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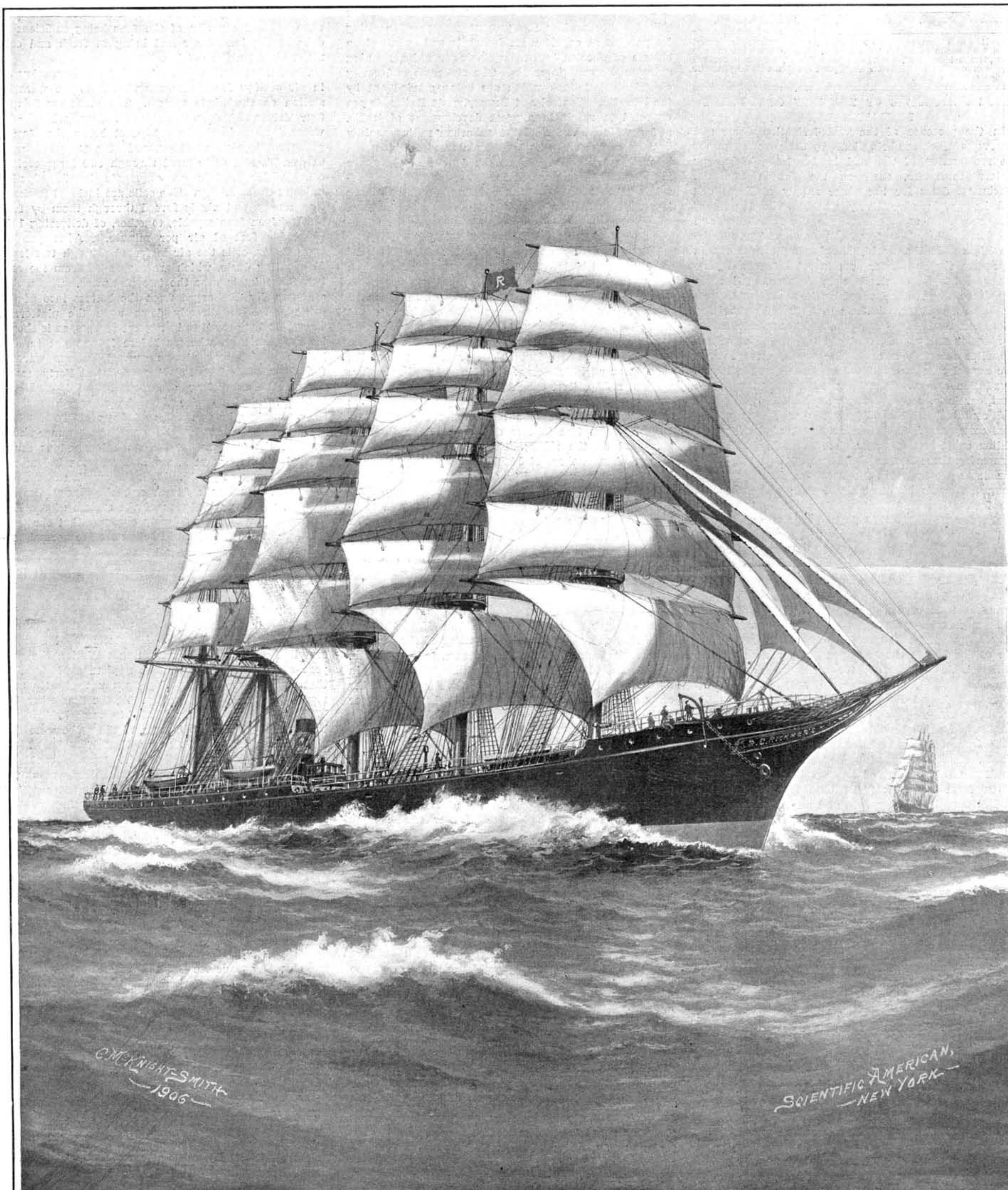

Length on Deck, 441 feet; **Beam,** 53 feet 8 inches; **Draft, loaded,** 26 feet 9 inches; **Carrying capacity,** 8,000 tons; **Displacement,** 11,360 tons; **Sailspread,** 50,000 square feet.

THE AUXILIARY CLIPPER "R. C. RICKMERS"—THE LARGEST SAILING SHIP AFLOAT.—[See page 250.]

SCIENTIFIC AMERICAN

ESTABLISHED 1845

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NEW YORK, SATURDAY, OCTOBER 6, 1906.

The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are *sharp*, the articles *short*, and the facts *authentic*, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

HUGE PROPORTIONS OF THE NEW GOVERNMENT IRRIGATION DAMS.

In the presence of the vast irrigation dams and reservoirs which are being built by the government for the reclamation of the arid lands of the West, our eastern reservoirs, such as the Croton and the Wachusett dams for the water supply of New York and Boston, look positively small. The largest of these reservoirs are the Shoshone, the Pathfinder, and the Roosevelt. The Shoshone dam, which will be the highest in the world, is being built in northern Wyoming, the Pathfinder dam in southeastern Wyoming, and the Roosevelt dam in Arizona. All three structures are greatly favored by the natural configuration of the country, which is such that, by damming up a comparatively narrow cañon, the water is impounded in vast natural basins, which widen out above the sites selected, and afford unusual storage area. The new Croton dam is 297 feet high from the lowest foundation course to the crest, 1,168 feet long on the crest, carries a depth of water at the dam of 157 feet, and contains 833,000 cubic yards of masonry. Its total cost was $7,600,000, and the cost of the dam per million cubic feet of water stored therein was $1,900. Comparing these figures with those of the three irrigation dams, we find that the Shoshone dam is 175 feet along the crest; Pathfinder, 226 feet; and Roosevelt, 650 feet. The height above foundations is, respectively, for Shoshone, 308 feet; Pathfinder, 210 feet; and Roosevelt, 280 feet. The depth of water at the dam at Shoshone is 240 feet; Pathfinder, 190 feet; and Roosevelt, 230 feet. While the new Croton dam can store 4,000 million cubic feet of water, Shoshone can store 19,863, Pathfinder, 43,560, and Roosevelt the enormous total of 61,000 million cubic feet of water. The great economy resulting from the advantages of lofty height and narrow width of the cañons at the site of the dam is shown in the comparative cost per million cubic feet stored; for while the new Croton dam cost $1,900, Shoshone cost only $35.25, Pathfinder $13.78, and Roosevelt $32.80 per million cubic feet of water.

A feature which broadly distinguishes these western dams from our large eastern structures is that the outlets, instead of passing through the masonry of the dam, are being formed in large tunnels, which are driven from the interior of the reservoir into the solid side walls of the cañon, and carried through the rock entirely around the masonry, finally discharging into the cañon below. This has the advantage of allowing the dams to be built in one solid monolithic mass.

SUCCESS OF THE INDEPENDENT RAILWAY MOTOR CAR.

Further proof of the ability of the independent motor car to meet the most severe requirements of railway service has recently been afforded by the performance of the gas-electric car, which was illustrated in the SCIENTIFIC AMERICAN SUPPLEMENT of March 10 of the present year. The new car is distinguished from others of its class by the novel character of its motive power. Practically all of the independent railroad motor cars are driven by steam or gasoline engines; but in this car the equipment includes a gasoline engine, a generator, a storage battery, and motors. The storage battery receives the surplus power from the generator when the load is light, and it is drawn upon for the extra power required in starting the car or in climbing steep grades. The interposition of the generator and storage battery between the engine and the car axle was made principally to overcome the difficulties of mechanical transmission, and to realize the well-known economy which is secured when the peak of the load is taken care of by a storage battery. Since the publication of our article, the car has traveled over 18,000 miles without any cost for repairs, except that due to the renewal of brake shoes. After being used in preliminary service on eastern railroads, it was sent from Philadelphia to Kansas City under its own power, and since its arrival it has been in continuous service on the Missouri and Kansas Interurban Railway. During the run to Kansas City the average speed for a considerable part of the distance was 45 miles an hour. During a round trip of 550 miles on the Santa Fé system an average speed was maintained of 40 miles per hour; and on a round trip of 118 miles over the Burlington branch, where the grades run as high as 3½ per cent and curves of 16 degrees are encountered, the average speed was 27 miles per hour. The advantage of reserve power, which is a distinguishing feature of this system of propulsion, was seen during a snowstorm early in the year, when, although the regular trains were delayed, the motor car was able to force its way through the drifts and maintain schedule time.

The continued success of the independent-unit car will tend to modify the present system of running long trains at considerable intervals and substitute a system of shorter trains, or single-car units, running at more frequent intervals. The elaborate and costly electric installations which are being carried out by the New York Central and Pennsylvania Railroads are expected to result in a great development of traffic, and a wide extension of the suburban radius, mainly because of the frequent short-train service which will be rendered possible. Where the density of the traffic is not sufficient to warrant the heavy expense of third-rail or trolley equipment, the independent motor car is certain to find an ever-widening field of usefulness.

THE CALIBER OF A GUN.

There is surely no word in the nomenclature of guns, big and little, which has caused, and is causing, so much confusion in the lay mind as the word *caliber*. Evidence of this is to be found in the large number of letters which we receive, asking for the exact meaning of the word as used in its different applications. The majority of these letters indicate that the confusion arises chiefly from the use of the term in an adjectival sense to indicate length, as when we say, a *50-caliber*, 6-inch gun. The word *caliber* as applied to artillery signifies essentially and at all times the diameter of the bore of a gun measured diametrically from face to face of the bore, the diameter measured on the rifling being, of course, somewhat larger. A gun, then, of 6-inch caliber is a gun whose bore is just 6 inches. For convenience, and because the power of a gun, when once its bore has been decided upon, depends so greatly upon its length, artillerists are in the habit of defining the length of the gun in terms of the caliber. Thus, the 12-inch United States naval gun, which is 40 feet in length, is spoken of as a 40-caliber, 12-inch, the length being just forty times the bore. The 6-inch rapid-fire gun, as mounted on the latest ships of the navy, is a trifle under 25 feet in length and is, therefore, known as a 50-caliber gun. From this it will be evident that the term may refer either to the diameter of the bore, or to the diameter of the bore used as a unit of length. In the case of small arms, the caliber is expressed in hundredths of an inch, as when we say a 22-caliber or 32-caliber pistol, meaning that the bore is 0.22 or 0.32 of an inch in diameter.

A NEW PROBLEM AND ITS SOLUTION.

The unlooked-for rise of temperature in the New York Subway, due to the operation of the trains, proves, once more, how essential it is, in planning a new work of this kind, to consider carefully the effect of any novel conditions that enter into it. It is seldom that a great engineering project of this magnitude receives such exhaustive consideration as was given to the preliminary plans for the Subway. Moreover, no expense was spared either in the construction of the tunnel or in its equipment, to render it in every particular absolutely first-class. And yet, it was discovered, as soon as the first spell of hot weather was encountered, that instead of the air in the Subway being, as was confidently predicted, cooler than that of the streets above, it was considerably warmer. The trouble was found to be due to the radiation of heat from the powerful motors. That electric motors, doing such heavy duty as those which drive the Subway trains, become heated and radiate a large amount of heat into the surrounding atmosphere was, of course, well known; but until the opening of the Subway, electrical traction in New York had been confined to the street-car and elevated-railroad service; and since the cars were run in the open, where the heat was quickly dissipated, no inconvenience resulted, and there was nothing to suggest that heat from the motors might, under other conditions, become a serious problem.

As the result of a very thorough investigation of the problem, the Rapid Transit engineers have installed a system of ventilation and cooling which, up to the present, has been showing highly satisfactory results. A plant for cooling the air has been established at the Brooklyn Bridge station, and a series of ventilating chambers has been built between the Bridge station and Ninety-sixth Street. The ventilating openings are placed midway between the stations. Each consists of a large chamber, opening out from the side of the tunnel, equipped with a series of shutters arranged somewhat after the plan of Venetian shutters, which are so balanced that normally they remain closed. At the approach of a train, the pressure of the air which is being driven forward in front of the train raises the shutters and the heated air is driven out into the chamber. The vacuum created at the rear of the train causes the shutters to close as the train passes by, and the same suction tends to draw the air in through the openings at the station which the train has just left, the double action of expulsion and suction thus serving to renew continually the whole body of air within the Subway. At each ventilating chamber there is an electrically-driven exhausting fan, which is used during the night when traffic is light, the combined capacity of the fans being sufficient to exhaust the heated air and bring in fresh and cold night air from the outside.

The Bridge station was selected for the experiments in air cooling for the reason that it is the warmest station on the whole system. The plant consists of four driven 6-inch wells, 45 feet deep, which take water from a level about 20 feet below the station platform. The water is pumped at a temperature of 61 deg. F., and distributed through two large cooling coils, which contain an aggregate length of nine miles of one-inch pipe. The coils are inclosed in sheet-iron casing, and air is forced through them by four motor-driven fans capable, together, of delivering 150,000 cubic feet of air per minute. After passing through the coils the air is forced through two large distributing ducts, which are suspended from the ceiling, immediately over the two platforms. The cooled air is finally discharged from the bottom face of the ducts and flows directly down upon the platforms. The plant has proved to be a great success, as is shown by the fact that, whereas before it was put in, the Bridge station was always several degrees warmer than Fourteenth Street station or that at Forty-second Street, the conditions are now reversed, and the Bridge is always cooler than the other stations, on some occasions by as much as 6 degrees. Tests taken during one of the warmest days of the summer showed that the temperature had been lowered as much as 8 deg. below what it would have been before the cooling plant was put in. With the erection of similar plants at Fourteenth Street and the Grand Central station, and the completion of the system of ventilating chambers, it is confidently expected that the temperature of the Subway will be restored to normal conditions.

A NEW PROCESS FOR THE COMMERCIAL UTILIZATION OF ATMOSPHERIC NITROGEN.

Nearly ten years ago—to speak more accurately, in 1898—Sir William Crookes, then president of the British Association for the Advancement of Science, compiled a series of disheartening statistics, the purpose of which was to present a picture of the fate that awaited us if something were not done to augment the world's wheat supply. At the time when Sir William delivered himself of his remarkable foreboding, about 163,000,000 acres of the globe were cultivated for wheat, yielding annually 2,070,000,000 bushels, on the assumption that 12.7 bushels could be grown on each average acre. In thirty years, the president of the British Association pointed out that 3,260,000,000 bushels would be required, that only by increasing the yield to 20 bushels for each acre would future demands be satisfied, and that 150 pounds of sodium nitrate must be annually mingled with the soil of every acre in order to encourage it to this greater activity. Inasmuch as the 12,000,000 tons of nitrate thus required were not then available, Sir William was not inclined to take a very cheerful view of the world's future breadstuff supply.

Fortunately, Sir William's gloomy forecast has not been fulfilled, but it had at least the effect of prompting chemists to devise ways of utilizing the nitrogen of the atmosphere. Perhaps the method of attaining this end with which Americans are most familiar is that of Bradley and Lovejoy, who built a plant at Niagara Falls, but never attained a commercial success. Bradley and Lovejoy, it will be recalled, employed potentials of 10,000 volts, securing steadiness in the discharges by the use of a rotating framework and of projecting electrodes. Arcs were produced and interrupted at the rate of 414,000 a minute, although the apparatus was only of five-kilowatt size. The technical obstacles encountered in the utilization of this apparatus proved a sufficient cause for abandoning the plant, notwithstanding the fact that much nitric acid was produced.

In Norway Birkeland and Eyde have attacked the problem in a different way, and apparently with such success that their plant at Notodden (described on another page), started in May, 1905, may be destined to endure. The high-tension arc in this Norwegian process is produced between water-cooled electrodes of copper tubing, which electrodes are held in the middle of an electro-magnetic field and are connected with a high-tension alternator. With a working potential of 5,000 volts and an alternating current of 50 periods per second, disk-flames are produced, which are inclosed in furnaces. By means of blowers 2,649 cubic feet of air are gently forced through each furnace every minute, which amount of air after leaving the furnace is charged with about one per cent of nitric oxide. The temperature of the hot air is reduced from 1,292 deg. F. to 122 deg. F. by sending it first through a steam boiler (the steam from which is used in making calcium nitrate) and then through a special cooler.

After converting the nitric oxide into nitrogen peroxide, nitric acid is formed by sending the gases through towers filled with broken quartz over which water trickles. The solution is conveyed to tanks containing limestone, with which it reacts and produces neutral calcium nitrate. After evaporation, concentration, and solidification the nitrate is obtained in marketable form.

It is stated that by this process calcium nitrate containing 13.2 per cent of nitrogen can be produced at a cost of $20 per ton, and sold for $40. This very respectable profit undoubtedly explains the erection of a 30,000-horse-power plant, which it is said will be shortly in operation.

CARBON DIOXIDE POCKETS IN FRANCE.

In the Auvergne region of France a large amount of carbonic acid gas comes from the soil, and is one of the last traces of the former volcanic activity of this region. All the springs contain a large quantity of the gas. These springs are found generally in the fissures of the ground which allow the water to rise. One of the Montpensier springs in the Puy de Dome region has been long known as the "poisoned spring." Animals which descend into the cavity to drink are soon asphyxiated by the gas which is given off by the water and accumulates here. Bodies of birds, rabbits, dogs, sheep, and other animals are found, and even persons have narrowly escaped. Vegetation is also affected by an overdose of the gas. Spots can be seen running in a line across the fields, where the plants have suffered from gas coming up through the fissures of the ground at different points. Soundings show the presence of a great quantity of gas, and it is usually in a very pure state. Such gas forms a source of commercial value, and could be utilized practically, as is done in Germany at present in Westphalia and other regions. At present the amount of carbonic acid gas given off per day is estimated at one million cubic feet, and this could be much increased. Aside from the gas production we have other interesting phenomena here. The fissures containing the springs occur in a calcareous marl in which the fauna consist of mammiferous animals such as the rhinoceros, crocodile, turtle, and others. Two of the springs are remarkable. Both of them come from cavities from 8 to 10 feet deep, in the midst of clay and mud. Excavations made at 15 feet depth show Gallo-Roman vases, one complete human skeleton, several skeletons of horse, cow, sheep, which have commenced to fossilize. Two feet below this were found remains of the mammoth, with skin and tusks, which indicate an unusually large specimen. Debris of bison bones is found. The cavities form veritable bone-pockets, coming from the local enlargement of the fissure by the action of the spring. The original depth of the pocket seems to be at least 60 feet. Different epochs from 50,000 years to 2,000 years are shown by the various layers of bone deposits in the cavity, which has been filled up by the deposits from the spring, and the water continued to flow through this. The animals and human beings do not seem to have been drawn into the cavity by the stream of water, but they must have descended into it in order to drink, for the access is easy, and were then asphyxiated. Such a fossil-bed in the form of a pocket seems to be unique.

HOW TO STUDY INDUSTRIAL CHEMISTRY.

The recent announcement by the New York University School of Commerce, Accounts, and Finance of an entirely new course in industrial chemistry for the school's first-year students of Business Management raises anew an interesting question. The distinctive feature of the course is that it is to be given to men who have not had any previous training whatever in scientific studies. Not even a knowledge of physics or of the most elementary chemical laws is to be presupposed by the instructor. Nevertheless, the school officials believe that students can obtain from the course a knowledge of the chemical principles involved in the more important industrial processes, which ought to prove of considerable advantage to them in whatever line of technical work they may be engaged. The question is, can so broad and difficult a subject as industrial chemistry be taught profitably in a one-year course?

The circular of the School of Commerce describes the course as follows: "A practical study of the chemical processes involved in the production of various commodities, including iron and steel, copper, and other metals, soap, glass, dyes, and the like. The work will be adapted especially to the needs of men who are connected with manufacturing concerns and do not have a technical education." The instructor is Prof. Martin A. Rosanoff, of the university faculty, who has long been a student of this subject, particularly in its more practical aspects. The course is to have a two-hour session every Thursday evening throughout the college year, and the instruction is to be given principally by lectures and experiments before the class. How widely the New York University plan differs from the ordinary method of teaching the subject, is made evident by a brief comparison with the corresponding courses in other universities and in the technical schools.

The usual arrangement in a four years' college or scientific school curriculum where considerable stress is laid upon the study of chemistry is somewhat as follows: In the first year the student has one lecture course in inorganic chemistry running through the year for say two hours or three hours per week. Generally there is a first year laboratory course also, in which students perform a prescribed set of introductory experiments. During the second year the student continues his lectures and laboratory work in inorganic chemistry and begins qualitative analysis. In the third year he attends lectures in organic chemistry, and takes up quantitative analysis in the laboratory. In the fourth year his laboratory practice is devoted to organic chemistry, and his lecture work probably to industrial chemistry.

At the end of such a four years' curriculum, wherein the student's time is devoted largely to the study of chemistry, he is entitled to rank as a fairly well-trained chemist. But suppose he should abandon his chemical work at the end of the third year's study. In that case he would still be ignorant of the most important branch of chemistry, namely, the application of chemical laws to industrial processes. Suppose he should stop at the end of the second year's work. He would have no knowledge at all of the chemistry of sugar, the alcoholic beverages, colors and dyes, explosives, and so on through a long list of important products, all of which are outside the range of inorganic chemistry, and therefore still unknown. There are many college and scientific school graduates holding the Bachelor of Science degree who have had two or perhaps three years' work in chemistry, and still have no chemical knowledge that could be of any practical use to them in business life. They do not know the difference between the chemical composition of iron and of steel, or between coal gas and water gas. They have no idea how glass is made, how artificial dyestuffs are produced, or how they should be used; how wood pulp is transformed into sheets of smooth paper; or how basic steel is now made from the impure ores which have lain useless for generations.

Their ignorance, which usually strikes the practical self-educated man as quite incomprehensible, is due simply to the fact that their studies have been based on a wrong idea. They have started out as if they were about to learn all that is to be known of chemical laws and processes, and have broken down before they obtained even a small measure of useful knowledge. Nevertheless, thousands of young men in the colleges and technical schools are to-day following in their footsteps, and will accomplish just as little. Indeed, under the usual college plan of reserving a study of the practical applications of chemistry until the very end of the college course, it is difficult to see how those students who are not specializing in the subject could be expected to derive anything except a certain amount of mental cultivation from their courses in chemistry.

That Prof. Rosanoff is strongly in favor of a simpler and more direct method of training is evident from a recent interview, in which he says: "It seems to me that we ought to discriminate between a knowledge of the essentials of a subject and an exhaustive knowledge of both fundamental principles and details. Just this lack of discrimination makes the education of many men one-sided. Being afraid to ignore anything, they start out to acquire a general education, with the apparent intention of learning everything about everything. The result is that they generally miss just the information and training that would do them most good. In the course in industrial chemistry planned for the School of Commerce an earnest attempt will be made to guide the students in learning essential facts which a thoroughgoing business man ought to know, and in avoiding the pitfalls of fruitless, desultory study. We are not expecting to develop scientists or practical chemists, but we do expect to give useful and needed help to many a young man who is ambitious to increase his technical or commercial efficiency."

The need of such a course as the New York University School of Commerce has instituted is obvious to anyone who has ever been connected with almost any manufacturing establishment. Even those concerns which carry on purely mechanical processes frequently find their operations handicapped by a misunderstanding of chemical laws. It would probably be difficult to estimate how much time and cash has been lost by manufacturers on account of the ignorance of their clerks and salesmen as to the technical features of manufacturing. For this reason the outcome of the New York University experiment will unquestionably be watched with great interest by the officials of progressive industrial corporations. If Prof. Rosanoff succeeds with his students, as we expect and as we sincerely hope, he will have performed a valuable service in pointing out a new pathway for many young men toward efficiency and advancement.

ACTION OF RADIUM ON ORGANISMS.

Experiments to show the action of radium upon the organism have been carried on at Paris by C. Bouchard and V. Balthuzard. In the first experiment, they introduce 30 grains of radiferous sulphide of barium, contained in a collodion bag, into the peritoneal cavity of a rabbit. The substance gives but a small amount of rays, but on the contrary produces an emanation which keeps passing through the collodion bag to the outside. The rabbit decreased in weight from 1.2 to 0.94 pound in five days, and succumbed on the tenth day, after being paralyzed. The autopsy showed a congestion of the lungs and entrails. A guinea-pig used in another experiment died in eight days, while a second animal used as a check, to which ordinary collodion bags were applied, thrived and even gained in weight. On the eighth day the blood taken from the check animal showed 16,000 white and 5,200,000 red corpuscles in proportion to 5,600 white and 4,600,000 red corpuscles for the radium-treated animal. The action of the radium is clearly seen. A small dose, if the emanation is continuous, will kill the animal. The presence of the emanation is found in the tissues of the animal, or localized in the organs, and a photographic plate shows this, especially in the lungs and the super-renal capsules. A closer method is to measure the emanation by extracting it from each organ by the mercury pump and then finding the electric conductivity of such gas. A guinea-pig was treated by radium and the gas extracted from the different organs. After one hour the gas was observed by the electric method to measure the amount of emanation, and under identical conditions. By volumes, the order for the largest amount of emanation is the following: lungs, kidneys, super-renal capsules, spleen, skin, liver. But when taken by weight, we find that one grain of the super-renal capsules contains as much emanation as 4.7 grains of the spleen, 11.4 grains of the lungs, 15 of the skin, 60 of the liver, and 100 of the kidneys. In the above case the animal had been given a subcutaneous injection of 1.5 cubic inches of gas containing the emanation given in four days by 0.4 grain of radium, and it was killed after four hours. The researches showed that the radium increases the zymotic action of pepsin, pancreatin, and the ferments in general. The localizing of the emanation on the secreting glands is to be noticed, and is not without importance in therapeutics. It explains perhaps the stimulating action given by mineral waters upon the secretions, when the water has been taken at the springs. Mineral springs have already been found to give off radium emanations in considerable quantity.

A NEW WIRELESS TELEPHONE.

The Paris journals report that M. Maiche, a well-known inventor, has made a sensational discovery in the field of wireless telephony. His new apparatus consists of two posts which are placed in his premises. Each post consists of a telephone, battery, a special form of induction coil and a frame which is formed of a series of insulated wires. One post is placed in the garden and a second one in a room in the building some distance off, about 100 feet, and several walls, doors, and windows come between the posts. Conversation can be carried on easily, and the sound is clear. The inventor started five years ago to work on the question. At the chateau of Marchais, belonging to the Prince of Monaco, he made experiments using the earth as a conductor, and these were successful at a distance of two miles. One year afterward he was able to communicate between Toulon and Ajaccio in Corsica, over the sea at 180 miles distance, using the sea as a conductor for the waves. These experiments were kept secret, however. As the new apparatus works without the use of ground, the results are more important. He expects to increase the distance indefinitely by giving more power to the apparatus, which is only in its first stages. Submarine boats could use the system to good advantage.

Pre-eminent among the skilled craftsmen of China, the carpenter still maintains the leadership. Though almost invariably wedded to the use of the tools of his ancestors and to their methods, judged by results he is more efficient in his line, says the Engineering Magazine, than are the average of the foreign-trained fitters and machinists in theirs.

A NEW 130,000-HORSE-POWER PLANT AT NIAGARA FALLS.

BY ORRIN E. DUNLAP.

It is the expectation of the Niagara Falls Hydraulic Power and Manufacturing Company that it will be prepared to deliver electric power from its No. 3 station in February or March next. This station is to be located at the water's edge in the Niagara gorge, a few hundred feet to the north of its present power house. The new station will be the greatest yet built by this company, and it is preparing to place a notable installation in it. The new power house will be 500 feet long, 95 feet wide, and 40 feet high. The design was made by engineers of the company, and guarantees a substantial and imposing structure. It will be built of concrete, with steel frame, the steel to be delivered about December 1. A double cage electric elevator installed at the south end of the building will afford a means of reaching the station from the top of the high bank.

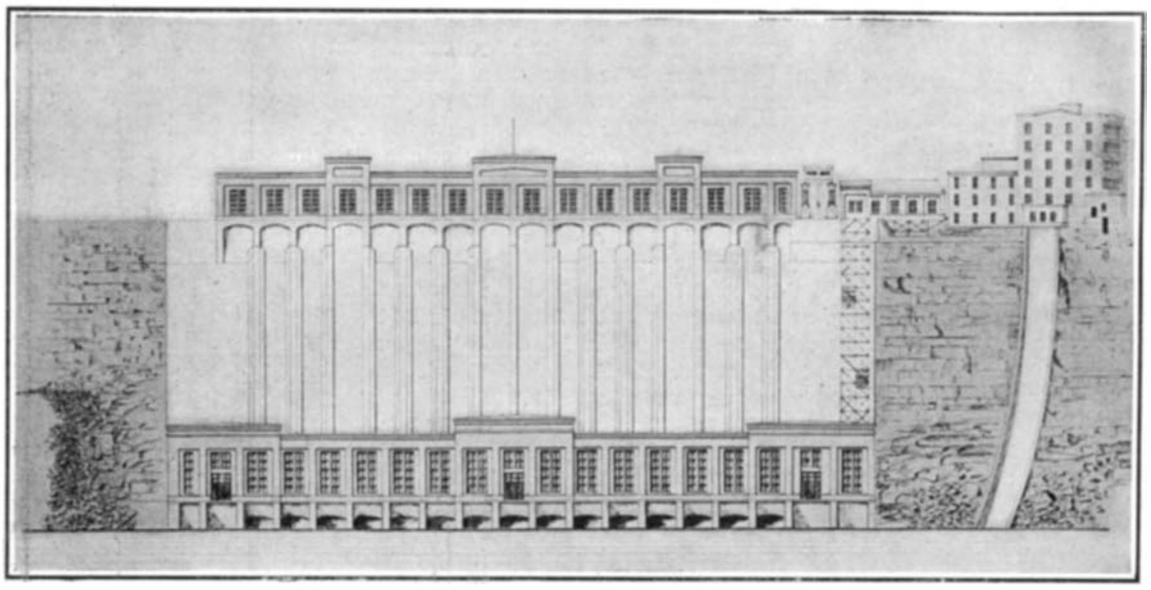
The turbine-generator installation will consist of thirteen units of 10,000 horse-power each, and two exciter units of 1,000 horse-power each. The turbines and generators, which will make 300 revolutions per minute, will be the first of this speed installed in connection with the Niagara power development. There will be a penstock for each turbine. The shafts will be horizontal and placed at right angles to the length of the power house, which will be divided by a central wall, the turbines to be on one side and the generators on the other. The switchboard will be in the generator room on a gallery that will run parallel to the river and overlook the entire interior of the station. Three towers will be built up the face of the cliff between the penstocks, and the supports of the cables for the vertical transmission will be similar to those in use in connection with the transmission from No. 2 station for the past three years. A minimum head of 200 feet will be used for the development.

The work which the company has done at the top of the high bank, in preparation for the extension of its power facilities, is the most notable ever undertaken by it. A canal has been built from the old canal basin, which is fed by a canal leading through Niagara Falls from the Niagara River above the Falls, to a new forebay north of the flour mills on the company's lands. This canal extension is 200 feet long, and of a width varying from 50 to 70 feet, while it will carry a depth of water of from 20 to 25 feet. The canal section as well as the entire forebay were excavated from solid rock. A concrete wall has been built along each side of this new connecting canal, while along the cliff side of the forebay a concrete retaining wall 30 feet high, 25 feet wide at the bottom and tapering to 15 feet at the top has been built. In this great retaining wall, at a distance of every 53 feet, there is a three-tooth expansion joint, the sides of the teeth or lugs of which batter one inch to the foot, and are coated with a preparation of asphalt and coal tar to make the joint waterproof. Cracking the great wall at predetermined points will prevent it from cracking promiscuously, while provision is also made for any shrinkage which may occur, and the structure remains water-tight.

Intakes for the fifteen penstocks which will lead the water down to the power station below have been built right in the retaining wall. Thirteen of the penstocks have a diameter of nine feet, and two are five feet in diameter. The larger penstocks will supply water to the 10,000-horse-power turbines, while the[illegible]er penstocks will furnish a supply of water to [illegible]urbines of the exciter sets. The penstocks have large bell mouths on the water side of the wall. Then come the nine-foot valves, and then the penstock proper. The vent pipe at the top of each penstock is built right into the wall, and a ladder affords access to the rear of the valve when the water is out of the penstock. An innovation worthy of note is that the valve of each penstock will be operated directly from the power house by an individual, specially-designed motor of 20 horse-power, operating suitable mechanism.

The penstocks will have flexible flanges riveted to them in the forebay wall, to prevent water seeping through along them from the forebay. A complete drainage system is provided underneath the bottom of the forebay. It runs the entire length, and consists of pipe varying from three to two feet in diameter. So carefully has the entire work been planned, that in case of injury to the main shut-off valves, the retaining wall is designed so that two steel gates can be quickly slipped into place in front of any of the bell mouths, and the main valve removed for repairs or adjustment.

Last year the Niagara Falls Hydraulic Power and Manufacturing Company completed a concrete facing wall on the cliff back of power station No. 2, and it plans to erect a similar wall back of this new power station. It will be even more massive than the facing wall first erected by the company, and the giant penstocks will be built right in it, giving a pilaster effect when viewed from the Canadian side or in the gorge; moreover, between each penstock there will be an arched effect that will be very effective. The concrete sheathing of the penstocks will be part of this wall. Between the old canal basin and the new forebay inlet gates have been installed in the connecting canal. They are three in number, each 16 feet wide and 30 feet high or deep. They will be used only when it is found necessary to remove the water from the forebay. They are operated by heavy gearing driven by electric motors, and it is evident they are for safety purposes. A gate house with steel frame and expanded metal covering will be built over them. The waterway leading from the basin to the forebay is so designed that the water will have a retardation from 4½ feet per second to two feet per second. The entrance to the forebay is protected by a stationary steel boom, which will deflect ice and debris over the ice-run gates. These gates are built into the side of the waterway, and are so designed as to lower and allow water to flow over the top and carry ice away. They are the largest of this type of gate ever built, being 12 feet deep, 16 feet wide, and three in number. They will be operated by motors, and can be instantly adjusted or set to any requirements of ice disposal, at the same time causing the least possible waste of water. An ogee dam, made of solid concrete and sheeted with steel, has been located at the bottom of the ice-run gates. The gates lower back of it, and when the ice comes over the gates, it will strike the dam and be deflected into the ice run proper. This ice run will conduct it over the bank and to the river below without causing a spray cloud to arise and float about, causing ice mountains, which in this locality have been found to be a source of danger to the power houses. A gate house will be erected over the forebay, and cranes will run its full length. There will also be a gate house over the ice-run gates, while a foot bridge will cross the forebay at the south end.

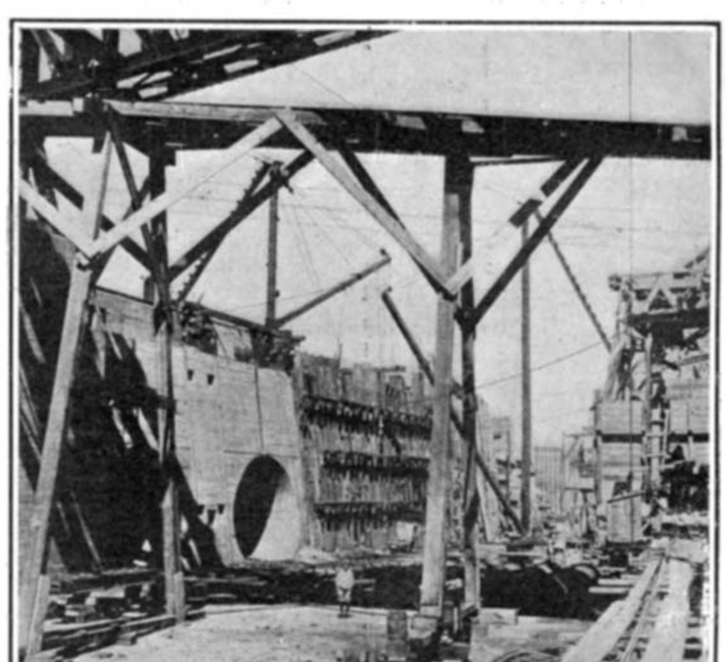


Elevation of Power House, Penstocks, Facing Wall, and Gate House.

In order that the heavy parts of the machinery to be installed in this new power house may be handled safely and expeditiously, a steel crane runway 200 feet long, and consisting of two pairs of cantilever trusses on which a traveling hoist capable of lifting 50 tons is operated, has been erected. It extends from the railroad tracks on the company's land to a point overhanging the cliff 40 feet, and crosses the forebay. It was built by the Buffalo Structural Company, and will remove material from the cars directly to the station. It is the first crane of the kind erected at Niagara. The chief engineer of the company is John L. Harper, and it is under his supervision that this great work is being built.

The company hopes that by next August it will have its main waterway deepened and widened to its full limits, which means that it will be 100 feet wide in all parts below Port Day, and that it will carry about 18 or 20 feet of water. During the present year great headway has been made. There has always been a narrow section in the vicinity of Third and Niagara Streets where it was impossible to get the city to rebuild bridges; but under an agreement between the city and the power company this work has been going on during the past summer, and the canal has been made 100 feet wide there. A magnificent

The Steel Crane Runway, Ice Gates to the Left.



Scene in Forebay, Showing Mouth of Penstock.

A NEW 130,000-HORSE-POWER PLANT AT NIAGARA FALLS.

new concrete bridge is being built to replace an old steel truss affair, and this bridge will be ready for crossing this fall. It is 110 feet long and 200 feet wide, covering the entire intersection of the streets referred to. Above Fourth Street the company's dredges are taking out the final bench of rock to widen the canal, and next spring the Fourth Street bridge will be taken out and a new structure put in. Thus by August next the work that has been under way more than a half century will have been completed.

The company is under contract to furnish the Pittsburg Reduction Company 37,000 electrical horse-power from the new station early next year. The Pittsburg Reduction Company has completed the foundations of a very large new works to the north of the forebay site, between the New York Central tracks and the edge of the high bank.

It will be recalled that at the hearing before Secretary of War Taft in Niagara Falls on July 12 last, the Niagara Falls Hydraulic Power and Manufacturing Company asked permission to divert 6,400 cubic feet of water per second from the upper river. The secretary later gave the company a permit to use 4,000 cubic feet, but it is understood that the additional 2,400 cubic feet will be allowed as soon as the company has this new plant ready for operation.

ARCHDEACON'S AIR-PROPELLED MOTOR BICYCLE.

BY THE PARIS CORRESPONDENT OF THE SCIENTIFIC AMERICAN.

M. Ernest Archdeacon, well known in Paris for his experiments with aeroplanes, has lately brought out a curious apparatus in the shape of a propeller-driven motor-cycle. This he constructed in order to make experiments upon different forms of blades and show their efficiency. He claims that the propeller, when well designed and adapted to the apparatus which it is intended to propel, has an efficiency which is to be compared with other forms of mechanical transmission. To show what can be done in this direction he built the present machine, which is certainly original and one of the first of its kind. What is more, it travels at a surprising speed. With a small air-cooled motor revolving the propeller, the latter pulled the bicycle and its rider—a combined weight of 335 pounds —at a speed of very nearly 50 miles an hour in an official trial made on September 12 over a stretch of good road not far from Paris. A number of persons, together with the official timekeeper, were on hand to see the test. The new bicycle, mounted by the champion Anzani, is shown in our engraving.

At the middle of the frame is mounted a Buchet two-cylinder light air-cooled motor, with the cylinders mounted in V-shape on an aluminium crank-box. The motor will give six horse-power. It is located crosswise of the frame. On the shaft is a small pulley, from which a triangular-section belt passes above to a larger pulley. The latter is mounted directly upon the long shaft of the propeller, which runs in two ball-bearings fixed to the frame and a third or outer bearing which is held to the frame by two long rods. On the end of the shaft is fixed the large aluminium propeller, which has perforated blades covered with gold beater's skin. A hand wheel is mounted at the back end of the propeller shaft so as to control the propeller for starting and stopping. A gasoline tank and spark-coil complete the outfit, and the whole is very light, weighing not more than 150 pounds.

Anzani took his place in the saddle and set the motor going, and then brought the propeller up to full speed. Even before reaching the top speed of the propeller the motor-cycle commenced to move, first at five miles, then at ten miles an hour, and soon began to run at a high speed. An official test of the speed was then made by two timekeepers. On a second run Anzani made a fine rush over the ground at full speed, and succeeded in covering a kilometer in 42 2/5 seconds, or at a speed of 49¼ miles an hour.

As to what is the practical use of such an apparatus, M. Archdeacon thinks that it will be of great utility in ascertaining the comparative values of different propellers, so as to find the best form and adjust the blades at the proper angle. These tests can be very quickly carried out, more so perhaps than with most other methods, and one propeller is soon taken off and another one substituted for it. In any case such a combination, which enables a good part of the motor's power to be transmitted to the propeller, is a novelty and may lead to other results of value either in theoretical or practical work. If a machine could be constructed with the propeller located directly on the engine shaft, there would be no loss in speed reduction from the engine to the propeller, and the full engine power would be had at the blades. Then the speed actually obtained compared with the speed which should be made with the horse-power developed by the engine, would give directly the efficiency of the propeller.

Excavating the Power House Site.

How Waste is Turned into Money.

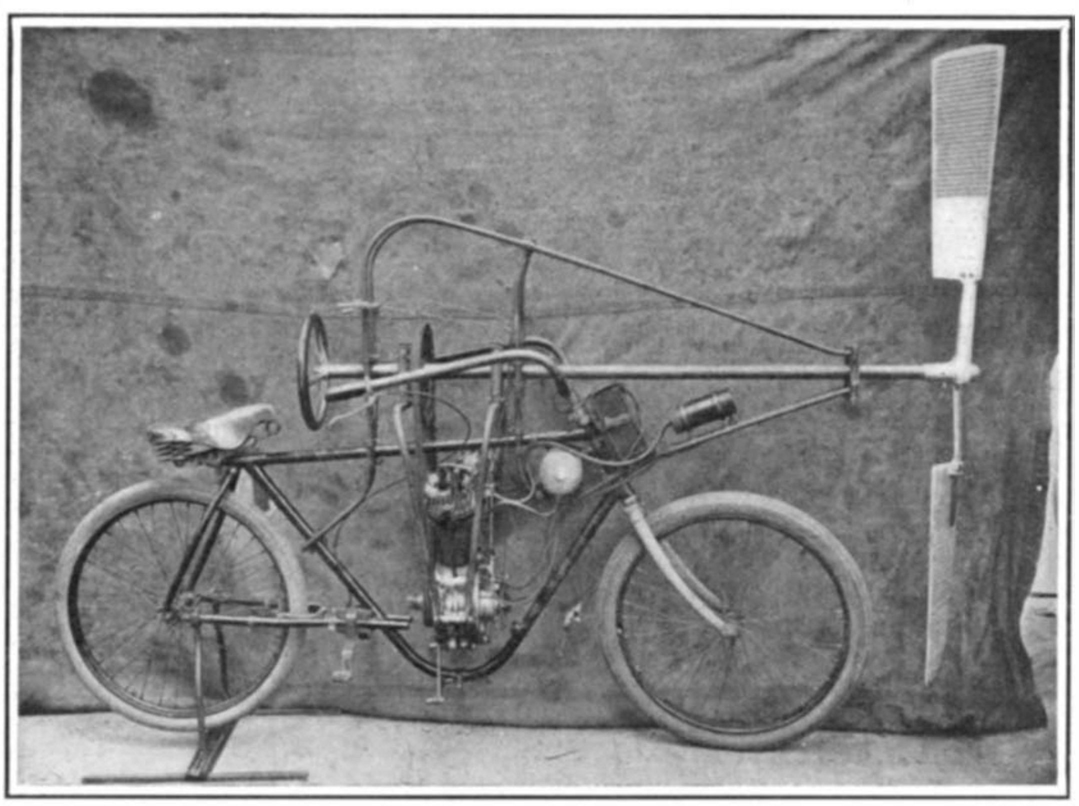
In a discussion of waste utilization it is customary to begin with that shining example of what can be accomplished along these lines—the coal-tar industry. A few years ago the thick, black, viscid liquid which condenses in the pipes during the distillation of gas from coal, was not only waste and useless, but its removal was a positive nuisance and a source of trouble and expense. To-day this tar on further distillation yields a series of products each of which is the basis for a valuable chemical manufacture. Among these products are paraffine, naphtha, benzol, creosote, anthracene, carbolic acid, naphthalene, and pitch. Basic oil of coal tar is the source of the splendid aniline colors, the various hues of which are due to the oxidation of aniline by means of acids or other chemicals. The utilization of some of these products has called into being entirely new industries in the manufacture of dyes, perfumes, medicaments, antiseptics, paving materials, and fuels.

It is undoubtedly true that no branch of science has contributed more to our knowledge of the waste values than chemistry, and a very large number of the great advances have been made along chemical lines. One of the most important of these was Le Blanc's discovery that the treatment of chloride of sodium—common salt—with sulphuric acid gave hydrochloric acid and sulphate of soda. This led to the upbuilding of one of the world's greatest industries of to-day, that of soap making, which formerly had been limited to the soda derived from the sulphuric acid manufacture. Hydrochloric acid, at first a waste, was soon found to be a valuable agent in bleaching. Originally, however, this use was not extensive, and it was necessary to employ a decomposing agent to obtain the chlorine from the acid. This agent was binoxide of manganese; and while the products of the decomposition other than chlorine were at first allowed to go to waste, a complete system of reclamation was soon developed.

The use of furnace slag, in former years not only useless but expensive to remove as well, is becoming more general for various commercial purposes, and the field for further development is excellent. At present, quantities of this material are made into bricks, paving stones, cements, and used as fertilizer. Slag wool, made by blowing steam through a stream of melted slag, is a splendid heat-insulating material. The heat in the slag as it runs from the furnace has also been used in various ways. A good example of metallurgical waste utilization is found in the production of pure tin, good weldable iron, ammoniac, and Prussian blue, from the waste clippings of white iron. The introduction of the gas engine offers excellent means for employing waste blast-furnace gases, though these have previously been made use of in other ways.

Few indeed are the industries which have developed utilization of by-products to such a state of perfection as has the slaughtering industry. It is no exaggeration to say that the animal slaughtered is used from the tip of the horn to the hair at the end of the tail. The quantity and variety of the products from formerly useless portions of the carcasses are almost incredible. Some of these are gelatine, glue, fertilizers, hair, bristles, neat's foot oil, bones, horns, hoofs, glands, and membranes from which are obtained pepsin, thymus, thyroids, pancreatin, parotid substances, capsules, etc.; soap-stock, glycerine, isinglass, albumen, and hides, skins, wool, and intestines.

On This Curious Machine a Speed of 49¼ Miles an Hour Was Made.



Side View of Bicycle, Showing Arrangement of Motor and Propeller-Shaft.

TESTING AN AIR PROPELLER BY USING IT TO DRIVE A MOTOR BICYCLE.

The lumbering industry now turns most of its waste products to useful purposes. The principal one of these wastes is sawdust, and this troublesome material now yields many valuable articles. One of the comparatively recent enterprises in this direction is the distillation of sawdust resulting in acetic acid, wood naphtha, wood alcohol, gas, oil, charcoal, and tar, the last yielding the bases for certain aniline colors. The sawdust may be burned in special furnaces or mixed with other material to form fuel. It is made into artificial wood, used in the manufacture of explosives, of heat-insulating material, in plaster, and largely in paper making. In the paper industry, too, many substances, wastes in the past, are usefully employed to-day. The recovery of the sulphite liquor from wood-cellulose factories has been the subject of many researches and inventions; and while numbers of these are ingenious and partially successful, much still remains to be done in this field. The paper manufacture now utilizes hundreds of thousands of tons of old newspapers, old stock, waste paper, etc., which would otherwise be practically valueless.

The utilization of wastes on an enormous scale, but of which the general public knows very little, occurs in the woolen industry. The principal articles of waste are woolen rags and wool grease. The first are reconverted into wool, and used again and again in the manufacture of cloth in an endless untraceable circle. The wool grease is employed in many industries and yields oils, fats, acids, potassium salts, and other elements of recognized value in arts and manufacturing. It is estimated that the enormous quantity of nearly 3,000,000 pounds of potassium carbonate are saved annually from the wool-wash waters of the mills and scouring establishments of France and Belgium. Waste soap-suds from textile factories yield many valuable substances, such as lubricating oils, fats, acids, and soaps. In one German establishment the suds are precipitated with lime, the coagulum is collected, pressed into bricks, dried, and heated in gas retorts. A gas is obtained which has three times the illuminating power of coal gas, and which in quantity is nearly double what is required to light the entire plant.

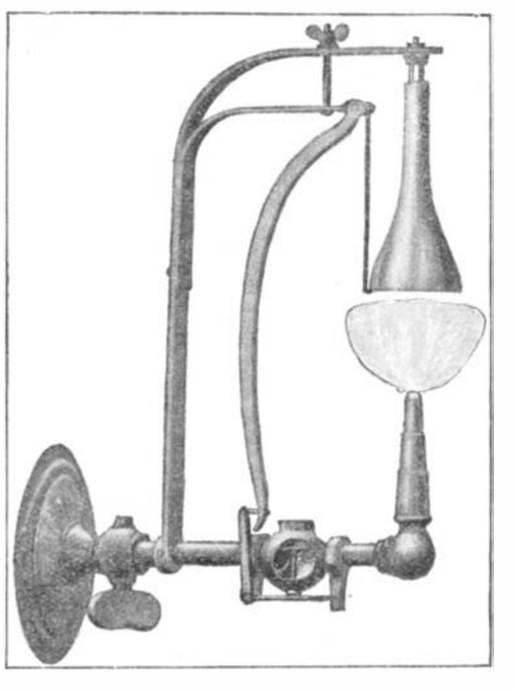
The cotton-seed oil industry can hardly to-day be considered the utilization of a by-product, though such was its origin, for at the present the annual value of the products derived from it is many millions of dollars. The fine cotton fiber still adhering to the seed after ginning, and known as linters, is used largely in the making of mattresses, pillows, felt hats, etc. The hulls of the seeds are used as cattle food, as are also the residues of the meats after the oil has been pressed from them. The pressed meats are also used as a fertilizer. The oil is used in the manufacture of lard compounds, salad and packing oils, soaps and washing powders, and is generally recognized to-day as a high-class food product.

Among other industries in which former by-products have become of the greatest value are those of dyeing, in which the manufacture of synthetic indigo is perhaps the highest attainment yet reached in this field, silk working, starch making, soap making, and brewing. The disposition of the garbage of cities, in the past often presenting much difficulty to the municipalities and frequently even a menace to public health, is remarkably successful from a sanitary as well as an industrial standpoint. From it are obtained valuable greases, fuels, and fertilizers, which often more than pay for the entire cost of operation. An interesting and valuable development is the production of coatings and sizings for paper, water-proof glues, paints, substitutes for hard rubber, horn, and ivory, from the casein, albumen, and milk sugar of skimmed milk. The list of examples of by-product utilization would not be complete without the mention of the use of corn pith for naval purposes, the manufacture of artificial stone from broken glass and from ashes, sash weights from tin scrap, cattle food from brewery residue, new rubber from old, glycerine from distillation washes, and the valuable corn oil as a by-product from breweries, distilleries, and starch works. Remarkable as is this brief account of waste utilization—and but a portion of the later advances have been touched upon—a great deal still remains to be accomplished in many branches of science and industry, and the future undoubtedly will see such an accomplishment, for there is nothing without an economic value for some purpose, if not in the industry in which it first appears, in some other where it can be turned to account.

It is a noteworthy fact in proof of the progress made by the German iron industry that the number of the workmen has not risen in proportion to the increase of the production. In 1895 the production amounted to 5,500,000 tons, and the workmen numbered 24,059; in 1904 the production had risen to 10,000,000 tons, and the number of the workmen only to 35,284. In 1895 the quantity produced per head of workmen employed amounted to 227 tons, in 1904 it had risen to 283 tons; that is to say, the number of workmen increased during the decade by 47 per cent, but the quantity produced increased by 84 per cent.

AUTOMATIC DEVICE FOR TURNING OFF THE GAS.

While the public has been pretty well educated to the dangers of "blowing out the gas," accidents from this cause are still of not infrequent occurrence. Now, however, it is seldom that the gas is deliberately blown out, but the flame is often extinguished accidentally by a strong draft, or the gas may be temporarily cut off for the purpose of repairing the mains, and then turned on again without due warning to sleeping inmates. In order to obviate such dangers, Mr. Iver C. Peterson, of 759 38th Street, Brooklyn, N. Y., has invented a controlling device for gas burners, which operates to shut off the flow of gas when the gas flame is extinguished. As shown in the accompanying engraving, the device comprises a standard, secured to the gas bracket, and supporting a bell-shaped thermostat directly over the burner. The standard also carries a spring arm, to which a bell-crank lever is pivoted. One arm of the lever is very short, and is connected by a hooked wire to the lower edge of the thermostat. The other arm is very long, and extends downward to the gas bracket. In addition to the usual valve, the fixture is provided with an auxiliary valve of the poppet type. The stem of this valve rests on a hinged plate, and the latter carries an arm which engages the longer arm of the bell-crank lever. Normally, the plate is tilted downward, permitting the valve to remain closed. When lighting the gas, the main valve is first opened, and then the hinged plate is raised to open the auxiliary valve. The plate is held up for a moment or two, or until the thermostat is expanded by the heat sufficiently to draw down the shorter bell-crank arm and swing back the longer arm, thereby holding the plate in its upper position. Now, should the gas flame be extinguished, the thermostat would contract, permitting the bell-crank lever to return to its normal position and allowing the plate to drop, whereupon the poppet valve would close, cutting off the flow of gas.



AUTOMATIC DEVICE FOR TURNING OFF THE GAS.

The Third Race for the Vanderbilt Cup.

As a result of a protest made by the makers of the Frayer-Miller racer (which was running splendidly in sixth place when the elimination race of September 22 was called off) this American air-cooled machine has been placed upon the team instead of the Pope-Toledo car, which was running fourth at the finish, but was in so crippled a condition that it would probably have been unable to complete its final round ahead of the Christie and Frayer-Miller cars. As the Haynes car (which gave an excellent demonstration of steady, smooth running) is too low-powered a machine to stand any chance with the foreign racers of double its power, its owners, showing their good sportsmanship, will doubtless withdraw it and allow its place to be taken by a more powerful car. Possibly the second Locomobile racer, which has been held in reserve, will be substituted for the Haynes machine, in view of the fine showing of the first racer in the elimination race. This would seem to be the most rational change, provided a suitable driver could be found for the second racer, as it is as powerful and carefully constructed a car as its mate, which showed the greatest speed of any car in the trial race.

As we go to press, the following is the list of eighteen cars that are expected to start in the third Vanderbilt Cup race at 6 A. M. October 6. The start and finish of the race will be at the grand stand located on the Jericho turnpike about a mile east of Westbury. The race will be of the same length as was the elimination trial, viz., 297.1 miles, consisting of ten rounds of the 29.71-mile course.

No.	Car.	H. P.	Driver.	Entrant.	Nation.
1	Thomas.	115	Le Blon.	E. R. Thomas.	United States
2	Panhard.	120	Heath.	Panhard-Levassor.	France.
3	Mercedes.	120	Jenatzy.	Robert Graves.	Germany.
4	Fiat.	120	Lancia.	F. I. A. T.	Italy.
5	Frayer-Miller.	110	Lawwell.	W. J. Miller.	United States
6	Hotchkiss.	130	Shepard.	Hotchkiss Co.	France.
7	Mercedes.	120	Luytgen.	Geo. McK. Brown.	Germany.
8	Fiat.	120	Nazarro.	F. I. A. T.	Italy.
9	Locomobile.	110	Tracy.	S. T. Davis, Jr.	United States
10	Darracq.	100	Wagner.	A. Darracq.	France.
1	Mercedes.	120	Keene.	Foxhall Keene.	Germany.
12	Itala.	120	Cagno.	Itala Co.	Italy.
14	Haynes.	60	Harding.	John Haynes.	United States
15	Clement-Bayard	100	Clement.	Clement-Bayard.	France.
16	Fiat.	120	Weillschott	F. I. A. T.	Italy.
17	Christie.	50	Christie.	Walter Christie.	United States
18	De Dietrich.	120	Duray.	A. de Turckheim.	France.
19	Itala.	120	Fabry.	Itala Co.	Italy.

Automobile Notes.

An automobilist of great experience suggests that it is a good idea for the driver of a car to show his companion on the front seat how to switch off the ignition current in case the driver suddenly becomes incapacitated. By this simple operation, the car can quickly be stopped, and the damage it is liable to do if it runs wild will be reduced.

The subject of motor racing cannot be left without referring to the undoubted benefit which long-distance racing was to the motor industry. The keen contests which took place between maker and maker and between nation and nation, have resulted in its being discovered by constructors that cars can, by the use of the very best material, be constructed within weight limits which would not have been admitted as theoretically possible by consulting engineers ten years ago. Since 1901, however, there has been a feeling that the time would come when the racing of purely racing machines would cease to be of particular advantage in the design and construction of touring cars. The Automobile Club of Great Britain therefore started last year a new form of racing for what is called the Tourist Trophy, in which the cars have to be *bona-fide* touring cars, affording a certain amount of seating capacity, and carrying four passengers or their equivalent weight on chassis of not less than a certain weight. The speed of the cars is limited by the fuel allowance, the same quantity of fuel being given to all the competing cars. The car which completes the distance in the shortest time, that is, the car which can most efficiently transmit the power obtained from the motor to the road wheels and can cover the distance without running out of petrol and without delay, is the car which wins. It is thought by many experts that this new form of racing is likely to considerably improve the construction and design of touring cars, inasmuch as it compels makers to study the question of efficiency rather than to obtain speed out of their cars by means of engines which are unnecessarily large in order to overcome the inefficiency of transmission.

Vice-Consul Charles Karminski reports a formula fixed upon by the German government as a basis or gage for getting at the horse-power of gasoline or alcohol fed automobiles. He writes:

A memorial, subscribed by a large number of autocar builders and addressed to the imperial treasury department, acknowledges their unanimity on the point of accepting the following formula for determining the horse-power of autocars, viz.: N equals 0.3 id^2s, in which N signifies the horse-power to be ascertained; d, diameter of cylinder; i, number of cylinders, and s, stroke. The formula is based on an allowance of 3.8 kgs. to the sq. cm. (54 lbs. per sq. in.) as the mean pressure of the piston and 900 revolutions per minute, and has been pronounced satisfactory by the technical department of the imperial treasury. The "Mitteleuropäische Motorwagen-Verein" (Automobile Association of Central Europe) has agreed also to accept this formula, which, according to the imperial treasury, will be recognized by the administrators of taxes in the federal states until the respective supplementary clause has been added to the provisions of the imperial stamp law. The proposed formula is applicable, however, only to gaging the horse-power of autocars fed with gasoline or alcohol, in which connection it is left with the builder of or dealer in such cars to supply the buyer with an authenticated certificate from the factory, showing the horse-power of each car, arrived at by means of the formula in question.

Relative to ascertaining the horse-power of electric motors, investigations are now on foot, the result of which will be duly enunciated upon their termination. To determine the horse-power of the old types still in use, the numbers which in most cases builders place on the name plates of their cars will be considered as authoritative. Should the tax-payer in such cases, however, declare the horse-power of his car to be less, he will be expected to prove the actual horse-power by producing a satisfactory certificate from some competent authority.

Correspondence.

Gun Erosion.

To the Editor of the SCIENTIFIC AMERICAN:

I have read with a good deal of interest your article on gun erosion, and from your description of the cause, it seems to me that if the rifling did not come quite to the powder chamber, and the rear of the shell was fitted with a copper disk, with the edge slightly curved so as to form a shallow dish, the force of the gases would drive the edges of the disk into the grooves in such a manner as completely to close all opening until the rings on the shell had been driven into the riflings. It seems to me that a half-inch flare would be no detriment to the shell, and should furnish enough pliable material to fill the grooves. I notice too that in comparing our older ships with the newer ones, you always speak of the advantage which the new ships possess in gun fire. I see no reason why this should be so. Could not our older ships be re-gunned and made as effective as the newer ones? The old guns could be used in land defenses, where space is not so expensive, and where they could render effective service. Let us take the "Iowa" and "Minneapolis," and arm them with the newest guns, and we believe both would, ton for ton, render a good account of themselves. It seems to me the "Minneapolis" and "Columbia" could each be strengthened and a modern 10-inch gun substituted for the old 8-inch. There is certainly no lack of room on either ship.

Manson, Ia., September 20, 1906. T. D. LONG.

[The use of a copper base-plate of the kind suggested by our correspondent was tried by Vickers-Maxim, but seems not to have been successful. The re-arming of old vessels has been carried out on some of the ships of the United States navy; but it is not generally favored here or abroad. It is considered that the money voted for naval purposes is better spent if it is used on new construction.—ED.]

The Use of the Hyphen.

To the Editor of the SCIENTIFIC AMERICAN:

I have read your journal for many years with more or less regularity, and now have it every week. I always feel, after reading a copy, that I have traveled a good many miles for a nickel and added much to my stock of knowledge.

I wish to congratulate you on the vastly improved punctuation you now use over that of a few years ago, especially in compound words, such as "twenty four-inch guns," instead of "twenty four inch guns," which is meaningless. But your practice of tying an adverb to an adjective is useless, I think, as in "widely-separated ships," for the adverb cannot jump over the adjective, as might be the case of the first adjective in "three masted vessels," where three vessels are referred to. I see you do not always use a hyphen thus, for on page 130 you speak of an "exceedingly sharp grade." Correct. On page 132 Mr. Claudy says, "The camera could *only expose* one plate at a time." He never meant that. He tried to say, "The camera could expose *only one plate* at a time." Seldom indeed is the word *only* used in the right place. Even our best writers "only get it right once in a while," or "get it right *only once* in a while."

I see you use the monstrosity *anyone* for *anybody* or *any one*. Anyone, someone, and noone are fakes made by linotype pounders. I have yet to find a dictionary that sanctions their use. *Nobody, somebody,* and *anybody* are the right words.

Some speak of *hardwood* floors. Redwood and whitewood are definite, but *hardwood* does not exist. A hardwood floor may be made of oak, beech, elm, or any wood that is hard. Why do such misconceptions live so long?

Pardon these suggestions from an old proof-reader, once of your city. W. P. ROOT.

Medina, O.

A Rapid Transit Proposal.

To the Editor of the SCIENTIFIC AMERICAN:

I read with great interest your recent editorial on "The Stupendous Traffic of New York." From the figures there revealed, it is clear that immediate measures looking to the proper handling of this vast human multitude must be taken, or the future interests of the city are bound to suffer.

New York is a city of "skyscrapers." Why not a skyscraper rapid transit system?

My plan is this: Procure a right of way through blocks of buildings, back of course of the more costly blocks for reasons both of economy and aesthetics, and locate there your railway system. It might be a combination of the subway and the elevated systems, a combination admitting of a considerable degree of expansion. The right of way need not be wider than that necessary for a two-track system. Two or more stories of subway tracks could be constructed, and just as many stories of elevated tracks as the mechanical limitations of such structures will admit, which, when curves are reduced to a minimum, could easily be anywhere from six to twenty. Ferro-concrete construction could be largely used throughout, insuring a stable and not prohibitively costly structure. Elevators run by the service electric current would solve the problem of reaching the various track elevations. The high-speed express trains could use the subway, and the moderate speed local traffic could utilize the elevated structure.

Such a system would have many advantages: 1. Construction could largely be carried on without impeding traffic on any important thoroughfare, which is impossible under present methods to prevent or even to mitigate except at great cost. Open-trench construction, under this system, would be possible for the subways, while the elevated structure could be built without impeding traffic more than does the erection of an ordinary building. Such economies would go far toward defraying the additional expenses of the right of way. 2. For the greater portion of its length such a system would be out of sight from the streets, owing to its running through the block rather than along the streets. The portion that crosses the streets could be made more or less ornamental, and add to, rather than detract from, the æsthetic appearance of the city. 3. Abutting buildings could be so constructed as to assist in giving stability to the structure. 4. By the use of solid concrete floors the noise of the elevated railway would be largely obviated.

Such a system is mechanically, financially, practically, and æsthetically possible. No city but New York could build such a system, but no city but New York needs such a thing; this, or something like it, she must have and soon. J. LOGAN IRVIN.

Americus, Ga.

Evolution of the Flying Machine.

To the Editor of the SCIENTIFIC AMERICAN:

The principal difficulty now in flying machine construction is the inefficiency of present methods for insuring the stability of the structure when submitted to the air. We now have the proper type of machine clearly defined—either the Langley machine or Chanute's superposed planes; the requisite power in the light and efficient air-cooled gasoline motor, and clever mechanicians, as witness the marvelous development of the automobile. What then is most needed is some sure way of maintaining the equipoise constant under varying wind pressure without endangering the control of the machine, as is the case with the navigable balloon. Two methods are here presented, which I have designated as inherent stability and automatic stability—inherent when a balloon is used, automatic when generated at the instant of its adoption, as with the bird. What is termed automatic stability may be obtained by the use of some special electrical appliance or the gyroscope, probably the latter, supplemented by the former; and to make clear in just what way it is intended to use the balloon, so as to allow as large a margin of weight as possible, I quote an excerpt from an article of mine published several years ago: "The flying machine of the immediate future will have a balloon attached, it will have no appreciable lift, but will be used to impart that stability, so essential to success, and which is distinguished by its absence in the present-day contrivances." In my judgment it is not possible, for the present at least, to dispense entirely with a balloon; it is impractical to suppose that perfection can be attained in the first machine built, even though the principle is correct. With this as with everything else of importance, success will be largely a matter of evolution.

From experiments with small flying screws of various shapes, the data presented here has been deduced, and it may, I think, be accepted as axiomatic that a spoon shape, or a long blade of equal width throughout, and slightly concave, approximates closely the true form; that the maximum of efficiency is obtained by applying screws to the propulsion of an aeroplane; that the work or thrust of a propeller is considerably enhanced by placing just back of it on the same shaft a propeller of the same or preferably smaller dimensions; that a screw flying free is very uncertain and erratic in its action, precluding the possibility of ascent with any degree of safety. In a recent statement the learned editor of Collier's Weekly expresses a disbelief in even the ultimate possibility of flight, and no doubt this opinion is shared by many others, but the same thing was said of the automobile, or practically that, as recently as 1890-3. Despite the pessimistic views held by such prominent men, I am encouraged to think from a careful review of the whole subject, that in five or six years navigable balloons will be fairly common; and in ten years, allowing for the inevitable improvements, winged machines built of steel for the most part, possessed of tremendous power, and flying with astonishing velocity, will be the rule rather than the exception. The trend of all modern scientific thought points conclusively to such a consummation. The problem has been studied assiduously for centuries, but it is only recently that certain vital features have been perfected to such an extent as to place it among the possibilities. So well advanced is the subject, indeed, and so thorough and complete the knowledge necessary for the initial experiments that will lead to final conquest, that it now requires only the intervention of some modern Midas to wake it from its somnolence. J. C. PRESS.

South Norwalk, Conn.

Animal Magnetism.

To the Editor of the SCIENTIFIC AMERICAN:

Owing to the fact of America's inferior position in the scientific world, and that we have no honors to spare, I think it is here justifiable to comment on your article, "A Revival of Animal Magnetism," issued September 8, in which you end by saying that due to Dr. Otto Neustätter, of Munich, our native scientists have at last shown that "animal magnetism" is no longer a thing of mystery, but that it really exists; that it is an offspring of muscular excitement, and that it may affect the galvanometer. According to my experiments five years ago, I had found that that very subtle fluid, with which the living body and brain is always charged with more or less density, is really a ponderable emanation from the nerves; this I have clearly described in a series of articles in the American Inventor during the early months of the present year. I doubt very much if this static and ponderable charge would have electromotive force enough to deflect an ordinary galvanometer, although the currents which often can be induced to flow from the head toward the lower limbs by simple arm conduction are easily felt, as are also the physiological changes thus caused in the brain and the said lower limbs. Similarly can we note the effects of nerve emanation, as when absorbed by a very weak or sick person from one in rugged health.

My own experience has shown that under these circumstances the skin, while not in direct contact, may be scalded almost beyond endurance while the transference goes on; while the after effect for more than an hour is one serving to stimulate and steady the mind and general nervous system.

Plain frictional static electricity can never have after effects as cited, and hence the assertion that "animal magnetism" is a ponderable emanation. In 1825 Nobili showed that whenever a muscle is contracted, an impulse is set free, which has an E. M. F. strong enough to violently deflect the galvanometer; but it has been found by an American in 1901, long before our esteemed European contemporaries had thought of reviving the problem of "animal magnetism," that besides these spontaneous discharges from muscles, there are also similar ones from every nerve cell called into action. We long knew that after an impulse has passed through a nerve, it is left charged negatively; and now the beautiful fact is at hand, that bodies within the range of radium bombardment are also charged negatively. Recent experiments have shown that all warm-blooded animals are slightly radio-active, although, according to the more recent discoveries of Rutherford, we may have reasons to believe that, of the great quantities of emanation from living matter, only a few straggling rays have velocity enough to produce that electromotive force necessary to affect our clumsy instruments.

As there is a countless number of nerve cells in the brain, which are always more or less active, we may look to a charge of this emanation, which does not only saturate the brain, but the body as well, though to a lesser degree of density; and hence the difference of potential and transference by arm conduction as mentioned. ALBERT F. SHORE.

Brooklyn, N. Y.

The Current Supplement.

The current SUPPLEMENT, No. 1605, opens with a well-illustrated article on the new Rotterdam electrically-operated floating dock. Sanford E. Thompson writes authoritatively on the proportioning of concrete. The improvement of roads by oiling and tarring and by calcium chloride is discussed at length. Most important of all the articles in the current SUPPLEMENT is perhaps that by A. Frederick Collins on the design and construction of a 100-mile wireless telegraphy set. Such clear drawings illustrate the article, and the wording is so simple and full, that anyone ought to be able to make a very efficient wireless telegraph outfit by studying Mr. Collins's instructions. Mr. Swinburne contributes an excellent article on radiation from gas mantles. The splendid treatise on the modern manufacture of alcohol is concluded. In this installment the extraction of alcohol from the mash or fermented wort, as well as distilling apparatus and refining and rectifying apparatus, is described at length. Robert Grimshaw's article on the industrial application of gypsum is concluded. The English correspondent of the SCIENTIFIC AMERICAN tells how to improve telephony, basing his arguments on an ingenious apparatus devised by William Duddell. Instruments for the composition of simultaneous movements are described by Dr. Alfred Gradenwitz.

MASKS OF CLASSIC AND MODERN TIMES.—I.

BY RANDOLPH I. GEARE.

The primal use of a mask was to shield or protect the face, and therefore ornamentation in the early stages of mask evolution was of far less importance than impenetrability. It naturally followed that fierce tribes adopted ferocious-looking masks, which succeeded more or less in frightening their enemies, and this tendency gradually increased, with a consequent decrease in defensive usefulness. Later special devices were invented for heightening the wearer's terror-inspiring powers, until the defensive idea was all but obliterated. It was not very long afterward that each warrior engrafted on his mask such features as were in his opinion best suited to carry out his own purpose; superhuman attributes were inaugurated, because of the influence which their representation exerted. In this way masks found their way among religious paraphernalia. It also came about that the portrayal of those very qualities which excited aversion or contempt in time of war, only provoked ridicule in time of peace; and ridicule, as Dr. Dall states in his excellent paper on Masks and Labrets, seems to be the only form of humor among savages. In the course of time, therefore, a set of devices became typical of buffoonery, and these were appropriate for use in public amusements. The scope of the mask thus became greatly widened, and henceforward it was applied in various ways, e.g., on the stage, as a social symbol, or in connection with religious ceremonies. Some masks were raised above the face of the wearer to the upper part of the headdress, in order to give increased height to the person playing the part of a supernatural hero. At times masks have so vividly portrayed the ideas for which they stood, that wearers could be dispensed with altogether, and the mask itself formed an independent object of attention. "It may be in this case," writes Dr. Dall, "associated with the bodies of the dead, as in Peruvian graves, or erected in connection with religious rites; a practice widely spread, and not to be confounded with statues or idols, which approach the same end by a different path; or finally attached to the altar or building devoted to such rites. In the last case weight is of no consequence; and, in general, durability is of importance, from whence are derived the stone models of faces or stone masks of which Mexico and the Caribbean islands have afforded such remarkable examples."

The stucco and wooden masks used by the ancient Egyptians for covering the faces of the dead, as well as the stone masks found in the ancient city of Pompeii, present another phase of this interesting study.

Having now briefly traced the origin of the mask, reference will be made to its particular uses in different regions, with illustrations of some conspicuous specimens in the collections of the United States National Museum.

The employment of masks in dramatic performances, as well as in funeral processions and in connection with the ceremonies attending the orgies of Dionysus, was general both in Greece and Rome. At first the Romans were only imitators of the Greeks, although in modern days the Italians, as well as the French, have endeavored to revive the art of the ancient stage, and other nations have made attempts in the same direction through the medium of tragedy. England and Spain are responsible for the romantic drama, which is neither tragedy nor comedy, and which began to flourish some three hundred years ago. Lastly came the German stage, which naturally showed evidence of influences derived from its predecessors. In all of these productions masks were frequently used.

But the use of masks was especially prominent in connection with histrionic art, and they differed in kind according to whether the play was tragic or comic. In their mimetic art the foremost idea of the ancient Greeks seems to have been to imbue their characters with heroic grandeur, a superhuman dignity and an ideal beauty. The exactness of the representation was not so important as its beauty, and from that standpoint the use of masks became essential, for the Greeks would have deemed it ignoble to allow an Apollo or a Hercules to be represented by a player who had perhaps a face that was anything but that of the god he represented. Masks were changed, too, to indicate different moods of the same person; such as joy, sorrow, or anger, according as the player was actuated by one or another of these emotions. Comic masks were distinguished by a grotesque, laughing countenance; while tragic masks had a more dignified appearance, but were sometimes hideous and frightful. Such arbitrary changes must have been very trying to the audience, and we can imagine their feelings if an absent-minded actor happened to present the wrong side of the mask. There were also satyr masks and other kinds for dancers. They usually had very large, open mouths, within which were metallic bars or other resonant bodies to strengthen the voice.

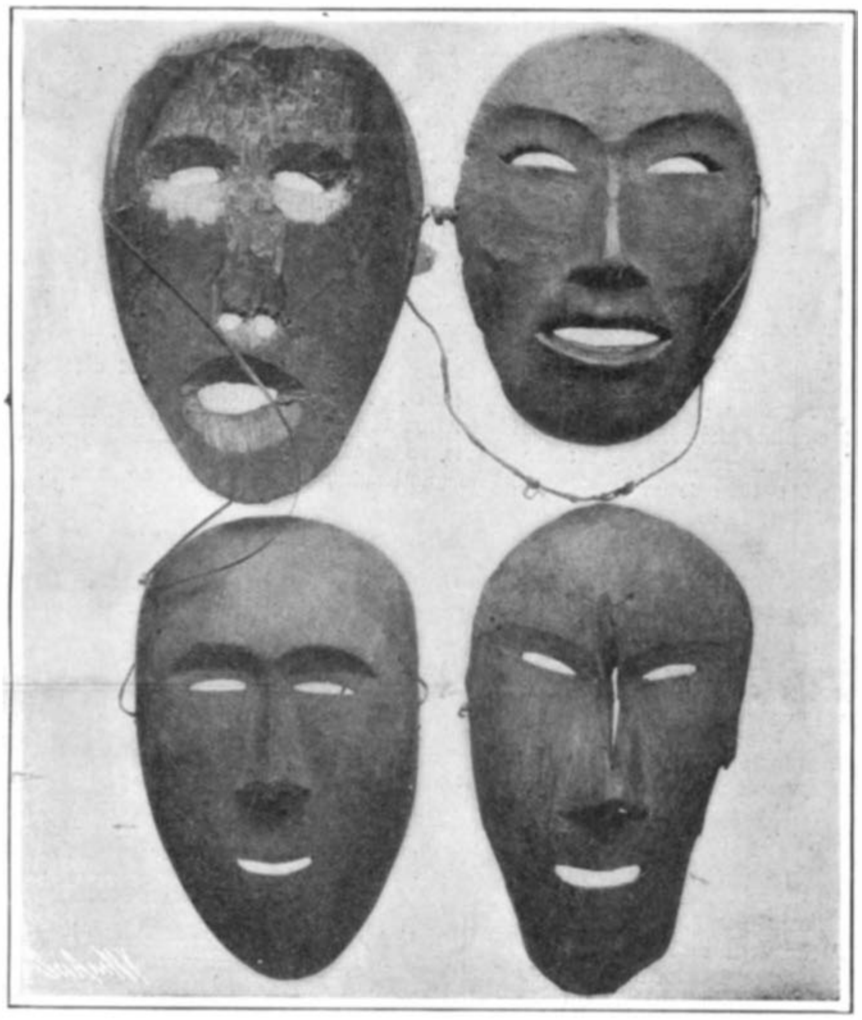
During the work of making excavations in Greece and Asia Minor some years ago, face masks of gold, bronze, and terra-cotta were found. In Greece they were also made of painted wood, bark, or linen.

Masks used on the stage were commonly head masks, which incased the whole head and rested on the shoulders, but such an increase of size in the head dwarfed the rest of the figure, and therefore the actor wore buskins with enormously thick soles, to augment his height and give a stately appearance to his gait. In order that due proportion might be preserved, the robes were also padded out, and the actor thus became like the statues which we call "heroic." The idea was that when a god or god-hero was to be represented, the ordinary proportions of a man were regarded as too puny. Even the mask itself was so designed as to present features in an exaggerated degree. The eyeballs were painted white, the pupils being left open to serve as peepholes. The mouth was left open in a square or trumpet shape.

A curious addition to the mask was the arrangement already mentioned for increasing the volume of sound. Some of the Grecian theaters held thirty thousand people and upward, and the natural voice [illegible]t strong enough, for which reason a mouthp[illegible] metal was introduced, whereby the voice could be thrown to the farthest seat. Everything was on a heroic scale—the stage, orchestra, and the buildings. And so critical were the audiences that a false intonation of a single syllable by an actor brought down on him a storm of vociferous dissent. The great tragedies of Sophocles, Æschylus, and Euripides, as well as the comedies of Aristophanes, were presented to the most intelligent audiences the world has ever known under the conditions which then existed.

The masks of wax used at more modern Roman carnivals afford a rather good idea of the appearance of the theatrical masks of the ancients. They imitate life movements in a masterly manner, causing an almost perfect deception when viewed from a distance. They always contain the apple of the eye, as seen in ancient masks, and the persons wearing them see only through the aperture left for the iris. The ancients went still further, and provided even an iris in their masks. Accidental circumstances were also imitated; as, for instance, the cheeks of Tyro, down which the blood had rolled from the cruel conduct of his stepmother.

(To be continued.)



Wooden Masks of the Chuckchi Indians of Siberia.

Egyptian Stucco and Wood Masks from Mummy Cases, with Coarse Matting of Dhoom Palm.

MASKS OF CLASSIC AND MODERN TIMES.

The Waterproofing of Concrete Blocks and Walls.

It is well that attention be called to the general use of the word waterproof without due regard to its meaning, and without analysis of those properties of concrete blocks which have a bearing on the subject. Dense, impermeable, and waterproof, as well as porosity, permeability, and absorption, are terms often used in a manner so indiscriminate as to lead to the supposition that, if not themselves synonymous, their ratios at least are unvarying. Such is not the case, although there are certain relations existing between them which deserve consideration.

A dense block is one in which the interstices between aggregates are filled as far as may be possible in actual practice, and the porosity of a concrete block is the percentage of voids which it contains.

An impermeable block is one through which water under such pressure as the member is calculated to withstand will not pass with rapidity sufficient to transmit dampness, and permeability is the rate of speed with which water permeates the block.

A waterproof block is one which when immersed in water will not absorb any of the liquid, and absorption is the ultimate water-consuming capacity of a block partially submerged. Absorption tests are usually made for forty-eight hours, and the average results obtained in a series of tests on concrete blocks made by the Bureau of Building Inspection in Philadelphia show five per cent by weight in that time.

It is therefore evident: First, That no concrete block of ordinary manufacture is waterproof in the sense stated; second, that proper materials and care in manufacture will greatly increase the impermeability of blocks; third, that proper selection, gradation and mixing of materials will so far eliminate voids as to reduce greatly the absorption of the average concrete block. The chief causes of permeability are: 1. Use of fine sand without coarse aggregate. 2. Use of a very dry mix. 3. Insufficient cement. 4. Careless mixing.

Porosity has reference to the total voids in a block while permeability is governed by the size and continuity of voids. Proper proportions of coarse and fine material are better than either used alone. It will be found that the density of a sand mixture is greatly increased by the introduction of properly graded coarse aggregate and that the permeability of broken stone concrete is greatly lessened by the introduction of sand or screenings which reduce the size of the voids. The reader will understand that "run of crusher" usually contains fine particles in sufficient quantities. It is evident that unless cement be reduced to solution it cannot fill the voids in the sand, and the use of an exceedingly dry mix is without question responsible for the greater portion of unreasonably permeable blocks. It is so easy to work a dry mix and the blocks are so quickly and easily removable from the molds that many, regardless of consequences, yield to the temptation.

Following the same line of reasoning, it is easy to see that in using too lean mixture the quantity of cement is inadequate to fill the voids and the result is similar.

Though the amount of water be sufficient and the quantity of cement adequate, uniform distribution can be secured only by thorough mixing, while faulty mixing causes in portions of the block results similar to those shown by a lack of water or cement.

While it is entirely practicable by following suggestions already made to manufacture blocks as impermeable as required in ordinary construction, and more so than the average of other building materials, it is nevertheless a fact that the indifferent work of many operators is such that, except with the very best appliances, blocks are marketed whose inefficiency is proven by the first storm. Moreover, there are machines offered to the prospective operator with which the most expert labor would find it difficult to produce a reasonably impermeable block.

The first and most natural remedy is the use of lime. We find, however, that unslaked portions of lime will burn, and expansion and disintegration will follow. These difficulties are overcome by the use of the slaked and sifted powder commercially known as "hydrated lime," to the use of which there seems to be no valid objection. The admixture of one-half of hydrated lime to one part of cement gives added density, occasions no loss of strength and greatly decreases the permeability. Some authorities advise the use of equal quantities of hydrated lime and cement, and equal parts of slaked lime and cement are recommended by the writer for mortar in which the blocks are laid.

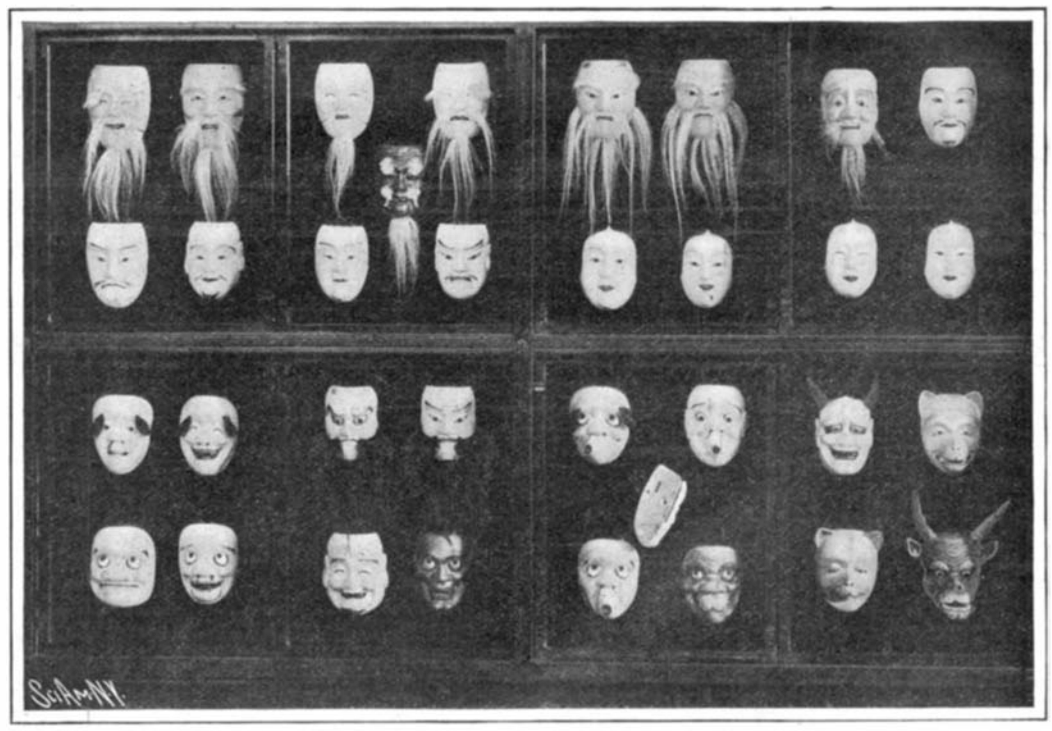
The application of a rich face has been found one of the most efficient methods of retarding the passage of moisture because of the protection afforded the interior of the block by an impermeable face. The process of manufacture must involve such condensation of the block as will thoroughly compact the face matter and firmly bond it with the underlying coarse concrete, leaving no distinct line of cleavage. If properly accomplished, this method gives excellent satisfaction, but any attempt to face a block after it is made, or to make separate operations of manufacturing the body and face of the block, will result disastrously.

With the usual materials of manufacture various ingredients may be incorporated designed to produce by chemical reaction substances impenetrable by water. Of those which may be locally compounded, doubtless the least harmful is five per cent of powdered alum, mixed with the cement and one per cent of soft soap, or ten per cent of a solution of laundry soap, mixed with the water. A number of chemical compounds of unknown ingredients are now offered to block makers and guaranteed to produce waterproof work. It is a serious question, even admitting that the initial strength of the cement might not be impaired by such adulteration, whether the life of the added ingredients will be as great as the life of the cement.

There are also numerous methods of waterproofing after erection. The alternate application of a hot solution of soap and a solution of alum is widely known as the Sylvester process. The patented colorless and odorless liquids of which one coat applied without heating will unquestionably render a wall proof against water under any reasonable pressure are advertised in technical journals. I have not found a man who was willing to venture an opinion as to the permanence, on work subjected to atmospheric exposure, of impermeability produced by the use of these solutions. Another method of waterproofing after erection, particularly adapted for cellar walls, is the application on the interior of hot roofing tar and Portland cement in equal parts, or of one of the patented waterproof paints.

Time is a factor of waterproofing. Careful observation has shown that in some cases the walls of buildings, damp during the first season, have gradually become more impermeable as the natural accumulation of soot and dust filled the exterior pores of the blocks.

The top mask is a mechanical contrivance made by the Thinkit Indians of S. E. Alaska. On the top is a jumping-jack. The bird's eyes and bill and the mouth and limbs of the manikin are worked by strings pulled by the wearer. The figure at the left is set on top of a small mask and is dressed in cedar-bark. It is used by the medicine men of British Columbia. The right-hand figure represents Olona, the mountain demon of the Kwakintil and other British Columbia Indians.



Papier Maché Masks Worn in the Sacred Japanese Drama "NÔ."

Burial Masks from Prince William Sound. These Are Laid Over the Faces of the Dead.

British Columbia Mask or Raven Costume Worn by Priest During Sacred Ceremonies.

MASKS OF CLASSIC AND MODERN TIMES.

It must be admitted that this observation is of little value as a source of satisfaction to the householder; the average man, finding his dwelling damp during the first season, will sell at a sacrifice and thereafter be an enemy of concrete.

No standard building material in use at the present day is absolutely waterproof. Brick and stone absorb varying percentages of water, and a dry interior is obtained only by furring or some other method of producing an air space between the outer section of the wall and the inner finish.—The Cement Age.

Santos-Dumont's Experiments in His Aeroplane "14 Bis."

BY THE PARIS CORRESPONDENT OF THE SCIENTIFIC AMERICAN.

After the first trials of his new aeroplane, Santos-Dumont succeeded in making a flight above the ground which, although of but a short distance, speaks well for the future performance of the apparatus. The flight took place on the 13th of September, in the presence of the Aero Club Commission, with the official timekeepers, for it was intended to compete for the Ernest Archdeacon Cup or the lesser prizes. Starting at 7:50 A. M., the aeronaut threw on the motor, but did not succeed in getting more than 900 revolutions per minute out of it instead of the expected 1,300. The aeroplane traveled at a good speed over the Polo grounds upon its wheels, but without rising entirely. Then the aeroplane was turned about so as to head in the other direction and started on a second run. Before the event the ground had been staked out at 30-foot distances, with a man behind each stake. It was important to measure the space, for a flight of 80 feet would have won the Archdeacon Cup, while a 300-foot flight would have earned a prize of $300. At 8:40 the motor was again started and the propeller turned at more than 1,000 revolutions, which was a good figure, if not at the best speed. The aeroplane rolled over the ground at a speed of 25 miles an hour or thereabouts. When at the proper point Santos-Dumont, thinking that he had a good enough start, turned up the front rudder so as to take the flight in the air.

The two front wheels left the ground, then the rear wheel rose, according to some, three feet, and according to others six feet. This lasted for a second or more, and during this time the aeroplane covered a distance of 15 or 20 feet. For some reason which it is hard to discover, the machine came to the ground again, and in spite of the rubber springs, the shock was enough to bring the rear propeller against the ground. One blade flew off, and the back end of the shaft was fouled; also the bamboo frame was broken at the rear end, and the radiator somewhat damaged. Santos-Dumont was not disheartened by the mishap. He had succeeded in flying a short distance, at least. He hoped to make a longer flight, but perhaps went up too soon by a sudden movement of the rudder. Such a movement is of course difficult to carry out without some practice. Moreover, his propeller did not speed up enough. After making the needed repairs, which will take two weeks at least, he expects to resume his experiments. The aeroplane proper was not damaged in the flight.

On the whole, the result is promising. M. Ernest Archdeacon, president of the Aero Club Commission, made inquiry into the previous aeroplane records and found that none of the previous machines had ever left the ground entirely, so that to Santos-Dumont belongs the honor of having made the first flight in France. The official report states that the apparatus left the ground entirely and sailed at a height estimated diversely at two to three feet, over a distance of 15 to 20 feet, with a speed of 18 to 20 miles an hour in the air.

The Alleged Influence of the Seasons Upon Earthquakes.

The majority of seismologists admit a periodic relation of the shocks of earthquakes with the vicissitudes of the seasons. The maximum frequency is held to occur in the cold season; the minimum, in the warm season. According to a memorandum of Mons. de Montessus de Ballore presented to the Académie des Sciences by Mons. de Lapparent, this theory is without foundation. Mons. de Ballore compared in all 75,737 tremors recorded in 81 catalogues, and corresponding actually with about 60,000 different quakes. The maxima of frequency were distributed in the following manner:

	Maximum of Apparent Seismic Frequency Falling.	
	From October to March, Per cent.	From April to September, Per cent
North latitude to 45 deg........	90	10
South latitude to 45 deg..........	47	49*

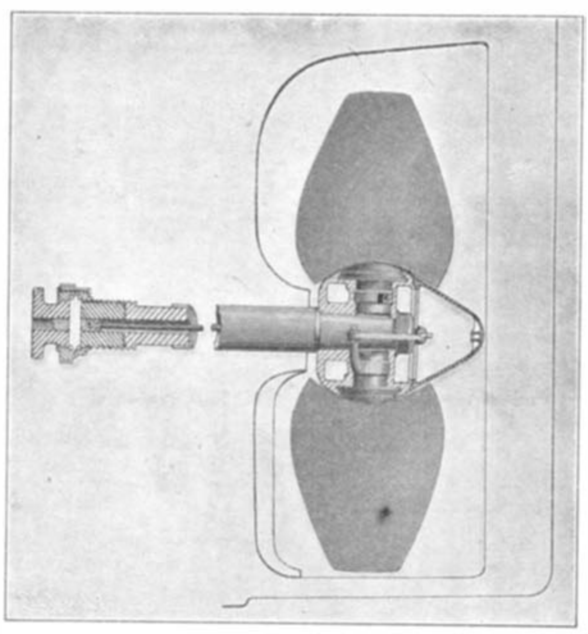
* Four per cent neither maximum nor minimum.

Thus the northern regions (north latitude to 45 deg.) show an enormous preponderance of cases in which the apparent frequency of earthquakes falls during the cold season; the southern regions appear indifferent to this point of view. Mons. de Ballore explains the matter in a very simple way. The number of weak shocks is in an enormous proportion more considerable than that of the shocks somewhat violent, and man perceives these light shocks much better when he is under the shelter of a habitation and quiet, than when he is about and in a state of activity. Now, in the northern regions it is during the cold season (from October to March) that we spend the most unoccupied time and are most under shelter; in the southern regions, the conditions remain perceptibly the same the whole year. Thus would be explained this apparent inequality in the frequency of earthquakes, which according to Mons. de Ballore occur equally at all seasons.—L'Illustration.

THE "R. C. RICKMERS"—THE LARGEST SAILING SHIP AFLOAT.

To Germany belongs the credit of possessing not merely the fastest steamships afloat, but also the largest sailing vessels. The credit for the latter distinction is due largely to the Rickmers Rice Mill, Freight, and Shipbuilding Company, at Bremerhaven-Geestemünde, who during the past few years have built several unusually large sailing vessels, chiefly for the handling of their enormous rice trade. The latest and largest of these ships is the "R. C. Rickmers," which recently arrived at New York on her maiden outward trip to Saigon and Bangkok by way of Cape Horn.

The "Rickmers" differs from her predecessors in the sailing fleet of this company, not merely in size, but in the fact that a decided innovation is being tried by providing her with an auxiliary steam engine, the object of which is to assist the ship across the belt of calms, and also in her movements in harbor when coming to an anchorage, warping alongside a dock, or threading her way through entrance channels and other narrow waterways.



FEATHERING PROPELLER OF THE "R. C. RICKMERS," WITH THE BLADES THROWN PARALLEL WITH THE KEEL FOR SAILING.

The spirited illustration of this great ship, which we present on the front page of this issue, gives an excellent impression of her great length, graceful sheer, lofty bow, and towering spread of canvas. She is shown with practically everything set, and bowling along at 13 to 14 knots on her favorite point of sailing, which is with the wind over the quarter. On deck the "Rickmers" measures 441 feet in length; her extreme beam is 53 feet 8 inches; her draft is 26 feet 9 inches when fully loaded, and her molded depth is 32 feet. Her gross tonnage is 5,548 tons, and on her maximum draft she displaces 11,360 tons. She carries, of course, a huge spread of canvas, the vertical height from the deck to the truck of the mainmast being 177 feet, and the length of the main yard 100 feet. There are five masts, known respectively as the fore, main, middle, mizzen, and spanker. All of the masts are of steel, except that at the extreme top of each there is a 6-foot wooden stump. The total spread of canvas is 50,000 square feet, and as the captain does not hesitate to hang onto every rag of this, long after smaller craft are shortening sail, it can readily be understood that the dimensions of the masts, and the number and size of the steel rope of the wire rigging, are unusual. The mainmast, which is built of half-inch steel plates, measures three feet in external diameter. To stay and hold up to its work the towering spread of canvas on this mast alone calls for no less than thirty shrouds and backstays, fifteen on each side. First there are six shrouds of special 5½-inch steel wire; then come six backstays of the same dimensions, two backstays of 4½-inch wire, and one of 4-inch; and so great is the holding strength of these fifteen ropes, that in the strongest breeze there is very little perceptible slackening of the lee shrouds or backstays. A rather surprising feature in this [illegible] that, in spite of her great size, all the sails are [illegible] by hand by means of special windlasses. The ship's complement consists of fifty-nine hands, two officers and two captains, the ship carrying two captains on the maiden trip only.

The auxiliary equipment consists of a triple-expansion engine of 750 indicated horse-power, steam for which is provided by two boilers; and in the side and between-deck bunkers a fuel supply of 650 tons can be carried. It was found that, in moderate weather, when the ship is in ballast, the engines can drive her at a speed of 8 knots per hour; when she is loaded the speed under steam is from 6 to 7 knots. Because of the great length and easy lines of the "Rickmers" and her large spread of canvas, she is capable, under favorable conditions, of sailing faster than any ship afloat, and probably faster than any ship that was ever built. On the trip to New York, for a period of eight hours, with the wind free, she averaged 15¾ knots per hour, and Capt. A. Walsen informed our representative that judging from this performance and the ability of the ship to carry her canvas in heavy weather, she would probably be able to make 17 knots an hour when going free in half a gale of wind. She is fitted with the well-known Bevis type of patent feathering propeller which, when sail power is to be used, can be so adjusted by means of a central shaft inclosed within the stern shaft, that the propeller blades will lie in the vertical plane of the keel.

The hull of the "Rickmers" is constructed with a cellular water-tight double bottom which, together with the four water-tight divisions, constituting the "deep tank" in the middle of the vessel, can be filled with water ballast to the amount of about 2,700 tons, which is sufficient to give the vessel the necessary sailing stability when she is in ballast. The actual weight of the ship itself is 3,350 tons, and she has a maximum carrying capacity of about 8,000 tons.

THE BIRKELAND-EYDE PROCESS AND THE ARTIFICIAL PRODUCTION OF NITRATES FROM THE ATMOSPHERE.

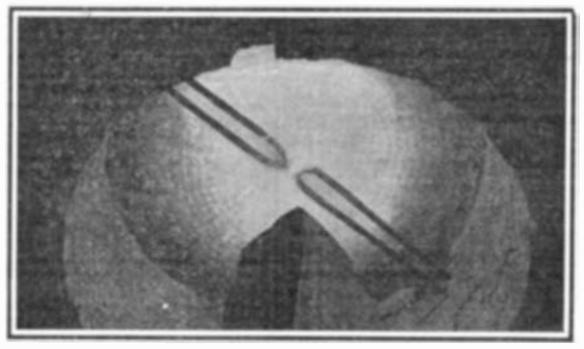
BY M. ALGER.

For years Prof. Birkeland, of the Christiania University, and S. Eyde, a civil engineer, have been experimenting with a process of removing nitrogen from the atmosphere by electrical processes for the ultimate purpose of employing it as a fertilizer, in the form of calcium nitrate. The Birkeland-Eyde plant is located at the waterfall Svaelgfos, Notodden, in the district of Telemarken, Norway, where 30,000 horse-power will soon be utilized, and large amounts of nitrate of calcium for direct use will be produced. In all processes for the reduction of atmospheric nitrogen the air is exposed to the high temperature of the electric arc, and cooled as rapidly as possible after the combination of a portion of the atmospheric oxygen and nitrogen. Without rapid cooling the compound decomposes. Furthermore, only very small arcs can be employed, for the larger the arc the smaller will be the amount of air exposed to the flame. In the Birkeland-Eyde process a short arc is formed at the terminals of the closely adjacent electrodes, establishing an easily movable and ductile current conductor in a strong and extensive magnetic field, i. e., from 4,000 to 5,000 lines of force per square centimeter in the center. The arc then moves in a direction perpendicular to the lines of force, at first with an enormous velocity which subsequently diminishes; and the extremities of the arc retire from the terminals of the electrodes. As the length of the arc increases its electrical resistance also increases, so that the tension is increased until it becomes sufficient to create a new arc at the points of the electrodes. The resistance of the short arc is small; hence the tension of the electrodes drops suddenly, with the result that the outer long arc is extinguished. In alternating current such as that used by Birkeland and Eyde all the arcs with a positive direction run one way, while all the arcs with a negative direction run the opposite way, assuming that magnetization is effected by direct currents. In this manner a complete luminous disk is presented to the eye.

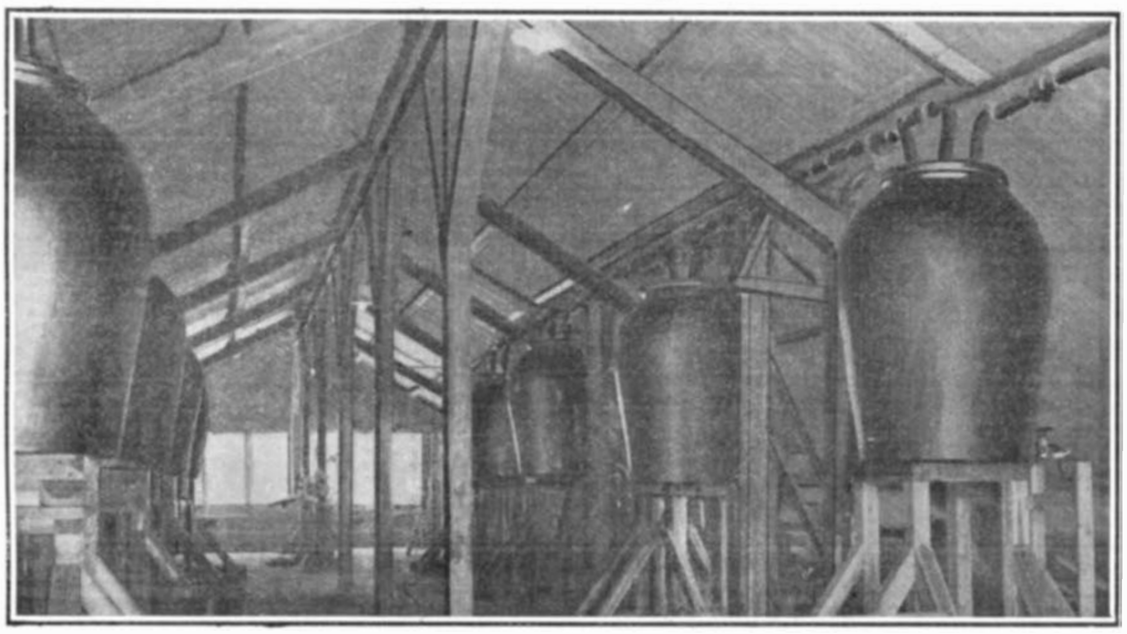
The arcs are contained in flat iron drums or furnaces lined with asbestos and mica. The electrodes are formed of copper tubes, through which cooling water flows, and are placed equatorially between the poles of a powerful electromagnet. The temperature to which the current of air passing through the drum is exposed is approximately 3,000 deg. C. (5,432 deg. F.); and it is calculated that one-fifth of the air acquires this temperature.

The nitrogen and oxygen combine to form nitric oxide; if this gas were allowed to cool slowly to atmospheric temperature, it would again be resolved into its constituents, but the arc closes and the gas is suddenly cooled, so that much of it escapes decomposition, and is swept along with the current into absorbers. It issues from the drum at a temperature of 600 deg. or 700 deg. C. (1,112 deg. to 1,292 deg. F.) and it passes through the tubes of tubular boilers and raises steam, which is utilized in a manner afterward to be described.

The nitric oxide, NO, combines with oxygen to form nitric peroxide, NO_2, on issuing from the boiler tubes; and it then passes through a succession of towers filled with broken quartz, over which water trickles. Nitric acid is thus formed. But not all the gas is absorbed; the unattacked air which passes along with it dilutes it to such an extent that at least half escapes absorption. Therefore, after passing the water towers, it enters a tower charged with milk of lime, and there it is nearly all absorbed, with the exception of about 5 per cent. The lime is converted into a mixture of calcium nitrite and nitrate. Nitrite of calcium is useless as a fertilizer; it is the nitrate alone which is valuable. The nitrite must therefore be converted into nitrate. This is done by adding to it a portion of the nitric acid, condensed in the towers, and distilling. The nitrite is decomposed; nitrous fumes, consisting of a mixture of NO and NO_2, pass over, and the lime is left in the liquor as a nitrate.



The Electric Arc Flame and Water-Cooled Electrodes.

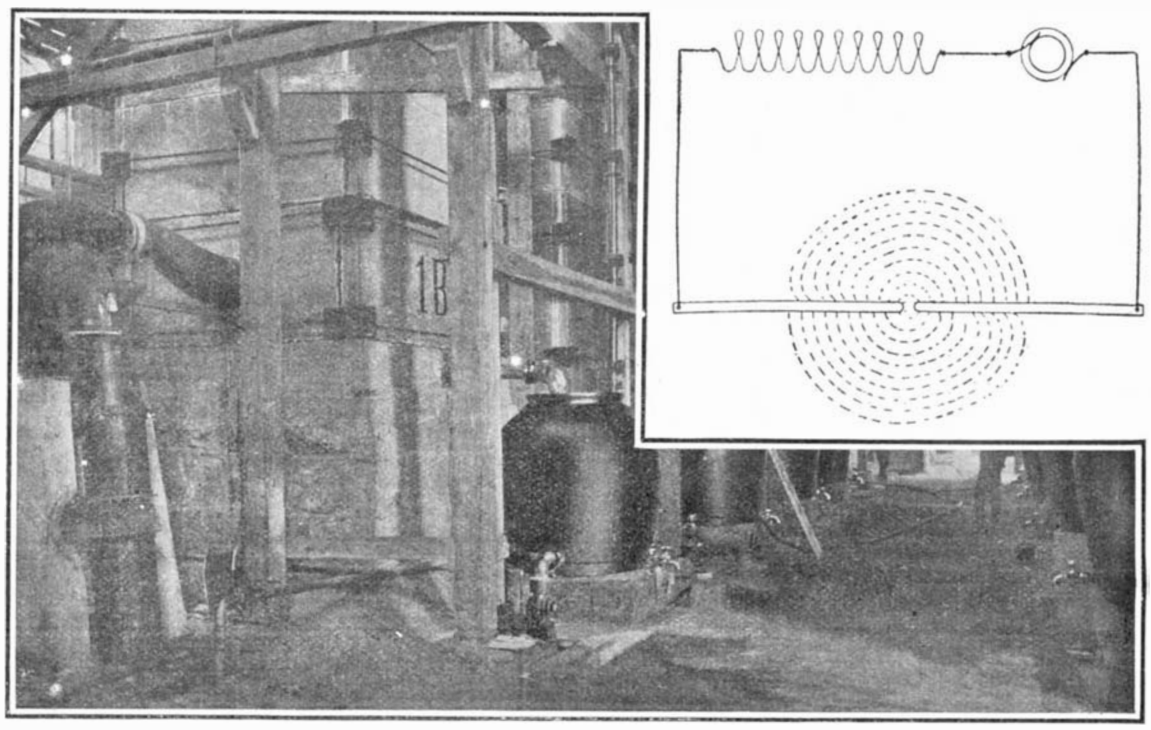


Acid-Proof Receptacles Into Which Vapors Pass.

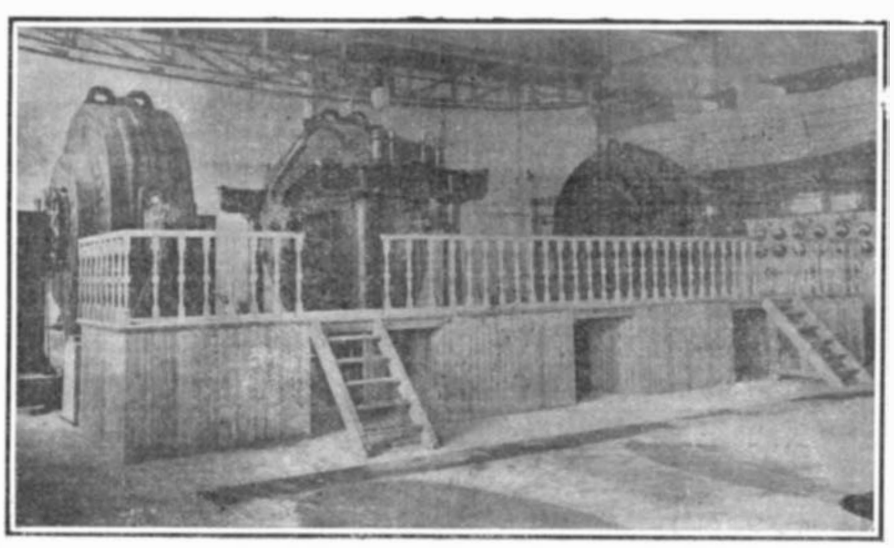
It is this nitrate solution which is evaporated by help of the steam raised in the boilers heated by the escaping gas. The nitrate of calcium may be brought to market in one of these forms: first, in a fused state, in which it contains 13.5 per cent of nitrogen; secondly, in crystals; and thirdly, as a basic salt, which forms a dry powder, not becoming moist on exposure to air. This valuable suggestion to use the basic nitrate and thus to produce a dry and non-deliquescent marketable article is due to Dr. Rudolph Messell. The extra lime which is introduced adds little to the cost and is itself of agricultural value.

The nitrous fumes are not lost. They may either be absorbed in caustic soda, giving nitrite of sodium, a salt much used by manufacturers of organic dyes, or they may be mixed with the stream of gases which have passed through the boiler tubes, and pass to the water towers, whereupon a portion will yield nitric acid and the rest will again be absorbed by lime.

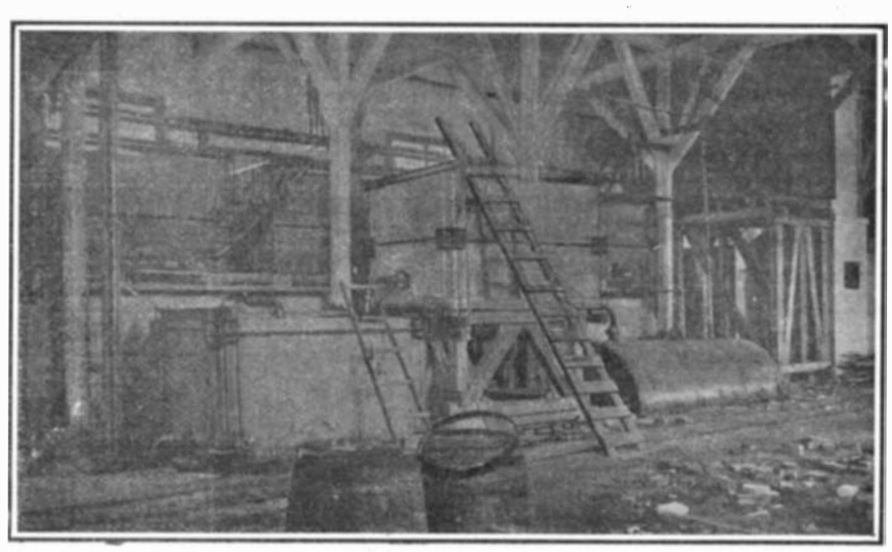
It is also possible to electrolyze the sodium nitrite, and to form ammonia and caustic soda; the ammonia can be distilled off and neutralized with nitric acid, giving the valuable product nitrate of ammonium, of use for explosives, the caustic soda being available for again absorbing the nitrous fumes. During electrolysis, oxygen is evolved, which may be introduced with air into the furnace, for air richer in oxygen forms more nitric oxide in the flame.



Absorption System of Stone Towers for Producing Nitric Acid.



The Arcs Are Formed in Flat Iron Drums.



The Oxidizing Chambers.

THE BIRKELAND-EYDE PROCESS AND THE ARTIFICIAL PRODUCTION OF NITRATES FROM THE ATMOSPHERE.

Automobile Steam Plowing.

In Cairo some very interesting tests with an automobile steam plow have been made at the instance of the multi-millionaire, his Excellency Boghos Pacha Nubar, and the Khedival Society of Agriculture. The results seem to promise favorably as regards the conditions prevailing in the Land of the Pyramids. The machine consists of a steam road locomotive of 40 horse-power, used as a traction motor for a plow working a breadth of 330 centimeters or 1,056 feet. The work done was about twice that done in the same time by the ordinary steam plow with rope traction, and about three times that which could have been done by animal traction. The experiments were conducted in a clover field that had not been plowed for many months and was perfectly dry and quite hard. The field was 300 meters or 924 feet long. The plow worked in an hour's time 6,729 meters of land, to a depth of 0.20 meter, or say eight inches, and the coal-briquette consumption was for 0.4 hectare, or 9.88 acres, only 100 kilogrammes, or 220 pounds. The fact that this type of plow can work in hard, dry ground makes it particularly adaptable to Egyptian cotton cultivation. The commission charged with the test endeavored to ascertain if the plow would mix artificial fertilizers well in with the soil, and found it in this particular quite satisfactory. The necessary labor required consists of one engine-runner, one stoker, and two men to look after the coal and water supply—this latter item seeming to Americans rather superfluous, or at any rate excessive. The advantages claimed for the automobile type over the traction plow are that it makes a better turned furrow (just why is hardly plain at first sight to those not on the spot), works faster, is more quickly turned at the end of the furrow (in this case thirty seconds is the time claimed), and can be kept supplied with water without stopping work, which, however, ought to be the case with any steam engine.

Generating Electricity at the Pit's Mouth.

Of recent years a good deal has been said about generating electricity at the pit's mouth, and transmitting it to various industrial centers. But it would be considerably cheaper to manufacture producer gas at the pit's mouth and transmit it through pipes to the industrial centers, there to use it for driving gas engines for generating electricity and also for heating purposes and furnace work. The questions of the distribution and transmission of power must not be confused. For the former it is agreed that there is no agent to compare with electricity. For the latter purpose it is suggested that it is more economical to employ producer-gas and piping than electricity and cables.

Business and Personal Wants.

READ THIS COLUMN CAREFULLY.—You will find inquiries for certain classes of articles numbered in consecutive order. If you manufacture these goods write us at once and we will send you the name and address of the party desiring the information. **In every case it is necessary to give the number of the inquiry.** MUNN & CO.

Marine Iron Works. Chicago. Catalogue free.

Inquiry No. 8385.—Wanted, a machine for printing metal signs with paint.

See our Ad. on back page. Star Expansion Bolt Co.

Inquiry No. 8386.—Wanted, cardboard disks, or disk-making machinery.

J. C. Sparks, B.C.S., F.C.S., Anal. Chemist. See adv't

Inquiry No. 8387.—Wanted, machinery for making starch from potatoes; also for the production of alcohol from potatoes.

"U. S." Metal Polish. Indianapolis. Samples free.

Inquiry No. 8388.—Wanted, parties manufacturing or selling Beaureau engines, 1898 model.

Handle & Spoke Mchy. Ober Mfg. Co., 10 Bell St., Chagrin Falls, O.

Inquiry No. 8389.—Wanted, the name and address of the manufacturer of the Chaffou condensed milk-can opener.

Sawmill machinery and outfits manufactured by the Lane Mfg. Co., Box 13, Montpelier, Vt.

Inquiry No. 8390.—Wanted, a small battery and motor outfit adapted to run a sewing machine.

I sell patents. To buy, or having one to sell, write Chas. A. Scott, 719 Mutual Life Building, Buffalo, N. Y

Inquiry No. 8391.—Wanted, the name and address of the manufacturer of the Imperial Smoothing Iron, which is heated by gasoline or oil.

The celebrated "Hornsby-Akroyd" safety oil engine. Koerting gas engine and producer. Ice machines. Built by De La Vergne Mch. Co., Ft. E. 138th St., N. Y. C.

Inquiry No. 8392.—Wanted, the name and address of the patentee and present manufacturer of the toy top called the New 20th Century Gyroscope.

Manufacturers of patent articles, dies, metal stamping, screw machine work, hardware specialties, machine work and special size washers. Quadriga Manufacturing Company, 18 South Canal St., Chicago.

Inquiry No. 8393.—Wanted, manufacturers of decorated glass, such as used in clock doors and quaint dials.

Inquiry No. 8394.—Wanted, manufacturers of bricks made of sawdust compressed with coal oil.

Inquiry No. 8395.—Wanted, the name and address of the manufacturer of the Mars Gas Engine Lubricator.

RECENTLY PATENTED INVENTIONS.

Electrical Devices.

SELECTOR OR LOCK-OUT FOR PARTY-LINES.—A. Marchand, Buckingham, Wash. The more particular object of the inventor is to provide a system combining selectively with an efficient lock-out and with an automatic busy signal. Means are provided for adjusting or alining the selectors used at the different stations so as to maintain the same in a proper step-by-step relation. An improved electric switch operates automatically and is capable of fine adjustment.

ELECTRIC HAMMER.—R. Smith, Middletown, N. Y. The invention is an improvement in electric hammers, and while it may be described as an invention applied to an electric hammer, it may be made use of in any form of construction when a reciprocating motor is desired, as in pumps, brakes, trip-hammers, etc. The invention is entirely automatic in its action.

TELEPHONE-RECEIVER SUPPORT.—F. F. Howe, Marietta, Ohio. On a suitable brace or bracket there are pivoted a receiver support and a transmitter support and among the features of novelty, devices are provided intermediate the mentioned supports whereby the shifting of one will shift the other support, the lever relation between the two supports and the intermediate devices being such as to effect by a slight movement of one of the supports a corresponding greater movement of the other support.

Of General Interest.

AMALGAM CARRIER AND PLUGGER.—H. W. Arthur, Pittsburg, Pa. One of the purposes of this invention is to provide a dental instrument which can be used as a conveyer of plastic filling material, such as amalgam, to a cavity in any part of the mouth and render the filling secure in the cavity by converting the instrument into a plugger.

JAR-CLOSURE.—F. Smith, Council Bluffs, Iowa. The invention refers particularly to an improvement in cardboard closures or stoppers for bottles and jars—such, for example, as are commonly employed for carrying milk. The object of the inventor is to enable the closures to be quickly and easily removed by hand without necessitating the use of a tool or instrument of any sort.

WINDOW-REFRIGERATOR.—C. Spadavecchia, New York, N. Y. One purpose of the inventor is to provide a construction which can be quickly and conveniently passed out through the window-opening from the inside of the room and readily and expeditiously secured in position outside of the window-frame resting upon the sill and against the outer parting-strip of the frame, the lower stile of the upper sash having bearing upon the top of the refrigerator when the upper sash is in its closed position.

MARINE VESSEL.—J. W. Martin, Scottsburg, Ind. The invention pertains to a marine vessel adapted particularly for use in shoal water, the boat or vessel being equipped with a propeller, the position of which may be changed at will, so that the propeller may extend downwardly below the keel of the vessel or upwardly above the keel-line, according to the depth of the water in which the propeller is operated.

FLOATING WHEEL-DAM.—F. W. McNeil, St. Louis, Mo. The object here is to utilize current force to generate power which may be transformed into mechanical or electrical energy capable of transmission to any point of application. It is effected by an improved construction using one or more pontoons carrying submerged or partially-submerged waterwheels and having wings in advance of the wheels which act to contract the water channel or flow, and thus increase the head or pressure of water at its point of application to the wheels.

COAL-WASHING JIG.—W. B. Gillon and J. M. Ricketts, Sopris, Col. This jig washes and separates coal from its impurities. In operation the raw coal is supplied to hoppers and resting on the coal screens is stratified by the pulsations of the water produced by the plungers, the clean coal passing to discharge troughs and the rock to the conveyers. The sludge drops through the screens to the screw conveyers. These carry the waste through openings in the inner walls to the middle compartment, when it is elevated and discharged by the flight conveyer therein.

CONCRETE-WALL-FORMING APPARATUS.—H. P. Engelhardt, New York, N. Y. The device is portable and readily adjusted to the work to be done. In wall building the inner and outer standards are arranged at intervals and spaced at various distances apart, as required. As the wall progresses from the foundation, the mold plates or boards will be added, and after the finishing of the wall the boards may be readily removed and also the standards or uprights.

Heating and Lighting.

GAS-BURNER.—W. S. Prim, New York, N. Y. The principal object of Mr. Prim's invention is to provide means for increasing the illuminating power of the gas and rendering the combustion thereof more perfect than in burners commonly used, to which end he provides a peculiar gas-heater arranged over the burners, from which heater the hot gas is conducted down to the mixing and burning devices. The burner is adapted for in or out of doors.

Household Utilities.

COMBINED STOVE-LID LIFTER AND CLOTHES-DRIER.—F. B. Small and J. C. Mulligan, Bath, Maine. The invention relates to improvements in combined stove-lid lifters and hangers for clothing or other articles to be dried by the heat of the stove, the object being to provide a device so constructed that when not in use the support for the articles to be dried may be slid into the handle of the lifter.

Note.—Copies of any of these patents will be furnished by Munn & Co. for ten cents each. Please state the name of the patentee, title of the invention, and date of this paper.

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Boots and shoes, leather, Geo. E. Keith Co. 56,412
Boots and shoes, leather, Smith-Briscoe Shoe Co. 56,423
Boots and shoes, leather, C. S. Stearns ... 56,424
Boots and shoes, men's leather, Streng & Thalheimer 56,426
Bottle heating kettle, H. H. Waugh 56,474
Brooms, whisk, J. S. Barron & Co. 56,435
Brushes, Wooster Brush Works 56,479
Candy, Lipps-Murbach Co. of Baltimore City .... 56,456 to 56,458
Cedar shavings or chips chemically prepared, A. G. Jones 56,453
Cigars, Duncan & Moorhead 56,410
Claret, S. Hochstadter 56,450
Coffee, S. S. Pierce Co. 56,467
Cotton piece goods not figured or printed, unbleached, Busk & Jevons 56,443
Dress shields, Amolin Chemical Co. 56,431
Dress skirts and underskirts, Lion Bros. Co. 56,455
Dyestuff, Badische Anilin- & Soda-Fabrik ... 56,434
Embalming fluid, J. Ralph 56,464
Fertilizers, Navassa Guano Company of Wilmington 56,420
Fire kindler, chemical, T. D. Bausher 56,436
Flour, wheat, Northwestern Consolidated Milling Co. 56,463
Flour, wheat, Windsor Milling and Elevator Co. 56,478
Fruits, vegetables, preserves, and jellies in tins and glass, National Grocer Co. 56,462
Furniture consisting of chairs, tables, desks, taborets, divans, sofas, and bedsteads, G. Stickley 56,425
Grooming machines and their parts, American Shearer Manufacturing Co. 56,430
Headlights, lanterns, and lamps, Badger Brass Manufacturing Co. 56,433
Lard, H. P. Fritot 56,447
Lead and oxids of lead, white, National Lead and Oil Co. of Pa. .... 56,416 to 56,419
Leather polish, Whittemore Brothers & Co. 56,428
Locks, padlocks, and keys, Miller Lock Co.. 56,461
Meats, smoked, Schwarzschild & Sulzberger Co. 56,468
Medicinal preparation, J. D. Riedel Aktiengesellschaft 56,451, 56,452
Mucilage, liquid adhesive starch gums, and liquid adhesive sizings and pastes, Arabol Manufacturing Co. 56,407
Oil, castor, Marsh Oil Co. 56,459
Oil, olive, D. S. Francesconi 56,446
Paints and pigments used for paints, stains, and paint oil, mixed, Sherwin-Williams Co. 56,422
Paints, varnishes, enamels, blacks, rough stuffs, and pigments used for paints, mixed, Valentine & Co. 56,427
Perfumery, toilet waters, extracts, and colognes, D. R. Bradley & Son 56,441
Potash, A. Mendleson's Sons 56,481
Potash and lye, A. Mendleson's Sons 56,460
Purses and satchels, leather, A. & E. Leather Goods Co. 56,406
Remedy for certain named diseases, Ripans Chemical Co. 56,465, 56,483
Remedy for rheumatism, O. C. Brown 56,442
Shoes, leather, W. D. Brackett & Co. 56,409
Soap, laundry, J. G. Haas Soap Co. 56,414
Spiced seasonings, William G. Bell Co. 56,477
Sporting goods, certain named, A. G. Spalding & Bros. 56,429
Steel, crucible, tool, drill, and pick, Dunham, Carrigan & Hayden Co. 56,445
Stoves and ranges, cook, P. D. Beckwith 56,454
Tobacco, natural leaf twist, Ryan-Hampton Tobacco Co. 56,421
Washing machines, White Lily Washer Co., 56,475, 56,476
Whisky, Black & Greiwe 56,432
Whisky, Bergin & Brady Co. 56,437
Whisky, Bonnie & Co. 56,439
Whisky, W. Borgmann 56,440
Whisky, F. Hesoun, Jr. 56,448
Whisky, Hiram Walker & Sons 56,449
Whisky, Rosenfield Bros. & Co. 56,466
Whisky, B. J. Semmes & Co. 56,469
Whisky, Straus Brothers Co. 56,471
Whisky, Thixton, Millet & Co. 56,472
Whisky, A. Breslauer Co. 56,480
Yeast in solid form, Vienna Pressed Yeast Co. 56,473

LABELS.

"Fort Leavenworth Sifted June Peas," for canned peas, Bittman-Todd Grocer Co. ... 13,098
"Lapin's Magic Felt Hat Cleaner," for cleaning preparation, Essential Chemical Co. 13,099
"Natural Mineral Water," for mineral water, Ledgerwood Bros. 13,095
"Noc," for cigars, W. Knoch 13,094
"Orchid Early June Peas," for canned peas, Bittman-Todd Grocer Co. 13,097
"Pennyrile," for flour, Farless & White 13,096
"Picture-Phone," for coin operated talking and picture displaying machines, L. P. Valiquet 13,103
"Pneumonia Bag," for bags designed to cover the chest area of the lung in the human body, American Rubber Co. 13,101
"The Decker Ledger and Balance Combined," for account books, L. Decker 13,102
"The Electric Cleaner and Polish," for a cleaning and polishing preparation, E. T. Lucas 13,100

PRINTS.

"Better Than Honey," for syrups and crushed fruits, J. Hungerford Smith Co. 1,800
"Fall and Winter Styles 1906-'07," for clothing, Garson Meyer & Co. 1,802
"Picture-Phone," for coin operated talking and picture displaying machines, L. P. Valiquet 1,804
"The Energy $1 Will Buy," for flour, L. P. Hubbard 1,801
"The Kismet Company," for glass and bottle holders, Kismet Co. 1,803
"The Purest in the Field," for whisky, Seiter & Kappes 1,799

A printed copy of the specification and drawing of any patent in the foregoing list, or any patent in print issued since 1863, will be furnished from this office for 10 cents, provided the name and number of the patent desired and the date be given. Address Munn & Co., 361 Broadway, New York.

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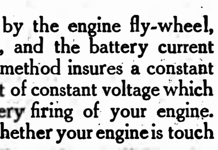

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