plains and in the mountains. There are two species of dogs. The larger, Canis magellanicus, is about the size of a small collie, of a reddish brown color, and frequents the wooded regions. It is rather shy, in striking contrast with the smaller C. azare, abundant in the plains, of a light gray color, and about the size of a small red fox. The guanaco or South American camel is very abundant over the plains, and occasionally enters the wooded mountainous districts. Among the birds, two, from their size, are especially noteworthy, the rhea, or so-called ostrich, found in great numbers on the plains, and the condor, common in the Andes, along the high bluffs of the sea coast and about the basalt cliffs of the interior plains region.

The natives of the eastern and western regions belong to two entirely distinct races, differing from each other in their customs, language, and mode of life. To the eastern region belong the Tehnelches, a large, well developed, and peaceable race, living entirely by the chase. They construct their habitations and make their ample clothing with considerable skill from the skins of the guanaco. In the capture of the guanaco, rhea, and other game animals and birds they are exceedingly proficient and show much ingenuity.

The Channel Indians of the western region are physically much inferior to the Tehnelches. They are essentially a maritime people with all their activities clustering about the shore, from which they never proceed more than a few miles inland. They subsist chiefly upon shell fish. the flesh of seals, fish, and the sea otter and a few edible fungi indigenous to the region they inhabit. From the skins of the seal and sea otter they construct their clothing, usually exceedingly scanty, notwithstanding the inhospitable climate. Rude huts are sometimes built from the branches of trees, but they spend much of their time in small open boats made of beech bark sewed together with whale bone. It is in the construction of their boats and the implements used by them in the capture of seals that they show greatest skill and resource.

Although the plains of eastern Patagonia are exceedingly monotonous and uninteresting to the casual observer, yet they are of the greatest interest to the geologist and paleontologist, for it is the rocks composing them that contain the remains of the extinct animals that in former times inhabited this region. In many places along the river valleys there are extensive exposures of the sedimentary rocks rich in fossil remains, and the high bluffs of the sea coast have proved among the most promising localities for the collector.

A careful examination of many exposures in various portions of Patagonia has made it possible to establish the exact sequence of the different strata and to give a section of the various formations with the fossils characteristic of each from middle Mesozoic to recent times, and to indicate approximately the present geographical distribution of these different formations throughout Patagonia.

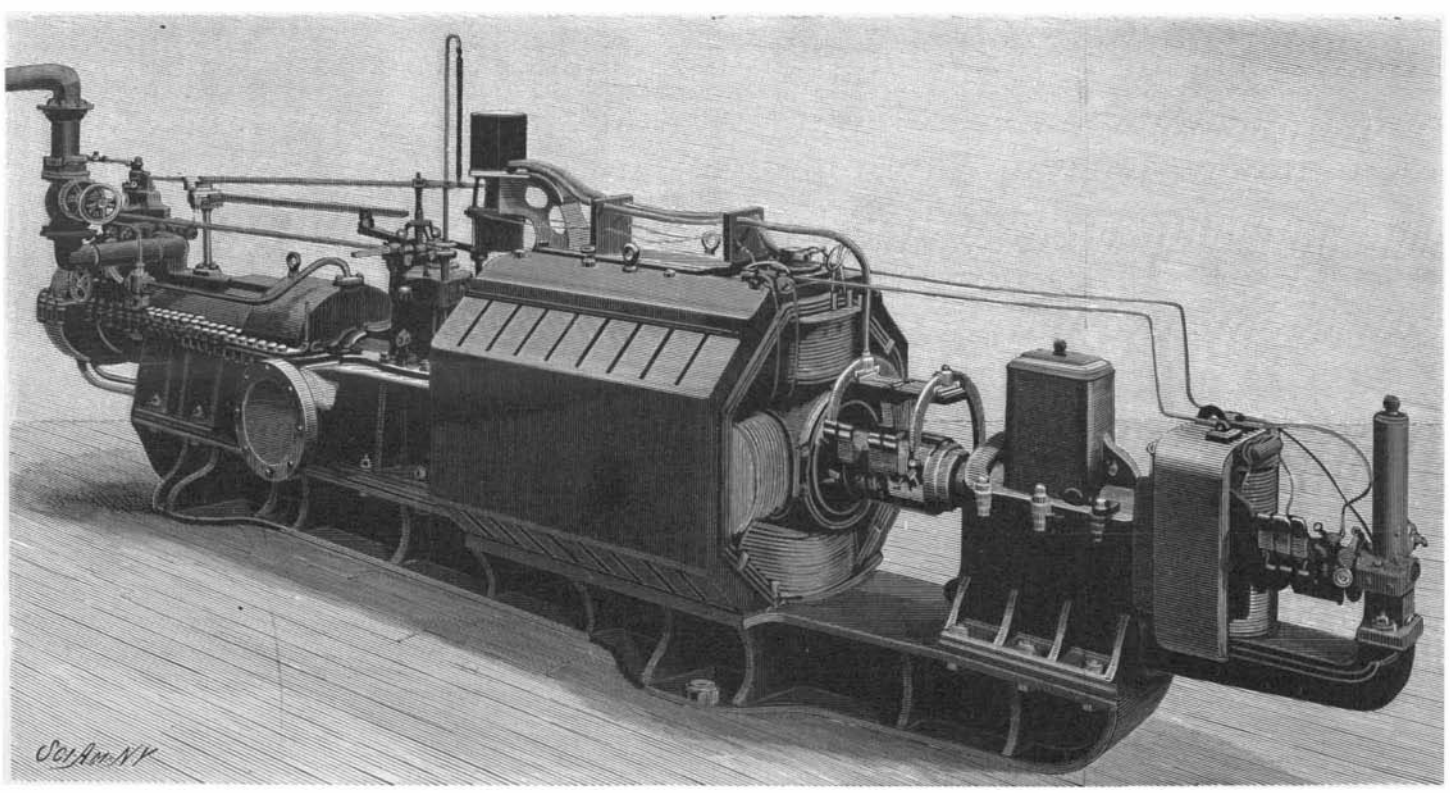
Rich and varied as was the mammalian fauna of South America in former Miocene times, the excellent preservation of many of the skeletons in our collections demonstrates beyond a doubt its unique character, so entirely distinct from anything then living in the northern hemisphere.

While there is a striking and universal dissimilarity between this fauna and that of the northern hemisphere, on the other hand there are many apparently close resemblances between the extinct Patagonian fauna and the recent Australian fauna. The same is also true, though in a more restricted sense, of this fauna and that of South Africa. The explanation of these similarities and dissimilarities in the faunas of the various regions can be best explained by assuming that they indicate in the one case a direct relationship and in the other a totally distinct origin for each. The relations apparently existing between this Patagonian fauna and certain forms now living in Australia and Africa would be the natural result of former land connections between these regions, perhaps, by way of an Antarctic continent permitting of an intermigration of species. The dissimilarity in the North American fauna would indicate a long period of isolation of the two Americas, continuing until comparatively recent tertiary times.

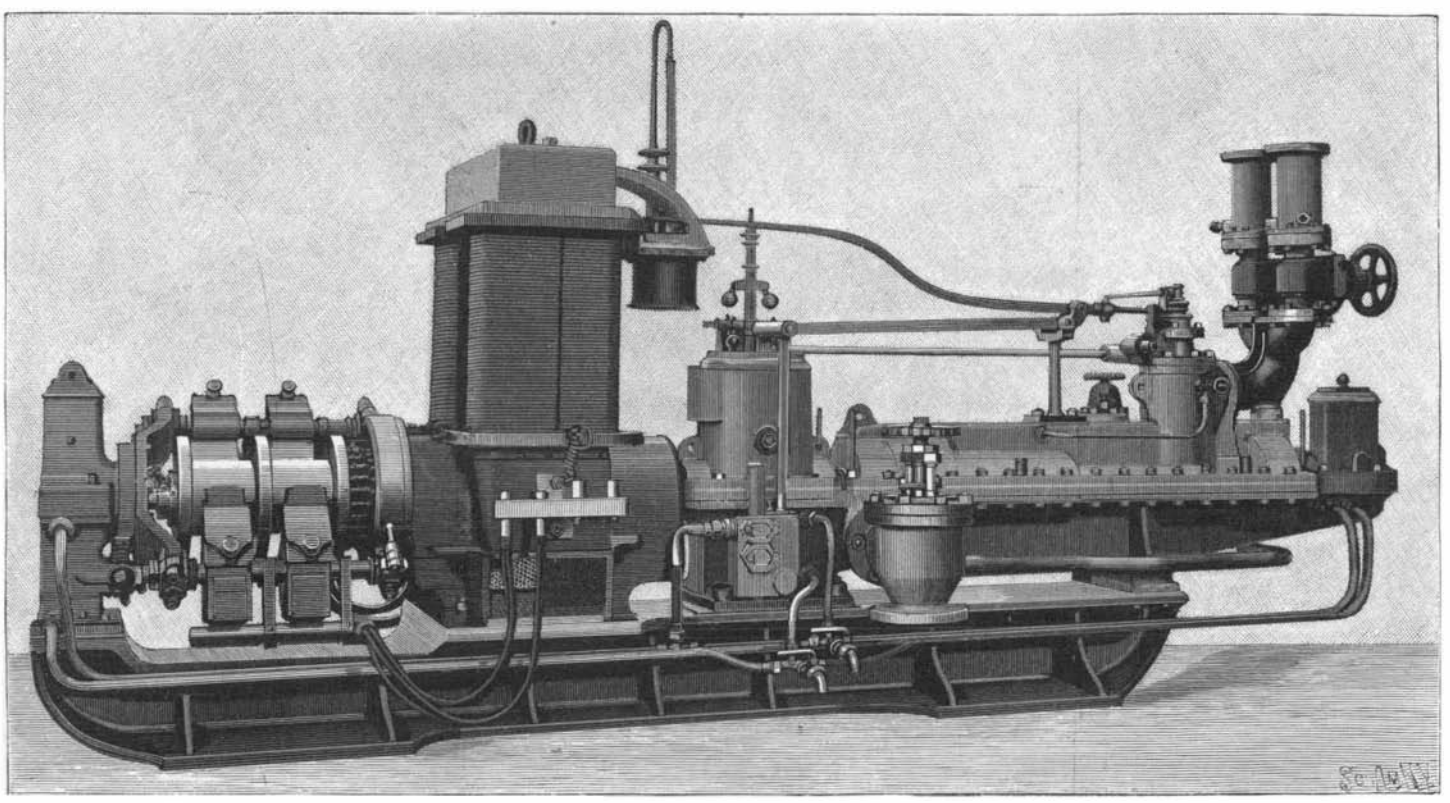
THE PARSONS STEAM TURBINE.

Although the Parsons steam turbine is identified in the public mind with high-speed torpedo boats, it is a fact that long before the "Turbinia" made her phenomenal speeds the Parsons turbines had been doing highly successful work on land, more particularly in connection with electric light and other electrical installations.

The Hon. Charles Parsons is the son of the late Earl of Rosse, whose great telescope, erected on his estates in Ireland, has long been one of the scientific landmarks of the age. His first successful invention was an epicycloidal engine, in which the cylinders revolve on a trunnion at half the speed of the crank-shaft. It enabled a perfect balancing of the moving parts to be obtained with a resulting high-speed rotation, and in this respect the invention may be regarded as forestalling the present demand for high-speed engines. In 1884 Mr. Parsons commenced the designing of a compound steam turbine and a dynamo with a working speed of 18,000 revolutions per minute. The preliminary experiments showed the necessity for bearings that should be somewhat elastic, and to meet the case the form of bearings shown herewith in Fig. 1 was designed. It consists of a gun-metal tube in which the shaft is rotated, and on this tube are threaded washers which are alternately larger and smaller in size, the smaller ones fitting the bush and the larger ones for the metal standard of the bearing. The whole series of washers is pressed tightly together by a spiral spring and a nut on the bush; one wider washer which is threaded on last fits both bush and standard and forms a fulcrum, with the result that when the shaft deflects a certain amount of elasticity is provided by the shaft itself, though the washers restrict the amplitude of vibration and bring the running to a steady rate about the principal axis of the rotating mass.



75-KILOWATT TURBO-GENERATOR AT THE HOTEL CECIL, LONDON.



350-KILOWATT TURBO-ALTERNATOR AND EXCITER AT THE METROPOLITAN ELECTRIC SUPPLY COMPANY'S STATIONS.

This form of bearing was abandoned in 1890 in favor of the simpler arrangement shown in Figs. 2 and 3. It consists of three concentric tubes of brass or steel fitting easily within each other, the oil between the tubes forming a self-centering cushion which has a considerable effect on the vibrations of the shaft. The tubes answer the purpose of the separate washers in the older form of bearing, with the added advantage that the tubes show no signs of wear, the oil film between them being preserved under all conditions of service.

The first successful steam turbine dynamo was constructed in 1885. It was operated at a speed of 18,000

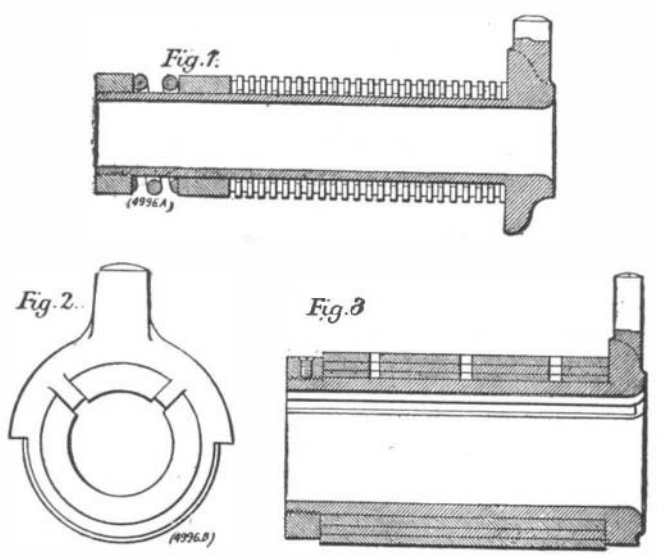
revolutions per minute for several years, and was quite successful. In this turbine provision for expansion was made by merely angling the vanes, but in subsequent plants both the height and the angle of the blades were varied and a more perfect range of expansion was thereby obtained. The first turbo-engine was put on board ship in 1885, and the first land engines of the kind were made in 1886. One of the latter is still at work. The first condensing type of steam turbine was constructed in 1891 for the Cambridge Electric Supply Company, and in the test by Prof. Ewing the results proved the compound condensing steam turbine to be about the equal of good compound condensing engines in regard to steam and consumption. In 1893 work was commenced upon the torpedo boat "Turbinia," whose remarkable performances are already familiar to the world. The highest speed achieved at any time by this little boat was between 34½ and 35 knots, and on a run of two miles she is credited with a speed of 32·76 knots under a boiler pressure of 210 pounds and with revolutions of over 2,000 per minute. It should be mentioned that on this occasion, owing to the use of a steam pipe too small for the capacity of the turbine, there was a drop of pressure of 50 pounds between the boiler and the engine.

Fig. 4 is of special interest as showing the arrangement of the moving blades and guide vanes in the Parsons turbine. The top outer cover has been removed and the revolving barrel into which the blades are keyed is shown. The cylinder containing the revolving barrel has a larger internal diameter than that of the drum. The flow of the steam is through the annular space thus formed, this space being filled with the fixed guide blades and the revolving blades on the drum. Between each two rings of the moving blades there is one ring of the guide blades, the latter being keyed into the containing case of the cylinder. Steam is admitted to the annular space, and is directed by a ring of the fixed blades in a direction spiral to the axis of the revolving barrel. It then strikes a ring of the revolving blades on the barrel, which are set at such an angle that the steam acts on them as wind on the sails of a windmill, thus causing the barrel to revolve. Then another set of fixed guide blades rotates the flow of the steam and directs it onto a second set of revolving blades, the process being continued throughout the full length of the annular space until the exhaust is reached.

As a result of the fact that an increase in the size of the steam turbine is accompanied by a corresponding increase in efficiency, the size of the turbine has grown very rapidly, until to-day the average turbine has a capacity of about 300 horse power, while turbine plants of 4,000 kilowatts output are being designed under the Parsons patents. In the turbine engine, as in the multiple-expansion reciprocating engine, it is essential for the best results that the capacities of the cylinders should be proportionate to the various stages of the expansion of the steam; and it is one of the many advantages of the Parsons compound turbine that any ratio of expansion can be obtained without a material increase of weight or bulk. In the larger condensing turbine motors now being built for marine propulsion the ratio of effective expansion within the engine is between one hundred and two hundred fold. It is just here that we find the explanation of the satisfactory results which have been obtained in the larger turbo-engines.

In the steam turbine increased expansion is obtained by extending the length of the blades and increasing the diameter of the turbines, which results, of course, in increasing area acted on by the steam. One of our illustrations, for which, in common with the other cuts and the data accompanying this article, we are indebted to The Engineer, of London, represents one of the thirteen 350-kilowatt turbo-alternators, which are now in use for the lighting of London at the Metropolitan Company's stations at Manchester Square and Sardinia Street, while another engraving represents a 75-kilowatt turbo-generator, four of which have been installed at the Hotel Cecil, London.

While the steam turbine has been chiefly used for driving electric generators, it has found a wide range of application for other purposes. Thus, it has been found that a centrifugal pump when somewhat modified is equally efficient, whether it is run at 1,200 revolutions or at 3,200 revolutions. An ordinary 6-inch pump at 1,200 revolutions will give a lift of about 40 feet, but the modified pump at 3,200 revolutions will give a lift of about 200 feet with proportionately greater output. Hence, combining such a pump with a 100 horse power turbine provides an effective arrangement specially suited to mining purposes. A plant recently erected is lifting 850 gallons per minute, at a lift of 160 feet, when run at about 3,300 revolutions per minute, and it is giving excellent results. The turbine is also being successfully used for ventilating purposes, and also for induced and forced draught. In both of our illustrations just referred to the method of governing adopted in these turbines is shown. The governing may be effected by an electrical governor or by a centrifugal governor. If constant speed is required, a centrifugal governor type is adopted, but if constant voltage is desired the electrical governor is used. In the latter the voltage is automatically controlled with such accuracy that any desired voltage can be obtained at either full load or low load to within one per cent without altering the governor. In both types of governor one end of a lever is moved vertically either by the centrifugal governor or by a core controlled by a spring and actuated by a solenoid in shunt with the terminals of the machine. A suitable connection is made from the lever to a small valve, which, by a steam relay arrangement, acts through a small piston on the main admission valve.



DETAILS OF THE PARSONS TURBINE, SHOWING FLEXIBLE BEARINGS (1, 2, 3) AND INTERIOR OF TURBINE (4).

Inventions That Are Unused.

One of the best mechanical engineers in New Orleans told an interesting story apropos of the tribulations of inventors to a representative of The New Orleans Times-Democrat. "About three years ago," he said, "I got up a little device that greatly simplified the working of a certain type of pump. I took out patents that cost me in the neighborhood of $300, including attorney's fees, and finally submitted the thing to a big manufacturing concern in the North. The proprietors at once conceded the merit of the invention, and offered me $500 down and a royalty of $125 on each one used. The cash payment amounted to nothing; for it really fell short of covering my time and expenses, but the royalty was generous, and I figured it out that it would yield me an income of $3,000 or $4,000 for several years—perhaps longer. It depended on how soon something better entered the field. Accordingly I accepted the proposition and transferred all my right. Now, how much do you think I actually received? Not a penny! No, I haven't been cheated; at least all the accounts have been perfectly straight. The trouble is they never put the device on the market. They simply stuck the patents and drawings in a pigeonhole and there they remain to this day. Why did they do it, did you ask? To save money. The public is very well suited with their pump as it stands, and it is doubtful if they could get any more for it with my improvement added. Such a step would merely cut down the net profit, so they prefer to let well enough alone. It was necessary, of course, to get my invention safely shelved, or it might have been taken up by some enterprising rival, and the only earthly reason for spending $500 on the thing was to put it out of the way. It was rather rough on me, to be sure, but the experience was valuable, and I won't get caught that way again."

[NOTE.—The experience of the pump inventor, as told by himself, exemplifies a trick too frequently resorted to by manufacturers to protect themselves against competing concerns who might acquire the patent and use it to their disadvantage. Patentees, when granting licenses, should stipulate that a royalty shall be paid on not less than a certain number of the article, whether manufactured or not, or in lieu of royalty, a stated sum sufficient in amount to deter the pigeonholing of the agreement.—ED.]

The Cocoa Palm and its Products in the Philippine Islands.

There are several species of cocoa palms growing in the archipelago, but the ordinary cocoanut tree (Cocos nucifera) is the most important. The Indians make use of it in a good many ways, but only the principal ones need be enumerated. The kernel of the nut they use for food, while the liquid the shell contains makes a refreshing drink. If allowed to stand for some time, this liquid forms a very agreeable milky juice, that is relished not only by the natives, but by Europeans as well. After this juice has coagulated, it is mixed with sugar and made into bonbons, known as cocoa sugar, and also into various other delicacies. According to a recent report of the United States Department of Agriculture, by tapping the central bud that crowns the cocoanut, a kind of wine, called tuba, of an agreeable pungent taste, is produced. This tuba, when allowed to ferment, produces vinegar, and when distilled, a kind of brandy, that is highly relished by the natives. From the husk of the cocoanut the Tagals make ropes and cords, and a material for calking their boats. From the woody shells they carve spoons, cups, beads for rosaries, and many other articles. The leaves they use to cover the roofs of their houses. Roofs made in this manner are thick and tight, but they have the disadvantage of burning readily, so that in the towns and villages where the houses are thus covered, conflagrations spread with great rapidity. The veins and smaller ribs of the leaves are used to make brooms, the midribs serve as fuel, and the ashes are utilized in making soap. The trunk of the palm is made to serve as a pillar to support the houses that its leaves overshadow. Oil barrels, tuba casks, and water pipes are fashioned from hollow sections of the trunk. From the roots the natives extract a red dyeing material, that they chew in place of the areca palm nuts or bonga when the latter cannot be procured. Large quantities of cocoanut oil are manufactured in the Philippines. This oil is much prized by the natives. The men and women both use it to anoint the thick growth of hair that adorns their heads, and it thus finds a ready sale at remunerative prices. It is also used in the lamps that take the place of gas-burners in the streets, and in those used by the natives and Chinese in their houses. Manila exports annually about 150,000 pesos (£25,000) worth of cocoanuts to China and British India, and about 30,000 pesos (£5,000) worth of cocoanut oil to China.—Journal of the Society of Arts.

THE wonderful ability of the Japanese is shown by the fact that almost everywhere in that country English and American instructors in the colleges and factories are being supplanted by natives. They wish it plainly understood, says Commercial Intelligence, that Japan is for the Japanese. A student at the university planned a work of great interest. He conceived the idea of building a canal to connect two lakes of different altitudes. He tunneled mountains and overcame other difficulties, but the chief point of interest lies in the fact that he built a railroad over which the canal boats were transported as they left the water to the next lake. Electricity was used, and enough was generated to light the city of Kioto and furnish power to sixty factories.

Automobile News.

Work has begun at Hartford on an automobile which is intended to tow canal boats on the Erie Canal. It will be built on entirely new plans, and it is intended to be powerful enough to tow from six to ten canal boats at once. It will cost more than $4,000, and if it is successful other boats will be built.

According to the tests conducted by the Liverpool Self-Propelled Traffic Association, a car capable of carrying a load of 3 tons 12 cwts. was actuated at a cost, for fuel, wages, etc., of a cent a mile. The average cost for keeping such a vehicle in repair and also the expense of operating it amounted to $1,980 per year. It makes the average cost 3 cents per net ton per mile. Horse-driven wagons cost 18 to 24 cents per ton mile for doing the same work.

One hundred thousand francs have been voted for the construction of a track and a grandstand at Vincennes for the use of automobiles. Special prizes will be given in addition to the medals and diplomas which will be awarded by the exposition. The carriages and wagons will be divided into four classes, heavy trucks, cabs, victorias, and voiturettes. The last class will include tricycles and motocycles. An electric charging station will be provided near the race course, so that the electrical machines will have no difficulty about the supply of motive power when they need it.

A public hearing on the admission of automobiles to Central Park, New York, was held before the Park Commissioners on November 9. Fifteen advocates and ten opponents appeared to make speeches. Ten minutes was allowed the first three speakers on each side and five minutes to the rest. One of the best-known horsemen in New York, Mr. Lawson N. Fuller, said that he had driven four, six, and eight horses around automobiles without inconvenience. "A good driver in two days could accustom any horse to an automobile. Ninety-nine runaways out of a hundred are due to carelessness on the part of drivers. Green horses soon become accustomed to city noises, and there is no reason for keeping automobiles out of the parks." Ex-Magistrate Simms said: "The same question has been agitated in regard to the locomotive, the bicycle, and the elevated railroad. The horse became accustomed to all these. It must get use to the horseless carriage. The automobile must win in the end. There will be a legislative enactment, if the owners do not gain their rights in any other way." Some of the opposition, such as liverymen, etc., protested against giving horseless vehicles permission to enter the park. The decision of the board will be announced later.

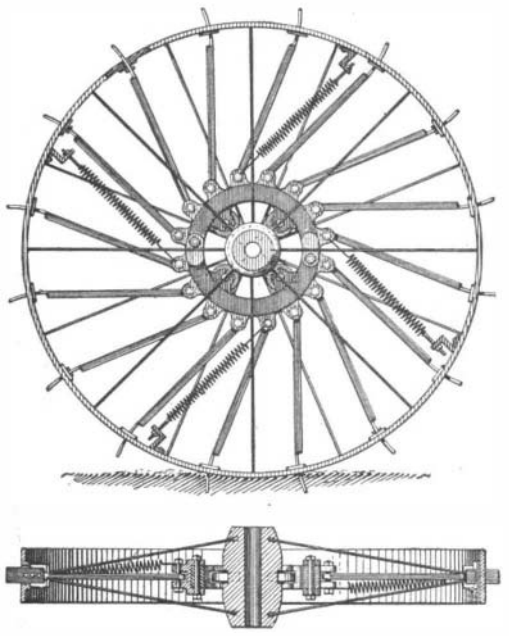
The automobile parade of November 4, in New York city, while not as extensive as might be desired, was important as showing how much public interest is shown in the new vehicles. When The Chicago Times-Herald race of 1895 is remembered, it demonstrated that the progress was substantial. The run was organized by The Automobile Club of America, and the course was about twenty miles, all on Manhattan Island. The parade formed at the southern side of the Waldorf-Astoria, and the start was made at 2 P. M. without confusion or delay, and for many blocks along the line of the run there was quite a crowd, and along the entire route there was a sprinkling of spectators. About thirty vehicles took part in the run, and they were all of well-known American types and makes with a few foreign carriages and motocycles. Most of them were of the open top variety. The drivers of the carriages and their guests were dressed in ordinary costumes, herein showing their good sense, for most French automobile outfits are ugly in the extreme. The carriages all behaved admirably, and while they ran through crowded streets the trip was made without accident and no horses were frightened. Electricity served to drive fifteen of the carriages, there were at least seven gasoline-driven vehicles, while four were propelled by steam. The latter were generally considered by the crowd to be the most picturesque on account of the exhaust, which was all but noiseless. Adjutant-General Avery D. Andrews led the procession and reviewed the carriages at Grant's Tomb in Riverside Park.

An Instrument for Locating the Direction of Sound.

A new instrument has been designed by Mr. Cowper-Coles, of London, for readily locating the direction of sound and for projecting sound long distances. It consists of a reflector mounted on an arm which can be readily turned on its center and depressed or elevated by the operator. When it is desired to ascertain the exact direction from which a sound emanated the apparatus is turned on its axis, and as soon as the reflector is opposite the source of the sound it is heard much more intensified in the receiver. Two instruments are used to carry on the conversation between two distant points or ships. The sound waves are thrown from one reflector to the other, the sound being focused in one instrument in the receiver when the operator speaks into the flexible tube, while the operator working the other instrument places the tube attachment to the receiver to his ear.

A TRACTION-WHEEL OF IMPROVED FORM.

The traction-wheel which we illustrate is the invention of Clarence Groseclose, of Sylvia, Kan., and is particularly adapted for traction-engines, automobiles, and harvesting-machines. Surrounding the hub of the wheel is a ring carrying rollers which bear upon the bottom of a groove formed in the hub. Arms pivoted to lugs on the outer side of the ring extend



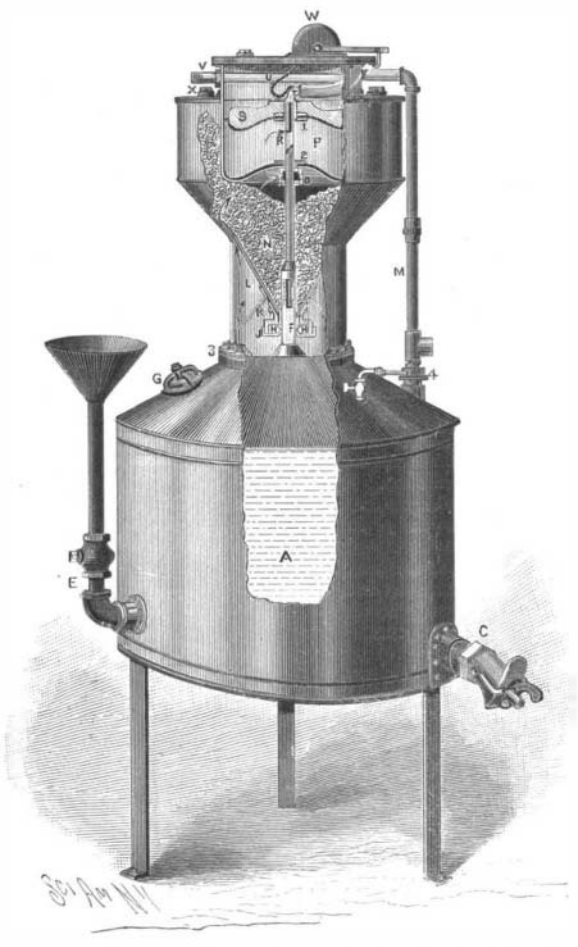
THE TRACTION-WHEEL IN SIDE ELEVATION AND SECTION.

outward tangentially to the ring and carry at their free ends blades which project through openings in the rim and which adapt themselves to the nature of the ground—hard or soft—over which the wheel must travel. Some of the blades are provided with stop-pins passing through holes in the arms; the blades are thereby prevented from moving too far outward. Springs are connected at their inner ends to the ring and are adjustably secured at their outer ends to brackets on the rim.

Should the wheel travel over hard ground or bridges, the blades, as they engage the ground or floor, will be forced inward, causing the ring to rotate on its bearing-rollers. Upon reaching soft ground the blades will be moved outward by means of the springs, acting upon the ring, so that they will engage in the ground. By arranging the arms at a tangent, the bearings formed upon the ring will be at one side of its vertical center line, thus insuring the rotary movement of the ring mentioned.

THE "BECKLIGHT" ACETYLENE-GAS GENERATOR.

Few industries have experienced a growth so rapid as the manufacture of acetylene-gas generators. When



THE "BECKLIGHT" ACETYLENE-GAS GENERATOR.

the production of calcium carbide was made a commercial possibility by the Willson process, a host of machines sprang up, which, as in most early forms of apparatus, were crude in construction and often wrong in principle. Gradually manufacturers began to investigate and apply the principles which should govern acetylene generation, and which would insure the safe and cheap production of the new illuminant. Of the many forms of apparatus constructed with a view of meeting these requirements, we may mention a machine made by the Acetylene Generator Manufacturing Company, of 106 Bell Block, Cincinnati, Ohio, a machine which is the result of no little study on the part of the inventor and makers.

The "Becklight," as the improved apparatus is termed, consists of a slaking-chamber, *A*, a gasometer, *P*, and a carbide-chamber, *N*, which communicates with the slaking-chamber by an opening having a yielding valve-seat, *H*, adjusted in position by a screw-cap, *J*. Through the valve-seat, *H*, a feed-plunger, *F*, passes, which is connected with an elbow, *T*, secured to a connection, *U*, for the gas-outlet. The carbide feed is locked by means of a lever and sheave connected with the elbow and contained in a housing, *W*. The stem of the feed-plunger, *F*, is provided with four indentations for feeding carbide, and with a passage, *R*, to conduct gas to the service pipes. At the lower end of the carbide-chamber, a condensing-chamber, *K*, is arranged, which also provides a drying-space, *L*, through which the gas passes upwardly. To force the gas through the pipes and regulate its pressure a counterpoise, *S*, is secured to a gas-bag.

In operating the machine, the gas is first shut off from the service pipes and the lever operated to lock the feed mechanism. After the residue is removed from the water-chamber, water is introduced. The generator is then entirely closed by shutting the various valves; and carbide is introduced by removing the plugs, *X*. After releasing the feed-mechanism by means of the lever and sheave, the generator begins to work by pressing gas out of the gasometer, thus lowering the feed-stem so that its indented portion passes the valve-seat, *H*. An opening being formed, the carbide drops in a circle to the water below. The pressure of the resulting gas naturally seeks the point of least resistance, which is that side of the gasometer exposed to the atmosphere. The gas therefore passes up first against the condensing surface, *K*, depositing its moisture on the cold surface, then through the reduced inlet between the lower edge of the surface, *K*, and the outside generator wall, into the drying-space, *L*, thence into the carbide-chamber as shown by the arrows, through or over the carbide, whereby it is both screened and dried, into the passage of the stuffing-box, *O*, and finally through the passage, *R*, the hollow elbow, *T*, and the connection, *U*, into the service-pipe, *V*. If the consumption fall off, the inflated gasometer forms a cushion for the weight, *S*, thus locking the feed-mechanism until the amount of gas in the gasometer, *P*, is reduced.

The weight, feed-stem and gas-bag being integral, no gas can possibly pass into the gasometer without at once closing the feed-opening. The gas is resisted by the weight, *S*; and when the pressure is excessive, the weight is raised.

It will be seen from our illustration that the carbide and slaking-chambers are so arranged with respect to each other that the apparatus is far more compact than most others of the same class. The carbide is fed into the water in small quantities; for it has been found that the gas thus generated is cool and free from the dangerous benzine and other hydrocarbon vapors which always accompany the gas formed by generators operating on the dripping system.

The Current Supplement.

The current SUPPLEMENT No. 1246 has many articles of great interest. "The Strike at Creusot" describes one of the most remarkable labor troubles of the century. The "Schneider-Canet Naval Turret" is an article illustrating in great detail the system which is largely used in French and other navies. "American Railroads—Their Relation to Commercial, Industrial and Agricultural Interests" is an address by G. H. Daniels, general passenger agent of a great railway system. It is a most interesting and important paper. "Gaston Tissandier" is a biographical article dealing with some of the important work of this French scientific editor. "Mechanical Science" is a continuance of Sir William White's important address. "The Pollak-Virág System of High-Speed Telegraphy" is a technical description of the new system. "The Test of the Marconi Wireless Telegraphy in the United States Navy" deals with some of the most important experiments which have ever been tried on the subject. It is illustrated by eng ravings made on the war vessels. "Stream Measuring in the United States" is continued and is elaborately illustrated.

Contents.