SCIENTIFIC AMERICAN

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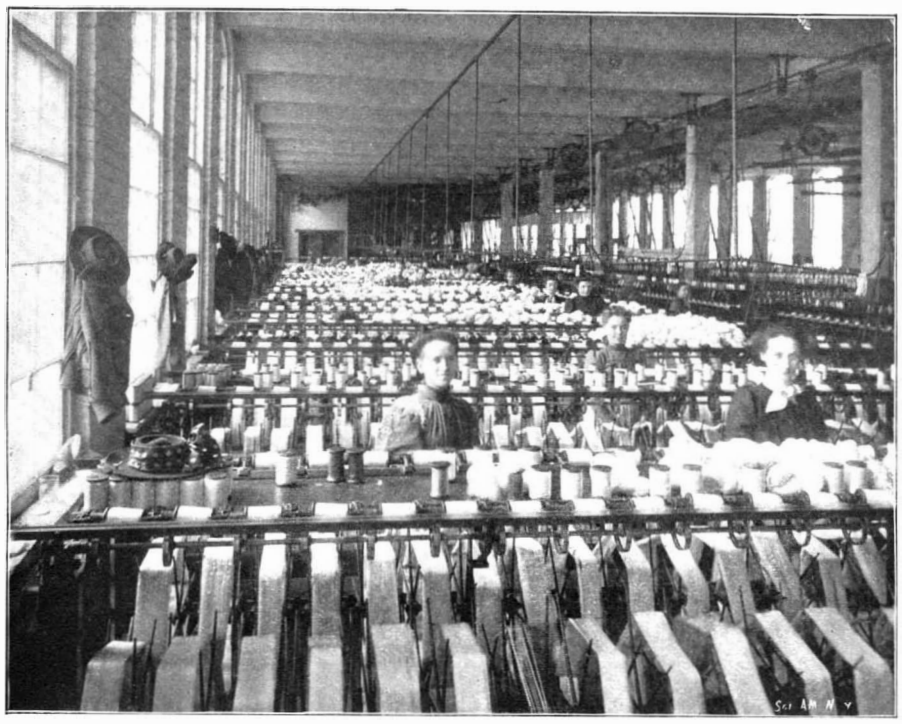
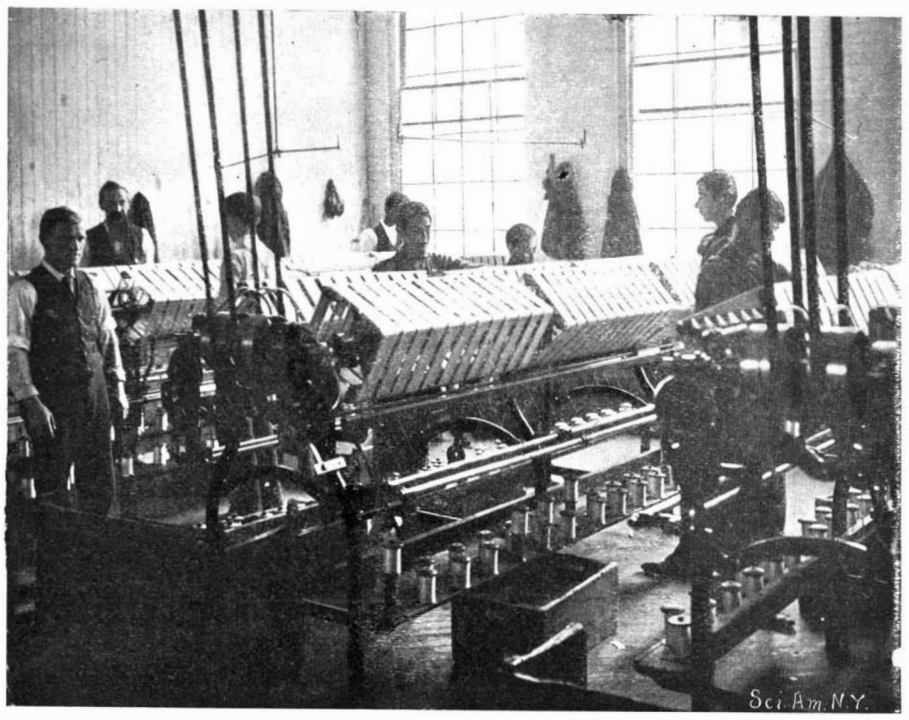
A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. LXXXIV.—No. 8. ESTABLISHED 1845. NEW YORK, FEBRUARY 23, 1901. $3.00 A YEAR. 8 CENTS A COPY.



Throwing Silk—Spinning and Doubling Machines.



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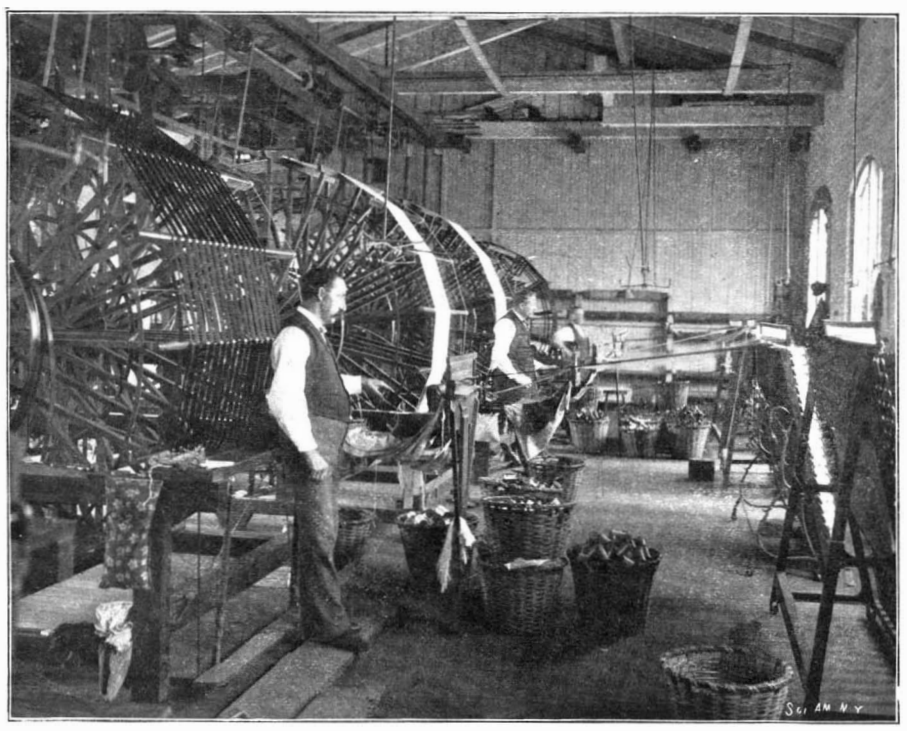
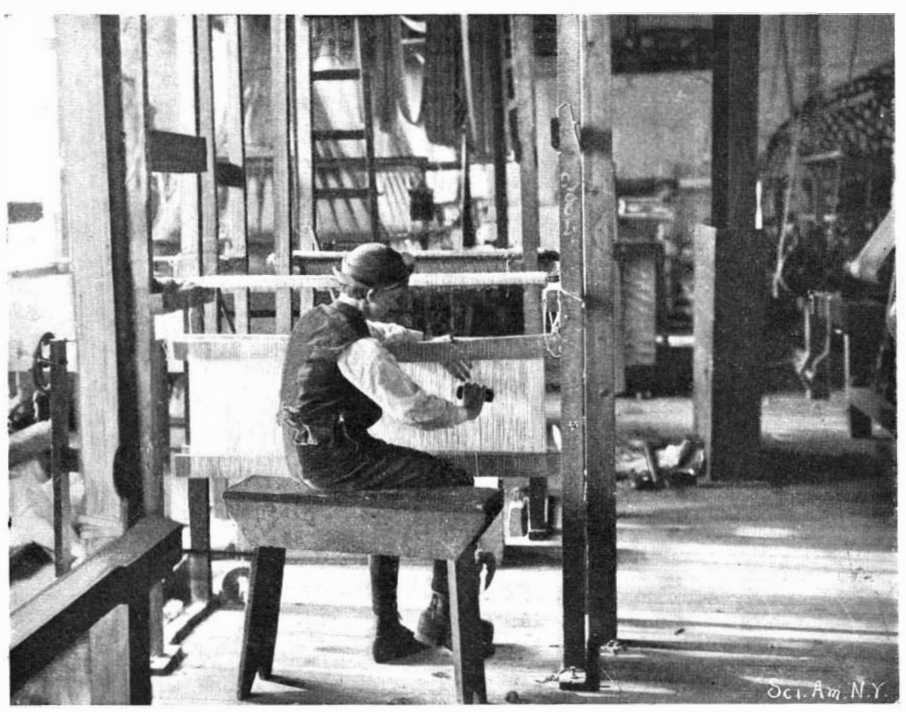
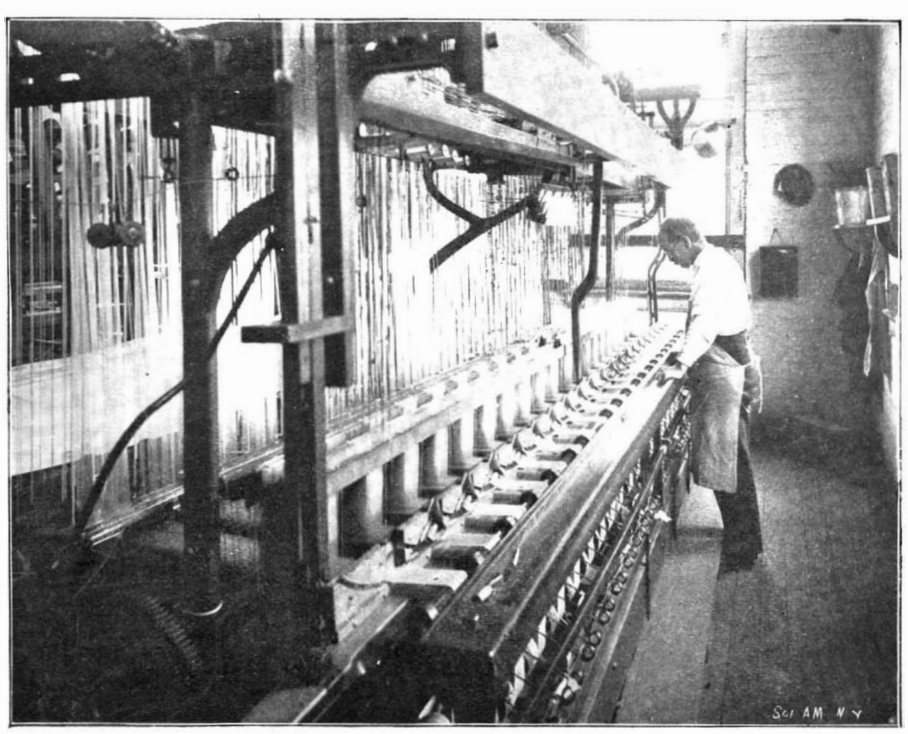


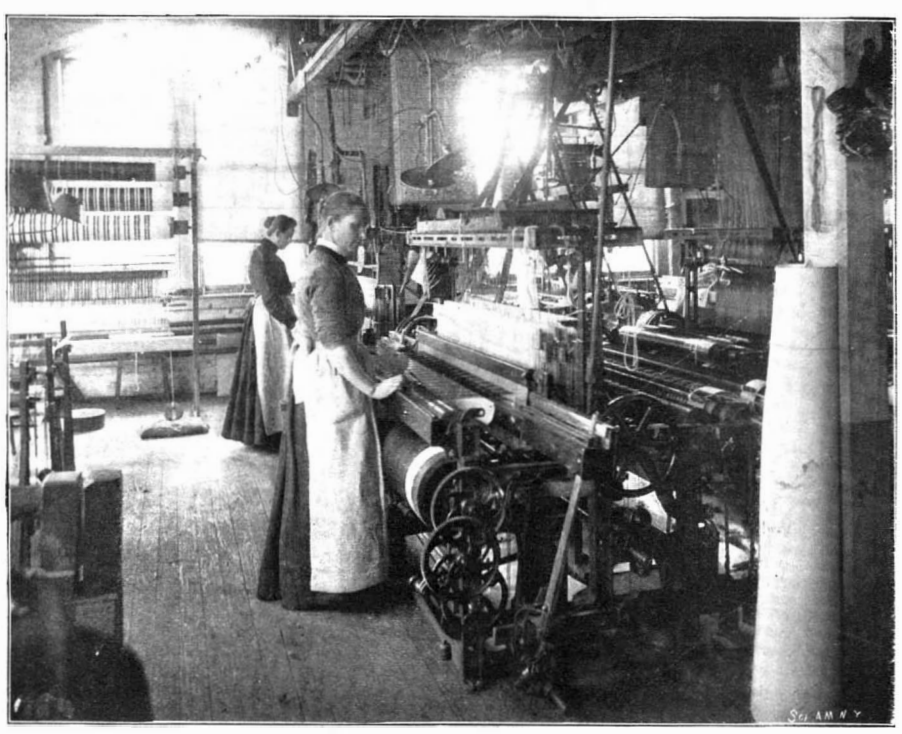
Setting a Warp for Broad Silk.



Cleaning a Harness.



A Ribbon Loom.



A Broad Silk Loom.

THE SILK INDUSTRY.—[See page 118.]

Scientific American.

ESTABLISHED 1845

MUNN & CO., - - - EDITORS AND PROPRIETORS.

PUBLISHED WEEKLY AT

No. 361 BROADWAY, - - NEW YORK.

TERMS TO SUBSCRIBERS

One copy, one year, for the United States, Canada, or Mexico $3.00
One copy, one year, to any foreign country, postage prepaid. £0 16s. 5d. 4.00

THE SCIENTIFIC AMERICAN PUBLICATIONS.

Scientific American (Established 1845).....$3.00 a year.
Scientific American Supplement (Established 1876) ..... 5.00 "
Scientific American Building Edition (Established 1885). ..... 2.50 "
Scientific American Export Edition (Established 1878)..... 3.00 "

The combined subscription rates and rates to foreign countries will be furnished upon application.
Remit by postal or express money order, or by bank draft or check.
MUNN & CO., 361 Broadway, corner Franklin Street, New York.

NEW YORK, SATURDAY, FEBRUARY 23, 1901.

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.

EAST RIVER RAPID TRANSIT TUNNEL.

The Rapid Transit Commission, having approved its engineers' plans for the extension of the subway system beneath the East River to Brooklyn, is now seeking the necessary powers to proceed with the construction. We trust that the required authority will be secured, and with the least possible delay. The present Rapid Transit scheme terminates in a four-track loop beneath City Hall Park. The proposed extension, the estimated cost of which is about $8,000,000, will reach from City Hall Park, New York, to the Borough Hall, Flatbush Avenue, and the Long Island Railroad depot in Brooklyn.

The new structure will consist of a two track subway which will extend from the City Hall, beneath Broadway to Pine Street, where it will change into two two-track structures, separated by a partition wall, each of which will contain an up and a down track. At Battery Park one of the two-track structures will swing into a return loop terminal. The other structure will turn to the left, and on a descending grade will connect with two 15-foot parallel cast iron tubes, by which the tracks will be carried beneath the East River. On the New York and Brooklyn sides of the river, the tracks will have an elevation of 66 feet and 68 feet below mean high water. They will descend from either side to a sump below the center of the river, where the elevation will be 91 feet below mean high water, the respective levels being 31, 47 and 32 feet below the bottom of the river. The tubes will be carried on the Brooklyn side beneath Joralemon Street to the Borough Hall, where they will connect with two subways, one of which will swing into a terminal loop encircling the Borough Hall, the other extending below Fulton Street. Above the terminal loop of the tunnel tubes already mentioned as encircling the Borough Hall, there will be another loop which, after making the circuit of the Hall, will also run up Fulton Street, ultimately connecting with the single track from the lower loop, and forming a two-track structure which will extend to Flatbush Avenue, and from there to the Long Island Railroad.

The sum of $8,000,000, which this extension is to cost, might seem, at first thought, to be a heavy addition to the cost of an enterprise for which a sum of over $35,000,000 has already been authorized; but we must remember, first, that the efficiency of the Manhattan Island subway will be vastly increased by this extension; and, secondly, that all provisions for rapid transit in a city which grows as rapidly as New York, must be built with an eye to the enormous traffic requirements of the future.

SIR WILLIAM WHITE AND THE NEW ROYAL YACHT.

A notable instance of the celerity with which a host of detractors will rush into print in the effort to ruin what they consider to be the shaken reputation of a truly great man is seen in the case of Sir William White, the Chief Constructor of the British navy. In all the world there is not to be found a naval architect who is responsible for such a vast amount of work as is carried out under the Chief Naval Constructor of Great Britain, and it must of necessity follow that, in a position which entails so much routine official work, he is unable to do more than lay down the broad features of new designs, and must leave the details to his subordinates. It seems that in the construction of the royal yacht, the distribution of weights was such at the time of her launch that she proved to be unstable. The error was traced to one of the staff, and subsequent reconstruction in the way of cutting down the topmasts, funnels, etc., so far corrected the instability of the vessel that at her recent trials, in which she made about 21 knots an hour, she proved to be an excellent seaboat in all kinds of weather. The attack upon Sir William White was indignantly resented in naval circles, and nowhere more so than in the United States navy. Several of our naval constructors, including Constructor Bowles, the coming Chief Constructor, were at one time students of Sir William White in England, and their strong testimony to his abilities has been indorsed by Charles Cramp, president of the well-known shipbuilding firm of that name. As a matter of fact, the modern navy of Great Britain, dating from the era of the Naval Defense Act, is entirely of his designing, and the correctness of his theories is proved by the fact that the type of ship to which he has clung steadily, with few variations, for the past fifteen years bids fair, at least in its general features, to become general throughout the world.

TESLA'S WIRELESS TELEGRAPHY.

Long distance wireless telegraphy, if we may believe the current story of its latest developments, is about to take an enormous stride both in its reach and its rapidity, for we are shortly to be in possession of a means of wireless telegraphic communication across the Atlantic, by which we can send messages at considerably greater speed than is possible by the present cable. The feat is to be accomplished by the assistance of that "oscillator" with which the name of Nicola Tesla is so well identified. We are, all of us, fairly well familiar with the Marconi system in which Hertzian waves are utilized, the transmission of currents being aerial, or to speak more correctly ethereal. Mr. Tesla, however, manipulates his recently discovered "stationary electrical waves in the earth" by setting up "vibratory currents which can be transmitted through the terrestrial globe, just as through a wire, to the greatest distances."

According to public reports, Mr. Tesla during the past year or so has been devoting his time chiefly to the improvement of his generator and receiver. He claims to have so far perfected the system that by means of proper "tuning" he can direct his messages infallibly to any particular receiver. It seems that the primary purpose of his recent Pike's Peak experiments was a series of elaborate tests, the result of which satisfied Mr. Tesla that when a suitable plant is built, he can establish wireless electrical communication between the old and the new world. The system, as described in interviews with the author, involves the production of electrical vibrations of enormous frequency, a transmitter which receives the current, intensifies it, and sends it to the earth, through which it flows in every direction. A receiver which is adjusted so that its vibrations are in tune with those of the transmitter is set up, say in London, Paris or Berlin, picks up the vibrations, and intensifies them so that they become decipherable at the receiving station. These electrical vibrations are recoverable at any spot on the surface of the globe, provided that the Tesla receiver be at hand to pick them up, and intensify them to a point at which they may be read.

HIGH-SPEED PASSENGER STEAMERS ON THE HUDSON

It is somewhat surprising, in view of the excellent facilities for a rapid steamer service afforded by the Hudson River, and the inducement which is offered by the existence of many populous residential suburbs along the shores of the river, that there has been no attempt as yet to manipulate such a line for the benefit of suburban residents. It was only at the close of last year that preliminary steps were taken looking to the provision of a service of this kind, and the scheme has now reached a stage of its development at which some facts regarding the vessels which are to be employed will be of interest. There will be three twin-screw vessels, built from designs by Mosher upon the lines of the remarkable type of craft with which his name is identified. They will be 130 feet in length, 15 feet in beam, with a depth of 7 feet, and an extreme draft of 4½ feet. They will have two twin-screw, quadruple-expansion engines of 4,000 horse power, and the displacement, with an average load on board, will be about 100 tons. There will be a large general saloon, and a smoking saloon, and a seating capacity for 250 passengers. The lines of the boats will be similar to those of the "Ellide," which is credited with a speed of 34¾ knots an hour on the measured mile; and while these steamers will be capable, when the engines are run at their full power, of making an equal or even greater speed than this, the present arrangements are to run them at a speed which under normal circumstances will enable them to make the trip from Nyack to 22d Street, New York, in one hour. A steamer will leave every hour from six o'clock in the morning to eleven o'clock at night, and calls will be made at Rector Street, 22d Street, Yonkers, Dobbs Ferry, Tarrytown and Nyack. The landings will be made at the ends of the piers and there will be special provision made to allow a clear course for the steamers in approaching and leaving the docks. We think it is more than likely that such a service will prove extremely popular during at least six months of the year, and its successful maintenance will mark a very important step in the development of high speed travel by water.

SMOKELESS POWDER AND GUN EROSION.

The Board of Ordnance of the navy is to be congratulated on the excellent results obtained with the multi-perforated smokeless powder, the perfecting of which has involved a great amount of investigation and experiment. The advantages of smokeless powder are well known to the public; but it is not so well understood, perhaps, that these advantages, in the case of some of the best-known smokeless powders, are largely offset by certain serious defects, chief among which is their destructive action upon the interior surface of the gun, which is shown in a pitting or eating away of the bore. The direct result of this erosion is that, the obturation being imperfect, the gases escape past the shell, and there is a consequent falling off of the muzzle velocity below that which theoretically should be produced by a given charge of powder. This erosion is most marked in the case of smokeless powders that contain a large percentage of nitroglycerine, the well-known cordite which contains over 58 per cent of this explosive being, perhaps, the chief offender in this respect. The temptation to include a large percentage of nitroglycerine is due to its enormous energy; but it has always been recognized that if a powder could be produced that contained a minimum of nitroglycerine, and still possessed high ballistic qualities, it would be an ideal powder. It is satisfactory to know that the ordnance officers both of the United States army and navy have developed powders which are so far superior to cordite, that the army smokeless powder contains only 25 per cent of nitroglycerine, and the navy powder none at all, the latter being an all-gun-cotton product.

It is with this powder that the Board of Ordnance has secured the remarkable ballistic results which, from time to time, have been chronicled in the SCIENTIFIC AMERICAN. Thus, the new 12-inch naval rifle has shown a velocity of 2,854 feet per second, while velocities of 3,000 foot seconds and over have been obtained with the 6-inch, 4-inch and 3-inch 50 caliber guns, and in every case these high velocities have been obtained without exceeding the designed chamber pressure of 17 tons to the square inch, and, what is equaly important, without any sacrifice of the mass of the projectile.

So much for proving ground results. Can they be sustained in regular service; or will there be, as in the case of the naval guns of at least one foreign power, a gradual falling off in velocity, due to erosion and enlargement of the bore? It is with considerable satisfaction that the Ordnance Bureau is able to certify that no such deterioration will result from the prolonged use of its new powder, since a 4-inch rapid fire gun at the Indian Head Proving Ground has been fired 661 times, and a 5-inch gun 636 times with the smokeless powder, without causing sufficient wear to be detected by micrometer measurement.

Another defect to which smokeless powders are liable is that when they are in storage, or in the magazine, for a considerable length of time, they are liable to undergo a chemical action which results in a great falling off of energy. Powders that depreciate with age give unreliable results in service, since it can never be determined just exactly how the gun sights should be adjusted. Should they be adjusted to suit the full velocity of the powder when that velocity is actually one or two hundred feet per second below the designed velocity, the shell will fall proportionately short of the object. Hence, stability is a feature which is second only in importance to that of erosion, and it is gratifying to learn from the Department that our navy powder has proved to be thoroughly stable, a sample of powder which had been in the magazine for two years having shown at a recent test that there had not been the least loss of its ballistic qualities, nor any evidence of chemical alteration.

PRIZES FOR INVENTIONS A LEGITIMATE ENCOURAGEMENT

The closing year of the nineteenth century was a remarkable one in the field of invention, not only as regards the number of patents issued, but for the remarkable inventive ability displayed. It is gratifying to note the increase in the esteem in which inventors are being held, and the substantial rewards which crowned many of their efforts. They can reap not only the full benefits to be derived from their inventions, but they can also compete for the remarkable series of prizes which have been offered by associations and individuals in the hope of improving our economic condition. The great prizes of 1900 were the Pollak prize for life-saving devices, which was $20,000; the prize offered for labor-saving machinery for the sugar business, made by the Hawaiian Planters' Association, the amount being $6,500, and a number of prizes of smaller value. There is every indication that the year 1901 will be even more fruitful in liberal offers for inventions than the year which preceded it. Only $2,000 of

the Pollak prize has been adjudged to those who exhibited their devices; consequently there is a large sum to be awarded in September, 1901. It has not been decided as yet to whom the prize of $6,500 for improved sugar machinery will be given. During 1901 the Nobel prizes will be awarded, and in three of them the inventor may find his opportunity. One prize will be for the invention or discovery made in the domain of physical science, another prize in chemistry, and a third in physiology and medicine. The value of each of these prizes is very large, being $80,400. It should be remembered that in none of these cases does the inventor part with any of his rights, and his receiving a prize does not interfere in any way with the material reward of the inventor. The recent success of Prof. Pupin in selling an invention for nearly $500,000 is fresh in the memory of all.

It is becoming quite customary for societies and associations to offer prizes for what might be termed minor discoveries. For instance, the chief topics of discussion of the Chemical Congress, at the recent meeting held at Hanover, was a substitute for benzine, and last autumn the subject came up once more at the meeting at Cassel, and it was decided to offer a premium of $250 for an effective substitute for benzine, or for means for rendering it less dangerous, the objectionable points about benzine being its inflammability and volatility and the danger of poisoning the atmosphere.

At first sight it might seem as though this was a very small prize for a society to offer, but, as it has already been stated, the inventor does not, by accepting a prize of this nature, cede any of his rights, which, in the case of a substitute for benzine, would undoubtedly bring the inventor large wealth. The Bressa prize of $1,920 is offered by the Académie Royale des Sciences de Turin, and the competition is open to savants and inventors of all nations for the most important discovery in the arts and sciences during the period 1897-1900. The aggregate of prizes offered is by no means inconsiderable, and tends to stimulate invention in a healthy manner.

ARE YOU ABOUT TO BUILD?

The Building Edition of the SCIENTIFIC AMERICAN occupies in its field the same important position held by the parent paper in its own sphere of activity. The scope of the Building Edition has been enlarged by the introduction of many new and valuable features. No periodical in the United States can claim more distinction as regards its mechanical execution than this beautiful monthly magazine, with its fine views of exteriors and attractive interiors. The policy of showing only executed work is strictly adhered to, thus differentiating it from many of its contemporaries. The illustrations show how the house actually looks, the plans show how it is arranged, the description of the plates tell how it is built, who owns it, who is the architect, and who are the contractors, and when attainable, its cost. This information is all valuable to those about to build, as well as those who are interested in the subject from a professional and financial point of view. There are many interiors and examples of home decoration, showing what can be accomplished on various scales of expenditure. Other plates are devoted to interesting subjects at home and abroad, such as public buildings, churches, libraries, fine iron-work, stables, etc. Groups of cozy corners, doors, windows and other similar features will be published throughout the year.

The literary contents comprise a number of new features which will enhance the value of the magazine many fold. "Monthly Comment" is devoted to current events. The editorials deal in a practical manner with the problems which confront the architect, contractor or owner in the design, execution or improvement of the house. As wide a range of the subjects as possible is given. "Interviews With Architects" forms a new feature of the year, and gives the ripe experience of men standing high in their profession in a most interesting manner. "New Books" will deal with the latest publications, and the reviews will be discriminating. The Correspondence column will tend to keep the Editor and reader in close touch. Any question relating to subjects of architecture, building, sanitary science, etc., will be answered and a cordial interchange of views between readers encouraged. "New Building Patents" will contain a digest of patents relating to building and sanitary science. Each month a considerable space is devoted to a summary of current articles within the purview of the paper. This digest will consist of condensations of long articles relating to building and also shorter notes, and the field covered will be a wide one. On the whole, the Building Edition merits the warm support of every one directly or indirectly interested in architecture or building.

ZENOBE T GRAMME.

Zénobe T. Gramme died near Paris on January 20, and in his death electrical science has suffered a great loss, as he was the inventor of the Gramme ring, which made the modern dynamo possible. He was born in 1836 in Belgium and in early life was a carpenter. He became interested in electrical construction, and in 1870 he improved on the toothed-ring armature of Pacinotti and devised the uniformly wound ring armature machine with which his name has ever since been connected. His dynamo, which was exhibited at the Centennial Exposition, 1876, attracted great attention. The commercial success of the machine was rapid. It was the first practical machine in which were combined the features of continuity of commutation, the self-exciting arrangement, good lamination in the armature core, and reasonably good proportions in the magnetic circuit.

OUR BUSINESS AND PERSONAL WANT COLUMN.

We would call the attention of our readers to our Business and Personal Want Column, which will be found on page 108 of our issue of February 16 and page 123 of the present issue. We have taken a new departure in connection with this column, which we think will be fully appreciated by manufacturers throughout the world and by all of our readers who are in search of information which they could not otherwise acquire.

The SCIENTIFIC AMERICAN has now become a center of information for thousands of readers, who apply for information regarding the particular line of manufactured goods in which they are interested—information which they are unable to obtain through the ordinary channels at their command. Our daily mail is flooded with letters inquiring as to who is the manufacturer of this and that article, or of some improvement on a certain machine, which the correspondent would like to buy if he could get into touch with the manufacturer.

We could, of course, give the person inquiring the name and address of one or two manufacturers in the line requested, but it occurred to us that it was only fair to our readers and enterprising manufacturers that we should endeavor to ascertain for the party inquiring the name and address of every manufacturer that we possibly could in the line desired, thus giving him a wide field for choice, and opening the way for pushing manufacturers to compete with some chance of success.

It will be seen at a glance that this column will open up a new and important field to manufacturers of all kinds. If they refer weekly to the inquiries in this column they may at any time find therein an inquiry for just the class of goods they deal in or manufacture. A letter to us, preferably accompanied by their catalogue and giving in brief as much information as is necessary, together with the number of the inquiry, will, in a short while, put them in immediate touch with the party who desires to buy the goods in question. We, in fact, act as a clearing house between the persons desiring information and the manufacturers ready to fill their wants.

We hope that our efforts will be appreciated to the extent that all manufacturers in the lines inquired for will assist us by weekly replying to these inquiries, as it may be the means of opening a greater field of trade than is now possible.

ZODIACAL LIGHT.

M. Leo Brenner has lately given an account of the observations on the zodiacal light which he has made at the Observatory of Manora (Austria). Very few persons have seen this phenomenon; in the northern part of the Continent it is usually quite masked by the lighting of the cities. In the south and in the tropical regions the phenomenon is more striking, but the writer has known many ship captains who have sailed around the globe for many years without having seen the zodiacal light. This phenomenon seems to have been observed only for the last 300 years, and the ancient writers make no mention of it; some have concluded from this fact that the light has only been visible in modern time, but this opinion is difficult to admit. It is generally supposed that the zodiacal light constitutes a clear and distinct phenomenon only in the tropical regions, and Humboldt says that at the Equator, at points of 9,000 to 12,000 feet altitude, it often exceeds in brightness the lightest part of the milky way. However, the author observes that at Lussin, from which he writes, at the sea level, the zodiacal light is generally from four to six times as intense as the milky way and often eight or ten times as bright; this can only be explained in two ways, either that the light is more intense in that region or that the milky way is less brilliant. There the zodiacal light appears at the most favorable times for its visibility, namely from January to March and also in September and October, as a pyramid of light whose base is at the point where the sun has set, while the point traverses the zodiac; at the summit the light is scarcely apparent, but it increases afterward and at a point opposite gives a second cone of light which is called "antizodiacal." This last phenomenon has been the object of observations since 1854, at which time it was examined by Brorsen; however, it was seen in 1803 by Humboldt. The author states that the brightness of the zodiacal light as he saw it was such that often in the main part and up to 40 deg. in height he could not see any of the stars with the naked eye; as to the antizodiacal light, which few observers on the Continent have seen, it appears three times as bright as the milky way, and thus his region seems to be especially favored in this respect. The spectroscope shows that the zodiacal light is reflected solar light, and the polariscope, by which the polarized light is separated from the ordinary rays, confirms this supposition. The green lines of the aurora borealis, sometimes seen in its spectrum, have been shown by Wright to belong not to the zodiacal light, but to aurores which are only observed by the spectroscope. Various theories have been proposed as to the formation of the zodiacal light, but none of these are conclusive.

SCIENCE NOTES.

Michael G. Mulhall, a noted statistician, died recently in London. He forecasted the twelfth American census within 95,000, showing how very precise and accurate statistical science can be in skillful hands.

The United States Weather Bureau was awarded a Grand Prix at the Paris Exposition. Gold medals were also awarded to Prof. C. F. Marvin for instruments, apparatus and appliances, and to Prof. A. J. Henry for cloud photographs. The Weather Bureau will make an extensive exhibit at the Pan-American Exposition.

Major Serpa Pinto, the fourth explorer to cross tropical Africa from sea to sea, died in Portugal a short time ago, his predecessors in the trans-African journey being Livingstone, Cameron, and Stanley. Pinto's journey lasted from November, 1877, when he started from Benguela, to March, 1879, when he arrived at Durban. His book entitled "How I Crossed Africa" is a record of original discovery and of fierce battling with the natives, of hair-breadth escapes, of perils from wild beasts and the depletion of supplies. He was a scientific explorer, which is more than can be said of many pioneers in geographical research.

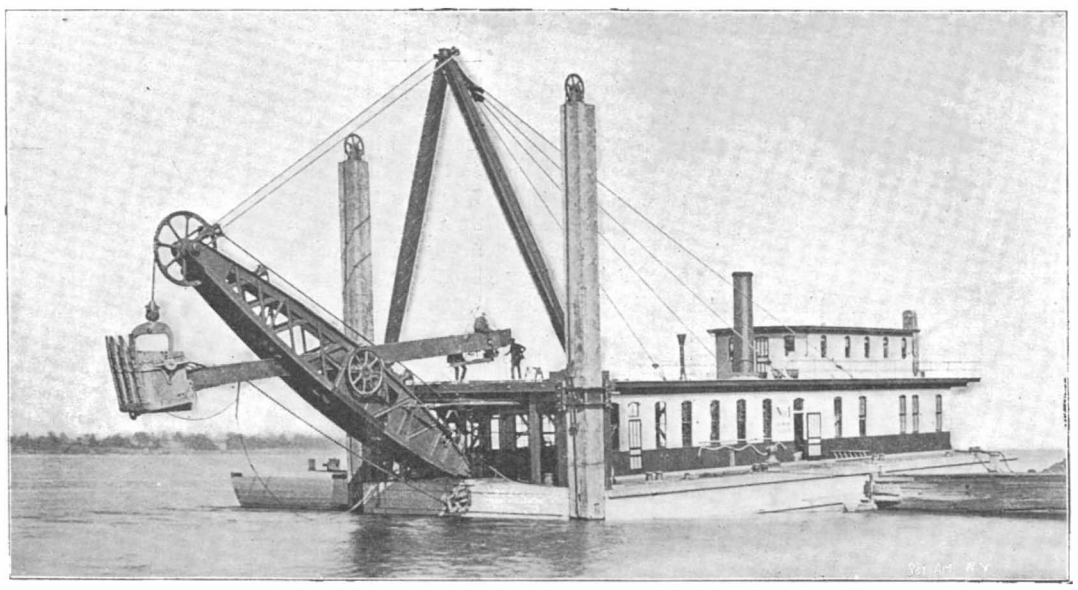
The American Physical Society met during the holidays in Columbia University. At the morning business meeting the following names of officers for the ensuing year were chosen to be balloted for by the members, the results to be announced at the next meeting: President, Henry A. Rowland, of Johns Hopkins University; Vice-President, A. A. Michelson, of Chicago University; Secretary, Ernest Merritt, of Cornell University; and Treasurer, William Hallock, of Columbia University. The Councilors are Henry Crew, of the Northwestern University, and Edward B. Rosa, of Wesleyan University. After the business meeting six papers bearing on problems in physics were read by as many university professors.

A new species of mountain sheep has been sent from Dawson City to Director Hornaday, of the New York Zoological Society. This species is absolutely new to science, and is so strikingly different as to render its title to independent specific rank beyond question. Director Hornaday has named it the Ovis Fannini, in honor of Curator Fannin, of the Provincial Museum of British Columbia. In the Klondike region it is known as a "saddlebacked" or "piebald" sheep. Its head, neck, breast, and abdomen and inside of the forelegs are of a snow white. The other portions of the body are a brownish gray, giving the animal the appearance of being covered with a gray blanket. There are now 945 members of the society, an increase of 271 during the year. It is desired to increase the membership to 3,000. The total attendance of the year was 525,938, the largest daily attendance being on Decoration Day, 20,134. A motor road will soon be completed in the park, on which the society will operate its own motor carriages for the convenience of the public.

Macaroni is made of hard red wheat from the Black Sea, mixed with Italian wheat grown mainly in the plains around Foggia. This is ground into a coarse flour. The bran and husks are removed, and it is kneaded in hot water until it has the appearance and consistency of dough. It is then placed in a vertical brass cylinder eight or nine inches in diameter, the bottom of which is perforated with holes of various sizes, according to the product desired. The dough is placed in the top of the cylinder and is driven down by hydraulic pressure through the perforated plate, and is cut off by hand in lengths. It is then hung up on canes in the sun to dry. In the case of tubular macaroni and spaghetti, a conical blade is fixed in the middle of the dough to form the tube. This cuts through the dough, and the macaroni issues from the blade with a slit all along its length. This, however, shrinks together at once, and a perfect tube is made. Almost no macaroni is now made by the laborious hand process. There was for a long time a prejudice against machinery, but this has been overcome. The best macaroni comes from Torre dell' Annunziata. Nearly half a million boxes are sent annually to the United States.

POWERFUL NINE-TON DIPPER DREDGE.

There are certain lines of engineering work upon which the American engineer has left his mark so deeply and distinctly that the mere mention of them is suggestive of certain great engineering works in the United States, whose fame has traveled to the ends of the earth. Of this kind are the powerful and ingeniously designed devices for removing material in large masses, of which the work on the Chicago Canal presented some of the earliest and finest examples. The accompanying illustrations represent the latest, and next to the largest, of the dipper dredge types of excavating machine that has been built in this country, the largest being the "Pan-American," which has recently been at work at the Portage Lake Michigan. The dipper dredge is so named because of the action of its excavating bucket, whose motions, as it is plunged into the water and drawn up with its load, is not unlike those of the household implement from which it takes its name. The dredge here illustrated was constructed at Ogdensburg, for use on the Massena Canal, and during the fall it was at work opening up the channel from the St. Lawrence River to the canal proper. The hull measures 121 feet 6 inches in length, by 40 feet in breadth, and its depth at the working end, or bow, is 12 feet 2 inches, and at the stern 10 feet 6 inches. In the construction of the hull care has been taken to give it sufficient longitudinal and transverse strength to withstand the heavy strains to which it is subjected when working in hard material. The sides and ends of the hull proper are stiffened by a continuous wall of wooden trussing, and it is further stiffened by running a deep steel truss entirely around the hull in the plane of the walls of the deck-house. This truss extends from the bottom floor of the dredge to the roof of the deck house, and, of course, adds enormously to the stiffness of the whole structure. In the two corners at the bow are two spuds of colossal dimensions, each consisting of a single stick of Oregon fir measuring 36 inches by 36 inches in section and 55 feet in length. There is another massive spud, also consisting of a single stick of Oregon fir, at the stern. The spuds are raised and lowered, each by means of a single steel wire cable, operated by independent engines. An idea of the power and massiveness of this machine may be judged from the fact that the dipper alone weighs 9¼ tons, and has a capacity of 6 cubic yards at a single lift. A novel feature in the machine is the substitution of a single heavy steel-wire cable for the usual chain-lifting gear for operating the dipper. This cable is 3½ inches in diameter and was specially made for this particular work. It leads direct to the hoisting drum, which is operated through compound gears by a pair of 16 by 18 inch engines. The swinging of the boom is worked by a pair of 11 by 12-inch engines, and the backing is done by another pair of engines of the same dimensions. A separate 8 by 3-inch engine is provided for handling the stern spud. There are also two steel capstans, one on each side of the dredge, each of which has its own independent engine. In addition to the considerable plant as outlined above, there is an engine and direct-connected dynamo for furnishing electric light for the whole dredge. The after part of the deck-house is devoted to the living and dining accommodations for the officers and crew, and two substantial scows, one of which is shown on the starboard side of the dredge, complete the outfit. Our thanks are due to Capt. W. J. Daly for courtesies extended in the preparation of this article.



POWERFUL NINE-TON DIPPER DREDGE FOR THE MASSENA CANAL.

The Rev. Hannibal Goodwin, well known as an inventor of photographic processes, died recently at Newark, N. J.

Oil Wells in Texas.

The discovery of oil in such abundance near Beaumont, Texas, is somewhat surprising, as the location of the well which has produced such large quantities is nearly 200 miles from the Corsicana field. This would indicate that the oil belt of Texas underlies an extensive territory in the eastern section of the State, representing a field almost as large as that of western Pennsylvania. Oil was first discovered in Texas in May, 1894, in the suburbs of the town of Corsicana while boring an artesian well. Pittsburg prospectors became interested, and a number of wells were bored to a depth of 1,000 feet, but none yielded a paying quantity until two years later. Since that time operations have extended over most of Navarro County, in which Corsicana is situated. During the year 1898 development work increased rapidly, and producing wells increased in proportion. During the year producers were drilled as follows: January, including all previous operations, 66 wells; February, 9 producers; March, 23; April, 29; May, 36; June, 24; July, 26; August, 38; September, 28; November, 23; December, 27, making a total of 342 producing wells on January 1, 1899, besides four gas wells, furnishing large quantities of natural gas, which is utilized here for fuel and steam-making purposes.

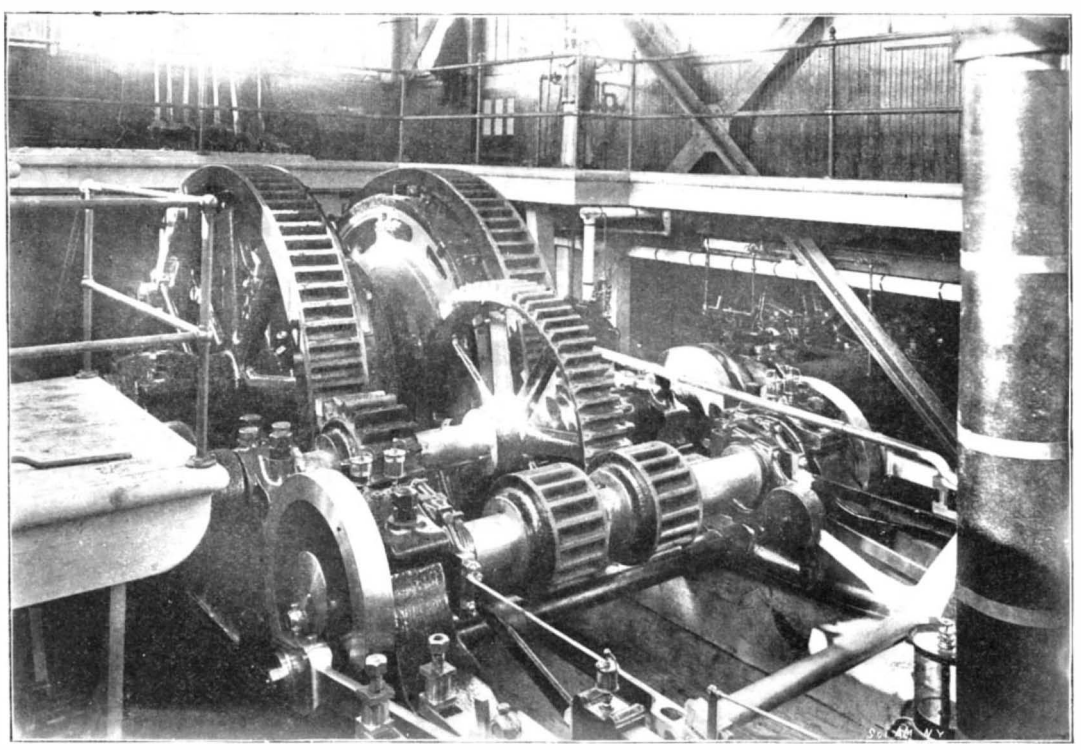
In 1898 was commenced by J. S. Collinan a refinery with a daily capacity of 1,500 barrels, which began operation early in January, 1899, its capacity since then having been largely increased, as was demanded by the increased output of the field. Month after month the tankage capacity of the refinery was increased, until now there are between thirty and forty tanks holding from 16,000 barrels to 36,000 barrels each, while others are being added as production increases. The refinery buildings, tanks, machinery, and pipe lines represent an expenditure of about $300,000. Prices since the first 100,000-barrel contract was made have gone up as high as $1.11 per barrel, at which point a decline began and continued until oil sold at 67 cents per barrel, which caused a movement to build an independent refinery and pipe line. A small refinery was built at Houston, 250 miles south, and the company has contracted for 100,000 barrels of oil, which will be shipped to that point and refined.

Since January 1, 1899, development work has gone on uninterruptedly until the number of producing wells in this field is about 600, besides 17 gas wells. The total output of the 600 wells is 4,000 barrels a day. The refinery is not able to refine the entire product, and large quantities of crude oil are shipped to Mexico, where it is refined by a company in a manner connected with the company in Texas. There is a low duty on the crude article, which admits of it being shipped and sold. The residuum of the oil is used in the mills and factories for fuel, and is sold to them by the refinery at 60 cents per barrel after all the illuminant has been abstracted from it. The consumption of this residuum, however, is not so large as the supply, and trainloads of it are shipped weekly to Sabine Pass, at which point it is loaded on steamships and shipped North, where the by-products are utilized for the manufacture of various articles of commerce.

In addition to the oil field in Corsicana, a new field has recently been opened near Powell, eight miles east, in which, at a depth of about 400 feet, oil of the lubricating variety has been found in paying quantities. One well in this field for nearly a week yielded 100 barrels a day, then subsided to a "pumper," with an output of 10 or 12 barrels a day—about the average of wells in that field. There is no market for this lubricating oil yet, but a pipe line will be built to the field in order to get it on the market.

Development work is still being pushed in both fields, and each month furnishes on an average of 25 producing wells, while the wells abandoned average about 9 per month.

Analyses made by various experts show that the Texas oil furnished the following distillates: One-half liter, or about one-half pint, was subjected to distillation, and the following fractions obtained at the respective temperatures expressed in degrees of the Centigrade scale: Began to boil at 80 degrees; between 80 degrees and 90 degrees gave off 16.4 per cent of its volume; between 90 degrees and 110 degrees gave off 7.8 per cent; between 110 and 140 degrees, 10.4 per cent; between 140 and 170 degrees, 9.2 per cent; between 170 and 200 degrees, 3.6 per cent; between 200 degrees and 280 degrees, 16 per cent; between 280 and 305 degrees, 11.2 per cent; above 305 degrees, 15.8 per cent, making the total volatile matter about 90 per cent, leaving a coke residuum of about 10 per cent. The Corsicana oil compares favorably with the Pennsylvania product, which generally yields in product 60 to 75 per cent of burning oil of first and second quality.



HOISTING ENGINES FOR THE DIPPER.

Russian Sugar Manufacture.

In our issue of November 3 we published a short notice entitled "How Russia Corners Sugar." We now find that in Russia every manufacturer is required by law to export a fixed amount of his product on which he receives a rebate of one ruble 85 kopeks per pood, excise tax. There are 280 manufacturers of sugar in Russia, but only 20 of them are refiners; they supply the home market, the refined article being too hard for other countries, it being the habit of the peasant class, the largest consumers of sugar, to hold a lump in their mouths while drinking tea.

Russian sugar is said to be 99 per cent pure, and for that reason the best in the world. Russian sugar stocks pay from 15 per cent to 50 per cent dividends annually. There is some demand for Russian sugar in the United States, and some Russian sugar is reaching this market. Two of the largest refineries in Russia were destroyed by fire last May and the owners were delayed in rebuilding by the scarcity of money and finally decided to rebuild with a decreased capacity.

PETROLEUM AS AN ILLUMINANT FOR BUOYS.

We have frequently advocated in the columns of the SCIENTIFIC AMERICAN the more general utilization of petroleum, both as an illuminant and a fuel, mainly because of its cheapness, abundant supply, and efficiency. One of the latest applications of this oil is that for the illumination of buoys, and it is the invention of Mr. James Richardson Wigham, the well-known lighthouse engineer of Dublin, Ireland.

Although the adequate illumination of rocks and shoals by buoys is indispensable for the safe navigation of rivers, estuaries and harbors, it is not imperative that the light cast from the buoys should be of very powerful illuminating intensity. Indeed, it is very seldom that the visibility of their rays is desired from a range exceeding five or six miles. But, on the other hand, occasionally buoys have to be placed in isolated positions, where it is impossible to erect lighthouses, and, owing to the difficulty of access thereto, it is essential that they should continue to burn brilliantly, without any attention, for several weeks or even months. Compressed oil gas is the illuminant generally employed for this purpose, since, although it is more expensive than oil, it possesses none of the drawbacks inherent to the latter. The principle expense incurred by the utilization of oil gas is the installation of the special gas-making establishment on shore. By the use of petroleum, however, all such expense is averted, because it is only necessary to convey the oil to the buoy to replenish the lamp reservoir.

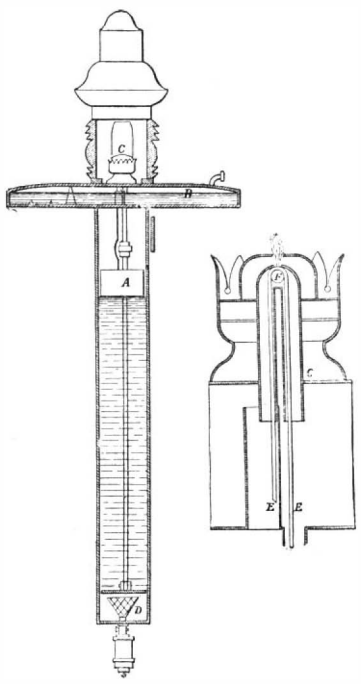
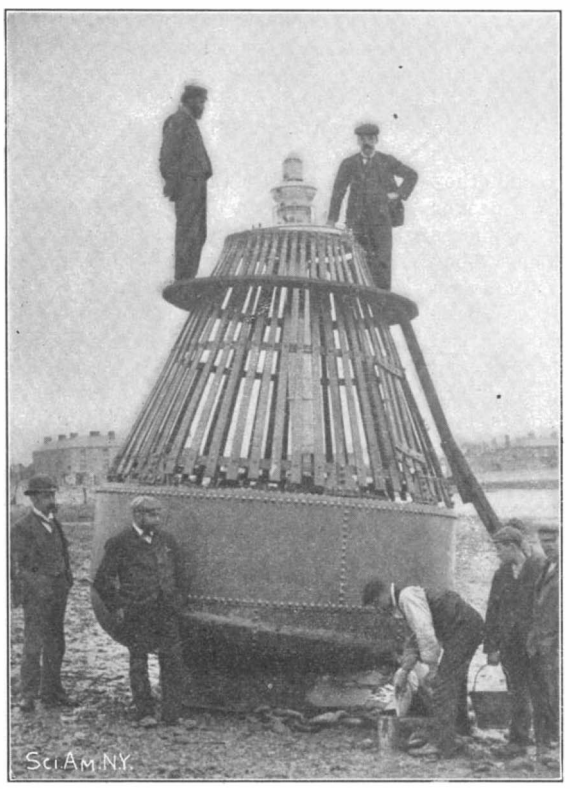


Fig. 2. Fig. 3.

SECTIONAL ELEVATIONS OF LAMP AND BURNER.



PETROLEUM BUOY.

The great disadvantage which has always militated against the satisfactory application of oil is the manipulation of the wick. In a short time after the ignition of the lamp the wick becomes so charred that the capillary attraction which brings the oil to the point of combustion is obstructed, and the light goes out. An attempt was made to overcome this drawback by the construction of a carbonized wick, but, although it lasted longer than the ordinary wick, in a few days the deposit from the oil was sufficient to extinguish the light.

The inventor carried out numerous experiments with a view to overcome this obstacle by causing the wick to move automatically as it was consumed, so that the same part of it would not be constantly exposed to the action of the heat of the combustion, thus securing a constant brilliant light. But this was an impossible task under the existing circumstances where the wick in the lamp is placed perpendicular to the level of the oil in the oil container, since it could not be readily made to alter its position automatically as its combustion proceeded. Mr. Wigham, therefore, conceived the ingenious plan of passing the wick over a roller, thus burning it horizontally, so that the light was obtained from the side and not from the end of the wick.

The burner he has invented is surmounted by a combustion cone, and surrounded by lenticular apparatus. One end of the wick, *E* (Fig. 3), is conveyed up through an oil tight copper tube with holes in its sides, and passes over a roller, *F* (Fig. 3), at the burner, *C* (Fig. 2). The other end is brought down through a tube standing above the level of the oil in the lamp and soldered or secured at the lower end. A circular float, *A* (Fig. 2), is placed in a copper cylinder fixed to the bottom of the lamp and filled with oil. When the lamp is first lighted this float is at the top of the cylinder, and is attached by means of hooks or loops to the wick. The oil in the cylinder is caused to drop slowly out of it through a valve, *D* (Fig. 2), of peculiar construction, supplied with a cotton core, at such speed as may be necessary. The oil thus descends into the receiver, bringing with it the float and the wick which is attached to it. When, at the end of one month, or any such other period as may be desired, it is necessary to replenish the lamp with oil, the cylinder is refilled, as is also the reservoir under the lamp.

It is necessary to fix the lamp upon swivels or gimbals, so that, however great may be the motion of the sea, the lamp always maintains practically a level position. Divisions are fixed in the oil reservoir by which, should it for a moment be brought out of level by the motion of the sea, the oil is prevented from flooding the wick during the passing of the wave, after which its proper level is again maintained.

The cost of lighting buoys by mineral oil is very trifling, the consumption being about half a gallon of oil every twenty-four hours. In connection with the buoys at present employed in Belfast Harbor, which are lighted by this means, this amounts to an expenditure of about 6 cents per twenty-four hours. This cost may be decreased if the oil, which constantly drips from the cylinder of the lamp, is collected in a portable vessel instead of falling upon the water, to 2 cents per twenty-four hours. The oil which apparently runs to waste, however, performs a valuable function, for it serves to calm the sea in the vicinity of the buoy.

This system of petroleum illumination of buoys has been used with conspicuous success in many of the harbors and estuaries of Ireland. In some cases the lamps only receive attention once in three months, which is sufficient testimony to their efficiency. The numerous advantages of the oil over the compressed gas are obvious, and the action of the lamp is so simple as to be of easy application.

THE ORCHESTRA-MAN OF THE EXPOSITION.

There was much music to be heard at the Exposition of 1900, but the most original was, without any doubt, that played by M. Malboech in the vicinity of the Gallery of Machines. This extraordinary man is capable of playing as many as thirteen instruments—the piano, cornet à piston, clarinet, violin, a chime of forty bells, the bass drum, cymbals, triangles, two kettle drums, tabor, and castanets.

By means of his hands he plays either the piano or the clarinet and piano at the same time, but more generally the cornet à piston and piano. The left hand, used for this latter instrument, actuates the chimes also. The secondary instruments are played through the pressure of the feet upon pedals.

These multiple occupations do not prevent the artist, while playing the cornet, from smoking his pipe. This is a fact that it is impossible to see accomplished every day. Our musician correctly executes pieces that are often difficult, and when a person closes his eyes he would be willing to affirm that he was present at a concert given by a dozen persons, so great is the volume of sound produced. The execution is sometimes fantastical, as, for example, when a gun is fired to terminate certain scores à la Berlioz or à la Wagner.

Malboech himself superintended the installation of his orchestra and arranged the different parts of it.

Although the artist, who is a native of Holland, is but forty years of age, he has traveled over nearly the entire world. He announces in his circulars that he offers $2,000 to any one who will succeed in imitating him, and styles himself "the greatest artist in the world."—La Nature.

MALBOECH THE ORCHESTRA-MAN.

Therapeutic Action of Light.

Dr. P. Garnault has lately read a paper before the Académie des Sciences dealing with the therapeutic action of light, and mentions a number of cases in which he has used this treatment with success. His attention was first called to the subject by M. Trouvé, who was among the first to bring out this action of light; in 1893 he observed that a workman afflicted with rheumatism was completely cured after having remained for forty-eight hours in the vicinity of a very intense arc light used for an electric fountain. Since then it has been observed that in works where electric soldering is carried on, this being accompanied by great luminous intensity, the workmen cease to be affected with gout or rheumatism. In the present experiments Dr. Garnault uses apparatus which has been specially constructed for the purpose by M. Trouvé. The experiments were confined to the effects of local action of light, and there seems to be no doubt that the results are due to the light radiations and not to other causes. A lamp of 50 candle power provided with a silvered parabolic reflector was applied in eight cases of muscular or articular rheumatism of average gravity and several years' standing, and in all these cases a very marked improvement was obtained at the end of three to twelve operations, and not followed by a relapse. Chronic catarrh of the nose may be also treated with success by the application of light accompanied by vibratory massage. The treatment was also applied in cases of deafness, accompanied or not by humming noises in the ear; the apparatus used consisted of two ten-volt lamps provided with reflectors and applied to each ear by a curved spring passing around the head; in some cases the action of heat was eliminated by placing alum screens in front of the lamps. In three such cases a marked diminution of the humming noises and an improvement of the hearing; other cases without the use of the alum screen were a so successful. The most complete observation was made upon a person thirty years of age who had undergone, the year before, an operation in which the tympanum and small bones of one ear had been removed; on the operated side the intensity of the humming noises had been greatly reduced, but on the other they were very marked; these were made to disappear by a series of applications of light. They reappeared after a severe cold contracted by the patient, but were again made to disappear by a second treatment. In twelve cases of deafness the application of light brought about good results. Dr. Garnault has also used the treatment in other cases, and is convinced that the luminous rays may be

used in certain affections as a local agent to great advantage, and that the results obtained are certainly due to its specific action.

SILK MANUFACTURE.

Although silk is a substance that is produced by several varieties of insects, it has come to be almost exclusively associated in the public mind with the product of a particular variety of caterpillar, which is popularly known as the silkworm, and by the entomologists as the larva of *Bombyx mori*, or the mulberry-feeding moth. The eggs of the silkworm are hatched by artificial means, and are exceedingly small, weighing about a hundred to the grain. It is customary to place pieces of finely punctured paper above the trays in which the eggs are being hatched. As soon as the worms break through the shell they creep through the holes in the paper in their endeavor to get to the light, and in doing so scrape off the pieces of shell which may adhere to their bodies. They are reared in rooms where particular care is taken that an abundance of fresh air and light are present, and where the temperature may be kept at an even point. The worms are voracious feeders and begin to increase rapidly in size from the day they are hatched. As a rule the silkworm moults four times during its life; usually about the sixth, tenth, fifteenth, and twenty-third days after being hatched. As soon as the caterpillars have reached their full growth they climb the twigs and small branches which have been prepared for them, and begin the spinning of their cocoons. The silk glands of the worm consist of two sacks running along the sides of the body, with a common opening on the under lip of the worm. In the process of spinning its cocoon the silkworm ejects from both glands a line of extremely fine thread. The two filaments from each gland are laid side by side and are held together by an adhesive secretion from the worm. The cocoons are either deep yellow, white, or light green in color, and oviform in shape. Their average length is from an inch to an inch and a half, and they are from half an inch to an inch in diameter. The cocoon consists of an exterior made up of broken and straggling filaments, while the interior layers are densely glued together into a mass which is not unlike parchment, and which is impossible to unwind except by moistening.

The manufacture of silk may be broadley divided under the heads of reel silk manufacture and the manufacture of spun or waste silk. The first method has to do with continuous fibers thousands of yards in length. In the spun silk industry the raw materials are worked up by methods similar to those used in the case of cotton and other fibrous materials.

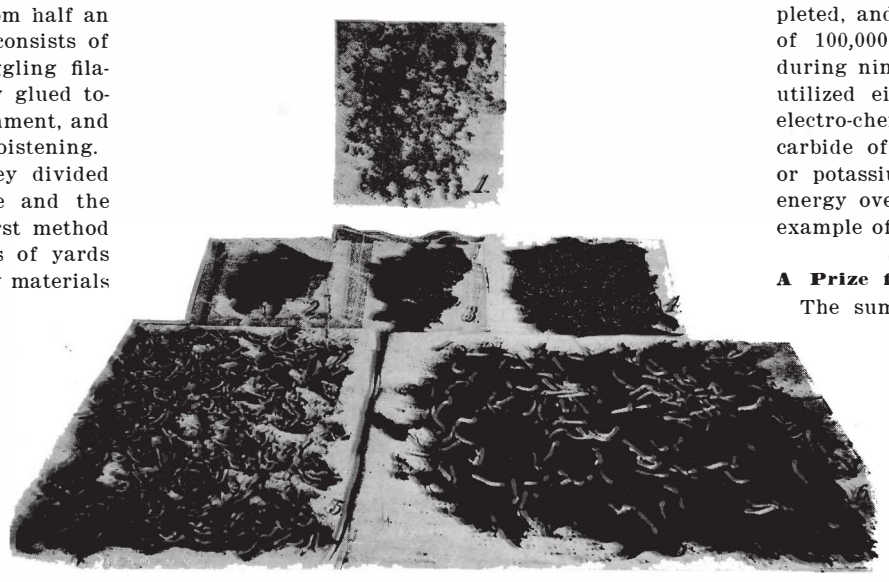
The first operation is to produce the "raw silk" of commerce. The cocoons are placed in warm water for the purpose of softening the natural gum with which the filaments of the cocoon were fastened at the time it was spun. From six to ten of the cocoons are put in a bath, and as soon as they are properly softened the threads of each are caught up by an attendant on a fine brush, and passed through an eyelet to a reel, upon which they are wound. The reel consists of a light, wooden, revolving frame, which winds the silk into what are known as skeins, and it is in this form that the silk is usually received at the silk mills.

The first thing to be done with the skeins after they are taken from the bales is to soak them thoroughly in cold water. The raw silk is too fine and delicate for textile manipulation, and has to be doubled and twisted to give it the necessary body and strength. To this end the skeins of raw silk are placed on light wheels, known as "shifts," from which the silk is wound onto spools; then two spools of silk are run together and doubled and afterward twisted, some of the twisting machines, however, performing the doubling and twisting in one operation. The twisted silk is then wound onto rectangular frames, known as creels or reels, and at the same time is measured off into lengths of from 10,000 to 15,000 yards, the silk now being once more in the form of skeins. It is then taken from the creels and rolled up into hanks, ready for dyeing.

After the silk has been dyed it is returned in skeins, which are slipped on over a set of what are known as "soft silk" winders, from which it is wound onto spools once more. It is then taken to the warping department, where the spools are placed upon tables which may carry from 110 up to as many as 600 pegs. In the hand-warping machines there will be from 100 to 120 spools on a table, while the power-warping machines will carry from 300 to 600 spools. The operator gathers up the ends of silk on each spool and runs the threads onto the frames in the mill, the threads in this case being wound parallel. From 100 to 4,000 threads are run off on warping spools, which are technically known as "beams"—round cylinders of wood or iron which are 6 or 7 inches in diameter, and of a width which varies from 4 inches to 36 inches, according to the character of the fabric of which the thread is to form the warp.

The beams are then carried to the looms, where the threads are first led through a "harness," and then passed through a steel "reed" or comb, there being from two to fourteen threads in one "dent," according to the quality of the goods. The harness consists of a series of top and bottom slats known as "shafts," each pair of which is connected by a number of parallel vertical threads at the center of each of which is a small brass eyelet through which the silk threads are passed. Several of these sets are arranged vertically behind each other in the loom, and each harness with its set of threads is raised in turn between each passage of the shuttle through the warp. Each harness thus serves to lift a different set of threads for the passage of the shuttle; and it is by the proper adjustment of the vertical motions of the harness to the strokes of the shuttle that the nature of the weave of the goods is determined. The woven fabric is then taken to the packing room, where all knots, dirt, and stains are removed.

The goods are now taken to the finishing department, where it is put through a variety of operations which would necessitate another article to adequately describe them. Among other operations is that of singeing, to take off any rough nap that may be left on the goods, and sprinkling or sponging with a preparation of wax and gelatine, a process which is not unlike that of starching in laundry work. The final gloss or finish is secured by calendering, in which the fabric is run between a series of superimposed steel rolls, where it is ironed out and the fine glossy finish is secured. The goods are then either folded or wrapped on blocks ready for the market.



THE SILKWORM, FROM EGG TO FULL-GROWN LARVA.

1. Eggs on paper. 2. Newly-hatched worms feeding on mulberry leaves. 3. Silkworms at first moult. 4. Second moult. 5. Third moult. 6. Full-grown, ready to spin.

Projects for Utilizing the Hydraulic Power of the Rhone.

A number of projects are under consideration for utilizing the hydraulic power of the Rhone, and there is no doubt that before long a number of plants will be established at different points, and it is expected that more than 200,000 horse power at a maximum, or 100,000 at a minimum, will be obtained. Three important projects have been planned, each by a syndicate of manufacturers; these plants will all be installed upon that portion of the Rhone which lies between Pyrimont and Fort de l'Ecluse, near the Swiss frontier. In this region the river has many rapids and falls; for instance, over a distance of only 12 miles the difference of level is about 200 feet. On the other hand, since the city of Geneva, using Lake Leman as a reservoir, has regularized the supply at periods of low water, as much as 160 cubic yards per second may be counted upon, below the junction of the Rhone and the Arve; from this it follows that over this stretch of 12 miles about 100,000 horse power may be obtained at low water. During 9 or 10 months, the maximum period, as much as 200,000 horse power is obtained. A hydraulic plant has already been installed in this region by an Anglo-Swiss company, who use about 10,000 horse power. The three projects in consideration have been made by syndicates of French manufacturers, who are only waiting until the formalities have been completed before commencing work. The plans have all been drawn up for some time past, and the land has been purchased. The first of these projects is that of Malpertuis. At 2½ miles below Bellegarde the river falls at a height of 30 to 35 feet at the "Passe de Malpertuis." The river here flows between two perpendicular banks only 160 feet apart. According to this project, a dam will be constructed at a point above the fall, and a part of the water, 160 cubic yards per second, will be taken off by a tunnel of 60 square yards section and 1.2 miles long; a total fall of 51 to 55 feet will thus be utilized, from which a force of 25,000 horse power will be obtained at low water. The second project is that of the "Boucle de Rhone." A dam will be placed at Les Andelieres, near Bellegarde; here the banks are somewhat wider, and the dam will cover 100 feet and have 20 to 22 feet height. A tunnel just above the dam will take off 160 cubic yards per second (80 to 90 at low water). The tunnel will be somewhat shorter than the preceding, and will end at Essertoux. A total fall of 80 to 85 feet will thus be obtained, giving 24,000 to 25,000 horse power, besides 5,000 to 6,000 horse power taken directly by a small hydraulic plant installed beside the dam on the right bank; this gives a total of 30,000 horse power. The third project is that of the Pont de Gresin. At this point, about 8 miles from the Swiss frontier, the river flows in a narrow gorge only 80 feet wide, and is here 25 feet deep, on an average. This point is near the railroad from Lyons to Geneva, and is thus a good locality for establishing industries; a branch line of 2 miles would connect it to the railroad. The fall of water obtained by a dam at this point will be 65 feet, with an output of 150 cubic yards per second during low water, and double this amount for the rest of the year. A minimum of 30,000 horse power may thus be counted on. The plant will include a dam with movable gates, a hydraulic plant with turbines and dynamos, and a system of canals for the discharge of water. The dam will form a vast lake, or water reservoir, and the water will be taken directly into the station by conduits passing through the walls; after passing the turbines it will be discharged into the river below the dam. The generating plant will contain fifteen turbine-dynamo groups of 2,000 horse power each; the turbines with horizontal shaft will be coupled directly to polyphase alternators; a set of smaller turbines will drive the exciting dynamos, and the station will have the necessary switchboards and appliances. It is probable that within three years these projects will have been completed, and the Bellegarde region will possess a total of 100,000 horse power at low water, and 200,000 during nine or ten months of the year. This will be utilized either on the spot for the manufacture of electro-chemical or metallurgical products—such as carbide of calcium, vanadium, carbonates of sodium or potassium, aluminium, etc.—or for the supply of energy over a radius of 80 to 90 miles, following the example of the Niagara plant.

A Prize for Communication With Other Planets.

The sum of 100,000 francs was bequeathed to the French Academy of Sciences in 1891 to be awarded to the first person who would be successful in communicating with another world. The Academy at first did not care to accept such a curious bequest, but finally it did so in the following words: "Madame Veuve Guzmann, a friend of astronomy and a believer in the plurality of inhabited worlds, has left to the Academy the sum of 100,000 francs to be given as a prize to the person who shall first enter into communication of an astre other than the planet Mars." The will wisely further stipulates that each time the prize has not been awarded for a period of five years, the accumulated interest shall be devoted to a work which will help the progress of astronomy. The intentions of the founder will be scrupulously followed. Astronomers naturally wonder why Mars was debarred.

A Funeral Trolley Car.

Baltimore has a number of fine suburban cemeteries, all of which are reached by some division of the street railway lines, and the company found by putting in a few crossovers they could take a car from any part of the city to any one of the burying grounds. It was, therefore, decided to offer cars for the transportation of funeral parties, says The Street Railway Review. The company built a special car well adapted for the purpose. The car is divided into two compartments, the smaller of which has running its full length another compartment or vault in which the casket is carried. A heavy plate glass door hinged to swing downward gives access to the vault from the outside. When a casket is to be placed in the car, the shelf is drawn out, the casket lifted upon it, and the shelf is then pushed back in place. The larger compartment has twelve cross seats in the center aisle, giving a seating capacity of twenty-four; the smaller compartment has four seats. Heavy black curtains divide this section into two private compartments for the immediate family of the deceased. Floral contributions are piled upon the top of the vault, and can be seen from the street. The car is finished inside and out with black enamel with nickel plated fixtures. The car has been named "Dolores," meaning sorrow, and it is rented at from $20 to $25 for each interment.

Automobile News.

The New York Zoological Society will soon operate automobiles of its own for the convenience of the public.

Consul Gibbs reports from Tamatave, December 3, 1900, that Mr. E. Cayeux, a sawmill owner of that city, invites correspondence in regard to liquid-air motors. Correspondence may be conducted in the English language.

A beginning has been made in Chicago to supplant the clanging gongs of public vehicles by more mellow chimes, says The Electrical World. A downtown firm which operates several automobiles was the first to make the change. The Municipal Art Association and the Anti-Noise League are interested in the matter, and it has been suggested that a crusade against gongs be inaugurated.

One of the disadvantages of motor-driven ambulances has been that they do not get the right of way as easily as horse driven vehicles. The familiar clanging of the ambulance gong and the sound of the clattering hoofs of the horses was always sure to clear the way promptly for an ambulance. Now the ambulances have been provided with electric bells which do not differ materially from those which other electric vehicles carry, and the result is that trucks or wagons do not get out of the way as quickly. It has been suggested that compressed air whistles or larger gongs might be used. A return to the old foot gong would probably obviate the difficulty to a certain extent.

An automobile exposition is to be held in Vienna this year, under the auspices of the Automobile Club of Austria and the patronage of the Archduke Francis-Salvator, who is himself a great lover of the sport. The exposition will be held from the 25th of May to the 6th of June, in the Prater, where a large space has been set apart for it. All kinds of automobile vehicles will be represented, including private carriages, towing machines, delivery wagons, motocycles, etc., besides the accessories and detached pieces, representing the advanced stage of development which the industry has reached in Austria. Foreign exhibitors will also be well represented, and the Automobile Club has extended a cordial invitation to all manufacturers. The club is taking measures to have the foreign products passed through the custom house free of duty on condition that they will be brought back directly after the exposition. It is expected that the German industry will show the advances it has recently made by a large number of exhibits.

Lieut. Edouard Engles, of Frankfort-on-the-Main, has lately made a tour of the Alps with a Benz machine of five horse power, accompanied by his wife and an assistant. The machine weighed 1,500 pounds and carried 175 pounds of baggage. Starting from Frankfort, they passed through Stuttgart and Munich, then Inssbruck by way of Kochelsee and Walchersee, and crossed the Karwendel at an altitude of 3,500 feet, and afterward the Brenner at 4,080 feet. They then continued their voyage by Sterzing, Cortino, Trevisi, to Kenmestri (Venice). The return trip was made by way of Trieste, the passes of Tonal (5,640 feet), Epaica (3,540 feet), then by Tirano and Stilfser Joch (8,260 feet), reaching Bregenz, Friedrichshofen, and Ulm. According to the declaration of the custom house officers at Stilfser Joch, theirs was the first German machine to make the passage at that point. About 1,200 miles in all were made on this trip, and the time was about 99 hours, giving an average speed of about 12 miles an hour, in spite of the high altitudes reached.

Among the novelties is the acetylene automobile which has been recently brought out in France. According to reports, the machine is quite successful in its operation. In one of these machines the truck, which weighs about 1,100 pounds, carries a double motor of four cylinders and two explosion chambers; the motor is of the saine general type as the petroleum motor, but has received some modifications to adapt it for use with acetylene. The normal speed of the motor is 2,000 revolutions per minute, and it works without a flywheel; the vehicle is given a mean speed of 12 miles an hour on level road. The motor is not reversible, but there is a mechanism for speed changing which is worked by a foot-pedal; the same device also makes the reversal of the machine at the rate of 2 miles an hour. The usual gasoline reservoir is replaced by an acetylene generator, and the supply of carbide carried on the machine will enable it to cover a distance of about 70 miles at a mean speed of 8 to 10 miles an hour. The motor is designed to develop from 8 to 10 horse power at normal working; it is mounted at the front of the truck, and the explosive mixture acts upon two pistons working in contrary directions, and thus the vibrations are almost neutralized. The apparatus is regulated so that the working of the motor is proportional to the power necessary to develop, and the supply of gas is furnished accordingly. If necessary the motor may be made to work with gasoline. It is expected that further details will be given as to this interesting system.

Archæological News.

Excavations are being carried on at Pompeii around the Basilica.

Many Etruscan tombs have been found in central Italy during the last two years.

The theater at Ephesus has been laid bare by the Austrian excavations. The great harbor appears to be of Greek, not Roman, origin.

L. Lindet considers that the windmill was imported into France and England from the East in the eleventh century, though it may have been in use earlier.

Remains of the ancient theater of Augusta Tauri vorum (Turin) have been found in the area of the Palazzo Vecchio on the northern side of the ancient town.

Remains of a house of Republican times have been found under the crypt of S. Cecilia in Trastevere, Rome. It was restored in the first part of the second century A. D.

In carrying out the repairs to the Temple of Karnak M. Legrain discovered a city gate. It is the first found in Egypt and is of great height. The chief causes of the fall of part of the temple are the character of the soil and the artificial flooding of the temple.

Drs. Grenfell and Hunt have a great mass of Ptolemaic papyri, some used for inside padding of crocodile coffins, others made up into human coffins, like the Petrie papyri. These latter have not been explored; the former contain at all events the official papers of a komogramateus, or village mayor, of the second century B. C.

The Palazzo Piombino has housed the notable collection of antique marbles transferred to it from the Villa Ludovici. This collection has been acquired by the Italian government and will be placed temporarily in the museum at the Baths of Diocletian. They will be transferred to the Villa Borghese after it is acquired by the government.

Below the pavement of the Æmilian Basilica in the Roman Forum a great antique sewer has been opened. Just where it passes under the steps which led up from the street to the outer arcade of the Basilica the base of a small circular shrine projects into the roadway. It has been suggested that this is the temple of Venus Cloacina, the cleaning goddess.

Cupellation is one of the most ancient of metallurgical processes, and was well known at least as early as the year 600 B. C., says Nature. It was used by the Romans to extract silver from its ores in Spain and at Laurian, but it has been hitherto supposed that the hearths of their furnaces were made of comparatively non-absorbent materials, such as clay and marl, the litharge and other oxides being skimmed off or allowed to flow away in side channels. It is now shown, however, by Mr. Gowland, in a paper read before the Society of Antiquaries in May last, that a silver refinery was worked at Silchester in which argentiferous copper was cupeled on hearths made of bone-ash. Bone-ash has the property of absorbing molten litharge and some other oxides as readily as blotting-paper absorbs water, and apparently only its high cost prevented its use by the Romans in all their later cupellation furnaces. Careful examination of the remains found at Silchester convinced Mr. Gowland that the work there resembled some of the operations formerly practised in Japan, and that it is probable that it consisted in the recovery of the silver from Roman copper coins issued in the third century A. D. The metal contained four per cent of silver, and was cupeled in three furnaces in succession with the aid of repeated additions of small quantities of lead.

American universities have received 118 papyri from the Egyptian Exploration Fund. Among the sixteen papyri for Yale are portions of a lost comedy of the second century and of Plato's Republic of the century before and after Christ. Harvard's share includes a fragment of Paul's Epistle to the Romans, of Aloman, the chief lyric poet of Sparta, 651 B. C., and seventeen other papyri. Columbia receives Xenophon's Hellenica, first century, a letter to the King of Macedon, and fourteen other pieces. Johns Hopkins gets extracts from Thucydides of the second century, two of Demosthenes on the Crown, and thirteen other fragments. A piece of Herodotus of the second century, a complete contract for a loan in the reign of Nero, and eleven other pieces are assigned to Princeton. Of five papyri for Hamilton College, one is a letter to the Clerk of the Court in the time of Trajan, acknowledging the receipt of a will; and of four papyri to Vassar College, one is about a loan of 3,000 drachmæ of silver, which shows that 8 per cent interest was then paid (third century). Of the total 118 papyri, 29 are presented to the University of Pennsylvania. The larger part of the papyri are from Oxyrhyncus and the rest from various sites. The former is where the "New Sayings of Jesus" were found by the society, and also portions of St. Matthew, Mark, and John, far antedating any other known texts.

Electrical Notes.

The moving sidewalk of the Paris Exposition was a great success; 6,694,308 persons paid for the privilege of using the platforms, while only 2,635,867 used the railway that carried passengers in the other direction.

Recent experiments in wireless telegraphy, in connection with the French fleet, have been so satisfactory that it has been decided to provide the whole Mediterranean squadron with wireless apparatus, which will be subjected to decisive tests during the coming cruise of the squadron.

A new hotel which is to be built on Fifth Avenue will have many interesting electrical features, among which will be a system of electric service elevators, or movable pantries, fitted with electric heating tables. They will be run through every apartment, thereby insuring rapid service and hot food to guests taking their meals in their rooms.

Visitors to Boston have often wondered at the obsolete Back Bay horse car line, which consisted of only two cars operated by four men. All the other street car lines in the city are, of course, operated electrically. The trolley is hardly adapted to that section of the Back Bay district served by the horse car line. The tracks are to be taken up and electric omnibuses are taking the place of the cars.

A test of the Murphy third-rail sectional system took place recently in the Baltimore & Ohio tunnel and in the yards at Baltimore. One of the heavy locomotives ran up and down the yard track at a high rate of speed by the sectional third-rail system. Everything worked perfectly, each switch operated as intended. It took six months to install the system through the yard and tunnel.

Prof. W. Nipher, of Washington University, has discovered that sensitized plates which have been exposed to sunlight and are therefore useless for ordinary photography can be employed in making X-ray photographs. The development of such plates which have been acted upon by the X-rays gives a positive image. Moreover, the plates can be developed by the feeble light of an ordinary lamp, so that the fine details which may be lost by over-development can be carefully observed.

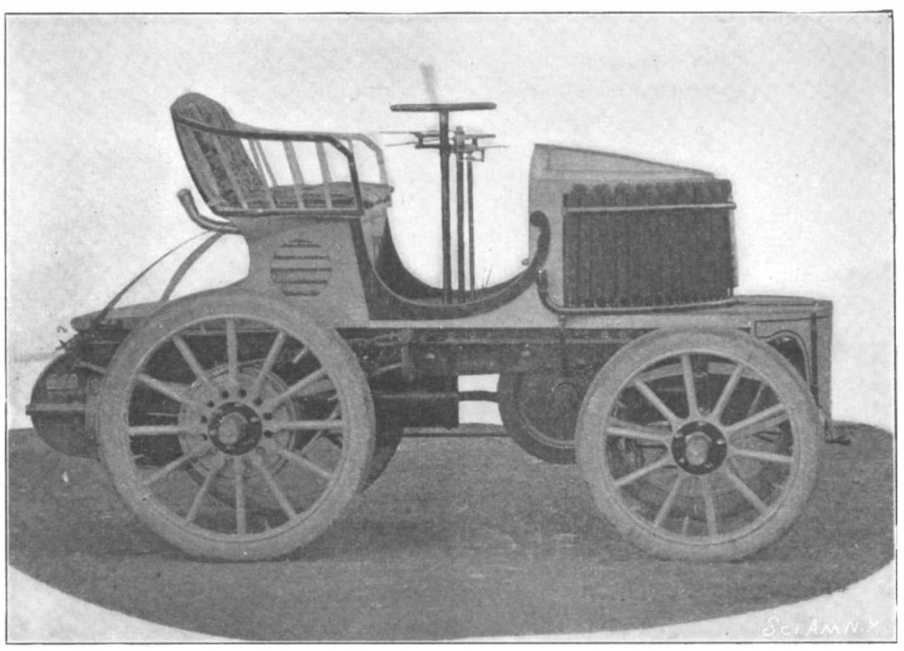
The installation of Marconi's wireless telegraphy upon the vessels plying between Dover and Ostend has proved a great success. In the first test the operators after they had left the latter port, and while still some distance from land, succeeded in communicating with the Marconi station at Dovercourt in Essex, considerably over 100 miles away. The distance from Dover to Ostend is 73 miles, and the operators were successful in transmitting a message from the vessel as she entered the harbor at Dover to the station on the Belgian side. The utility of the system was, however, more adequately exemplified a few days after its installation during a gale. The vessel encountered heavy seas, and her passage was consequently delayed. The operators, however, continued in communication with the shore, and were able to announce their bearings from time to time. Messages were also transmitted for the passengers, while one was received from Brussels. The system has been of great advantage in connection with the navigation of the vessel, since on more than one occasion the captain has received notification by ether communication of the presence of fogs off the Belgian shore, and has, therefore, been able to reduce the speed of his vessel accordingly.

The Central London Electric Railway has met with such popularity that the officials are experiencing considerable difficulty in preventing overcrowding of the carriages. The daily conveyance of passengers now amounts to over 200,000, and on wet days the complement is greatly increased. One solution of the problem is the lengthening of the trains by the addition of one or two extra carriages, but if this is resorted to the platforms will have to be extended. Another suggestion is a more frequent service, but the success of this scheme depends entirely upon the public itself. At the present time the trains are only scheduled to make a 15 seconds stoppage at the stations, but, of course, at some places such a short stoppage is impossible. The duration of a stop must depend upon the number of passengers who desire to detrain at that particular point. The company suggests that the passengers should prepare to leave the train before it reaches their destination. If this were followed no doubt the difficulty would be to a certain extent solved. The trains are at present running at intervals of 3 minutes, but this service is to be increased to 2½ minutes headway. Probably this latter will be the limit at which the trains can run with perfect safety. The earning capacity of the railway is enormous, as may be recognized from the number of passengers carried, but up to the present nothing has been published regarding the expenses, so that it is impossible to estimate what dividend the railway will pay.

DE DIETRICH AUTOMOBILES.

AMEDEE BOLLÉE (FILS) SYSTEM.

The type of automobile exhibited by the De Dietrich Company is shown in the illustrations and diagrams. The truck rests upon the axles by long and elastic springs; as it carries all the organs of the motor and the transmission, any form of carriage body may be used. Two of the principal types are shown in the engravings, one of these being a racing machine. In front of the truck is placed the motor which is supported by a cross-tube and a T-iron. The starting of the motor is effected by the handle, whose shaft carries at the other end a bevel gear, which engages with a similar gear on the motor shaft. The movement of the motor is transmitted to the rear by the belt, *J*. The speed-changing mechanism, shown in Fig. 2, is placed in the rear of the truck, and includes four speeds and reversal. The two main pulleys, *P P'*, mounted on the intermediate shaft, *A*, carry the belt from the motor; the pulley, *P*, is fixed, while *P'* is loose on the shaft. The fork, *F*, displaces the belt to the fixed pulley and starts the system, the fork being controlled by a handle within reach of the conductor and a series of levers. The shaft, *A*, is mounted in two bearings. The gears, 1, 2, 3, 4, for the different speeds are mounted on a collar which turns with the shaft, but is keyed to it and may be displaced to one side or the other, throwing the different gears into connection with the gears, 1', 2', 3', 4', on the shaft of the differential. The gears are displaced by a lever, *L*, which engages in a collar, *r*. In the figure showing the speed-changing device the wheels, 4 and 4', are engaged, this giving the maximum speed; by pushing the lever the wheels, 3, 3', are engaged and so on to 1 1' which gives the slowest speed. The rear movement is obtained by the small pinion, *p*, mounted on a shaft carried at the end of a lever, *V;* the pinions, 1 1', are placed near together, but without touching, and the lever then moves the small pinion into contact with each of the gears, transmitting the movement in the inverse direction. The differential, *D* (Fig. 2), is of the usual type; it carries a drum, *O*, upon which a braking action is obtained by a steel band. The pinions, *M* and *N*, are mounted at each end of the shaft and turn in oil, transmitting their movement by two bevel gears to two lateral shafts upon whose extremities are carried the small pinions in the side elevation, which engage with the gears upon the driving wheels. The motor, Fig. 3, is horizontal, and has two cylinders cast with their water envelopes. The ignition is made by incandescent tubes. The normal speed of the motor is 650 revolutions. The 6½ horse power size weighs 330 pounds, and the 10 horse power, 400 pounds. The cooling of the cylinders is obtained by water contained in a special tank where it remains cold until entirely exhausted; it is brought to the cylinders by a tube of small diameter without any mechanical device, thus suppressing the circulation pump. The steam from the cooling chamber of the motor passes into a condenser formed of tubes, placed generally in front of the vehicle; the steam is condensed in whole or part and the water returns to the cylinder jackets by a tube passing below the motor. For a motor of 9 horse power, 12 or 14 yards of cooling tube placed in front of the vehicle allow a whole day's run without renewing the water. The motor is provided with a centrifugal governor which acts upon the exhaust valves. The carbureter is shown in Fig. 4. The reservoir, *R*, carries the cylindrical float, *F;* the gasoline arrives by the tube *r*, and a constant level is obtained in the reservoir by the conical plug, *c*, which stops the orifice at a certain level. The tube, *T*, below, communicates with the second part, containing two cylindrical chambers. The lower chamber admits air by the opening, *A*, and in the upper is the aspiration orifice, *D*, of the cylinders. In the center is a circular plate, pierced with holes carried upon the rod, *V*, whose lower part enters into the conical orifice, *t*, of the gasoline tube. Owing to the aspirating effect of the piston, the gasoline comes out in jets and strikes the plate, producing an atomizing effect, and the air arriving by the orifice, *A*, is thus carbureted, and passes into the upper cylinder and thence to the motor. The gasoline supply is regulated by a screw above, which limits the course of the vertical rod; the screw is operated by a lever within reach of the conductor. The steering of the vehicle is effected by a hand-wheel whose movement is transmitted to the front wheels by a system of levers. The conductor has also at hand the brake lever, the speed-changing device for the pinions, the lever for regulating the carburetion, and a lever which acts upon the governor spring and thus changes the speed of the motor. A second brake is provided, which acts upon a collar on the main driving gears.



DE DIETRICH RACING MACHINE.

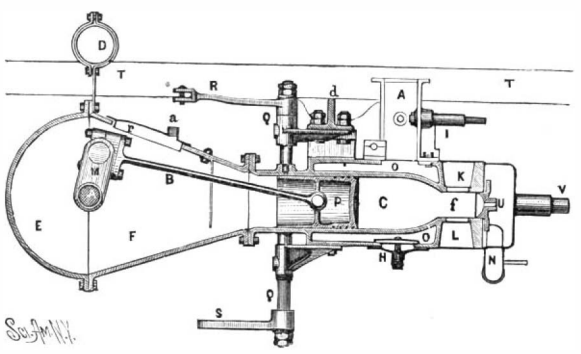


Fig. 3.—THE DE DIETRICH MOTOR.

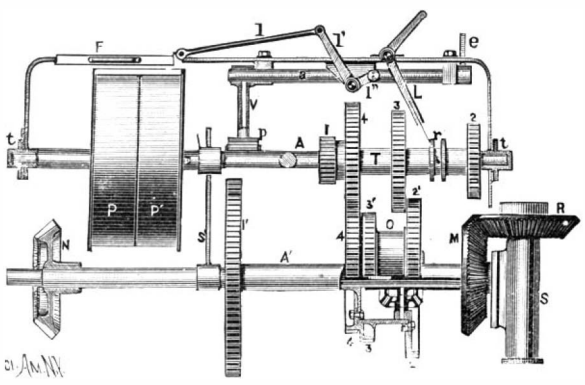


Fig. 2.—THE SPEED-CHANGING GEAR.

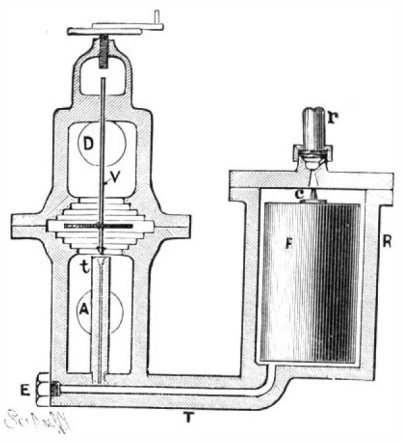


Fig. 4.—THE DE DIETRICH CARBURETER.

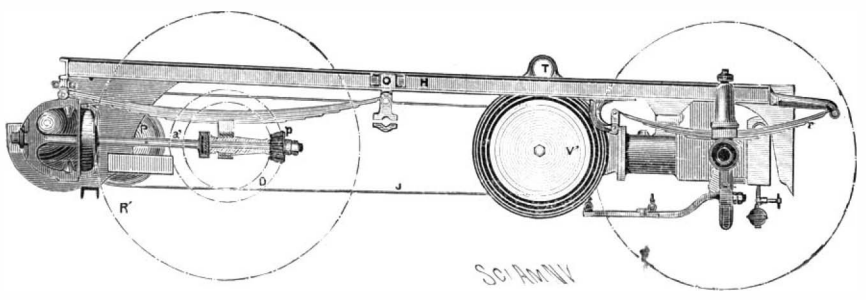
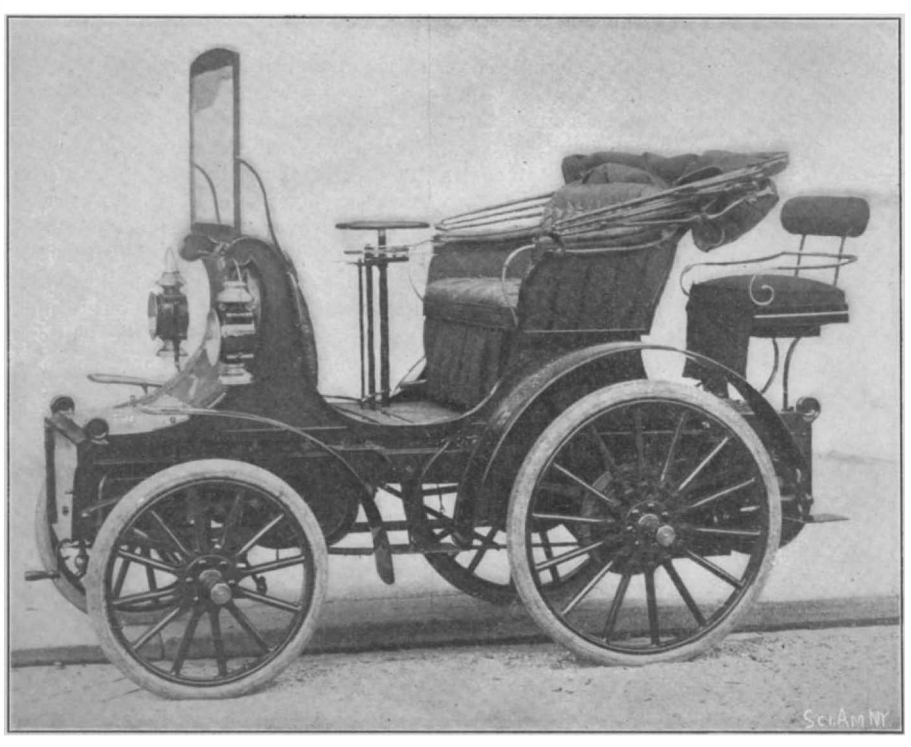
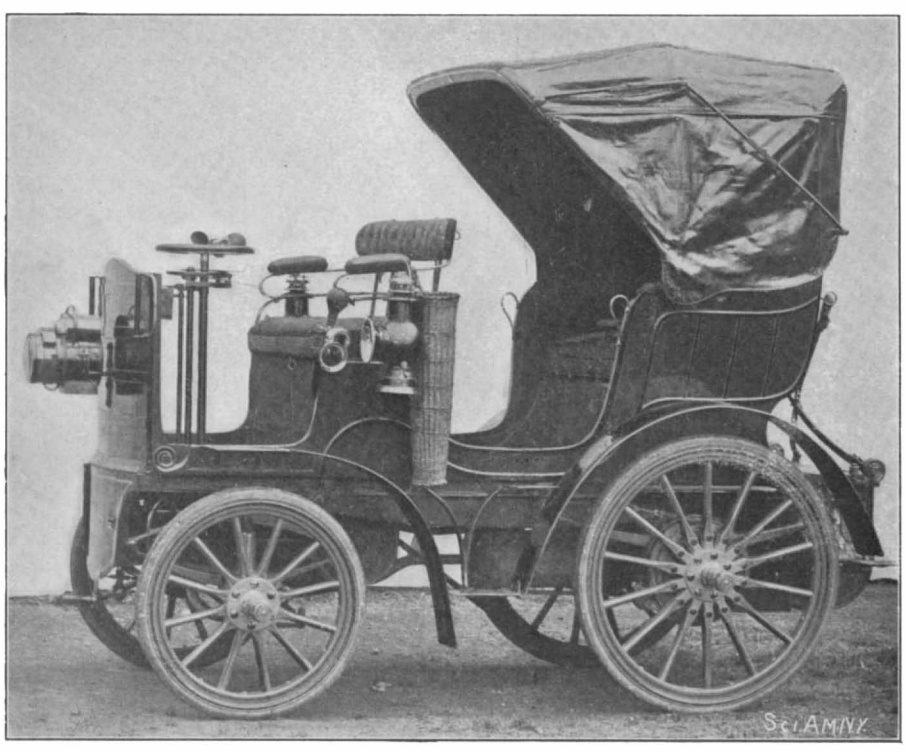


Fig. 1.—SIDE ELEVATION OF THE CARRIAGE FRAME.



DE DIETRICH MOTOR CARRIAGE.



DE DIETRICH MOTOR CARRIAGE WITH TOP UP.

Rafia fiber is a staple article of commerce in Madagascar. The Hovas use the under part of the leaf, split very fine, as a warp with a weft of white silk producing an article called silklamba, which is sold both in Europe and America. The coast tribes use it for clothing, but of coarse quality, with dyed stripes of indigo, saffron, black, and a dirty green. It is a cold, comfortless-looking material and does not lend itself to graceful folds, and when two natives come down a road clad in new rafia shirts the noise produced is somewhat similar to that of two wire meat covers rubbing together.

RUNNING DOWN WHALES.

BY CHARLES FREDERICK HOLDER.

The coast of Southern California is protected, to a certain extent, by the islands off shore. The group begins at Santa Barbara with San Miguel; then come Santa Rosa, Santa Cruz, Anacapa, and farther out to sea, thirty miles, San Nicolas. The next following south are Santa Barbara, Santa Catalina, San Clement, and then with a break of seventy miles the Coronadoes. These islands are almost parallel to the coast range and constitute virtually an out-to sea coast range of mountains which, in all probability, were thrust up at the time the coast was formed, leaving a deep depression between them and the mainland.

This region of extremely deep water is a famous roadway for whales, several kinds being found here feeding upon the vast schools of jelly fishes which are nearly always present. The whale most common is the California gray, which goes every year to the shallows of the Gulf of California to give birth to its young, then moving north along the California coast in what is virtually a great procession. At this time the channel is the sporting ground for the huge animals, and nearly every steamer that crosses sights a school, the scene forming one of the attractions of the trip, as the whales, far from being wild or timid, sometimes evince a playful mood, or, incited by curiosity, come near the steamer, affording the passengers a near view of the largest of living animals.

This sociable disposition has resulted in several encounters between the whales and vessels in which the former have always come off second best. Some years ago a steamer on the trip from San Pedro to San Francisco struck some body, supposed at first to be a log. Several of the men were thrown to the deck; the wheel turned over so violently that the helmsman was also thrown down, and the steamer for the moment came to a standstill. All hands were called, the pumps sounded, and as the mate ran aft he saw a large whale lashing the water astern. The vessel had struck it directly back of the right paddle and evidently crushed it down, rising over it. This whale drifted into Santa Catalina some days later and was towed into one of the little bays of the coast where it was cut up by the fishermen.

During the summer of 1900 the steamer "Hermosa" killed a whale off San Pedro, which was at least eighty feet in length. The steamer was plowing along at a rate of twelve miles an hour when suddenly a large whale rose to spout directly in front of her, placing itself inadvertently across her bows, so that the blow was struck fairly. The shock created a sensation on board and the blow was so violent that several people were thrown from their feet. It was supposed that the vessel had struck a sunken rock; she stopped for a few seconds, trembled, then rose about three feet, heeling slightly, then resumed her course, passing through a mass of blood which colored the water, showing that she had plunged into some large animal. A dead whale was sighted two days later and for several days, on account of its size, it drifted up and down the coast with the tide, defying the efforts of speculative fishermen to secure it. Finally a heavy sea tossed it on the coast at the resort of Redondo, where it was hauled in at high tide, and when the latter went out left a marvelous spectacle of the remains of one of the largest of living animals. Hundreds of people visited the spot before it was dismembered. A long wound told the story of its contact with the steamer that was wholly uninjured.

Doubtless if the records of shipping disasters were examined many instances would be found where vessels had crashed into whales with results fatal to the animal and more or less injurious to the vessel. In this connection a curious incident may be related regarding the actions of a school of whales at the island of Santa Rosa, Cal. The channel between this island is narrow and often extremely rough, and during a storm it was believed by those on the island that the whales became demoralized, as they deliberately

CALIFORNIA GRAY WHALE KILLED BY A STEAMER.

ran ashore, and the remarkable sight of five or six large whales was observed helpless on the sands. Their bones remained for a long time on what became known as the whales' graveyard.

A GLIMPSE OF THE NAVAL BATTLE OF SANTIAGO.

To those of our readers who take a lively interest in the history of the United States navy, the engraving which we present of one of the most important phases of the battle of Santiago will possess special attraction. In proportion to its size there is no navy, surely, to whose credit stands such a long list of successful encounters, and in the absolute completeness of the victory gained, even after every allowance has been made for the numbers and power of our ships and the superior discipline of the crews, this battle off the south coast of Cuba will always stand pre-eminent.

Santiago was a triumph both of material and men; a victory the winning of which commenced long before the war-cloud arose and the first gun was heard. The swift destruction of the flower of the enemy's fleet was merely the culmination of a work for whose inception we must go back to the time when our ships first took form on the designer's draughting board, and our ordnance experts drew the diagrams of gun and gun mount, or the engineers converted their allotted share of the displacement into engines, boilers and fuel.

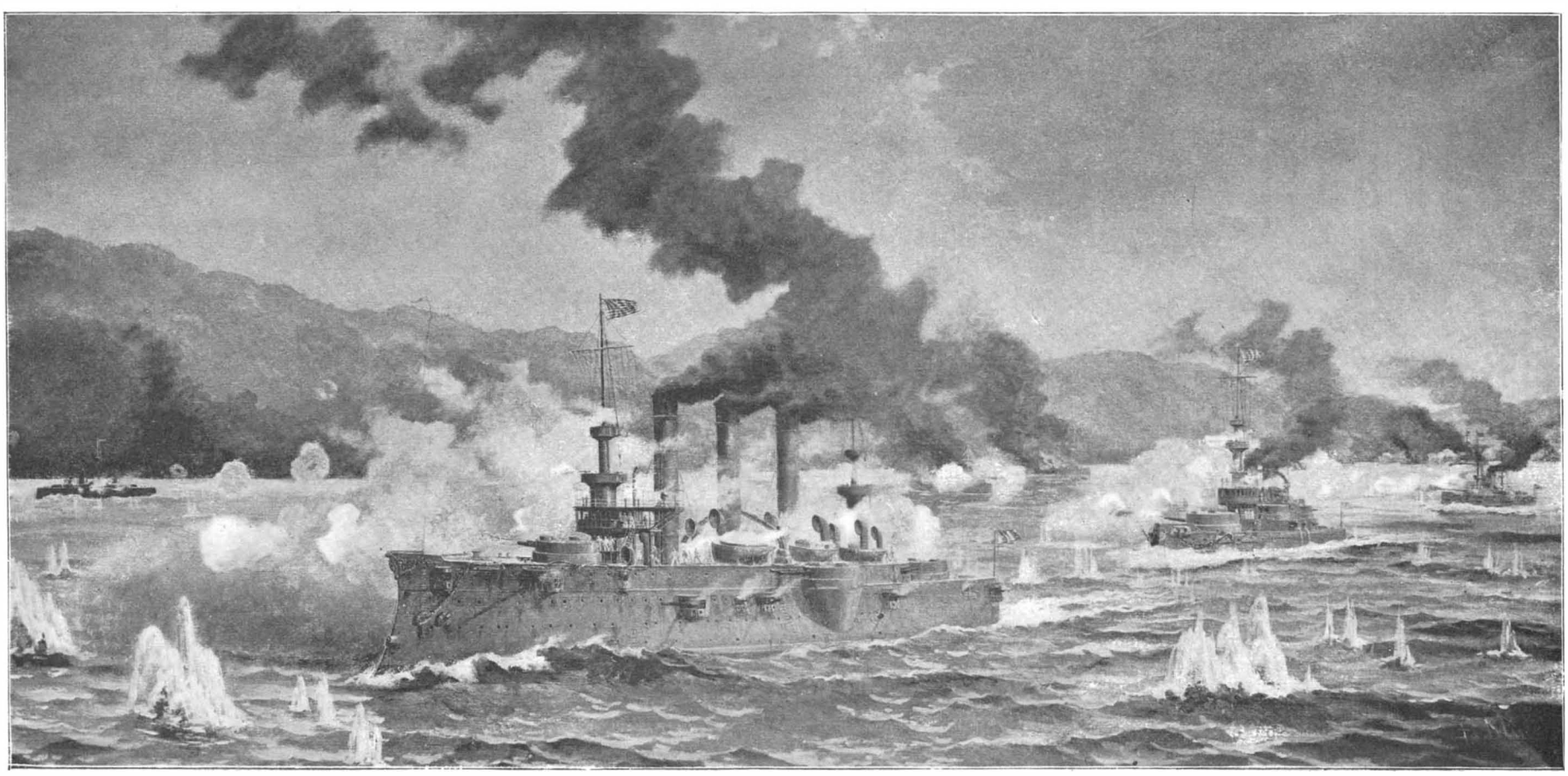
Our engraving of the famous battle was made from one of a series of historical paintings which the retiring Chief Naval Constructor, Rear-Admiral Hichborn, has had painted to represent the development of naval architecture in America. These paintings, which are hung in the office of the Chief of the Bureau, commence with the caravels of Columbus, 1492, and end with the "Pennsylvania" class of battleships of 1901. In addition to this series, and as a climax to the story of naval progress, a large painting of the battle of Santiago de Cuba, the latest engagement which reflected credit alike on the design, the material, and the men of the United States navy, has been added. As almost all the vessels engaged in this action were from designs of which the retiring Chief Constructor has had supervision, there was something peculiarly fitting in placing a painting of this engagement among those of the vessels that engaged in it.

It will be remembered that between 9:35 and 10 o'clock on the morning of Sunday, July 3, 1898, when the Spanish vessels attempted to escape from Santiago de Cuba, the United States' blockading fleet consisted of the "Brooklyn," "Texas," "Oregon," "Iowa," "Indiana" and the auxiliaries "Gloucester" and "Vixen," arranged in a semicircle about the harbor entrance, about 2½ to 4 miles from shore, that being the limit of the day blockading distance. Two other vessels of the fleet, the "Massachusetts" and the "New York," were unavoidably absent, the former having left at 4 o'clock A. M. for Guantanamo to coal, and the latter to convey Rear Admiral Sampson to Siboney for a conference with General Shafter.

When the Spanish fleet cleared the harbor's entrance, it became at once apparent that a running fight was planned instead of an attack upon the American fleet. This method of escape attempted by the Spanish fleet, all steering in the same direction and in single formation, made the scheme of battle very easy for the American squadron.

The first rush of the Spaniards to the westward carried them past a number of the vessels of the blockading squadron, whose crews were at Sunday "Quarters for inspection," but when the warning, "Enemy's ships escaping," was reported from the lookout and "General quarters" sounded, the men dropped clean clothes and polished accouterments and with a cheer sprang to man the guns. The thorough training they had received in the service quickly demonstrated to the enemy that they had encountered no ordinary opponent, for in less than three-quarters of an hour from the time the last Spanish vessel had left the harbor, four of the six vessels comprising the fleet had been set on fire and beached.

The time selected for the painting was about 10:20 o'clock A. M. at a point off Cabrera Point looking eastward. The Spanish ships are seen close in shore, the "Viscaya" leading and the "Colon" following, the "Maria Teresa" and "Oquendo" on fire turning to run

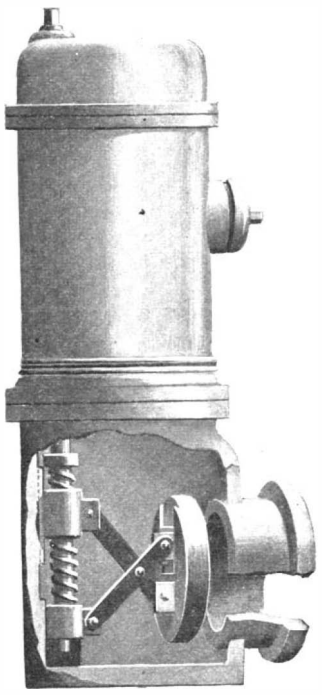


THE NAVAL BATTLE OF SANTIAGO, AS SEEN OFF CABRERA POINT.

in shore, and the torpedo boats "Furor" and "Pluton" practically destroyed. The American fleet is shown in the foreground with the "Brooklyn" in the lead, followed by the "Oregon" and "Texas," while in the distance are seen the "Iowa," "Indiana" and the auxiliary yacht "Gloucester." The engagement at this time and in this position was probably the most exciting and picturesque of any during the battle, and its portrayal by the artist is very realistic and inspiring.

THREE RECENTLY PATENTED NOVELTIES.

In certain forms of fire-hydrants, the face of the valve is moved across the seat, whereby not only the valve, but also the seat, is injured. To overcome this objection Robert Hughes, of Waterford, N. Y., employs a novel arrangement of levers by means of which the valve is made to move parallel to a desired plane.

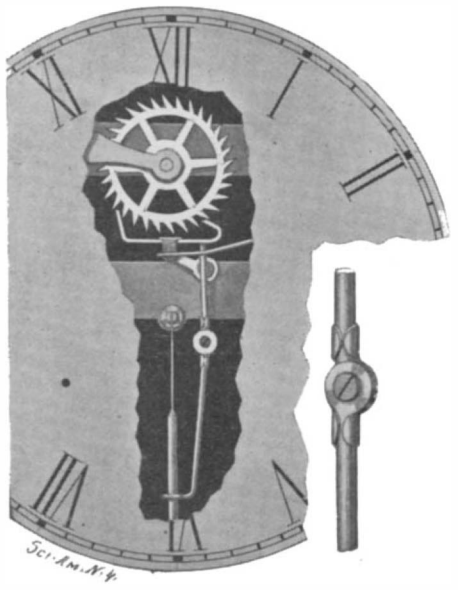


A SIMPLE VALVE MECHANISM FOR FIRE-HYDRANTS.

The valve is provided with two blocks, one fixed and the other capable of sliding in a slot. To each block one end of a lever is pivoted, the other end of one lever being pivoted to a support loosely receiving the end of a screw stem, and the other end of the second lever being pivoted to a nut threaded on the stem. The levers are pivoted together. When the screw-stem is turned in one direction the nut is carried up and the valve drawn from its seat. The sliding block as it works in its seat reduces the downward travel of the valve to a minimum. When the levers are pivoted together at their middle points there is no downward travel of the valve.

A self-marking try-square is an invention patented by Isaac W. Stephens, of Sardis, Tenn., which is distinctly novel in form and operation. The handle of the try-square is hollowed to receive a spring-actuated push-pin joined by a pin and slot connection with one end of a lever fulcrumed near its middle. The other end of the lever is loosely received by a recess in a scoring-plate having reciprocating movement in the channeled blade of the try-square. The edge of the scoring-plate is provided with elastic spring tongues formed with prongs bent in opposite directions. By pressing upon the push-pin the scoring-plate is moved in one direction. When the push-pin is released the spring moves the scoring-plate in the other direction.

A very simple and ingenious pendulum adjuster has



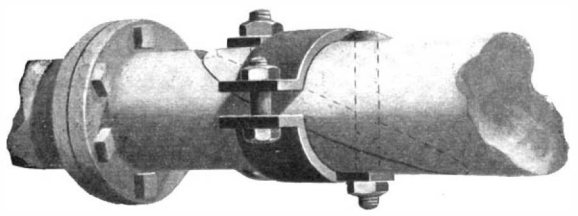
THE DIVIDED PALLET-ROD FOR ADJUSTING THE BEAT OF A PENDULUM.

been devised by Simon B. Parker, of Springfield, Mass. The novel feature of the invention consists in employing a divided pallet-rod, the two sections of which are connected by means of separable metal disks held together by a clamping-screw. Proper friction can be given to the disks by the adjustment of the clamping screw. By simply starting the pendulum to bank the pallet on the escape-wheel, the pendulum swings within its normal arc by reason of the adjustment of the disks. The arrangement can easily be applied to old clocks by cutting the pallet-rod in two and securing the disks in place.

REPAIRING A BROKEN SHAFT AT SEA.

On the 12th of December last, at three o'clock in the afternoon, the Danish steamer "Louisiana" was in the Gulf of Mexico, about sixty miles from the mouth of the Mississippi River, loaded with a full cargo for Aarhus, Denmark, when suddenly the first intermediate shaft broke completely through and the engines commenced to race violently. On stopping the engines it was found that the accident had happened within the shaft tunnel, a diagonal fracture 28 inches in length having occurred in the first intermediate shaft. The gland-bush in the watertight partition, and the foremost bearing, were found to have been demolished, as well as the head of the second bearing. On examining the shaft, which measured 11¼ inches in diameter, it was found that only one-quarter of its length was intact.

Repairs were started at four o'clock, one hour after the accident, the first work to be done consisting in boring two 1½-inch holes through the fracture, one near each end, the engine-room force being also set to work at the same time forging the special tools required for the repairs. To hold the broken ends together two band-rings were taken from the hoisting gear and clamped around the shaft, and in order to get rid of the vibration from the propeller the tail-end shaft was disconnected. It took 39 hours altogether to complete the boring of the two 1½-inch holes. During the boring a band was taken from the foremast of the steamer and forged into a collar 1½ inches thick by 6 inches in width, and of the diameter of the shaft. As soon as the holes had been bored to 1½ inches, work was started on enlarging them to a diameter of 2¼ inches, and two bolts were taken from the main bearing, cut down to length and bolted through the shafts, as shown in the drawing. The forged collar was then fitted on and Babbitt-metal was poured into the joint. The first bearing box was replaced by a wooden one, and the tail-end shaft and the repaired intermediate shaft were then connected up. The repairs were completed at one P. M. on the 17th, the chief engineer and his assistants having worked continuously day and night for nearly five days. At three



THE SHAFT REPAIRED.

P. M. the vessel started at slow speed and reached the lightship at the South Pass of the Mississippi six hours later, where she anchored until she was picked up by a tug that took her and taken into the river. The greatest credit is due to Capt. Jensen and the engineer staff for the pluck and resourcefulness shown in the carrying out of such a repair job at sea.

The Charleston Exposition.

The new Exposition at Charleston will open December, 1901, and will remain open until June, 1902. It is intended to advertise to the world the progress of South Carolina and the neighboring Southern cities, and the advantage Charleston enjoys as a natural seaport for the trade between the West Indies and the United States. There will be a large number of exhibits from the West Indies, and from Florida, and the whole exposition will be characteristic of the tropics. The grounds cover about 250 acres of land, and are situated on the Ashley River, 4½ miles above Charleston. As the river is navigable for large ships up to that point two or more naval vessels will be stationed there. An artificial lake will be constructed near the middle of the grounds extending over an area of 30 acres. In the middle of the lake will be an electrical island. Two old colonial houses situated on the exposition grounds will be retained. The plaza will be 1,200 by 900, and there will be an auditorium capable of holding 6,000 persons. On it will also be situated the Cotton Palace and the buildings of Commerce and Agriculture. The style of architecture will be Spanish-Renaissance. The materials used will be pine and staff.

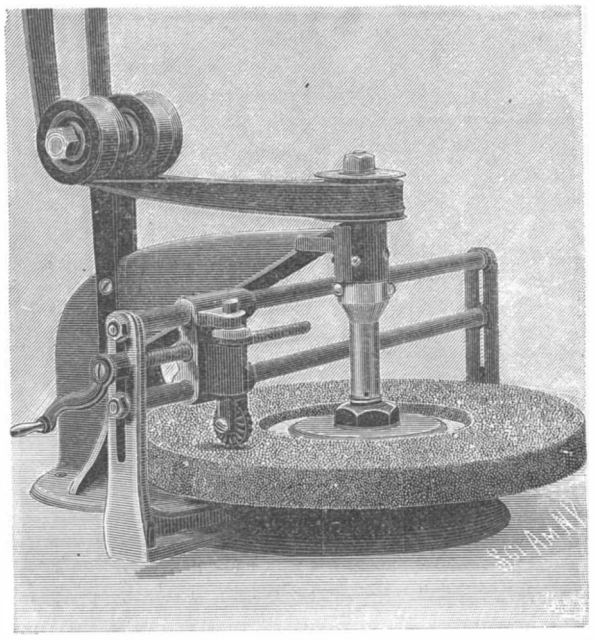
Harvesting Extraordinary.

The bulk of the flax grown in Kittson County, Minn., was harvested under very remarkable conditions. The fall was unusually wet, and it was found impossible to get on the fields. Freezing weather came almost immediately thereafter, and an extremely heavy fall of snow. The old methods had to be abandoned, and mowers brought into use. The sickle bar was entirely under the snow, and after the flax was cut it still stood as erect as ever, but the hay-rake following had no trouble in gathering it, as it was so thick and so entwined that the rake caught it all.

A SIMPLE AND EFFICIENT CLIPPER GRINDER AND SURFACE GRINDER.

The subject of the accompanying illustration is a novel grinding device for sharpening the blades of clippers. The inventor of the machine is William Taber, and its manufacturer J. Van Benschoten, 14 to 20 Catherine Street, Poughkeepsie, N. Y.

As our illustration shows, the machine comprises essentially a frame having a horizontal arm and a base. Between the horizontal arm and the base a vertical shaft, carrying a 14-inch emery wheel, turns on a cone bearing. Power is transmitted by belt and pulley. In its upper face the stone is provided with a circular depression four inches in diameter.



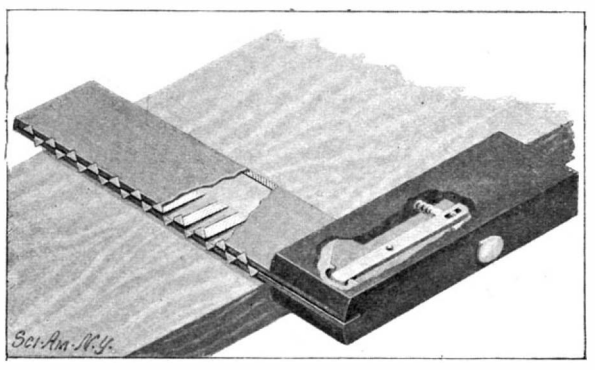
THE VAN BENSCHOTEN CLIPPER GRINDER.

On the five inches of flat grinding surface thus furnished clippers are held parallel and moved laterally over the two edges, whereby the surface of the stone is maintained both flat and true. In order that the stone can be trued without removing the vertical shaft from its bearing, a special truing attachment has been devised consisting of two half-inch rods, fitted in proper supports on which a star-wheel emery-dresser is moved gradually across the surface by means of a small crank and a screw. The dresser is also adjustable, so that any cut desired can be made. Thus not only can the stone be trued absolutely, but all glaze is removed as well.

Owing to the accuracy with which the surface of the stone can be ground, this device can be used on any light surface, such as the blades of sausage cutters, meat choppers, dies, cutter knives, and the like.

The Current Supplement.

The current SUPPLEMENT, No. 1312, has many interesting articles. "The Ancient History of Water Engineering" is by James Mansergh. "Observations on Crookes Tubes" is by H. Westbury. "The Optics of Tri-Chromatic Photography" is by F. E. Ives. "Mammals and Reptiles; or, What Was the Ice Age?" by



TRY-SQUARE WITH SELF-ADJUSTING SCORING DEVICE.

Joshua Rutland, is a most interesting paper. "The Mosquito as Transmitter of Micro Organisms" is by Dr. R. Menger. "The Galileo Museum at Florence" is the subject of an interesting engraving. The usual Consular matter and Trade Notes and Receipts are given.

Contents.

(Illustrated articles are marked with an asterisk.)

RECENTLY PATENTED INVENTIONS.

Engineering Improvements.

FEEDING SCALE-PREVENTIVES INTO BOILERS.—GEORGE NEUBAUER, Manhattan, New York city. The apparatus comprises an injector connected at the inlet with the discharge of a boiler feed-pump and at the outlet with the suction of the boiler feed-pump; and a container for the scale-preventive, discharging into the injector. By means of this apparatus the engineer can force more or less of the preventive into the boiler, according to the condition of the feed-water.

Mechanical Devices.

CAR-BRAKE.—JOHN H. DIERCKS, Minneapolis, Minn. One end of a brake-band on one of the wheel-hubs is connected with a lever, and the other end of the band is connected with a second lever. A rock-shaft has operative connection with the first lever; and a brake-rod has connection with the rock-shaft. Band-brakes, co-acting with the other wheels, have operative connection with the lever and the rock-shaft. The brake is set upon one wheel by manual exertion, and this brake thus set operates all the others. Upon releasing the brake-rod the several brake-bands will be relieved of pressure.

CLEARING DEVICE FOR LIFE-BOATS.—ERICK WOLFGANG, London, England. This chock-releasing device for life-boats comprises an overhead support for the life-boat, normally inactive, and a keel-support, normally supporting the boat. This keel-support is movable under the control of the operator, to shift the keel-support from under the life-boat and allow the latter to hang from the overhead support. The keel-support comprises a number of center keel-blocks and side keel-blocks movable independently. One side block and the bottom keel-block are arranged to move vertically, and the other side keel-block is hinged to swing transversely relatively to the life-boat. A single operator can release the boat in case of an emergency.

FIRE-ESCAPE.—FRANCIS J. HUGH, Manhattan, New York city. Mr. Hugh has already received a patent for a fire-escape in which a cable unwinds from a pulley controlled by a speed-checking governor. The present invention is an improvement upon this device, and relates primarily to a governor. The principal object of the invention is to utilize a wire rope or cable in such a manner that a positive rotation of the pulley over which the wire passes, and a consequent actuating of the governor co-acting with that pulley, takes place. The ordinary ropes frequently used in fire-escapes are objectionable, owing to the danger of being burnt. In order that the cable may not slip, initial friction devices and a V-shaped groove in the pulley are provided. The heavier the load on the cable, the less danger will there be of a cable's slipping, so that the governor is caused to operate properly and check the speed of the load.

Miscellaneous Inventions.

RADIATOR.—JOHN F. THOMPSON, Manhattan, New York city. The principal object of this invention is to provide a radiator with an auxiliary water-heating device which may be used when comparatively little heat is required and when the radiator is cut off from the main steam or heating boiler. The auxiliary heat supply is automatically controlled.

PAPER BOX.—JOSEPH T. CRAW, Jersey City, N. J. In order to seal the ends of sugar-boxes siftlessly, Mr. Craw provides his box with a snugly fitting interior sealing-strip having adhesive material upon its outer face and a sealing-flap portion of a size to fold over the outside of the sealing-strip and to cover the strip entirely so that its outer surface will be entirely invisible. Thus the flat portion of the box is cemented to the outer face of the strip; the ends of the strip are cemented to the body of the box, and the adhesive material is forced into the spaces between the edges of the flap portion and the sides of the box. Thus the flap portion is held in a folded position, and, together with the strip, closes the box to prevent sifting.

HOP-DRYING BOX.—ADOLF WOLF, Silverton, Ore. The inventor has provided a construction by which a hop-drying box can be readily turned upside down without discharging the contents, the top being left open for a thorough evaporation and escape of steam. The box has a removable top and a removable bottom, constructed and secured in a novel manner to attain the desired end.

FISH-TRAP.—DANIEL H. WELCH and JOB H. LAMLEY, Astoria, Ore. The object of the invention is to facilitate the capture of fish by traps. To this end the inventors employ a movable lead with novel devices for securing one end thereof. Between this movable lead and the stationary or main lead of the trap the fish are impounded, so that they are forced along the main or stationary lead into the pot or crib of the trap.

DEVICE FOR DISINFECTING TRANSMITTERS AND RECEIVERS OF TELEPHONES.—CYRUS F. AXTELL, Manhattan, New York city. The necessity for the application of some efficient and simple means of disinfecting the receivers and transmitters of telephones has long been recognized. The present invention provides means for accomplishing this much-desired end. The disinfecting agent employed by the inventor is ozone or ozonized air, the antiseptic properties of which are well known. The ozone necessary for the purpose is produced through the agency of a current of electricity generated by the "magneto" forming a part of all ordinary telephones, although the necessary current may be obtained from other sources.

BALE-TIE.—EDWARD T. WARN, Sterling, Ill. A wire has its ends formed with loops, one of which is bent forward and upward, and the other of which is bent forward and downward. The short ends of the loops are normally in contact with the main portion of the wire, but adapted to spring away therefrom. The construction is so simple and durable that the tie can be easily and cheaply manufactured. The ends of the tie safely interlock to hold the baled material in place.

TOP FOR POWDER, COLOGNE OR SAUCE BOTTLES.—JACOB A. MOLLER, JR., Brooklyn, New York city. In its upper portion this top has an opening in line with which is a washer. Below this upper washer is a lower washer having a registering opening. Through the opening in the top and between the two washers a slide has endwise movement. The slide has an opening adapted to register with the openings in the washers and in the top. The washers, between which the slide has movement, tend to clean the slide from any substance that may adhere. By removing the top, the various parts may be conveniently cleaned. By means of the top, the discharge of the material contained in the bottle can be readily regulated.

SORTING DEVICE.—JACOB PFEIFFER, Kaiserslautern, Bavaria, Germany. The invention provides a machine for separating flour from dust and from semolina. A series of superposed rotary disks or spreaders of a diameter increasing downwardly from disk to disk are employed, so that the material is subjected to a centrifugal action of progressively-increasing strength. A disk below the topmost disk is apertured centrally. Each of the disks flares downwardly to throw the material scattered by the spreaders upon the next spreader below. A ventilator forces an upward current of air through the apertured disk or disks and between the peripheries of the disks and their surrounding rings. An upwardly-flaring, annular deflector extends from the upper contracted edge of the uppermost ring.

BOLT AND NUT LOCK—WILLIAM H. PARDEE, Antigo, and JAMES H. MORGAN, Rhinelander, Wis. The bolt has a reduced portion and an elongated head. The nut has an inner thread. A threaded sleeve screws in the nut and has an elongated bore for the passage of the head, a reduced portion, and also an elongated recess at the outer end at an angle to the bore for engagement by the head, so that the sleeve is held from turning in the nut when the latter is turned.

PRACTICE-BALL.—FRANCIS OAKELY, Newport, R. I. The inventor has devised a ball to be used by baseball players in practising. Externally the ball is similar to the ordinary baseball. The ball, however, is provided with an elastic cord which may be attached to the wrist of the player, so that the ball, when thrown, will be returned to the hand.

ANVIL.—NELSON H. SNYDER, Newton, N. J. This anvil is especially adapted for horseshoers or blacksmiths, and is so made that all horseshoe work can be done without requiring the constant movement of the smith to and from the ends of the anvil. Extended bearing surfaces are provided flush with the upper face of the body of the anvil, which extended bearing surfaces are especially useful when working upon axles and when forming the toe and side clips of horseshoes.

TARGET.—WILLIAM G. SMITH, Glendale, Queens, New York city. Mr. Smith has invented a target representing pigeons in flight, which target can, therefore, be used to take the place of the live pigeons usually employed by sportsmen in trials of marksmanship. In order to give the trial the appearance of real bird-shooting, the target carries a cartridge which, when discharged, causes feathers to fly. The bird not only drops as in death, but the feathers fall as the bird falls.

WOVEN PILE FABRIC.—HOVCEP SARAFIAN, Titusville, Pa. The invention provides a pile fabric which has a fine appearance and excellent wearing qualities, and which can be readily woven without requiring highly skilled labor. Warp-threads and pile weft-threads comprise the fabric. Each of the weft-threads consists of a strip formed of fringe-threads, at the center of the length of which, binding-threads are interwoven. The strip is folded and the parts are secured together to form a strip with a woven back, from which all the fringe-threads extend in one direction.

SUSPENDING ATTACHMENT FOR MANTLES.—WARREN D. HANN, 132 Arch Street. Philadelphia, Pa. The means of suspending incandescent mantles of Welsbach lights have not prevented injury and destruction during transportation. To remedy the evil, a suspending attachment is described in this patent, which consists of an asbestos device made of such length and so attached to the ordinary rigid loop of the mantle and to the hook of the ordinary rigid wire or rod support as to be free to swing laterally in all directions and to allow corresponding movement of the top portion of the mantle.

TESTER FOR BLAST-CAVITIES.—WILLIAM GIBBONEY, JR., Bane, Va. Mr. Gibboney has invented a tester for ascertaining the size of the preliminary blast-cavity usually employed in blasting rocks for railroad and other construction, so that if not large enough it may be enlarged by additional cartridges of dynamite, or if already larger than desired, it may be sufficiently filled with powder to produce the proper lifting and dislodging effect on the rock without waste of powder. Thus the difficulties of enlarging the lower end of a drilled hole—"springing the hole," as it is usually called—are overcome.

CONVERTIBLE TUB.—MRS. N. F. HURDEL, Manhattan, New York city. The tub is so constructed that it can be used either as a bath-tub or as a laundry-tub. When the bath-tub is to be used as a laundry-tub, a partition is inserted which divides the tub into two compartments. By means of a pivoted spigot hot or cold water can be directed into either compartment. In order that the tub can be raised from the low position of a bath-tub to the raised position of a laundry-tub, or *vice versa*, a simple form of gearing is provided which can be easily operated by a small handwheel.

Designs.

BELT.—LOUIS SANDERS, Brooklyn, New York city. The upper central marginal portion of the belt is a concaved line, gradually merging into convex lines extending to the edges of the belt. The ends of the belt incline from the top downward and outward, and the width of the belt at the ends is greater than at any other portion.

BOX FOR HYPODERMIC NEEDLES.—FAIRLEIGH S. DICKINSON, Bayonne, N. J. The design provides a tray body and a large bridge within the tray body. In the bridge are a series of elongated openings for the reception of the needles.

SKIRT-SUPPORTER.—WILHELMINA MCW. LOWRIE, Buffalo, N. Y. The design shows a very simple and efficient skirt-supporter, comprising a triple-hooked head from which an apertured shank springs.

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.

NEW BOOKS, ETC.

THE PROCESS YEAR-BOOK FOR 1900. Edited by William Gamble. London: Penrose & Company. New York: Tennant & Ward. 1900. 8vo. Pp. 111. $1.50.

Penrose's pictorial annual, of which the present is the sixth volume, is illustrated as usual with a most elaborate series of engravings and plates which show the wonderful possibilities of the half-tone, especially the three-color process. Some of the latter are not very successful. The literary contents are thoroughly up to the usual high standard. The interior views of some of the large German process establishments are very interesting.

TECHNOLOGISCHES LEXIKON. Handbuch fuer alle Industrien und Gewerbe. Uebersicht der gesammten Technologie der Jetztzeit, zum Gebrauche fuer Techniker, Chemiker, Gewerbetreibende, Kaufleute u. s. w. Unter Mitwirkung von Fachgenossen redigirt von Louis Edgar Andes. Illustrated. Parts 11 to 15. Vienna: A. Hartleben. 1900. Post octavo. Price per part 20 cents.

TASCHENBUCH DER DEUTSCHEN UND DER FREMDEN KRIEGSFLOTTEN, 1901. Herausgegeben von B. Weyer, Kapitänleutnant a. D. München: Verlag von J. F. Lehman. 1901. Illustrated. 12mo. Pp. 273. Price 75 cents.

Capt. Weyer has compiled a handbook which presents in the most concise form conceivable everything that is worth knowing about the sea power of the countries of the world. A careful examination of the book convinces us that its information is as trustworthy as that conveyed by any of the more pretentious naval annuals, with the additional merit of being much briefer. The paragraph on page 92, in which the possibilities of a war with the United States—for that, we take it, is the country referred to by the writer—growing out of commercial jealousy, is too preposterous to warrant insertion. Moreover, the argument might as readily be used by an American against Germany.

HANDBUCH DER INGENIEURWISSENSCHAFTEN. Dritter Band. Dritte vermehrte Auflage. Herausgegeben von L. Franzius, A. Frühling, H. Garbe, J. Schlichting, und Ed. Sonne. Dritte Abteilung. Erste Lieferung. Leipzig: Wilhelm Engelman. 1900. Large octavo. Pp. 352. Price, paper, $5.

The third part of the third volume of this admirable handbook is devoted to exhaustive dissertations on the ocean and navigation; the effect of the sea on coasts; shore structures: the effect of the sea on estuaries, and seaharbors. The text is illustrated by many clear engravings. In the back of the book will be found fourteen handsome plates.

DER HAUSFREUND. Illustrirter Familien-Kalender fuer das Jahr 1901. Buffalo: Published by the Volksfreund.

SURVIVALS. A Book of Poems. By Lewis V. F. Randolph. Embellished by Bryson Burroughs. New York and London: G. P. Putnam's Sons. 1900.

Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters or no attention will be paid thereto. This is for our information and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.

Buyers wishing to purchase any article not advertised in our columns will be furnished with addresses of houses manufacturing or carrying the same.

Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.

Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Books referred to promptly supplied on receipt of price.

Minerals sent for examination should be distinctly marked or labeled.

(8067) C. A. C. writes: I want to make a coil for a jump spark suitable for a gasoline engine. Can you give me any information in regard to it? A. Supplement No. 1281, price 10 cents, contains an article upon gas engine ignition. A description of a jump spark coil is given therein which can be made from the description if you understand the general method of doing such work.

(8068) F. L. asks: Does water, when converted into vapor, obey Avogadro's law, and expand so as to equal to the sum of two volumes of hydrogen and one volume of oxygen of which it is composed? A. Water obeys Avogadro's law when in the form of vapor, just as any other vapor does, but its volume is not that of two volumes of hydrogen and one of oxygen. When two volumes of hydrogen and one of oxygen combine to form water, they furnish two volumes of water vapor. There is a shrinkage of one-third in the result. See any good chemistry, such as Remsen's, price $1.25.

(8069) C. F. De W. writes: What is meant by expansion engines? Also what is meant by high and low pressure engines? If a condensing engine is a low pressure engine, why is it so? A. An expansion engine is any engine in which the steam at full pressure does not follow the piston for the whole stroke, but is cut off at some specified point, allowing the steam to drive the piston to the end of the stroke under a decreasing pressure. "Low pressure engine" is the old name for a condensing engine. High pressure engine is the usual designation of a non-condensing engine running with high pressure. The early low pressure engine used steam at from 7 to 10 pounds pressure and depended upon a vacuum and condenser to add to its work.

(8070) W. G. writes: Kindly state how much voltage is needed to run the motor described in your issue of December 8 last; also state if No. 22 wire will answer just as well to wind the armature as No. 21, which I cannot get? A. The diagram of the motor and its connections shown in the issue of December 15 gives a battery of four cells, two in series and two series in multiple for running the motor. This indicates not more than four volts as needed. No. 22 wire will answer for winding the motor.

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FEBRUARY 12, 1901,

AND EACH BEARING THAT DATE.

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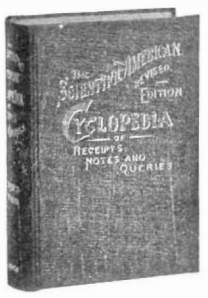

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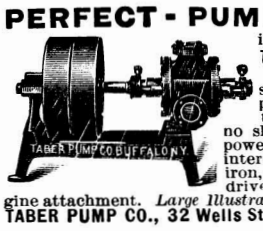

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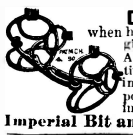

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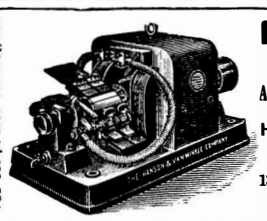

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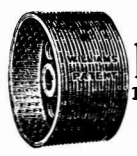

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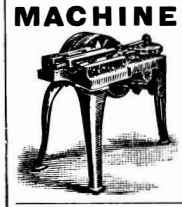

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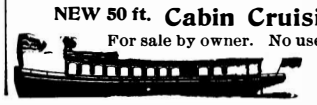

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