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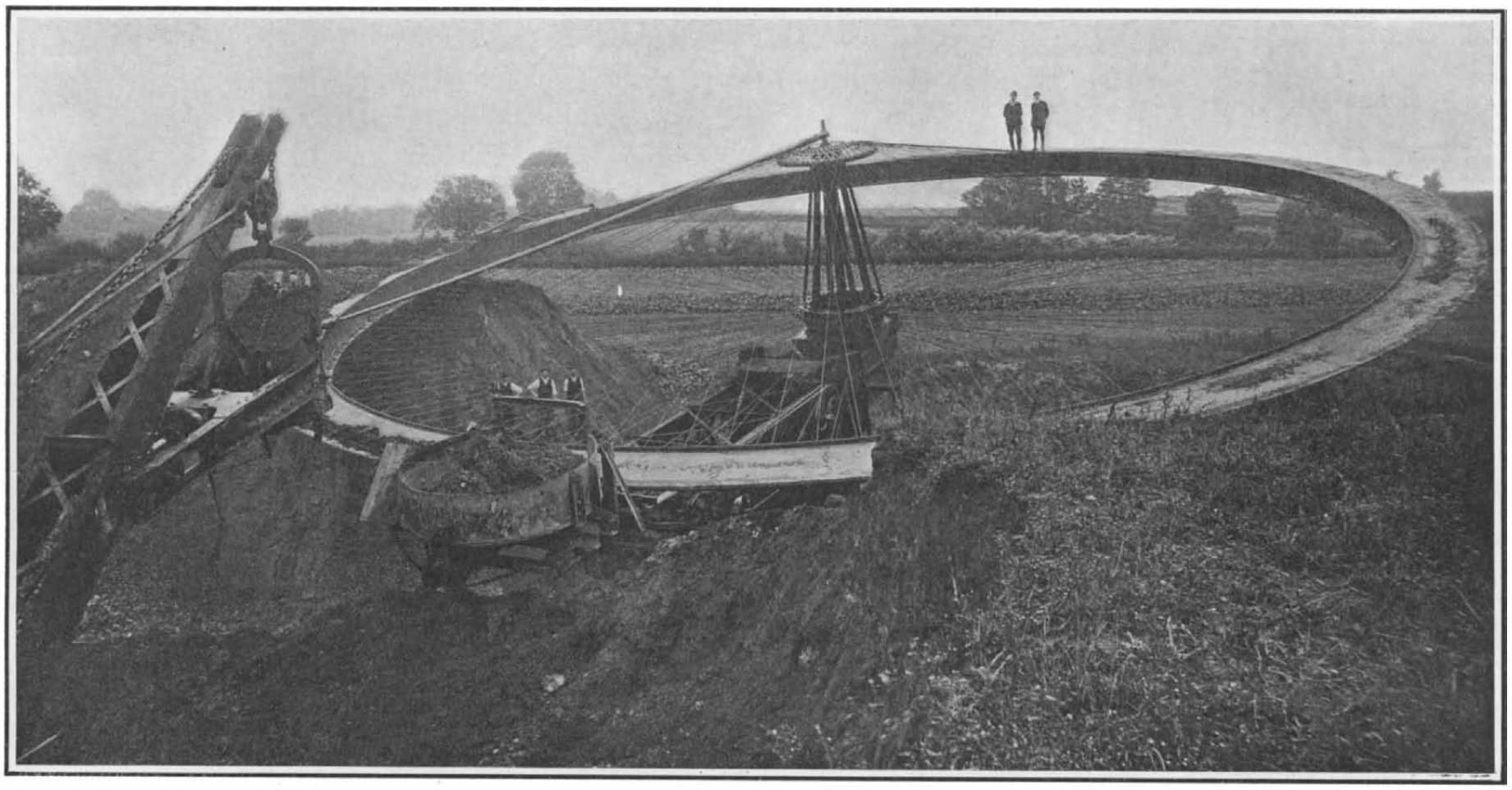
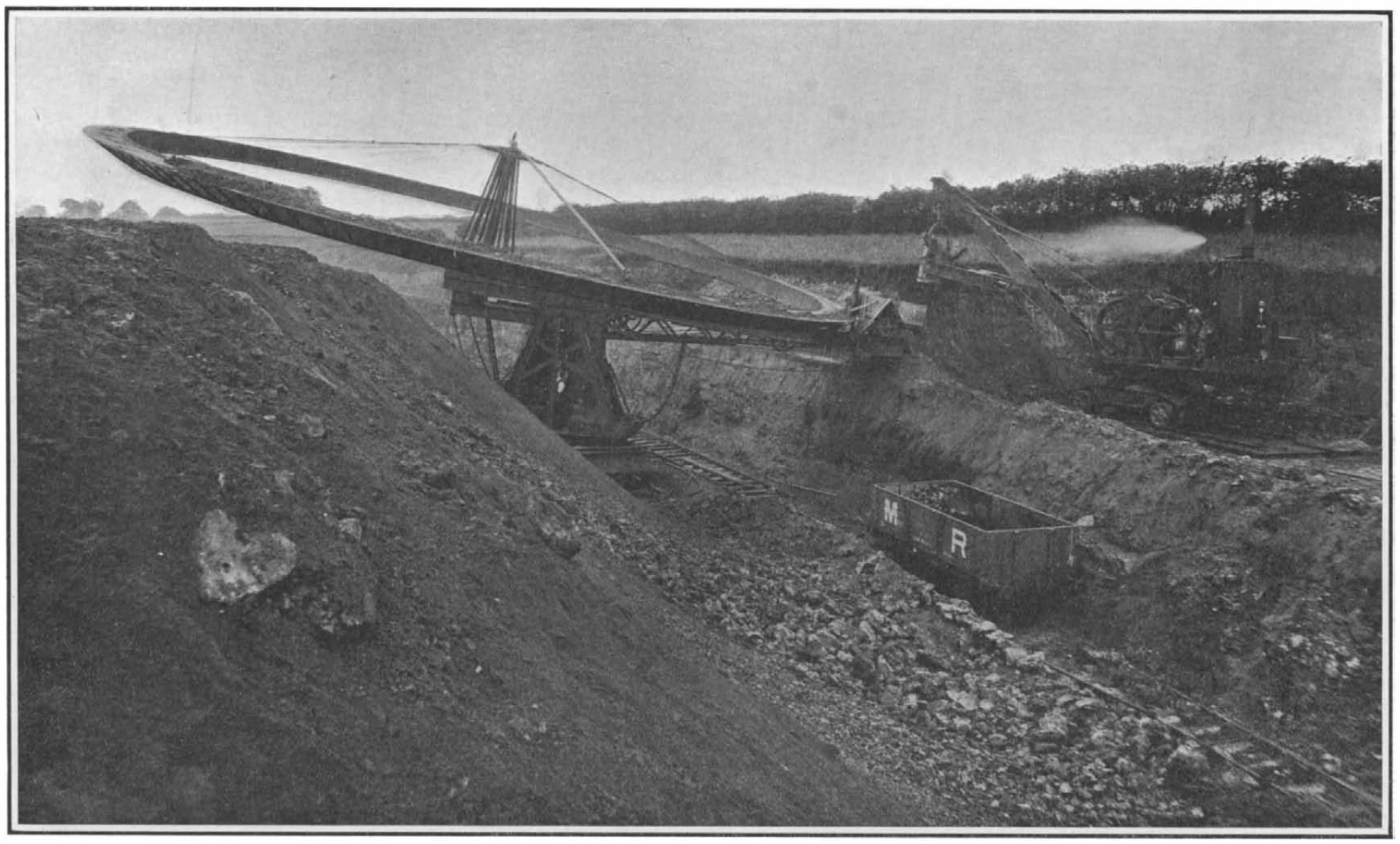


Top view of rotary conveyer, showing table of wheel and special revolving hopper for charging.



Side view of the rotary conveyer. The conveyer is traveling from the observer.

A NOVEL TYPE OF ROTARY CONVEYER.—[See page 90.]

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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.

BLERIOT'S CHANNEL FLIGHT.

History is making fast, these days, in the world of aeronautics, and the dramatic flight of Bleriot across the English Channel has set a milestone of progress which must forever be memorable. No one, surely, would be so unjust as to belittle this great performance by reference to earlier and longer flights over the land. In point of risk and daring, that bold, early morning dash across the Channel stands in a class by itself. Quite apart from its spectacular features, there are serious reasons, well understood by the aeronaut, why a flight across a twenty-mile arm of the sea, edged on either side by cliffs hundreds of feet in height, is a more hazardous undertaking than a flight in a closed circle over chosen ground, or even a straight-away dash across country, between starting and alighting places which have been already selected. In a land flight the aeroplane rises gradually from the ground; the height at which the aeronaut will travel is a matter of choice; and it may be attained by gradual ascent. So also in landing, the descent is a matter of gradual control. In the cross-Channel flight, however, the aeroplanist, immediately after the start, must launch himself out from cliffs several hundred feet high, and find the distance between himself and the earth's surface increased suddenly by that amount. Should his motor fail during the twenty-one-mile stretch of the course, he must forthwith make a swift swoop into the sea, where, in spite of the fact that Latham has twice been rescued, the chances of disaster are very great indeed. The speed of the aeroplane is so much greater than that of an attendant torpedo boat, that the latter is quickly left behind; and when the aeroplane is once in the water, it is merely a question of the flooding of the hollow wings and central body, before the weight of the motor, tanks, and chassis, to say nothing of the operator, will submerge the whole machine.

The Wright brothers have described in a paper before one of the technical societies the great agitation of the lower strata of the air caused by the uneven surface of the ground, where trees, hills, buildings, and other obstructions cause the air in contact with it, should a wind be blowing, to roll in billows and swirl in eddies, in much the same way as the waves break on the shore, or as water is thrown into commotion when flowing in a cataract over a rocky river bed. Bleriot encountered these atmospheric billows as he passed from sea to shore above the lofty cliffs of Dover, where his machine was described as having been driven violently from its true line of flight.

The fact that the first machine to cross the Channel was a monoplane has raised the prestige of that type. Throughout his experimental work Bleriot has made almost exclusive use of the monoplane; and although recently he has done some work, we believe, with the biplane, the fact that he selected his favorite machine for the great venture would seem to indicate that he considers it, at least at the present stage, superior to a multi-plane flier. On the other hand, it should be remembered that the other notable success of this memorable week in the history of aviation, when a flight of 1 hour, 12 minutes. 36 seconds with a passenger, and a speed test of 10 miles across country, were made by Orville Wright in the government tests at Fort Myer, was achieved with that biplane type of machine with which the brothers ushered in the era of practical aeroplane flight.

GRANDEUR OF THE HUDSON-FULTON NAVAL PARADE.

Of the many imposing pageants that will lend interest and dignity to the Hudson-Fulton Celebration, the most notable will be the great naval parade with which the week of festivities will open. It is difficult to say whether this stately procession will be richer in historical or in contemporary interest. The presence in the van of that stately column of the "Half Moon" and the "Clermont," absolute replicas, as they are, of the quaint little sailing craft of Hudson and of Fulton's epoch-making steamboat, will in itself form an attraction that should prove sufficient to draw hundreds of thousands of patriotic lovers of their country's history to the shores of the Hudson River. Yet without disparaging the rich historic interest of these two vessels, it is certain that the spectacular, we had almost said dramatic, element of the naval parade will be furnished by the vast assemblage of modern warships, which, gathered from every naval country of importance in the world, will follow in the lead of the two vessels of 1609 and 1807.

So successful have been the efforts to make the military features of the naval parade worthy of the occasion, that it is now certain the fleet of warships will be the largest, if we except the rendezvous of British ships in the English Channel, that has ever been gathered together. Including the foreign representatives, there will be eighty war vessels; and of these, fifty-three will fly the flag of the United States. The dominant feature in the United States fleet will be the sixteen battleships which last year made the circuit of the world. It is to be hoped that among the battleships will be the "South Carolina" and "Michigan," the first vessels of the "Dreadnought" type to be built for the United States navy. An effort should certainly be made to place these vessels at the head of the naval section. The other battleships of the fleet will possess special interest from the fact that they will appear with the curious latticework or "basket" masts, with which the ships of the North Atlantic squadron have now been equipped. The fleet will come down from the rendezvous off Provincetown, Cape Cod, where it is now engaged in the summer maneuvers, and every ship will be in the very pink of condition and tuned up to the highest pitch of excellency in training and equipment. As the crowds look upon this stately line of battleships, they will be able to more fully appreciate the enthusiasm which it awakened in the various ports throughout the world at which a call was made. Following the battleships will be three of the latest armored cruisers, vessels 500 feet in length and of 22 knots speed; the three scout cruisers, of the speed trials of which so much has lately been said and written, the fastest of which are good for 25 and 26 knots maximum speed. The torpedo-boat division will contain twelve torpedo boats and four submarines. Associated with these will be the two cruisers, "Dixie" and "Castine," whose duty it is to act as "mother" ships to the small craft. The rest of the naval fleet will be made up of the tender "Yankee"; two supply ships, "Celtic" and "Culgoa"; the repair ship "Panther," fitted internally with forges and a complete machine shop; besides seven colliers and a tug and torpedo vessel. The total number of ships in the fleet, as given above, is fifty-three, and it is possible that certain auxiliaries will be added before the final list is made up.

Not only will this be the largest collection of war vessels ever assembled on this side of the Atlantic, but it will be the largest fleet of an international character that has yet been gathered either here or in Europe. England will be represented by four armored cruisers, the "Drake," which it will be remembered was the flagship of the Atlantic squadron which visited this country a few years ago under Prince Louis of Battenberg; the "Duke of Edinburgh" and the "Black Prince," two of the latest of the pre-"Dreadnought" armored cruisers; and the "Argyll," a smaller armored cruiser of earlier date. This squadron will be under the command of Rear Admiral Hamilton. The German government has notified the Department that it will send a squadron, probably of four vessels, under the command of the ranking officer of the German navy, Admiral Von Kaister. This squadron will probably include the four powerful and modern cruisers of the "Scharnhorst" and "Roon" classes, and they will afford visitors to the celebration an opportunity to see some of the latest German cruisers prior to the introduction of the "Dreadnought" type. France will send a squadron of battleships under an admiral of the navy. The flag of Italy will fly from the cruiser "Etruria" and her cadet ship "Aetna." The Netherlands will send the cruiser "Utrecht" (a part of whose crew will man the "Half Moon"), and probably two or three other war vessels. It is also expected that South America will be represented by five warships; and Japan, although she will have no vessels in the parade, will send a member of the Royal House, Prince Kunihiko of Kuni, to act as the official representative of that country.

LEFFERT LEFFERTS BUCK.

The sudden death from apoplexy at his home in Hastings-on-Hudson, N. Y., on July 17th of Leffert Lefferts Buck has removed one more of the race of bridge engineers who by their work during the past few decades have made America famous as the country of long-span bridges. Mr. Buck who was best known in this city as a former chief engineer of the Bridge Department, New York, was born in Canton, New York, in 1837. His early schooling was received in the Canton Academy, which he left before the completion of the course to serve an apprenticeship as a machinist. In 1859 he entered St. Lawrence University, but at the outbreak of the war, two years later, enlisted as a private in the 60th New York Volunteers. After serving through the war he was mustered out in 1865 with the rank of captain. He then entered the Rensselaer Polytechnic Institute from which he graduated in 1868. The early years of his engineering practice included some notable work in Peru, where he was connected with the construction of the famous Verugas Viaduct on the Lima & Oroya Railroad. In later years he replaced this bridge with a cantilever structure. He also built a suspension bridge over the Santa River in northern Peru. After his return to the United States in 1873 Mr. Buck entered the Mechanical Department of the Illinois Central Railroad. One of the works with which his name will always be honorably associated was the rebuilding of the International Suspension Bridge at Niagara Falls. First reinforcing the anchorages, he gradually rebuilt the suspended structure and replaced the stone piers with steel towers, the whole of the work being done without interruption of the traffic. In 1881 he became resident engineer of the Central Railroad of New Jersey, and his work at this period includes the construction of a number of truss bridges of the Northern Pacific Railroad and large bridge across the Willamette River in Oregon. Two of his finest structures are the steel arch which took the place of the old Clifton suspension bridge at Niagara and the steel arch railroad bridge across the river at the head of the Whirlpool Rapids. In 1895 he was made chief engineer of the Bridge Department, and became responsible for the construction of the Williamsburg Bridge, the longest suspension bridge in existence. Mr. Buck was a member and director of the American Society of Civil Engineers, a member of the Loyal Legion, of the Military Service Institute, of the Burns Society, and of the Engineers' and Century clubs.

AN ANTIQUE ENCYCLOPEDIA.

A quite recent record of the aggregate results of the investigation of papyri states that Berlin, through its fortunate acquisition of certain of these documents, has come to share a cherished precedence. A late number of the Sitzungs-Berichte of the Berlin Academy, speaking especially of the papyri in Germany. says: "First we had the Persians of Timotheos, then the Didymos commentaries on Demosthenes, together with many other fragments of Greek poetry and prose, and to-day we have a very remarkable text indeed. It is written on a leaf that formerly was wound around a mummy. It was unrolled from the body without receiving the slightest injury. Through the style of the letters used on it, it is traced to the second century B. C."

In the text mention is made in formal order of legislators, painters, sculptors, architects, and mechanics. Only the most prominent representatives of the professions and trades have been selected, and frequently the particular achievement is stated to which the representative owes his fame. Following these the seven wonders of the world, the largest islands, the highest mountains, the longest rivers and the most beautiful fountains are enumerated.

The text, which is concluded with these, is only an extract from a larger work which, in its turn, is based on the results of Alexandrine investigation. How fragmentary the transmission to us of these results formerly was is shown by the fact that not seldom we read mention of new texts and of new men. We are told, for instance, of a certain Phœnician, Abdaraxos, who is said to have produced the objects of mechanical art found in Alexandria, and of one Dorion who invented an engine of war that bore the appropriate name, The Ender of War.

The greatest significance of the new find lies in the fact that it answers the question, what men in antiquity were known as classics in their art, with new and authentic information.

According to press dispatches, an inventor named Frank Russak has devised a machine for the benefit of that large public eager to hire a book for a few hours' reading without the trouble of going to a circulating library. These machines are said to hold ten or twelve books, and display their titles so that they can be read without being removed from the case. This case opens only when a certain coin is inserted in the slot as the price of hire. Another coin is inserted in another slot as the price of the book, should the reader desire to keep it. The machines are to be distributed in hotels, trains, and seaside resorts, and wherever there is likely to be a demand for books to while away an hour or two.

ENGINEERING.

Some details have lately been made public of the instrumental work on the Gunnison tunnel, recently completed by the government, which will bring some 200,000 acres of land under cultivation. The tunnel from entrance to entrance is six miles in length. The survey lines at the point of meeting differed 0.32 foot in level, 0.04 foot in alignment, and 0.86 foot in distance.

For two years past, the Pittsburg & Lake Erie Railroad has been testing a car wheel that was designed by the chief engineer of the Carnegie Steel Company. Although the Pittsburg & Lake Erie Railroad carries an unusually heavy freight traffic, the wheel has stood up so well under the trying service that the company has announced that it will build a $3,000,000 plant at Homestead for the exclusive manufacture of the new wheel.

Rumor has it that another long step forward has been made in the art of armor plate manufacture. It is stated that the new plate, which is fabricated from a steel alloy, combines great toughness with extreme hardness of face, and that in a recent test a 6-inch plate stopped a 9-inch capped explosive shell. We doubt it; but if it was done, the new armor must be even more superior to Krupp armor than Krupp armor is to that made under the old Harvey patents.

During the month of June the total excavation on the Panama Canal was 2,895,793 cubic yards, which is slightly less than the total for the month of May. The mean rainfall was 11.85 inches for the month as compared with 9.82 inches in May. There were 366,998 cubic yards of material placed in the Gatun Dam, and 10,668 cubic yards of concrete were laid in the floor of the spillway.

The advantage of having the White Star Line steamers call at Holyhead was shown on a recent trip of the "Cedric," when mails and passengers were landed at 1:30 P. M. and reached London at 7:15 P. M. Those passengers who went on to Liverpool were not disembarked until 10 P. M., being detained by the state of the tide in the Mersey. The passengers who landed at Holyhead, therefore, reached London three hours before their fellow passengers were landed in Liverpool.

So rapid has been the extension of block signaling on the lines of the Pennsylvania Railroad Company, that they have established signal schools to train men specially for the signal service. Apprentices serve a three years' course. The first year is spent in mechanical work with the construction gangs; the second year in the office of the supervisor of signals; and the third year will be devoted to outside work on electric and other signal appliances.

Some idea of the scale of the Hudson-Fulton river parade may be had from the fact that over 800 vessels, big and little, are expected to take part in it. The Atlantic ports from New England to Norfolk have been drawn upon for reinforcements, and it is stated that not a single licensed passenger steamer remains unchartered for the opening day, September 25th.

Another shocking submarine disaster has happened, this time in the British navy. The cruiser "Bonaventure" was convoying a flotilla of eight submarines, when the cargo steamer "Eddystone" ran through the flotilla, ramming the submarine "C 11" and sending her to the bottom. Of the sixteen men in the submarine thirteen were drowned. A similar accident occurred a few years ago off Portsmouth, England, when a submarine was struck by an outbound liner, which, coming up from astern, ran over the craft and sent it to the bottom.

If Henry Hudson could have come back in the flesh last week and seen the "Half Moon," or rather a modern version of it, lifted bodily from the deck of a steamer by a floating derrick and lowered into the water, he would have realized what great strides have been taken in marine architecture during the three centuries which have elapsed since his tragic death in the waters of Hudson Bay. The "Half Moon" looked small even beside the navy yard tugs; and seafaring men, as they looked at the tiny craft, conceived a high respect for the courage of those early navigators in submitting themselves to the perils of long voyages over boisterous seas and along shores of which no chart existed.

Much has been said of late years about the ease with which a lock canal could be destroyed by the malicious use of dynamite or other high explosive. Engineering News calls attention to the fact that an attempt made in 1900 to wreck the Welland Canal in this way produced surprisingly small results. After two weeks' examination, the two men concerned selected lock 24, and each lowered a satchel containing dynamite and a fuse to the water behind the gate at each end of the lock. Both charges were exploded; but the dynamite failed to carry away the gates. Although the explosives blew a hole about a foot in diameter through each gate and loosened the hinges, the gates remained in position, holding back the water.

ELECTRICITY

The United Railways and Electric Company of Baltimore celebrated on July 26th the fiftieth anniversary of the inauguration of its street railway service. This company also started one of the earliest electric car lines in the country in 1885.

Canadian doctors having reported frequent cases of slight injury or strain to passengers alighting from electric cars, the Toronto Railway Company at the request of the Railway and Municipal Board has made some experiments with both two and three steps below the car platform level. The latter were found to project too far from the side of the car, but the two-step pattern has been adopted.

An electric rail grinder has been devised by the Albany & Hudson Railway for use in grinding the wing rails of frogs to insure smoother passage of car wheels. A motor is carried on an ordinary hand car, a sort of small barrow carrying the emery wheel being suspended from a crane overhanging the end of the car, and the operator supplying the necessary pressure upon the grinding wheel through the handles of the barrow.

A new use for the oscillograph is described by Mr. K. Simons, in the Elektrotechnische Zeitschrift, in the investigation of the oscillations which occur when switching off a continuous current in an inductionless circuit. A record is obtained photographically showing most clearly simultaneous variations of different amplitudes. It is suggested that a valuable application of the oscillograph to wireless telegraphy may be made in this way.

An additional advantage claimed for electric welding of rails is the reduction of corrugation of the surface by traffic and resultant noisy riding of the cars. Electric railways in Berlin, Hamburg, and Bremen claim that the welding of a strip of soft iron to the rail surface not only prevents the corrugation but actually reduces the noise due to corrugations already made, but the experiment is not old enough to prove whether the relief is permanent.

A curious accident occurred at the No. 3 power house of the Niagara Falls Hydraulic Power and Manufacturing Company on Sunday afternoon, July 25th, by which two employees were injured. The casing of one of the new 10,000-horse-power turbines burst and a large piece of casting was thrown across the station, which was partly flooded by the outrush of water. The turbine was under the normal head of about 165 feet of water, but had been tested to a much higher pressure.

The "boosters" of the town of Montgomery, Ala., have erected a monster electrically illuminated sign bearing the name of their community on the roof of a factory facing the railroad. The sign is 75 feet high and 85 feet long, lit by 2,600 lamps, and bears an immense key and the inscription "Montgomery, Your Opportunity," with a sky-rocket effect. The idea is to impress the name on thousands of passengers going by on the railroad and possibly ignorant even of the name of the town.

The advantages of lifting magnets for the handling of all kinds of loose material—piles of turnings and other scrap, castings of awkward shape, and rails, etc., requiring to be compactly bound in order to be handled by a crane—have won rapidly increasing recognition of late. Lifting magnets are in use at the immense new plant of the United States Steel Corporation at Gary, Ind., capable of lifting the entire top layer of a pile of 60-foot rails "lock section" (alternate rails inverted so as to hang together) with an aggregate weight of 15 tons.

The use of transformers as choking coils is suggested by Mr. J. D. Coates in a paper read before the Institution of Electrical Engineers (Brit.). He excites the core with direct current in addition to the alternating current and employs, to prevent alternating current being induced in the direct-current circuit, a second transformer inducing an E. M. F. in the direct-current circuit equal and opposite to that induced by the first transformer. Choking coils so made are used for the testing of single-phase and polyphase alternators.

Some interesting experiments are being conducted by the South Park commissioners of Chicago in the lighting of the boulevards under their control. Several different types of lamps have been installed on temporary posts in order to observe the comparative illuminating effect and determine how high the lamps should be hung and how far apart, and similar considerations. The lamps under test or about to be tested include incandescent gas lamps, inclosed arcs, magnetite arcs, flaming arcs, and incandescent tungsten lamps. The commissioners hope to obtain valuable data, both as regards illumination and economy, from these trials, the latter being an important factor, as it is estimated that 1,000,000 kilowatt hours per annum will be required for the lighting of Grant Park alone. The tests are under the supervision of Mr. J. A. Radford, consulting engineer to the commission.

SCIENCE.

Prof. William G. Anderson, director of the Yale gymnasium, is carrying on a series of experiments on the heart action of athletes. More than 600 experiments have been made for the object of determining which sports exert the most harmful effect upon the heart. Moreover, the effect of oxygen on the heart during exertion is also being carefully studied. A report is promised in October.

The French parliament has passed a law which provides that, in transactions relative to diamonds, pearls, and precious stones, the term "metric carat" may be employed to designate a weight of 200 milligrammes (3.086 grains Troy), and prohibits the use of the word carat to designate any other weight. As many other governments are ready to enter into the reform and unification of the carat and have only been awaiting the initiative of France, it is reasonably certain that the metric carat of 200 milligrammes will, within a few months, be the only carat recognized by law in the majority of countries interested in the trade in gems.

Doelter has published the results of experiments on the action of radium rays on the colors of precious stones, and those of dyed fabrics in atmospheres of oxygen and of nitrogen. The effect of hydrogen dioxide, ultra-violet rays, and elevation of temperature, on the color changes caused by radium was also studied. In these changes neither organic colors nor the rare earths played any considerable part, the oxides of iron, chromium, and manganese being, in all probability, the principal factors. The hypothesis that the colors, like those of rock salt, are due to traces of colloidal metals, which are ionized by the radium rays, appears worthy of consideration. Most mineral dyes, however, appear to be unstable, even the suboxides.

Modern military exercises are designed with a view of increasing the efficiency of the individual soldier. The same idea is carried out in the equipment. Gaudy uniforms have been replaced by dull and almost invisible tints of gray and khaki, and the weight of the gun and kit has been reduced for the sake of mobility and increased ammunition-carrying capacity. The art of utilizing natural cover and of maneuvering under cover is taught by long and varied practice. In the execution of these maneuvers crawling or creeping is usually necessary. To facilitate this movement Gustav Mueller of Stuttgart has invented and patented a device, consisting of wheels, rollers, or runners, attached to a frame or to tent poles, knapsacks or other suitable parts of the equipment. The utility of this invention remains to be proved by practical experience, but there can be no question of its novelty and originality.

A discovery of great interest has been made not long since at Pompeii, where the excavation work is being steadily carried on. Under the ash deposits there was found an extensive villa of a handsome construction and ornamented with very fine frescoes. The villa contains statues and other works of sculpture both Greek and Roman, besides very rich furniture which is well ornamented and also many vases of different kinds. There were also found coffers filled with gold and silver money. In the basement are great amphoræ which were used for storage purposes, and in the triclinium the tables were prepared for a banquet of thirty persons. An abundance of silverware is one of the features of the discovery, and it is said to be equal in weight and artistic character to the silverware discovered in the villa of Boscoreale and now possessed by the Louvre. Some of the silver pieces seem to have been taken out at a previous epoch, for there are traces of clandestine search which was made at a former date.

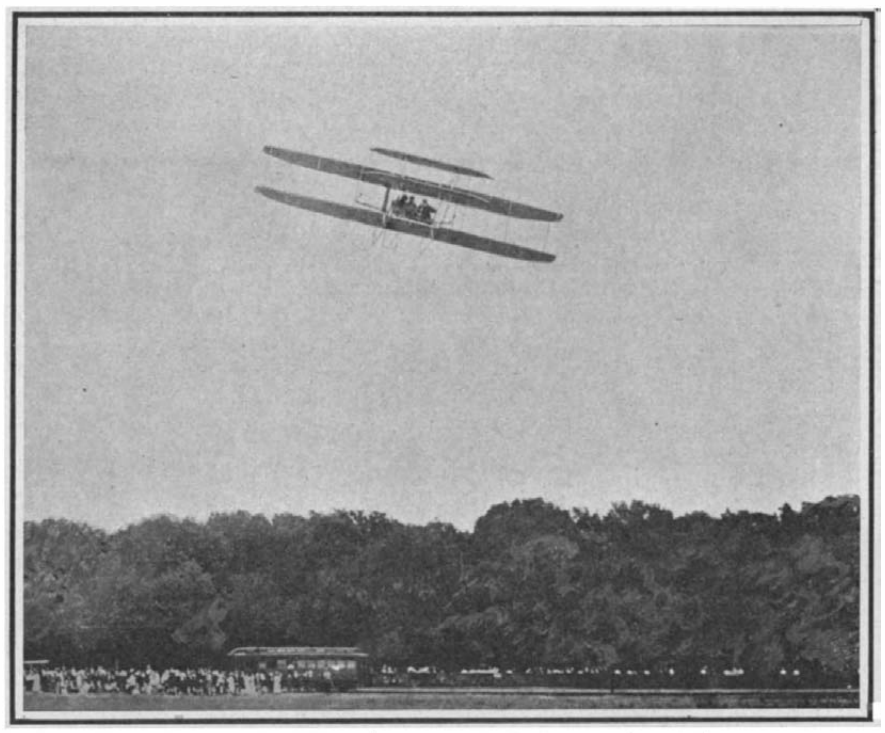
Neuberg has recently completed a comprehensive study of the changes produced in organic compounds by light. These compounds, in great variety, were employed in the form of 5 per cent aqueous solutions containing small quantities of uranium salts, which act as catalyzers, probably by absorbing the luminous rays and conveying their energy, in another form, to the surrounding medium. All of the solutions employed remained unaltered so long as they were kept in the dark, but exposure to light produced a great variety of changes in color and odor, and caused the formation of new chemical compounds, often within a few minutes. Alcohols were converted into aldehydes and acids were transformed into aldehydes or acetones containing an equal or smaller number of atoms of carbon. Cane sugar and other di-saccharides were inverted. Glucosides were hydrolyzed, or separated, with absorption of water, into the glucose base and the acid characteristic of each glucoside. Glycerides, or fats and oils, were partially saponified, and albuminoids were partially hydrolyzed. In general, chemically inert substances are converted by light into chemically active compounds, such as aldehydes and acetones. This fact may account for the therapeutic value of light baths in certain diseases.

ORVILLE WRIGHT'S RECORD FLIGHTS AT FORT MYER.

On Saturday, July 24th, Orville Wright, in continuing his practice flights for the performance of the government contract, made a flight of 20½ minutes. He made this flight preparatory to taking Lieut. Lahm as a passenger, but unfortunately, when descending, the aeroplane was caught by a sharp air current and twisted slightly, so that when it struck the ground one of the skids was broken. During this practice flight, Mr. Wright described very small circles and performed various difficult maneuvers in order that a cinematograph operator could take photographs. The flight began at 6:56 P. M., and was terminated at 7:16:30. There was a light breeze of about 6 miles an hour, and the aeroplane bobbed up and down considerably. It also tipped at an alarming angle when making the short turns.

On July 26th Orville Wright started the machine successfully without the aid of the falling weight. The machine was placed upon the rail and held in position. It gathered headway quickly as soon as it was released, but after running off the rail it skimmed along through the grass a considerable distance before it finally rose in the air. The start was made against a wind of some 15 to 18 miles an hour velocity. On the first round the machine did not rise more than 25 feet, but during the remaining two and one-half circuits of the parade ground it went up to three or four times this height, and the descent made in several long swoops, was quite thrilling. The flight was made specially for President Taft, who for the first time visited Fort Myer for the purpose of seeing an aeroplane fly. The War Department had announced that the endurance test would be made, and a crowd estimated at 10,000 people was present; but on account of the wind Orville Wright thought it best not to make the test, so he made the brief exhibition flight instead. The flight was also notable for the fact that it is the first time the Wrights have publicly demonstrated in their native land that their machine can rise from the starting rail under its own power, and also that it is capable of flying in a strong wind.

July 27th was the record-breaking day as far as the endurance flight with a passenger was concerned. At 6:36:40 P. M. Orville Wright and Lieut. Lahm started on what turned out to be the longest flight yet made by an aeroplane carrying two men. To fulfill the government contract, an hour's flight with two men was required. There was no breeze of any account blowing at the time the flight began, though during the course of it a breeze sprang up which at times caused the machine to bob up and down considerably. There had been a high wind all the afternoon, and just at its close there was a slight shower. Subsequent to this the wind died down, and it was decided to attempt a flight. As soon as the machine had been started by the falling weight, Orville Wright drove it to a good height and circled seventy-five times around the parade ground, which is about 4,000 feet in circumference. Some of these circuits were smaller than others, but their average was probably such that the machine traveled in all in the neighborhood of 50 miles at an average height of 75 feet. At the close of the seventieth round, which completed the hour in the air, there was great applause, waving of hats and handkerchiefs, and tooting of automobile horns. Also when Wilbur Wright's record of 1 hour, 9 minutes, and 45 seconds was broken, the latter ran out and cheered for his brother. Soon after this the machine gradually sank to a lower altitude, and finally alighted easily at the end of the seventy-fifth round. Orville Wright's previous best record with a passenger was 9 minutes and 6 seconds on September 12th, 1908, when he traveled about 5.88 miles with Major Squier as passenger. He had also made a 6-minute flight with Lieut. Lahm as passenger last September. It is therefore quite remarkable that he was able to soar aloft with Lieut. Lahm for the first time this year on a machine which is somewhat smaller than that used before, and to remain in the air nearly an hour and a quarter without mishap. The time of the flight was 1 hour, 12 minutes, and 36 seconds. The next day he hoped to complete the cross-country speed test to Alexandria, Va., and back, a distance of 5 miles each way, but owing to a strong wind and afterward to a balky motor, due, it seems, to a stoppage in the gasoline feed pipe, no flight was attempted. Nor was it possible to make a flight on July 29th; for after the wind had died out at Fort Myer, and when he was about to start, word was received from Alexandria that a very strong wind was blowing, and so it was not thought best to attempt the flight.



ORVILLE WRIGHT AND LIEUT. LAHM FLYING IN THE GOVERNMENT ENDURANCE TEST AT FORT MYER, VA., ON JULY 27TH.

Late in the afternoon of Friday, July 30th, Orville Wright accomplished a flight such as had never been made before by any aviator—a flight which gives without question to him and his brother the title of premier aviators of the world. This was the 10-mile speed test across rough, wooded, and broken country to Alexandria, Va., and back. The flight was made with a strong westerly wind blowing across the course. The wind carried the machine out of the direct line which

(*Concluded on page 99.*)

THE FIRST SUCCESSFUL CROSS-CHANNEL FLIGHT.

Six days after the first attempt at flying across the English Channel was made by Hubert Latham, M. Louis Bleriot, who had brought his "No. XI." monoplane from Paris to Calais especially for the purpose, made a successful flight and landed on the English shore. The "Antoinette IV." monoplane used by Latham was so badly damaged when being pulled aboard the torpedo-boat destroyer and transported to the shore, that a complete new machine—"Antoinette VII."—was brought on from Paris and was in readiness whenever this aviator should make a second attempt. On Sunday, July 25th, M. Bleriot arose at 3 A. M. As the weather conditions seemed favorable, he examined his machine, started the motor, and, shortly after 4 A. M., made a fifteen-minute trial flight, circling for 9½ miles around Calais and its environs and landing upon the cliff from which he was to start. Everything worked perfectly and consequently, as soon as the sun had risen, he immediately climbed into his seat, had the motor started, and, speeding it to the limit, shot up over the telegraph wires and started off over the strait, heading directly for the English shore. The start occurred at 4.35 A. M. The air was clear and a southwest breeze was blowing. The torpedo-boat destroyer "Escopette" was several miles out in the Channel, headed for England also. As soon as the captain saw Bleriot coming, he put on full speed, but was soon overtaken and passed by the fast-flying mechanical bird. Ten minutes after leaving the French coast the monoplane was out of sight. After passing the torpedo boat, Bleriot flew for ten minutes without steering to right or left. There was nothing to go by and flying at a forty-mile clip without compass or any other guide must indeed have been a thrilling sensation. After about ten minutes of such flight the English shore came into the view of the intrepid aviator. He recognized that the strong southwest wind of about twenty miles an hour velocity had carried him to the eastward. He was heading toward Deal. As soon as he found this out, he turned to the left, heading directly into the wind, and following the coast for two or three miles until, when within a mile or two of Dover, he turned into an opening between the cliffs. A strong wind caught him and swung him completely around, but he managed to make an abrupt descent upon suitable ground between the cliffs, where a fellow countryman was awaiting him and holding aloft the French flag. The running gear and propeller were damaged, but the aviator landed without hurt, although he dropped quite suddenly from a height of 65 feet. The news had been flashed to England that Bleriot was making the crossing and there were a considerable number of people on hand to witness him make the descent. He was given a great ovation and was taken by his friends to the hotel immediately. Mme. Bleriot arrived on the destroyer soon after and added her congratulations when met by her husband at the pier.

M. Latham overslept and was only awakened just after Bleriot had left France. He attempted to follow with his Antoinette monoplane, but the strong wind that sprang up soon after caused him to change his mind. He wired congratulations and said he hoped to follow soon.

Two days later he made a second attempt in the afternoon, and this time he succeeded in traveling to within two miles of the English shore,

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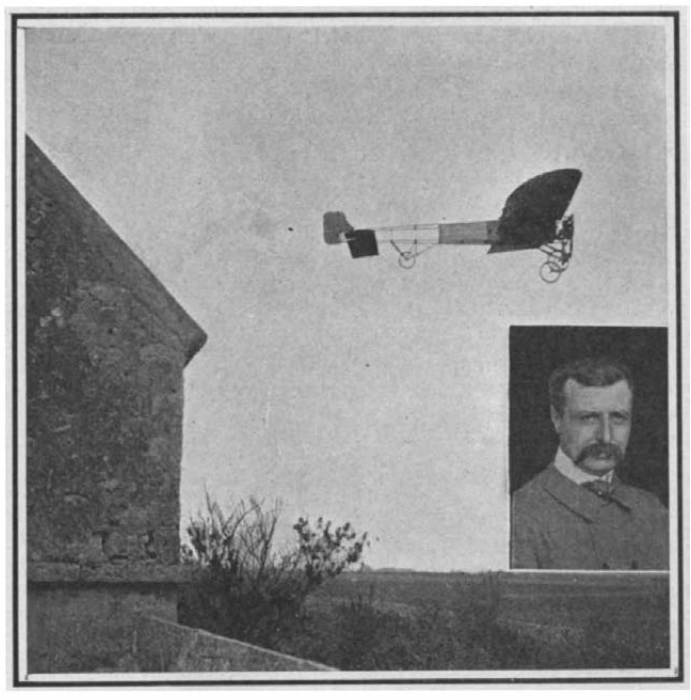


The No. XI. monoplane and M. Louis Bleriot, engineer, its designer, builder, and pilot.

The machine is shown in its ¾-hour cross-country flight of July 13th. It covered 25 miles with one intentional stop at an average speed of 35¾ miles an hour.

Rear view of the Bleriot XI. monoplane making its 25-mile cross-country flight.

This is the same machine which, 12 days later, on July 25th, accomplished the record-breaking feat of flying across the English Channel in 37 minutes.

LOUIS BLERIOT AND HIS FAMOUS NO. XI. MONOPLANE WHICH CARRIED HIM SAFELY ACROSS THE ENGLISH CHANNEL.

ELECTRIC LAMPS IN THE MAKING.

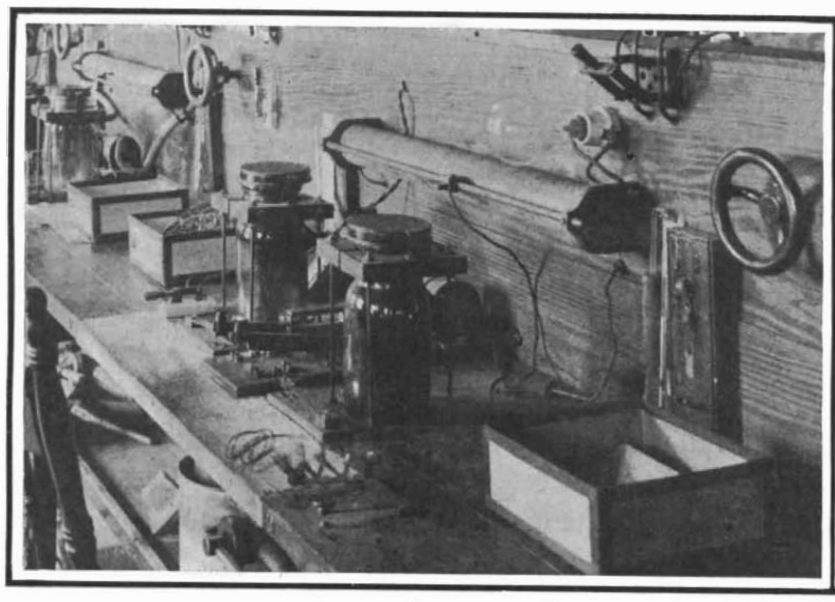
BY FREDERIC BLOUNT WARREN.

Very few persons out of the great number who are familiar with the many uses to which electricity may be put know how the bulbs are made. In the Philadelphia plant here illustrated and described, 7,000 lamps are turned out daily, and each lamp must be handled sixty-four times. Sixty-four handlings seem an incredible number for so small an article. Many of the handlings are relatively unimportant to the layman, and will be eliminated from this article.

First of all, no lamp manufacturer makes his own bulbs, since only about one-half or six-tenths of the glass product of a factory is of the requisite standard for bulb making. Fortunes have been spent to bring the lead glass standard up to this requirement.

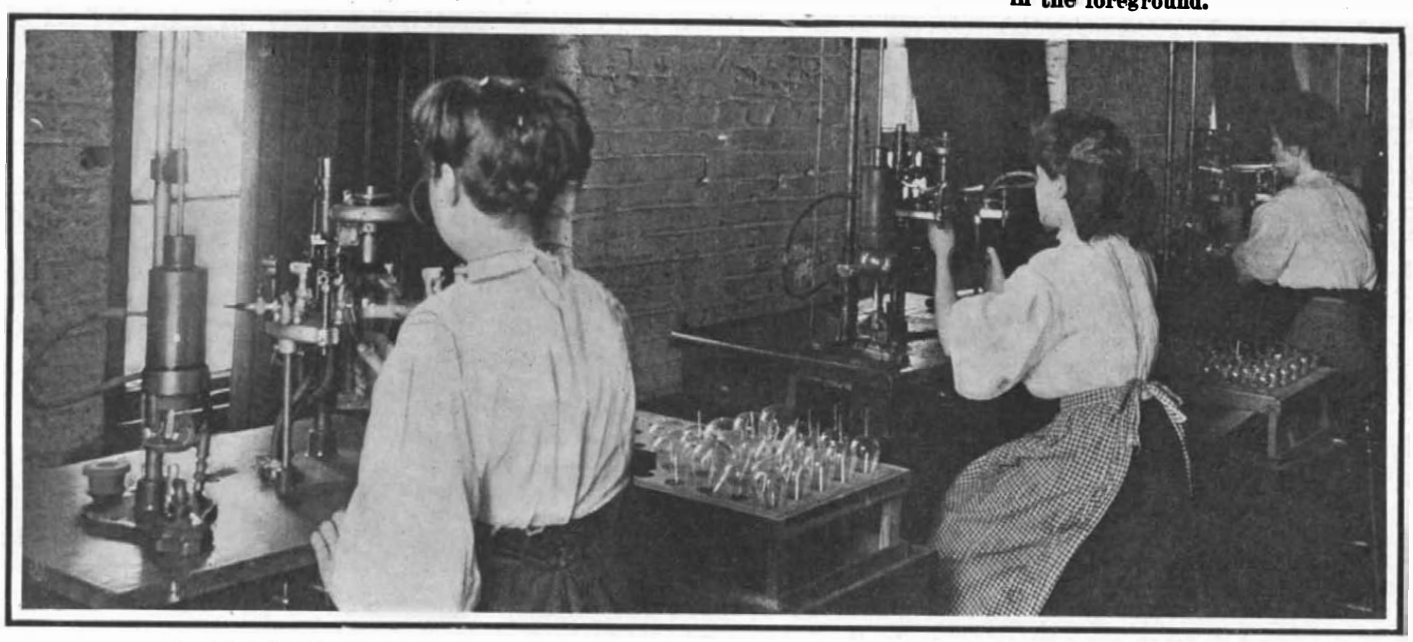
The bulb is first blown into a divided iron mold. When the "dip" or mass of nearly molten glass has been twirled a moment at the end of a tube, the operative inserts it into the mold, and gives the tube a puff of air until the glass bubble on the end fills out to the limit of the mold. An assistant reaches over and cuts the tube away from the now hardening bulb; the iron mold is divided, and the hardened glass bulb is thrown out. Its shape is about like that of a young leek or onion—much enlarged—and with the sprouts or stem nearly all cut away.

In all there are three glass parts that enter into the manufacture of a lamp. These are the bulb itself, the stem, and a top tubing through which the air in the bulb is extracted. When the air has been removed and the bulb sealed, this tubing is cut off with a jet of flame and thrown away. The parts are all made by the same formula; otherwise, when heated, they would not join together. Filaments of the type in general use are made from ordinary absorbent cotton, reduced by a chloride process to a thick liquid state. By this process the silicon in the cotton is removed, leaving a residue of cellulose, which is treated for carbonization. Under air pressure this liquid is squirted through a glass die, emerging in the form of thread or string. After this fiber has been passed through a number of hardening chemical baths, it is wound on spools for drying. When thoroughly dried, it is about as strong as a catgut violin string and is cut in desired lengths, ranging from 2½ to 7 mils. A mil is a unit used almost exclusively in electric wire measurement.

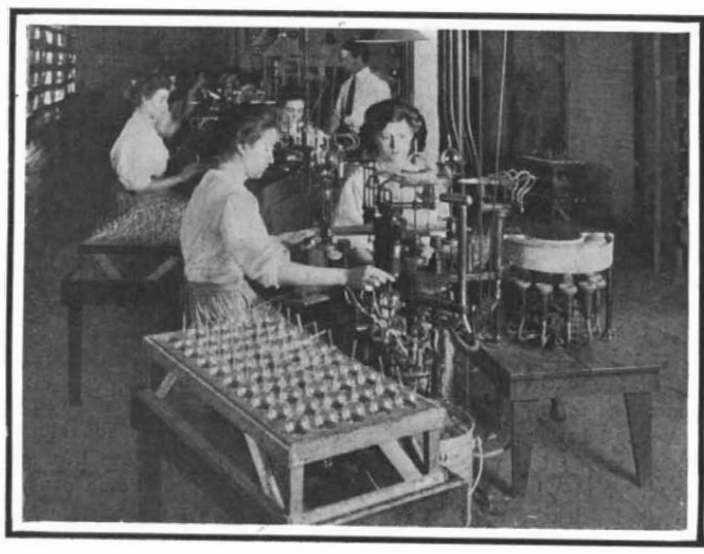


Treating machines for carbonization and equalization of filaments.

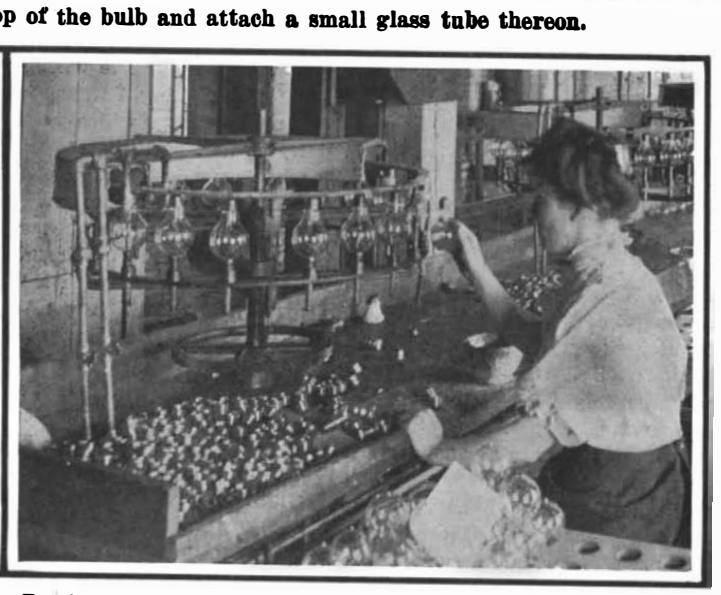
Pasting and straightening tables—straightening in the foreground.



The "tubulating" machines melt a hole in the top of the bulb and attach a small glass tube thereon.



Sealing the stems into the bulbs.



Placing the threaded brass collars on the necks of the bulbs.

ELECTRIC LAMPS IN THE MAKING.

The next step is to form the thread in the shape desired, there being several different-shaped carbons on the market. The one in general use is known as the oval-anchored filament. Formerly a pure black carbon was used on which to form and carbonize thread, but the more recent method is to use a compressed low temperature and then, after forming, to carbonize the thread. Carbonization requires high temperature, and when the thread comes out of the oven it is pure carbon, possessing a higher resistance than any other known carbon.

From the baking oven the carbons come out jet black and about two-thirds of their original length. On account of their shrinkage and uneven air pressure when being forced through the die—and from a liquid to a stringy state—the carbons are rarely, if ever, of equal diameter throughout their length. These weak spots are corrected by a process known as flashing or treating, the object of which is to make the carbons of uniform diameter and resistance throughout their length. It is not merely a question of filling up the cavities, as the provision of a uniform resistance in the carbon is of equal importance.

Carbons are treated in glass jars or vessels, electrically connected through the cover of the jars, through which a vacuum is drawn. When the vacuum has been produced, an electric current is turned through the carbons under test for the purpose of heating them. The temperature of the carbon is gradually increased until a pure carbon has been formed by the electrical vaporization of gas, derived from gasoline injected into the vessel. At this moment, when the filament under test is burning at a high temperature, the smallest parts of the filament are naturally glowing with the greatest heat. This attracts the newly-introduced carbon, which deposits itself in the parts of the filament possessing the greatest temperature. In this manner the cavities are filled out and the filament brought to an equal diameter throughout its length. When the filament under treatment shows the desired resistance, the current and gas flowing into the vessel are automatically cut off. After each filament has been tested and inspected it is passed on to the mounting department, where it meets a glass tube blown as a stem. This tube is flanged at one end and flattened at the other with a piece of platinum extending through the flattened end. To this platinum are joined two copper outleading wires. Platinum wire is the best material to which a filament can be attached, since it has a greater power of heat resistance than any other known metal. But platinum is very expensive. Its cost is seldom less than $27 an ounce, and it sometimes advances as high as $42.

The carbonized filament is next attached to the platinum ends of the wire, and then the stem with its wires and filaments is ready for insertion and sealing into the bulb. But before this sealing operation, the stems and their filaments are again "flashed" as a final test.

After the bulbs have been unpacked on their arrival at the lamp factory, they are washed internally with cold filtered water to remove the bluish cast which, from a cause unknown to lamp makers, comes in bulbs and must be eliminated before an undimmed light can be procured.

When the bulbs have been dried they are brought, in racks of fifty, to the tubulating machine, which first, by means of an air-driven jet of flame, melts a hole in the top of the bulb and, when this bulb has been set in another mechanical socket, drops a small tube through a magazine channel on the spot in the glass that was melted through. This tube and

(*Concluded on page 100.*)

A NOVEL TYPE OF ROTARY CONVEYER.

BY THE ENGLISH CORRESPONDENT OF THE SCIENTIFIC AMERICAN.

Various methods have been devised for the mechanical transportation of the top-soil or callow overlying iron from the excavating site to the dump. A belt or a tray conveyer is ordinarily employed. Unfortunately, the belt conveyer, while efficient, is somewhat expensive to install and its maintenance is costly, while the tray conveyer lacks sufficient capacity.

In order to overcome these deficiencies a novel type of transporter has been devised by an English engineer, Mr. A. R. Grossmith, of Kettering, Northampton. He has evolved a rotary type of conveyer, the general principles of which may be gathered from a reference to the front-page illustrations.

Prior to the adoption of this system the method was to drive a cutting through the ore bed, along which cutting railroad tracks were laid, so as to enable the ore to be dumped straight into the cars. The greatest difficulty experienced, however, was in the removal of the callow, which was invariably taken out by hand from one side of the cut, and transported by wheelbarrows running over temporarily laid planks to the opposite side, where the dump was formed. The adoption of large steam excavators, however, called for a more expeditious means of dealing with the spoil, and as the conveyer did not meet the situation to the best and most economical advantage the rotary system was invented.

As may be seen, the transporter itself comprises a huge wheel, 80 feet in diameter, built on the principle of a bicycle wheel. The rim is so designed as to offer a flat table on the horizontal face which measures 3 feet 6 inches in width, and which is made up of ⅛-inch steel plates. The vertical support on the inner side is also built up of ⅛-inch plate 2 feet in depth with a diagonal strut extending from the lower end of the outer face of the vertical member to the outer under edge of the horizontal table at frequent intervals around the periphery of the wheel, to insure the rigidity and strenght of the structure. In the center of the wheel is a light steelwork hub to which the rim is supported by 224 (112 top and 112 bottom) ⅝-inch steel wire radiating tension spokes disposed tangentially in precisely the same manner as in the ordinary bicycle wheel, these spokes being kept taut by means of eye bolts at the rim.

The lower extremity of the hub is carried on roller bearings. The mounting and balancing are such that the unloaded wheel, despite its weight and size, can be turned round by hand without effort. The wheel is mounted upon a substantial pedestal carrying the driving mechanism, which in turn is carried on a heavy-wheeled trolley, so that the whole machine can travel up and down the cut in either direction, as desired, upon an ordinary track. Moreover, the wheel can be rotated in either direction according to the forward or backward traveling motion of the machine.

Probably the two most important features of the plant are the loading and discharging facilities respectively. On the banks where the steam excavator works is a special form of mechanical hopper. This is circular in form and consists of four essential parts. A central annular disk, built up of mild steel plate ⅝ inch thick by 8 feet in diameter, forms the bottom. This is revolved by means of under bevel gearing. Around its outer periphery is fixed a vertical stationary steel guard 2 feet in height by ½ inch thick, completely inclosing the revolving section, except at that point opposite the annular table of the conveyer wheel, which is the discharge opening. There is another annular shield or ring, 3 feet 6 inches in diameter, disposed around the boss of the central hopper mounting. This ring is only 4 inches in height and is used to take the end thrust of the scraper, by means of which the material is shot on to the rotating transporter wheel. This scraper or plow has its outer extremity securely held by one end of the outer vertical wall of the hopper, and stretches diagonally across the revolving base plate so that its opposite end bears against the inner thrust ring. The plow is 6 inches in height. The hopper is mechanically driven from the mechanism of the transporter wheel, so that when the latter is stopped the revolution of the hopper is also brought to rest.

When the steam excavator bucket deposits its charge into the hopper the material is swung round by the revolving base until it comes into contact with the diagonal plow, which deflects the stream of ballast on to the transporter wheel, through the opening in the outer vertical wall of the hopper. Should a greater mass of material collect at this opening than the conveyer wheel can successfully handle, because the deflecting plow is only 6 inches in height it rides over the latter, is carried round again in the hopper, and is then shot out. Thus the hopper can maintain a steady, uniform feed onto the rotating conveyer wheel. Indeed, the uniformity of this discharge constitutes one of the most important features of the invention and is directly attributable to the design of the hopper, since its discharge can be adapted to the capacity of the conveyer to a nicety. By dumping the excavated material first into the hopper instead of straight on to the wheel, there is no disturbance of the load as the shock of the shovel dump is absorbed by the hopper and is not felt by the wheel owing to its flexibility and the fact that the rim is not connected at that end of the cantilever. Nor can any blocking ensue, such as, for instance, is often the case with the ordinary type of hopper, especially when dealing with wet clay.

Another equally important feature is the means of discharging the material from the revolving conveyer wheel at the desired spot. This comprises a small plow which can be easily and readily moved and placed in position at any point of the annular table, even to a point well beyond the diametrical position of the hopper or in excess of 180 degrees. The plow is mounted upon a carriage and stretches diagonally right across the width of the rim table. The top edge of the wheel rim is surmounted by a T-bar and there are a series of roller carriages arranged to run on it and to which the plow and a ⅜-inch wire control cord are attached. The inner point of the plow holds itself in position against this bar and cannot possibly move. An angle frame serves to keep the plow face rigid and at the angle a horizontal wheel runs on the T-bar, being kept there by the pressure of the ballast, and also serves to take the back thrust against the outer point of the plow. In order to prevent drag and to reduce friction the plow carriage is mounted on small wheels which engage with the surface of the revolving annular table of the conveyer. The control cord is supported by carriages mounted on hardened rollers engaging with the T-bar and may be varied in number as desired, but which insure the cord passing in a series of short tangents to the driving station. From this point either by paying out or winding in the cord the position of the plow can be set wherever desired, while the conveyer wheel is in operation. The conveyer in its revolution carries round with it the earth it has received from the charging hopper until it comes into contact with this scraper, which deflects the material off the table on to the spoil dump, and the simple means of varying the position of the discharging plow enables the spoil to be distributed evenly over a wide area. This is a most important consideration in many places, such as at Corby, since afterward the spoil dumps are reclaimed for agricultural purposes, which is an easy matter when the waste has been evenly distributed in such a manner as is possible by this means. The method of mounting the plow and the easy angle at which it is set serve to render it very efficient in its work, and the wear and tear upon the revolving table is practically *nil*. In fact, in one instance after the conveyer had been at work for six months continuously, handling from 400 to 500 cubic yards of sandy material per day, it was found that all the bloom had not been removed from the plates of which the table is built.

The large conveyer wheel is driven by a 1½-inch cotton rope which runs in a groove provided at the lower end of the vertical member of the rim table to which the spokes are attached. Owing to the absence of intricate mechanism, chains, rollers, idlers, and so forth, the power required to drive the installation is very small. The wheel, including the hub and platform, weighing 7 tons, is carried upon a horizontal cantilever arm which in turn is carried in trunnions. By means of these latter the arm, together with the wheel, can be raised and lowered to any desired level either to suit the excavator shovel or to permit railroad trains to pass beneath to and from the mines. The heavy pedestal frame upon which the whole is mounted is fitted with a turntable, a very convenient arrangement which permits the plant to enter narrow cuttings standing obliquely thereto, independent of the direction of travel. As the whole plant runs upon a three-wheel track it can be easily made to follow sideways in the track of the excavator as it eats its way into the hill, as well as follow it up and down the length of the cut. A small boiler and steam engine housed on the turntable provide the whole of the power for driving the hopper and wheel as well as propelling the conveyer along its track.

Simulated Disease Revealed by Electricity.

Some cases of apparent local paralysis are feigned or simulated. For example, long after a broken arm is healed, the patient may assert that he is unable to use the arm properly. It is then the duty of the physician to find whether a real paralysis exists, and where. Electrical energy may be compared to psychical energy, the battery to the brain, the wire to the nerve, and the electric bell, for example, to the member moved. A muscle contracts when a faradic current is applied to the corresponding nerve. If the muscle on the affected side of the body reacts as strongly as the corresponding muscle on the opposite side the partial paralysis is simulated. If the muscle on the wounded side reacts less strongly than its fellow there is a real disease of the nerve. Finally, if the muscle on the wounded side reacts more strongly than its fellow the seat of the paralysis is the central nervous system, the brain or the spinal cord.

Dr. Larat has devised an instrument which makes a graphical record of the muscular contraction. The curves thus obtained form important pieces of evidence in suits of damage for accident.

The Marblehead Race for Motor Boats.

The fifth Marblehead race, which has now become an annual function and bids fair to become considered the accepted Derby of the motor boat, took place on Saturday and Sunday, July 17th and 18th. There were twelve starters and only two failed to finish, one of which was unfortunately burned and sunk.

A start was made at 10:30 A. M. on the 17th from the pier of the Crescent Athletic Club at Bay Ridge in New York bay in perfect weather which continued throughout the run, being even calmer on Sunday and interrupted only by a slight squall that afternoon.

The "Kitcinque," built specially for the race and launched only four days before, was the largest and much the most powerful boat entered, having a 75-horse-power Sterling motor, while the "Josephine," which finished first, though an inch longer, has 4 inches less beam and only one-third of the power, being equipped with a 25-horse-power Jäger engine. The former was expected to beat all records for the course and bade fair to do so, being out of sight ahead of the second and third boats when they were hull down ahead of the rest of the fleet, and it was most unfortunate that she should have been so tragically lost, keen sympathy being felt for her owner and crew, who were fortunately rescued unhurt. The "Kitcinque" was off the Sow and Pigs lightship in Vineyard Sound when a stoppage of the gasoline pipe caused the engine to back-fire through the carbureter, setting fire to oil in the bilge. Efforts to smother the flame were fruitless, and the crew were compelled to abandon their vessel, some taking to the water and others to the small dinghy carried, which would only hold three, only just in time before the gasoline tank exploded. The "Josephine" was therefore the first boat to cross the line at Marblehead six hours after the burnt boat had been expected, at 6:36 P. M. on Sunday, her official time for the 285 miles run being 32 h. 1 m. 45 s. The second to arrive was the "Nimrod," the smallest boat entered, only 30 feet 2 inches long, with a 15-horse-power Atlantic engine, which received quite an ovation and has been highly commended, and would have been higher on the official list had she not lost an hour in putting in at Cottage City to replenish her gasoline supply. The "Elmo II," which finished seventh, was the official winner on time allowance, the latter being figured on a complicated proportion of engine power to measurement; she is 34 feet 2 inches long, 8 feet 9 inches beam, and has an 18-horse-power Standard motor, and her corrected time was 25 h. 24 m. 55 s. out of an elapsed time of 36 h. 32 m. 25 s.

The Current Supplement.

Perhaps the most distinguished physicist of our time is Prof. Svante Arrhenius. A splendid portrait of Arrhenius appears on the front page of the current SUPPLEMENT, No. 1753, and mention is made of his remarkable scientific work. Mr. Rufus P. Williams writes on an ancient duodecimal system. How a garden seat can be made is told by Mr. A. C. Horth. M. Kennett tells how electromagnets may be calculated. It is a well recognized fact that our present railway systems are very inadequate to the demands of modern traffic. Many railway men have studied the question of reform without finding a satisfactory solution. The latest proposition is that of the well-known Berlin publisher, August Scherl. Mr. Scherl's plan is fully described and illustrated in the current SUPPLEMENT. Lieut. John C. Soley writes on the Messina earthquake and the events preceding it. Everyone remembers the old-fashioned glass globe in which a few gold-fishes led a wretched existence. In its place we now use the aquarium, which is adapted to the conditions of piscine life, and which is an adornment to any room. Some ornamental fishes that can be kept in such an aquarium are enumerated and described by Berthold Koerting. Maria Parloa tells how fruit can be canned and preserved. Zeolites are a comparatively small group of silicates distinguished by the fact that they contain water as an essential constituent. That they play an important part in the economy of plants is pointed out by Prof. O. N. Witt.

A consular report dealing with the trade and commerce of Mozambique (Portugal), states that a light railway running from Matamba, in the Bay of Inhambane, to Inharrime, 50 miles to the southwest of that point, has been under contemplation for some few years past. This scheme, for which it is understood orders have now been placed for the rails and sleepers, is intended to develop the rich northern districts of Gaza, which are regarded as among the most valuable in the province. No work has yet been commenced, however, possibly because of a heavy rainy season.

Correspondence.

THE NUMBER OF OUR ANCESTORS.

To the Editor of the SCIENTIFIC AMERICAN:

My only excuse for asking you to give more space of your valuable paper to this question is that there still seems to exist a doubt as to the location of the fallacy in the proposition that x generations ago we each had 2^x ancestors; for, as Mr. Venning states, history probably justifies the conclusion that such a fallacy exists. As Mr. Eakin and Mr. Constable have shown, Mr. McCullough's contribution furnishes no solution to the problem. However, it contains a hint. Mr. Venning's calculation of the number of A's ancestors is based upon the assumption that the two members of every marriage among his progenitors have been totally unrelated. However, had some of these couples certain ancestors in common, a reduction in the number of A's ancestors would result. And looking from Mr. McCullough's point of view, which shows well the large number of descendants ordinarily following in several generations from one couple, we can easily imagine that the marriage of distant relatives occurs with unsuspected frequency.

Ithaca, N. Y. ROBERT KING.

HOW DOES A BIRD SOAR?

To the Editor of the SCIENTIFIC AMERICAN:

In regard to the question "How does a bird soar?" the writer has a theory which he has never seen in print.

Some writers claim that a soaring bird utilizes an ascending current of air which has been caused by some obstruction on the earth's surface in order to maintain a practically horizontal line of flight. The writer believes a bird creates (by the displacement of its body) a strong swell or upward pressure of air which does materially assist it in soaring flight.

Boatmen know that a swell is created off each side of a swift-moving boat. A certain distance back of this swell is a trough, and following a trough a breaker appears. A full, round bow will drive this swell nearly at right angles from the direction the boat is moving; a very sharp bow will send this swell away aft. These swells are all created by the displacement at the bow of the craft, and the direction of the swell will be governed by the shape of the bow and the speed of the boat. Water being a solid medium, a sudden displacement will cause a bulge in the water near the displacement, for it must follow the lines of least resistance, which in this case must be upward and outward.

A bird flying through the air must displace an area of air equal to its body. Air being an extremely elastic medium, an object like a bird's body (with a full breast and a hollow or concave surface in the body under the wing) passing through it will tend to compress the air and drive a large portion of it outwardly and upwardly practically at right angles to the line of flight. This compressed air will instantly expand largely in the direction in which it was driven by the displacement. The upward and outward expansion of this current will create practically the same swell in the air as the boat created on the surface of the water. Or there will be a high-pressure area under the wing seeking to expand in every direction. If the air above the wing is neutral and the air under the wing is compressed, say, two volumes in one, the expanding force upward will be ? pounds to the inch. If the concave surface of the wing fits the curvature of the swell, and the bird advances its wing well toward the front of this swell, the wing will have a pitch of at least 10 deg. downward with the horizon. With a slight contraction of the muscles (invisible to the eye) driving the wing backward against this air swell, the bird will be capable of keeping up a speed sufficient to cause the angle or line of expansion to follow lengthwise of the wing.

When muscular contraction can no longer keep up the necessary speed, the wing will drop backward to the top of the swell, or the swell will outrun the wing; the bird will then be compelled to flap his wings a few times; they will act as propellers to gain momentum or speed, until the wing can again take its place at the front of the swell or expanding air.

A careful examination of all heavy soaring birds shows them to be full-breasted (note the pelican for instance), while all our swift, flapping-wing birds, such as pigeons, have very sharp lines. The soaring birds with their full, blunt breasts drive large swells nearly at right angles to the line of flight, while the fine, narrow-breasted birds drive their swells far backward, leaving their wings to perform their action on undisturbed air.

There is yet another point to be taken into consideration; the rear edge of all birds' wings is very thin and flexible. The diameter of the compressed body of air will be possibly two-thirds the width of wing near the bird's body. It is believed that the sharp curve under the front edge of the wing is where the bird gets its muscular push on the air swell, tending to drive the swell backward. As the air cannot expand upward through the solid concave part of the wing, it is driven backward by the new forming swell toward the rear edge of the wing. Here the flexible tips of the feathers give way to the expanding air and turn upward. This tends to drive the wing forward through the spring of the feathers as the air escapes upward at the rear.

It is hoped that some of our aeronautical friends who have the necessary apparatus will experiment along the above lines and give the results of their findings to the ever anxious inventors as this may, in the end, result in a practical flying machine.

W. Palm Beach, Fla. C. N. NEWCOMB.

ELECTROCHEMICAL AMALGAMATION.

To the Editor of the SCIENTIFIC AMERICAN:

In recent years it has been discovered that there are large areas in southern California, Nevada, Arizona, New and Old Mexico, which contain vast deposits of low-grade sands containing gold values averaging from $1.50 to $7.50 per ton. Many of these deposits are of unknown depth. The values are microscopic, and there is no method at present known to the miner by which the values can be profitably extracted. There are also immense ledges and even mountains of low-grade ore, very refractory, which cannot now be profitably mined. The sea beaches from the Isthmus to the Arctic contain vast deposits of gold-bearing sands, but no practical method is known of recovering the gold, which is fine and flakey, and which cannot be saved by the usual gravity devices. In addition to these unworked gold fields, there are in California many miles of river beds containing debris and tailings from the placer mines; these tailings contain gold to the amount of $1 per ton, this amount being a low average, and the tonnage is beyond computation. The values are too elusive for extraction by any of the standard processes of gold saving.

In Alaska there are hundreds of miles of beach and river deposits containing vast sums of gold which is beyond the reach of the miner. In the sands of the Nome beaches the miners probably left $100,000,000 in gold because the riffles would not hold the fine beach gold, and they knew of no way to save the microscopic values which are associated with the particles of black sand.

There is enough gold in these various deposits to furnish ample coinage for all nations for a century; and it may interest the readers of the SCIENTIFIC AMERICAN to learn something of the attempts that are being made to break into Nature's secret store of wealth.

Scores of gold-saving machines working on the gravity principle have been constructed in a vain endeavor to solve the problem; amalgamating devices have been tried, but the impalpable values will not adhere to the amalgam surface; and when the particles of gold are larger, it is found often that the gold is coated or rusty or oily, so that mercury has no affinity for it.

About twenty years ago tests were made with a device using electrochemical principles (see page 205, vol. i, Proceedings London Inst. Min. and Met.) and the results were very encouraging. The science of electrochemistry has made wonderful strides in the last decade, and lately the problem of saving the impalpable values I have mentioned has been approached in a practical manner by various experimenters.

It has been found that the amalgamating action of mercury is greatly increased in the presence of electrochemical conditions, and devices have been constructed to utilize this fact in a commercial way. The bottom of a sluice box is covered with a copper sheet or plate; suitable electrodes (anodes) are arranged so that they may come in contact with the surface of the water flowing through the device; a solution containing a definite amount of mercuric bichloride is added to the water, and a low-voltage generator is connected with the anodes and the copper plate (cathode). The mercury from the solution is deposited in its nascent form on the copper plate, forming an amalgamating surface of the highest state of efficiency. The electric current passing through the water (electrolyte) cleans and brightens the gold, and all unfavorable conditions are destroyed. The microscopic gold particles are coated with mercury while in suspension, and the cataphoretic action of the electric current, aided by gravity, forces the values into an amalgamating contact with the mercurial surface. All values are deposited in the form of amalgam, which adheres tenaciously to the plate by the electroplating action of the electric current. We have an electrolytic amalgam which is smooth, firm, tenacious, yet elastic and viscid. The amalgam is not dislodged; and the mercury does not "flour." All the electrochemical processes assist in cleaning the gold, forcing it to the plate, and holding the resulting amalgam in place.

A current with a voltage too low to produce a shock is sufficient to give results that are marvelous; the device is so simple that its potency would never be suspected; its cost is trifling, and any electrician can make the installation. Yet the percentage of extraction is so high that ordinarily the tailings contain no values of importance.

Judging from numerous tests that I have witnessed, there seems to be no reason why electrochemical amalgamation should not prove to be the key which will unlock the vast hidden resources of Nature, and open mining fields and mining operations which will eclipse all efforts of the past. Electrochemical processes have also been used in connection with lixiviation and cyanide practice, and the time of treatment reduced from 24, 36, and 72 hours to 2 hours, while the extraction has been raised to 99 per cent.

San Jose, Cal. ELMER ELLSWORTH CAREY.

THE TERRESTRIAL ORIGIN OF THE MOON—A PROTEST.

To the Editor of the SCIENTIFIC AMERICAN:

In your issue of July 17th, 1909, you reprint a letter from Prof. Patterson of the University of North Carolina regarding the terrestrial origin of the moon, against which I am obliged to protest. Prof. Patterson's views are no doubt justified by opinions heretofore adopted, but are quite inadmissible in view of my recent discoveries regarding the origin of the planets and satellites. It is now proved (in A. N. 4308) that not one of our planets was ever detached from the sun by rotation, as very generally believed since the time of Laplace; and in the same way that the satellites could not have been detached from their several planets.

These conclusions were first drawn from the exact calculations based on Babinet's criterion, which is simply a formulation of the mechanical law of the conservation of areas that enables us to compute the rotation period of the sun or any planet when the globe in question is imagined expanded so as to fill the orbits of the bodies revolving about it.

But not content with showing that the planets and satellites could not have been detached by rotation, I afterward worked out a rigorous mathematical proof of the process by which the satellites had been captured. It was thus proved beyond doubt that the satellites of the solar system had originated by capture, and at one time moved in independent orbits around the sun. Jupiter's satellites are therefore nothing but captured planets. Though this investigation is one of extreme generality, I carefully avoided reaching any conclusion in the case of our terrestrial moon till the special circumstances of the lunar terrestrial system had been investigated. It was then found: (1) That the moon could have been captured by the earth quite as easily as any of the satellites of Jupiter and Saturn could have been captured by those planets. In fact, the probability that the moon was captured, like the other satellites, was shown to be literally *infinity to one*, by rigorous calculations based on the theory of probability.

(2) On the other hand, an independent investigation based on other phenomena showed the probability to be *infinity to one* that the earth could at no time in the past have had a rotation sufficiently rapid to detach the moon. The details of these mathematical investigations have been sent to the Astronomische Nachrichten for publication, and will appear very soon.

It is sufficient therefore to say that the moon never had a terrestrial origin, and all this terrestrial speculation is without foundation. In my papers I have carefully examined the celebrated researches of Sir George Darwin, and shown that he was misled by accidental coincidences. As the moon never was near the earth, but is really a planet which came to us from celestial space (see cablegram of May 24th in the Astron. Nachr. 4325), we shall have to give up all the old views about the former rapid rotation of the earth. In the same way the mathematical investigation recently published by Prof. Slichter of the University of Wisconsin in Publication 107 of the Carnegie Institution (pp. 61-67) on "The Rotation Period of a Heterogeneous Spheroid," is invalidated, so far as concerns application to our actual earth. All the bodies of the solar system have been captured, and not one of them formed by detachment from the central masses which now govern their motions. Besides the investigations above referred to, a further paper on this subject was presented to the Astronomical Society of the Pacific June 25th, 1909.

T. J. J. SEE.

U. S. Naval Observatory, Mare Island, Cal.

Luna Park, in the suburbs of Paris, is a new enterprise laid out after its Coney Island namesake at a cost of $500,000. The Temple of Mirth is packed with the usual queer contrivances such as human roulettes, zigzag steps and torpedo floors. The scenic railway, electrically run, has tunnels and caverns. "Shooting the Chutes" is another familiar attraction. One of the sensations is a realistic representation of the Johnstown flood which has remarkable electrical effects and which once used to thrill Coney Island. There is also the Infernal Wheel, and many other attractions.

THE CHRONOSPHERE—AN EMPIRE CLOCK.

BY THE ENGLISH CORRESPONDENT OF THE SCIENTIFIC AMERICAN.

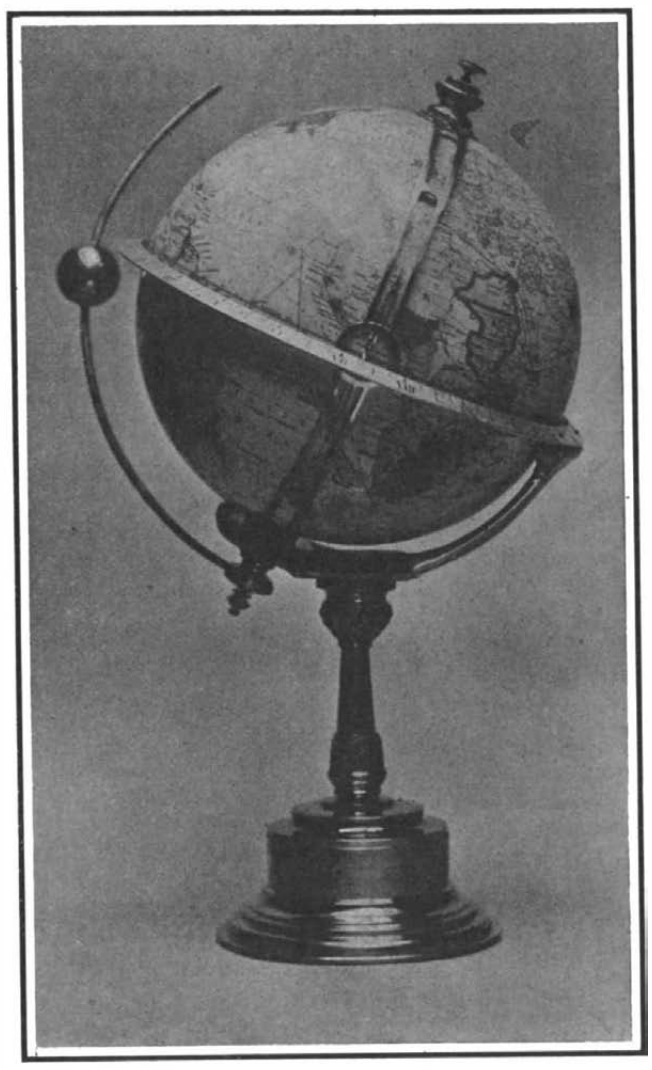
The accompanying engraving illustrates an ingenious and useful horological novelty that has recently been perfected by an English inventor, Mr. J. H. Overton, and which is described as an Empire clock. As the name implies, it is a universal timepiece, for not only does it give the correct time all over the world, but supplies in a glance the difference in the times between all places on the earth's surface and the correct mean time at any town or place in the eastern or western hemisphere. Moreover, it demonstrates the actual rotation of the earth on its axis in the twenty-four hours, as well as the actual speed of the earth.

The clock is made in two sizes and patterns, but the principle of design and operation is fundamentally the same in both instances. There is a terrestrial globe inclined at 23½ degrees similar to that used in schools and suitably mounted. The diameter of this glove varies from 3 to 4 inches, according to the size of the clock. It completes one revolution about its axis in the course of twenty-four hours in the same direction as the earth itself revolves. Parallel with the equator is a fixed ring dial upon which are inscribed the numerals representing the twenty-four hours with sub-divisions, the hours from 6 P. M. to 5.45 A. M. being engraved in black, and from 6 A. M. to 5.45 P. M. in red, to distinguish the twelve hours before and after meridian. The meridians of longitude are 15 degrees apart. When any meridian is adjusted to its own mean time all the other meridians denote their own mean time and each meridian will continue to do this correctly throughout the twenty-four hours. In order to determine conveniently the time at any desired spot on the earth's surface relative to another point, such as New York, there is an adjustable and movable guide fitted with a pointer which turns with the globe, and whereby the time is indicated in the hour ring just as the hand of an ordinary clock at any place. This guide is held in position by means of a small knob which enables it to be turned in an easterly direction without moving or changing the position of the globe, and it can be set over any town where the chronosphere is to be permanently used. As an example, the clock is installed in New York and it is desired to ascertain the relative time in London when it is 12 noon in the first-named city. The guide is set to stop over New York, and the pointer indicates this city's mean time. The guide is moved eastward until it is brought over London and the hour 4:46 P. M. is instantly shown on the ring dial. The guide is then turned eastward and brought over New York, upon reaching which point it will stop and click, denoting that it is over the place at which it is adjusted for permanent use, when it again indicates correct New York time. The guide is easily adjusted to stop over any part of the globe where the timepiece is permanently used.

In the second type of chronosphere the terrestrial globe is of 8 inches diameter and it indicates the relative times between any two places. In this case the globe should be secured in the manner later explained before the guide is moved. For instance, the chronosphere is permanently used in London. It is 1 o'clock there, and it is desired to ascertain what would be the time in Pekin when it is 3 o'clock in Vienna. The pointer is set to indicate 1 o'clock in London, and the guide is brought over Vienna. The globe is then turned together with the guide by means of the milled screw at the top of the sphere, until the pointer indicates 3 o'clock on the hour ring. By tightening the milled screw, the globe is then secured in that position so that it will not revolve in either direction—east or west—and the guide is then turned until it is exactly over Pekin. Instantly the pointer indicates the Pekin time on the hour ring when it is 3 o'clock in Vienna. The top screw is released and the guide is carried eastward, until it is brought over London, when it stops. The milled screw at the top of the globe is released and the latter rotated in an easterly direction until it stops itself, so that the pointer once more indicates actual London time, that is 1 o'clock, plus the minutes that the experiments have occupied in determining the relative times between Vienna and Pekin.

The globe mechanism is so designed that after displacement from local time in order to carry out any such investigations as are described above, it will when brought by the hand back to the local time, stop itself in the correct position for the pointer to indicate actual local time once more. If desired the guide can be easily adjusted for merely permanent use as in the smaller model. Moreover, if required, a sun attachment can be fixed in position, whereby the height of the sun in degrees above the horizon is shown for every day of the year. This fitting renders the clock capable of more extensive use in schools and colleges. The total heights of the two models are 12 and 15½ inches respectively, so that they occupy but a small space. It is only necessary to bear in mind that the guide and the globe must be turned in an easterly direction only, and when setting time, to exercise care that the guide be over the place at which it is adjusted for permanent use, and that the globe has been turned eastward until it has come to a stop.

For schools and colleges the clock is especially useful, since it enables one to demonstrate in the concrete the daily rotation of the earth from west to east, the difference in time arising from such rotation corresponding to the difference in longtitude, that is 15 deg. longitude east or west, one hour's difference, or four minutes for each degree east or west of the standard meridian; and the exact relative position of every place in the world and its exact position at any time in relation to the light of the sun, that is by day or night, as well as certain phases of solar phenomena by means of the sun attachment. The clock requires winding only once a week, and its steadiness and accuracy in running are distinctly noticeable features. It should prove of marked utility to steamship and railway companies as well as to other commercial enterprises having an extensive trade overseas.



THE CHRONOSPHERE.

Showing time ring, pointer or hand of clock, and sun attachment.

THE FIGUREHEAD AND ITS STORY.

From time immemorial the seagoing vessel, whether a creation of wood and hemp or of iron and steel, has presented herself as an almost human individuality to the eyes of her crew. From the earliest ages those little differences between craft of the same type which are only perceptible to the trained eye of the seaman were recognized to be insufficient to distinguish one individual ship from another. Hence ships were variously ornamented and named by their owners and commanders, who frequently adopted one of the numerous deities of heathen mythology as especial protector of their vessel and of those who intrusted themselves and their fortunes to its keeping. As in almost every branch of antiquarian research, we look to the ancient Egyptians for the earliest information on the subject. These wonderful people were among the very first recorded ocean travelers, and shipbuilding with them had at an early date quite attained the proportions of an art. Many of their boats were elaborately painted and decorated and among their decorations the figurehead stands out somewhat prominently. The sacred ibis, the lotus, and the phœnix were favorite designs; sometimes placed on the raised-up prow itself and at others rather behind it as in the one illustrated. Note the huge eye that is painted on the bow just below the figure. This peculiar badge is very illustrative of the general feeling that a ship is endowed with a personality of its own, and in one form or another it has maintained its position on the bows century after century up to the present day, in which it is often seen on the bows of Maltese *dysos* and other gaudily painted European craft, to say nothing of its almost universal use in China. "If no have eye, how can see?" asks the Chinese sailor; and the expression "Right in the eyes of her" is still usual afloat among our own seamen, meaning as far forward in the ship as possible. The ships of the Greeks and Romans preserved the "eye" on their bows and carried a distinguishing emblem or figurehead (*parsemon*) at the bow while their tutelary deities were generally given a billet at the stern. All these vessels had their distinguishing devices and figureheads in addition to which those named after mountains and rivers had a lion or a crocodile respectively painted or carved in relief on either bow. Numbers of representations of these may be seen on old coins.

A special class of Phœnician vessels had a figurehead representing a horse and were therefore known as *hippi*, the idea of riding over the sea as on horseback being evidently the origin of the adornment. It is interesting to note that in the year 112 B. C. one of these figureheads was found thrown up on the east coast of Africa and brought to Egypt, strong circumstantial evidence that some early Phœnician mariners had already doubled the Cape of Good Hope.

Ramming being the most usual form of attack among the ancients in their sea engagements, the bow decoration often took the form of the head of a ram or of a wild boar, the well-known butting tactics of these animals rendering the figure very appropriate.

When Rome in the days of her decadence lost the command of the sea the most formidable navies were those of the Scandinavian sea robbers, the famous Vikings. The term "Viking," by the way, has nothing to do with the English word king, as is often supposed, but is derived from *vik*, a creek or fiord, and *ing*, meaning "the son of." The word thus should be translated "the sons of the fiords"—a very good descriptive name for these Norse sea rovers. Their vessels—the famous long-ships—were adorned with figureheads. But the Viking's conception of this form of ship ornamentation started from a standpoint quite different from that of the ancients. It was not so much a distinctive design or a religious emblem. Its intention was to strike terror into an enemy. What form of reasoning led up to it is well described by Baring-Gould in his "Strange Survivals and Superstitions":

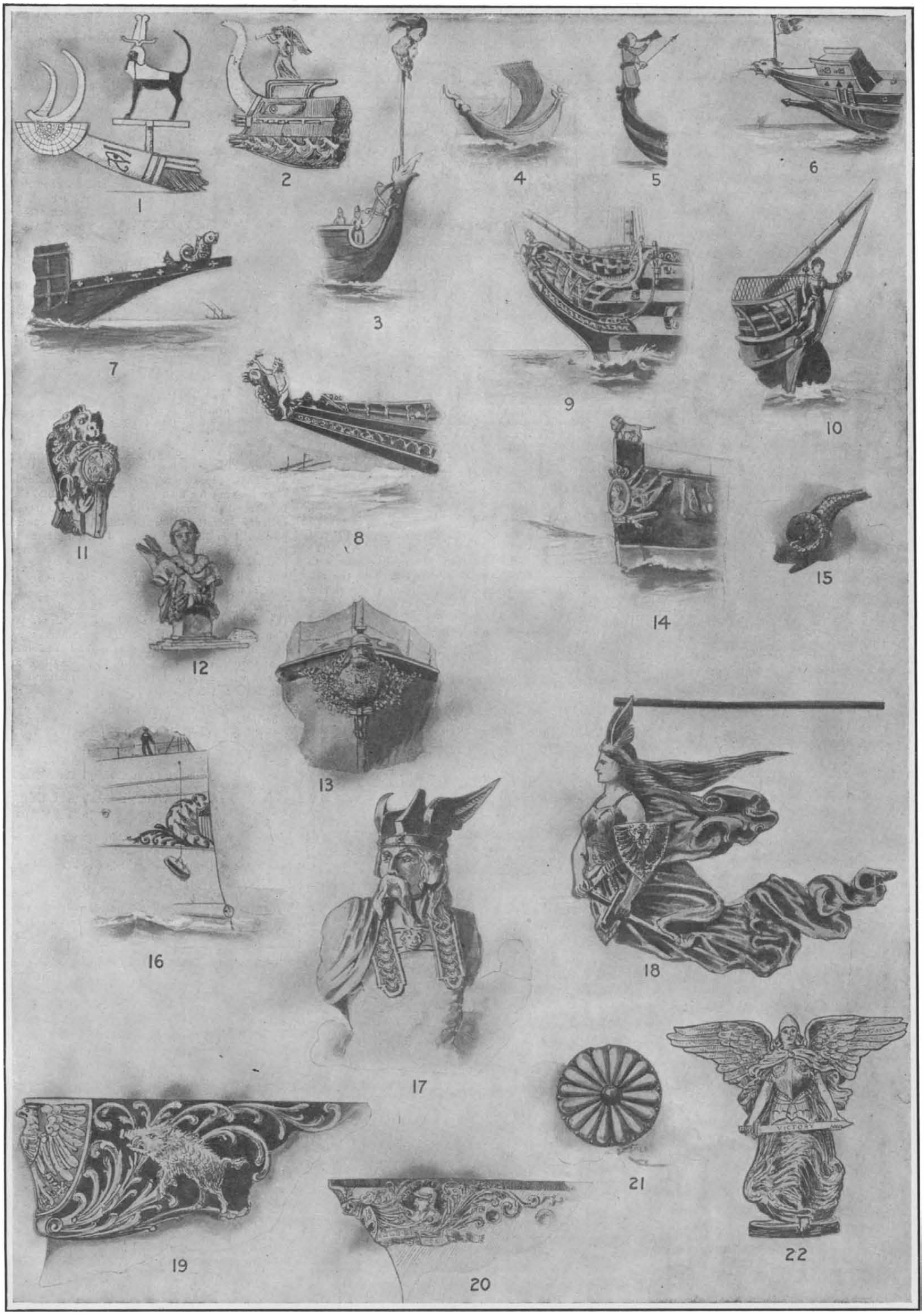
"In the Egil's Saga, an old Icelandic chief is said to have taken a post, fixed a horse's head at the top, and to have recited an incantation over it which carried a curse on Norway and the king and queen; when he turned the head inland it made all the guardian spirits of the land to fly. This post he fixed into the side of a mountain with the open jaws turned toward Norway. These figures were called *nith-stangs*. The *nith-stang* was primarily the head of the victim offered in sacrifice, lifted up with an invocation to the god to look on the sacrifice, and in return carry evil to the house of all who wished ill to the sacrificer.

"The figurehead of a warship was designed in like manner to strike terror into the opponents and scare away their guardian spirits. An Icelandic law forbade a vessel coming within sight of the island without first removing its figurehead, lest it should frighten away the guardian spirits of the land."

Here, then, we have the *raison d'être* of the Viking figurehead, and the annexed reproduction of an old drawing in Strutt's "Chronicle of England" shows not only a figurehead of this period but actually a *nith-stang* in combination with it.

It is obvious that the word head comes directly from the *nith-stang*, and although the advent of Christianity abolished the barbarous form of witchcraft which it exemplified, yet the figurehead and hence the "head" of the ship remain terms in constant use to this day. In the drawing referred to it will be observed that the actual bow terminates with the head and neck of some animal which is probably intended for a dragon. This fabulous monster has always been a favorite emblem in all ages and from China to Wales, in both of which widely separated countries it occupies a prominent position in the national heraldry. In all cases it probably has been taken as the symbol of malevolent power capable of inflicting evil upon the human race. In the Bible the dragon is always represented in this light, and its wings, serpent form, claws, and fire-spouting mouth render it formidable in "the air above, the earth beneath, or in the waters under the earth." With the *nith-stang* theory before us we can well understand the old Scandinavian sea-rovers being very partial to its use as a figurehead. The dragon, too, from its power was also frequently adopted as a mark of chieftainship or sovereignty. It was the badge of the famous King Arthur, the ensign of the Merovingians and of the Saxons at the battle of Hastings. An-

(*Continued on page 101.*)



1. An ancient Egyptian figurehead. 2. The bow of a Greek galley, B. C. 294. 3. The *nith-stang* of the Vikings. 4. A Saxon dragon-ship. 5. Figure on the "Mora," the ship in which William the Conqueror crossed to England. 6. A seventeenth-century Turkish *caramunzel*. 7. Italian war galley of seventeenth and eighteenth centuries. 8. Figurehead of "La Couronne," 1661. 9. The bow of the "Fighting Temeraire." 10. H. M. S. "Queen," 1794. 11. Figurehead of the "Vriheid," eighteenth-century Dutch ship. 12. Figurehead of U. S. frigate "Tecumseh," now at Annapolis. 13. Figurehead of H. M. S. "Centurion." 14. The bow of H. M. S. "Royal Sovereign." 15. H. M. S. "Serpent." 16. Bow of U. S. S. "Castine." 17. Figurehead of French battleship "Brennus." 18. "Germania" at the bow of the German battleship "Deutschland." 19. Bow of the German gun-vessel "Eber." 20. Bow of the German cruiser "Bismarck." 21. A Japanese chrysanthemum from the battleship "Asahi." 22. Bronze Victory on U. S. S. "Massachusetts."

THE FIGUREHEAD AND ITS STORY.

A Partial Solution of the Problem of Tele-Vision.

BY OUR BERLIN CORRESPONDENT.

The problem of tele-vision has long been a favorite one with enterprising inventors. The many tele-photographic apparatus which have been made known in the course of the last few years are the outcome of their endeavors. But the transmission of photographs, drawings, and handwriting over a telegraph wire is incomparably more easy than the instantaneous rendering of the moving objects situated at the transmitting station.

It is true a solution of the problem could be attempted on the very principle underlying the construction of these tele-photographic apparatus. The various sections of a picture would be produced—not successively, as in the case of tele-photography, but simultaneously, as well as instantaneously, without any lag, and would become visible immediately without any photographic process. There are two difficulties in the way of a practical realization of this idea, viz., (1) the extraordinary costliness of such an outfit; (2) the sluggishness or inertia of the vital organ of most systems, viz., the photo-electric selenium cell.

Mr. Ernest Ruhmer, of Berlin, well known for his inventions in the field of wireless telephony and telegraphy, has succeeded in perfecting what is probably the first demonstration apparatus which may be said actually to solve the problem. The writer has had an opportunity of inspecting this curious machine immediately before its being sent to Brussels, in order there to be demonstrated before the promoters of the Universal Exhibition planned for next year. In fact, a complete and definite tele-vision apparatus, costing the trifling sum of one and a quarter million dollars, is to be the *clou* of this exposition. The demonstration apparatus has been produced at a cost of $1,250, and by reason of its more elementary construction, lends itself only to the reproduction of the pattern, consisting of squares arranged in different combinations.

The pattern is thrown on a screen hung on a wall, which screen is a square divided into 25 square sections. Behind each of these sections is arranged a highly sensitive selenium cell in which, by a novel process, inertia has been eliminated so far as possible. It thus responds instantaneously to any variation in lighting it is exposed to.

At the receiving station is arranged a similar screen, divided into the same number of sections, each of which communicates with the corresponding section on the transmitting screen. While the actual system used in transmission is kept secret, this much may be stated, that a highly sensitive mirror galvanometer reconverts the fluctuations of current produced by fluctuations in luminous intensity on the transmitting screen, into corresponding light-variations. An accumulator battery supplies current to the tele-vision circuits.

As soon as a perforated pattern is inserted in the projector, a telegraphic reproduction of the picture appears at the very moment it is thrown on the transmitting screen. The sluggishness of the cells has been overcome to such a degree that the telegraphic picture will respond practically instantaneously to any motion. In fact, a reproduction obtained at most in a few minutes with the photo-telegraphic apparatus so far constructed is here achieved in a fraction of a second, so that several phases of a motion can be reproduced within a second.

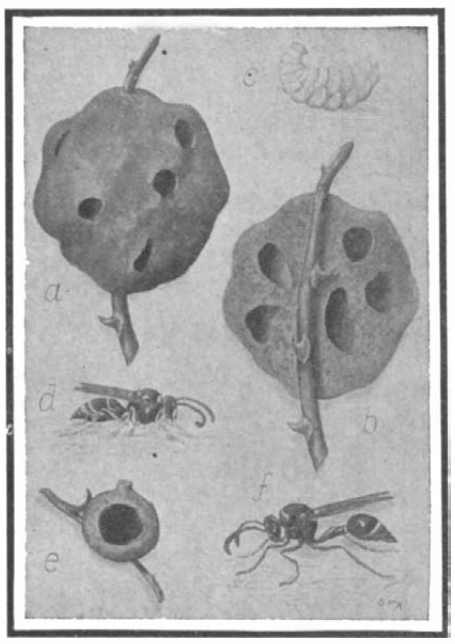
It is hard to realize what an amount of laborious work has been expended in constructing even this comparatively simple apparatus. In fact, each section, with its selenium cell and mirror galvanometer device, is an instrument of precision in itself, while the final apparatus will be composed of 10,000 elements of the same kind. Each selenium cell will have to be wound personally by the inventor, who never intrusts this work to anybody else.

Drawn glass is constantly becoming more widely employed in machine construction because of its extraordinary strength. It is little affected by sudden change of temperature, and resists the effect of fire, heavy loads, and violent shocks. Tests of the effect of loads show the great influence of the thickness of the sheet of glass, a variation of 1/25 inch producing a considerable change of strength. Glass broken by overloading exhibits numerous cracks radiating from the center to the edge. In regard to the fire-resisting qualities, official tests are made at Breslau by the following method: The glass is first heated during 87 minutes, then it is sprinkled 1 minute, and receives the impact of a strong jet of water for 2 minutes. The glass is required to show no crack under this treatment. Drawn glass is easily cleaned and transmits much light. It is made in sheets about 1 1/3 inches thick, measuring about 9 by 10 inches and 13 by 14 inches, and capable of supporting, respectively, 23,000 and 30,000 pounds per square inch.

THE CEMENT WORK OF THE MUD WASPS.

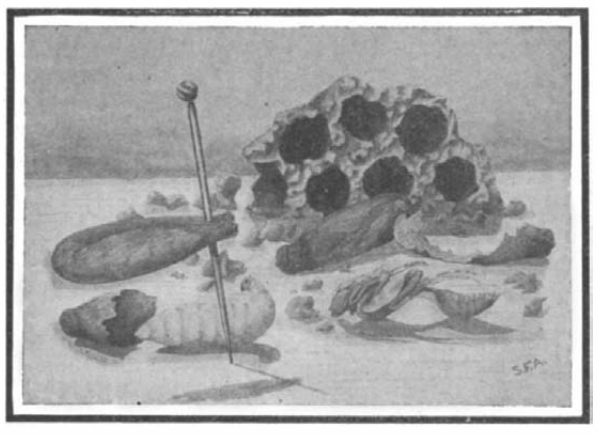
BY S. F. AARON.

The cocoon-making habit is so common with insects, that there are only comparatively few species that do not possess it in some form or other. It amounts simply to making use of a salivary secretion, which hardens and toughens upon exposure to the air. Silk is a common illustration, and the spider web is similar, though spun from the posterior of the animal. Many insects spin this thread-like substance; others spread the saliva as a coating within the larval cell or boring; still others make an independent, parchment-like cocoon within the larval cell. Many Hymenoptera, as the bees, social hornets, ants, mason wasps, etc., commonly employ the last method. Many species of most orders use the salivary secretion as a glue, and remarkable illustrations of this can be seen in caddis fly cases under water, for the saliva is cold waterproof when hardened. An effect of warm water upon the insect salivary secretion is commonly illustrated by the reeling of silk from cocoons softened in warm water, and any insect cocoon is so affected.



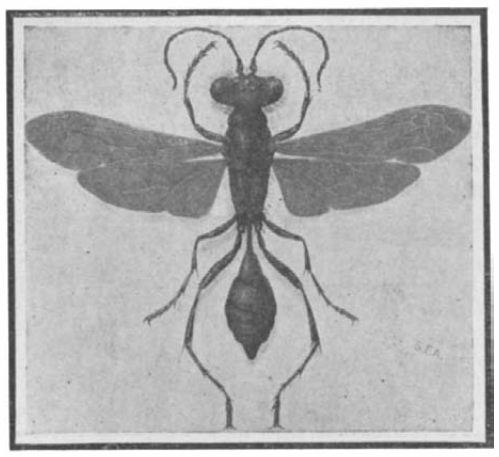
The mud mason wasps and their nest.

a is the bulky stone-like nest construction of a species of Odynerus and from which the adult wasps have escaped; *b*, same broken open showing cells within, natural size; *c*, larva, and *d*, the adult insect that makes the nest, both enlarged, the latter brown with yellow markings. The jug-like single cell of *Eumenes fraterna* is shown at *e*, natural size; *f*, the wasp, much enlarged. The colors are black or brown with pale yellow markings.



A broken nest of blue mud dauber wasp and the larva, pupa, and cocoons taken from it.

The nest is the work of the adult wasp. The cocoons, brown and parchment-like, are the work of the full-grown larvæ and within which they go through their further transformation.



The common blue mud dauber wasp, Pelopæus cœruleus.

The color of the insect is a bright metallic or steel blue, the wings clouded. The body is about ¾ inch long. An allied species, *Sceliphron cementarius*, with similar habits and as common, is brown with yellow markings.

THE CEMENT WORK OF THE MUD WASPS.

The making of strong-walled, hard-baked earthen cells does not seem to be a sufficient protection for the mud mason wasps in their larval state, and hence a cocoon is spun within the mud cell. While all insect cocoons are made by the larvæ, certain adult insects possess the power to secrete saliva and use it for nest building and as a means of protection against their enemies.

The hard, compact, durable, and waterproof mud nests of the mason wasps, superior in construction to the mere hardening of mud put together when moist, was always a mystery to the writer until after watching a blue mud dauber wasp at work on the habitation for its offspring.

The wasp makes certain off motions with its head close to its work after adding the mud in its proper place, and it was evident that this was a gluing operation for the purpose of holding together the particles of earth. Upon closer examination, immediately after the wasp had finished a portion of its work, it was found that the clay was slightly sticky, as if a viscid material had been mixed with it. Finding where the wasp obtained its clay, I procured a bit of this, and forced it together on a smooth surface in such a way that it would be under no strain and would naturally adhere, then dried it carefully in the air, and found that it by no means made as strong a substance as the wasp's nest. Another experiment was to drop part of a mud nest into hot water, and the other part into cold water, and note the result. The latter piece merely softened but remained intact after soaking for nearly half an hour, while the other in part disintegrated, showing the presence of the salivary secretion through the clay. Upon taking a piece of this dissolved nest and forming it as the raw clay above mentioned was formed, it was found that the material adhered far more strongly when dry. The salivary secretion, therefore, is probably through the clay and within the cells of certain species, and makes the lining thereof. In what manner, however, the small and slender-bodied wasp can secrete sufficient saliva to glue together the numerous particles of its bulky mud nest is beyond understanding. Waterproof animal glue in very small quantities, mixed with clay or sand, makes a material hard to surpass for the purpose needed. The clay nest of a species of Odynerus saddled on a twig or vine in the woods is almost like a stone, and even harder than many sandstones, and is impervious to the water. It is difficult to understand how the little wasps can burrow out of the cells when sufficiently warm weather has brought them through their transformations.

An Electric Rat Destroyer.

A new method for destruction of rats by the electric current has been lately put in use by the municipal electric station of Charlottenburg, near Berlin. The method is a patented one, and is invented by M. Von Biederheim. A special kind of trap on the electric system which was constructed is said to give very good results. The current used in this case is three-phase current, working at a tension of 120 volts, which voltage seems to be sufficient to kill the rats. Direct current at 220 volts can also be employed. The animals to be destroyed, rats, mice, etc., are attracted by bait and enter the trap. By doing this they close a circuit which turns on the current. A set of wires is arranged so that they come in contact with the animals. The creatures are killed instantly. There is no appreciable combustion in the present device. A number of appliances of this kind can be mounted together in a large box. At the electric traps it is advisable to use a method of a special contact which is put on and rings an electric bell or lights a lamp so that it can be noticed when to readjust the trap.

To Distinguish American from Russian Petroleum.

American petroleum can easily be distinguished from Galician and Russian petroleum by the action of colorless nitric acid; that is to say, acid which is not colored yellow by nitrous fumes. The acid should have a density of 1.4 and should have been freed from nitrous vapor by heating it with a little urea. Equal parts of acid and petroleum are mixed in a cylindrical glass jar provided with a ground glass stopper. The mixture is shaken violently for a minute or two. American petroleum assumes a violet color, while the acid upon which the oil floats becomes yellow. Galician and Russian petroleum, on the contrary, turn yellow and the acid becomes brown. When all three varieties are mixed together, the mixture first assumes the violet coloration, which changes suddenly to yellow after long agitation. The reaction is so sensitive that the presence of 10 per cent of Galician petroleum in American petroleum can be detected.

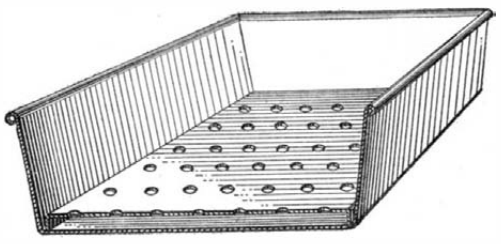
Handy Man's Workshop

HOUSEHOLD SUGGESTIONS.

AN IMPROVEMENT FOR THE BROILING PAN.

BY J. A. BERGSTROM.

When broiling steak, chops or the like in a gas-range, the suet that is tried out from the fatty part invariably catches fire. As a rule the fat is overheated and burns fiercely, and many efforts to put it out, when taken from the oven, fail.



DOUBLE-BOTTOMED BROILING PAN.

The accompanying illustration shows a very simple way to avoid this. In the pan used for broiling is placed a perforated false bottom, made out of black iron of any thickness. The edges are turned down, say one quarter of an inch, forming supports for the bottom. This false bottom should be nearly the same size as the pan. On large pans, of course, the bottom should be braced with strips of iron, to prevent warping from the heat.

In service the suet melts, and runs down through the perforations to the bottom of the pan. No matter how hot the fire, the suet will not catch fire, as it is protected from the flames by the perforated bottom which acts like the screen of a miner's lamp. The bottom can easily be removed and cleaned and the suet in the pan be emptied out.

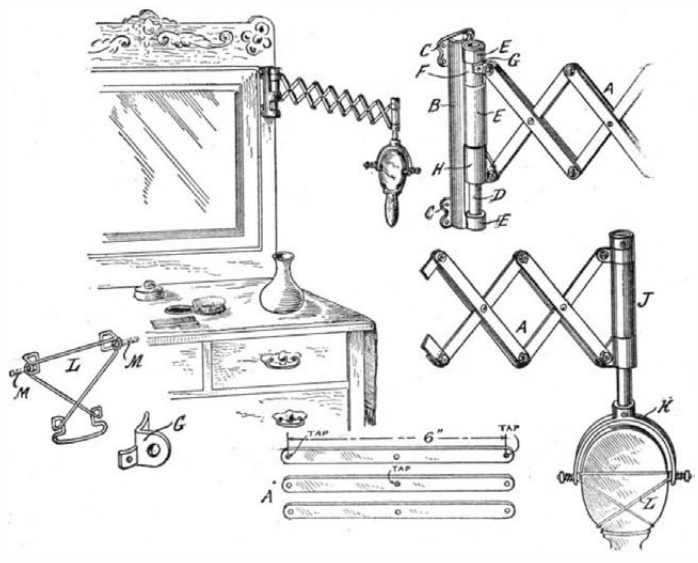
FOLDING BRACKET FOR THE HAND GLASS.

BY A. R. VAN DER VEER.

A very useful adjunct to the dressing table is a small mirror, supported in such a way as to permit a person to view the side or back of the head without having to hold the glass in the hand. The writer after searching the city over for an article of this character, was forced to make one for himself. The task was not a difficult one, and directions are given herewith, which will enable anyone who knows anything about the use of tools to make such a bracket. Instead of having the mirror secured permanently to the bracket, it was decided to make a holder in which an ordinary hand glass could be inserted at a moment's notice. The bracket is illustrated in the accompanying drawing. It is of the lazy tongs type, consisting of a series of brass links joined together after the manner of a ferryboat gate. These links are all of the same size, 6 inches long and ½ inch wide. Each of the links *A* is provided with three holes, one at the center and one at each end. One set of links is provided with tapped holes at the ends only, another set of equal number with tapped holes at the center only, and a third set of equal number with plain holes only.

At the end which is secured to the wall, or the dresser, a half-round piece *B* is provided, which consists of a 1½-inch brass tube cut in two lengthwise. Plates *C* are soldered to the upper and lower ends of the piece *B* to provide lugs, through which the screws are passed that secure the bracket to its support. Two pieces of tubing are procured, one with a half-inch outside diameter, and the other a half-inch inside diameter. The former is smoothed down with emery paper, so that it will slide easily into the latter. A section of the smaller tube is cut to form a pintle *D*, and three pieces *E* of the latter tube are fitted on to the pintle, the whole being secured to the half tube *B* by means of screws, which pass through the sections *E* and are threaded into the pintle *D*. Before the pintle is made fast a collar *F*, cut from the larger tube, is mounted thereon between the upper sections *E*. To the collar *F* a lug *G* is soldered. A detail of this is shown in the drawing, and it will be seen that the base of this lug is slit to form two ears, which are bent in opposite directions, and curved to fit the surface of the collar *F*. This construction provides a broad surface for soldering, and is made necessary by the fact that in use this point is subjected to a great strain. Between the middle and the lower sections *E* a sleeve *H* is mounted to slide. This sleeve is also cut from the larger tubing. A pair of lugs are soldered to this section, to receive one of the links of the lazy tongs between them. It will be observed that the lazy tongs consists of pairs of links alternating with single links, the latter being the ones with the plain holes. The links are held together by machine screws, and jam nuts are used to prevent them from working loose. It will be observed that the nuts for the center pivots are on one side of the lazy tongs, while those for the end pivots are on the opposite side.

At the opposite end of the lazy tongs the links connect to a pair of sleeves of the larger tubing, which slide on section *J* of the smaller tubing. Sections of the larger tubing are fastened to the tube *J* by means of screws, so as to form shoulders thereon. Soldered to the bottom of the tube *J* is a strap *K*, which is bent to form a semicircle. The mirror is supported in a wire frame *L*, which is bent to the form indicated in the drawing. The upper ends of this frame are fitted with bolts *M*, soldered fast. The threaded ends of these bolts pass through openings in the ends of the strap *K*. A light spring on each bolt and a nut to press this spring against the strap *K* provide sufficient friction to hold the mirror at any desired angle. The hand glass may be slipped into or out of its holder at will.



FOLDING BRACKET FOR THE HAND GLASS.

ELECTRIC COFFEE POT.

BY HOWARD M. NICHOLS.

A simple electrically heated coffee pot can be made as follows:

Procure a round tin can of about two quarts capacity. This can should be about 5 inches in diameter and should be open at one end. The open end should be round and smooth, so that a wooden cover can be easily fitted into it.

AN ELECTRIC COFFEE POT.

Cover the bottom and sides of the can with heavy felt, sticking it on with shellac. Put on a layer of electrician's tape over the felt, and stick a piece of fiber or cardboard on the bottom. Then give the whole outside of the coffee pot a couple of good coats of shellac. It is very important that this part of the work be well done, since if the can is not properly covered with felt, the heat generated in the coffee pot will be conducted off so quickly by the air, that it will be impossible to boil water in it.

The next step is to make a cover for the can. This cover should be made from hard wood, should fit tightly, and should have a small hole in it to allow steam to escape. A standard water-proof lamp socket should be screwed to the inner side of the cover, and the leading-in wires should be brought out through small holes drilled in the cover for that purpose. Each wire should be brought through a separate hole, so as to avoid possibilities of a short circuit; and wherever there are live metal parts care should be taken to insulate them, as it is very easy to get a short circuit where all parts are exposed to steam.

The leads from the socket should be connected to a screw plug by a suitable length of flexible lamp cord.

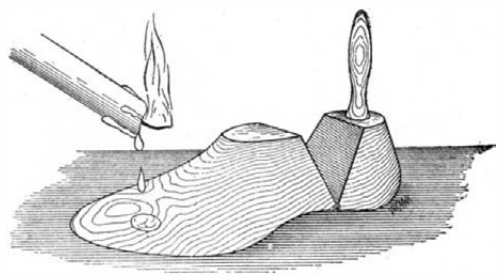
Screw an ordinary 32-candle-power lamp into the water-proof socket. Cover the joint with tape and shellac to keep the steam away from it.

The coffee pot is now complete, and all that is required is to fill the pot with water and coffee, put the cover on with the lamp projecting down into the pot, and screw the plug into the handiest lamp socket.

AN IMPROVISED SHOE STRETCHER.

BY JOHN K. BRACHVOGEL.

Nearly every person, at some time or other, has wished he could stretch a shoe which at a particular point pinched the foot or irritated a corn. It is not necessary to go to a shoemaker to have the leather stretched. It can easily be done at home by means of a shoe tree of suitable form upon which an enlargement is formed at the necessary point. The enlargement must adhere firmly to the tree and must be of such a nature that it can be easily molded, and that it will not become detached from the tree when the latter is forced into the shoe. A material answering all these requirements is ordinary candle wax. Sealing wax might be used but the candle wax is preferable as it will not injure the tree, and as it is easier to manipulate. The enlargement is formed by dripping a suitable quantity of the melted wax upon the tree at the desired point, and molding the resulting excrescence into proper shape while the wax is plastic. It adheres to the tree with remarkable and unexpected tenacity, and owing to its waxy nature tends to slip easily into the shoe with the tree. The shoe can be slightly moistened at the troublesome part, to facilitate the stretching action.



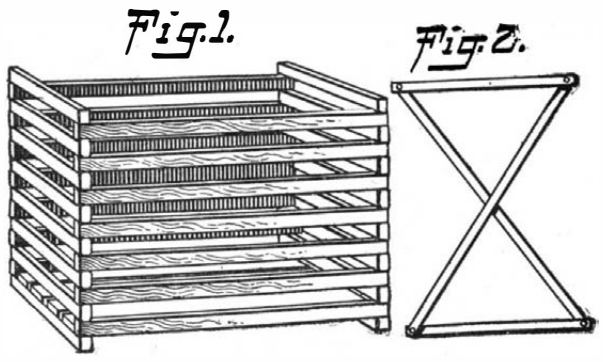
AN IMPROVISED SHOE STRETCHER.

TABOURET MADE FROM AN ONION CRATE.

BY WILLIAM P. GOEBEL.

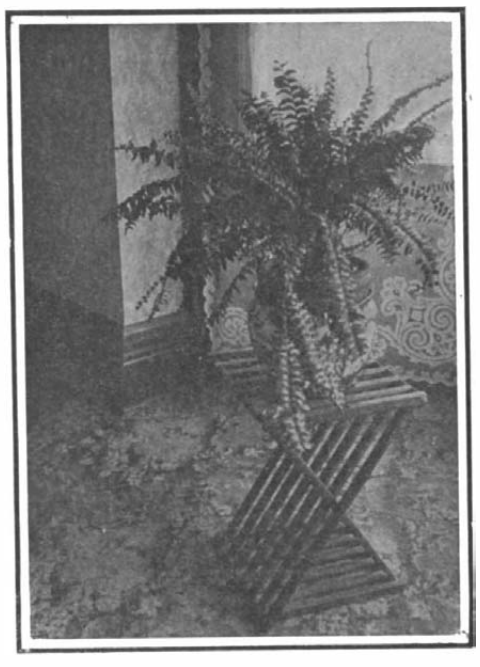
The accompanying illustrations show how a simple crate, used in shipping potatoes or onions, can be readily converted into a tabouret or flower stand.

A crate such as shown in Fig. 1 can be secured from any grocer or from a vegetable dealer. The sides and ends of the crate, which are comprised of slats arranged as shown, are fastened at their corners by a long nail, passing through holes in the ends of the slats.



COMMON ONION CRATE AND THE REARRANGEMENT OF THE SLATS.

To construct a tabouret, the nails in each corner are withdrawn and the slats, being separated, are then



ARTISTIC POSSIBILITIES IN AN ONION CRATE.

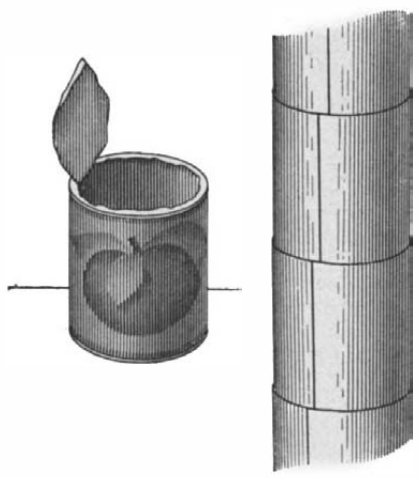
taken and slipped on the nails, and arranged as shown in Fig. 2, the long slats forming a cross and the short slats arranged horizontally. After the slats have been assembled, the point of the nail can be riveted, holding the slats together, and producing an article of rigid construction, as shown in the photograph.

The same can be stained or painted at a small cost. While the slats are fairly well planed, the appearance of the article can be improved by planing the slats a trifle more before assembling them.

A TIN CAN LEADER.

BY WILLIAM C. M'KENZIE.

A friend of mine who hates to see anything go to waste has found an excellent use for old tin cans. The rain pipes or leaders of his house are all home made, and built up of tomato cans. He claims that



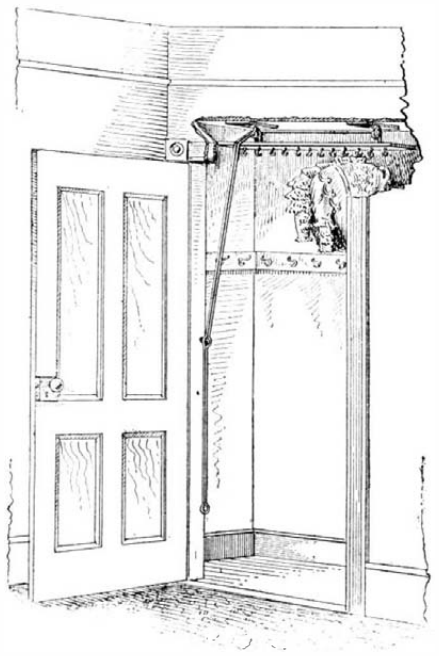
A LEADER MADE OF OLD TIN CANS.

they are much more satisfactory than the ordinary galvanized iron leader, for the reason that they were thickly coated with paint on the inside as they were built up can by can. The first step in the operation was to remove the top and bottom of each can. The solder was melted off by placing the cans on a hot stove. After the tops and bottoms dropped off, one end of each can was expanded slightly so as to receive the end of the next can, which was fitted in, to a depth of about a quarter of an inch. Then they were soldered together and, as an extra precaution, the longitudinal seam of each was re-soldered so as to close any leak that may have been sprung during the process of removing the top and bottom of the can. To increase the strength of the leader the cans were so arranged that the longitudinal seams of the successive sections were staggered as shown in the illustration so as to form a symmetrical and regular spiral running around the leader. Each can as it was soldered to the leader was painted on the inside wall with a thick coat of paint, special attention being given to the joints. After the leader was completed the outside also was protected with several coats of paint.

CONVENIENT HANGER FOR THE CLOTHES CLOSET.

BY MRS. T. G. HOSTER.

The accompanying illustration shows a hanger, for shirtwaists and other garments, located in the upper part of a clothes closet to utilize space that is usually



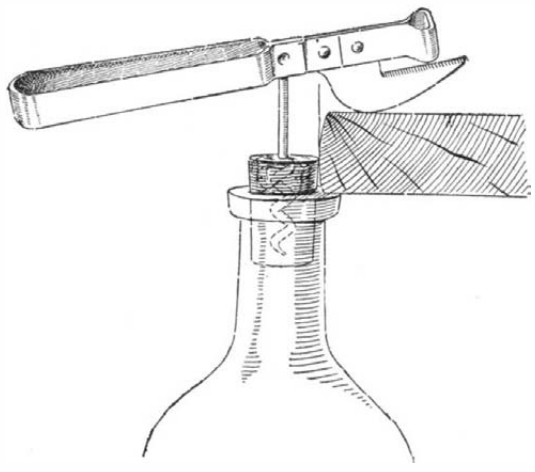
CONVENIENT HANGER FOR THE CLOTHES CLOSET.

wasted. The hanger is so placed that garments hung thereon will not interfere with clothing that is hung on the usual hooks. But it may be lowered wherever desired so as to provide access to the garments thereon.

The boards are fastened to the ceiling of the closet and are provided with pulleys one of which is a double pulley to receive its own cord and the cord running over the other pulley as well. The cords are secured at one end by means of screw eyes to the top of a board hanger which is provided on the under side with a row of hooks properly spaced to support the shirtwaists or other garments, one alongside the other, without crumpling them. The cords are fastened together at the opposite end and are provided with two loops for engagement with a hook fastened to the side of the door casing. One loop when caught on the hook holds the hanger in its highest position, as illustrated, while the other is used when the hanger is lowered for the purpose of hanging or removing a garment. The hanger may be raised or lowered at will by operating the cords.

SIMPLE METHOD OF PULLING A CORK.

If you own a corkscrew of the kind illustrated, you



SIMPLE METHOD OF PULLING A CORK.

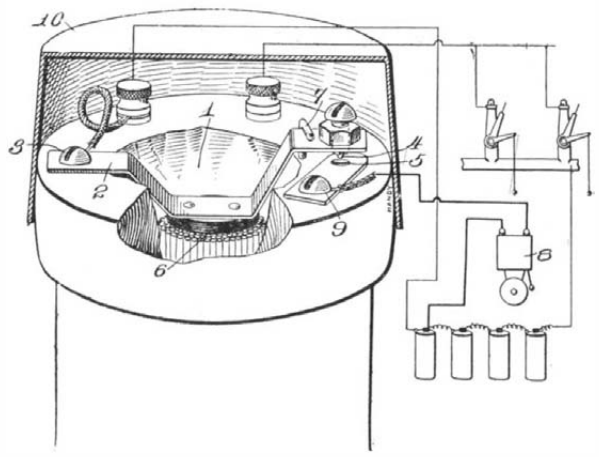
can easily remove the tightest cork without fear of soiling your clothes. After turning the screw well into the cork, place the lip of the bottle under the edge of a table or shelf, then with the upper surface of the table as a rest, lift up on the handle of the implement, and the cork will follow smoothly.

ALARM FOR BATTERIES OF ELECTRIC GAS LIGHTERS.

BY L. G. HANDY.

My home is equipped with electric sparking devices for lighting the gas jets. The system as I found it had one serious drawback, namely, that in some mysterious way the current would become short circuited and exhaust and ruin the battery. Upon investigation, I found that a device could be bought which would give an alarm in time to correct the short circuit before the battery was affected, but that the device was attached to and made a part of a spark coil. I proceeded to construct one on the spark coil which formed part of the lighting system. It is an extremely simple arrangement and can be made in a few minutes.

Cut away the wood of the end of the spark coil as shown at 1 in the illustration, so as to get to the ends of the core wires. Bend a piece of thin sheet spring brass ⅜ inch wide into the shape shown at 2. Fasten one end with a screw 3 to the end of the coil. Fix a platinum contact point to the under side of the opposite end at 4. Under this contact place the co-working contact 5. The contacts taken from an old bell will be found satisfactory. To the under side of the bent portion of the piece 2 secure a small disk of soft iron 6. Care must be taken to bend the piece 2 so as to bring the iron against the core at the same



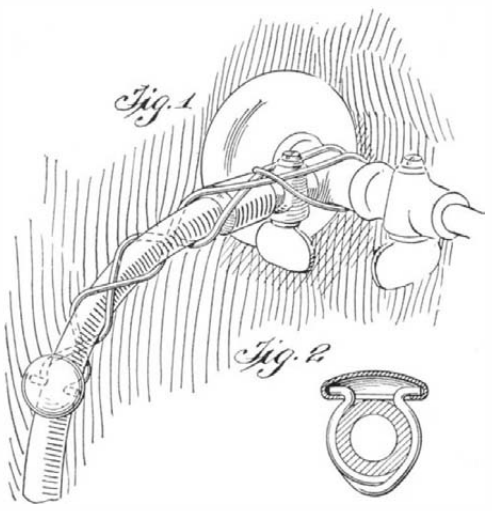
ALARM FOR THE BATTERY OF AN ELECTRIC GAS LIGHTER.

time that the contact is made at the platinum points. Arrange a small stop 7 to prevent the iron rising too far from the core. The movement at the contact points should not be more than 1/16 inch, and the spring of the piece 2 should be very light. Place a small bell or buzzer 8 at any convenient point to give the alarm. This should be connected to the device as shown; one of the posts on the coil is connected by insulated wire to one of the contacts as at 3, the opposite contact 9 is connected to one side of the bell. The return wire is connected to the battery so as to place only a single cell in the alarm circuit. A cap 10 of pasteboard or other material must be used to keep out the dust.

This device has been in use upward of three years, and has saved the battery on several occasions.

GAS-TUBE SUPPORT.

To prevent your gas tube from breaking where it hangs from the fixture, use a piece of spring-brass wire, 16 gage, 18 inches long. Fold this double, and wrap about the fixture as illustrated. Bend the free ends outward, and set into the under side of a large paper-tack head or similar article as in Fig. 2. This arrangement, if neatly executed, will support the tube



GAS-TUBE SUPPORT.

in a graceful curve. It is extremely simple, and will not prevent removal of the tube.

SUBSTITUTE FOR ROD THREADER.

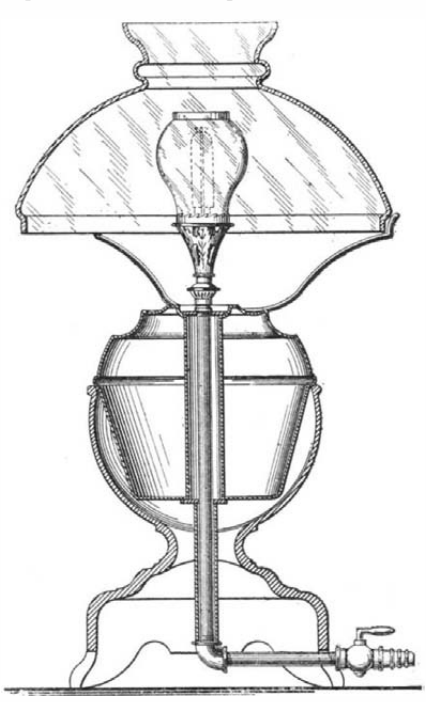
Not long ago the writer hit upon the following idea for a rod threader for quick and accurate work on rods from 1/16 to 3/8 inch in diameter. All one needs is a bench or blacksmith's drill, with a three-jawed chuck. Clamp the rod to be threaded in the chuck of the drill. Place the die in the holder as usual, hold the die against the end of the rod to be threaded, and turn the drill at slow speed. Those trying this method will find it a much quicker and better way than threading by hand in the usual manner.

DROP LIGHT MADE FROM AN OIL LAMP.

BY B. A. JOHNS.

Since gas has supplanted kerosene for illuminating purposes many quaint and highly prized oil lamps have been put out of commission. These lamps may be changed into attractve drop-lamps in the manner illustrated herewith.

A center-draft lamp is best adapted for the purpose, but any kind will answer. The hole on top of the oil reservoir is first soldered up, and through the central draft tube a small gas pipe is placed, with a threaded end on top, to receive the burner. Any mantled burner may be used. Under the burner is placed a washer, resting on top of the oil reservoir, which keeps the burner in place. At the lower end



DROP LIGHT MADE FROM AN OIL LAMP.

of the gas-pipe an elbow is screwed on. Between this elbow and the bottom of the oil reservoir is placed a short piece of pipe, so that, when the elbow is screwed up, the tube will be tight, thereby holding burner secure to the oil reservoir. From the elbow, a short piece of gas pipe is screwed in, with the ordinary stop-cock and attachment for the gas hose.

RECENTLY PATENTED INVENTIONS.

Pertaining to Apparel.

CLAMP FOR GARMENT-SUPPORTERS.—J. C. COPELAND, New York, N. Y. The more particular purpose of the inventor is to provide a metallic member for supporting garters and the like and comprising certain parts, some of which are movable relatively to others, and so arranged as to facilitate the clasping and unclasping of the movable portions and for enabling the movable portions to spring automatically into the positions which they occupy when unclasped.

Electrical Devices.

TUBULAR INSULATOR.—L. STEINBERGER, New York, N. Y. The invention relates to insulators, the more particular object being to produce a high-tension insulating tube suitable for insulating cables, wires, and other conductors energized by high-tension currents, the tube providing a very high degree of insulation and at the same time affording great mechanical strength.

HIGH-POTENTIAL STRAIN-INSULATOR.—L. STEINBERGER, New York, N. Y. The invention relates to strain insulators used in connection with electrical conductors, and more particularly to conductors adapted to convey currents of high potential. Among its many purposes, one is to give the various parts of the strain insulator such conformity as will confer upon them a comparatively high degree of mechanical strength coupled with a high dielectric capacity.

ELECTRIC ISOLATION SYSTEM.—N. C. MCCLURE, Healdsburg, Cal. In this invention the aim is to enable the operator on a circuit where there are a number of instruments being used, to call up or form connection with any one instrument such as a telephone, telegraph, etc., on the said circuit by ringing a bell or by other signal, without disturbing the others; and when such call is answered, to enable the parties to communicate with each other without being heard by others on the same line.

INSULATOR.—J. T. BOND, Palatka, Fla. The insulator is designed for use in inside and outside work, and for outside work where wires pass along buildings and the like, and also for pole work. Under-cut edges of an annular groove form a species of hook for retaining wires in place in certain pole work. This form of groove assists in stringing wires when constructing new lines or renewing old, since the wire may be laid in its grooves during the construction and afterward secured in place.

METER-LOCK.—J. H. JACKSON, New York, N. Y. An object in this case is to provide a durable lock for use in electric meters and similar devices, by means of which unauthorized opening of the meter and tampering therewith is prevented, and which, when the seal is broken, can be easily released and can easily be replaced.

Of Interest to Farmers.

LINT-COTTON PICKER AND CLEANER.—J. L. HART, Chickasha, Okla. The machine is adapted for picking and cleaning lint-cotton, either in loose form or as it comes from the bale. Cotton placed in a reception box is pushed and fed forward by a head block to the vertical run of an endless toothed traveling belt, whereby the cotton is picked, subjected to the action of the air, and largely freed from foreign matter.

THRESHING-CYLINDER TOOTH. — T. DAGEL, Sibley, Iowa. The object of the inventor is to produce a tooth which may be easily replaced and removed, and which is firmly braced against the cylinder in the direction of the greatest strain. The tooth is not complicated in structure and is easily removed and replaced.

TROUGH-VALVE.—B. I. MAULDIN, Ozona, Texas. This automatic float valve is designed especially for use in water troughs wherein the supply of water is conducted from a reservoir into a trough and consumed in the latter, so that the water will be automatically supplied as the water level lowers in the trough.

VALVE.—R. H. CHALK, Sonora, Texas. In operation, as long as the float valve operates properly, the water will be shut off whenever the float is in the required position. Should the device fail to operate, the trough will soon fill up with water, which passing out through an overflow pipe, enters a cup, and when this is full, a lever will swing into position, thus cutting off the inlet from the outlet, and stopping the flow until the trouble is remedied.

Of General Interest.

OAR-LOCK.—T. W. CAREY, JR., New Orleans, La. The purpose here is to improve upon the oar-lock for which application for Letters Patent was made by Mr. Carey, the improvement consisting in the material simplification and lightening of the construction without detracting from its strength, together with an improved means for regulating the rotation of the oar in its bearings, and for regulating the dip of the oar.

FILE.—E. RUSTIN, Atlanta, Ga. By use of this file the wrapping girl or cashier can sort the sales checks as they are received, so that those received from each salesman will at all times be filed by themselves in the order received. In use it is possible for the girl or cashier to file the sales check by one movement of one hand, and there is no danger of the sales checks being blown away by electric fans while being filed or subsequently.

FIRE-ESCAPE.—W. H. JAY, Le Beau, S. D. In this instance the invention refers to fire escapes, and it has for its object to provide a standard which will permit a person to embrace it and slide to the ground, there being means to enable the person to regulate the rapidity of his descent, without burning or chafing his hands or other portions of his body.

CABLE-SQUEEZER.—H. D. ROBINSON, New York, N. Y. The object of the improvement is to provide a device which may be easily and quickly applied to the mass of strands going to make up the cable, which will force them together into a perfectly cylindrical mass, and which may be very readily loosened and moved after the permanent securing means has been applied adjacent the point last squeezed into shape.

PROCESS FOR THE PRODUCTION OF A LEATHER SUBSTITUTE. — R. WEEBER, Vienna, Austria-Hungary. In this case, the product obtained by the process resembles leather very closely, being flexible, extensible, and possesses a high degree of strength and the other physical products of leather, so that it may be used as a complete substitute for that material.

FEED-BAG.—D. L. TOLAND, Bayonne, N. J. The bag insures a liberal supply of air to the animal's nostrils, and the construction is such that it will prevent the waste of grain which may fall out under the animal's throat. Such a waste often occurs on account of the habit of tossing the head in order to bring the grain within reach of the lips.

PISTON-PACKING.—G. R. THOMPSON, Republic, Mich. The invention pertains to piston packing for air cylinders, and relates more particularly to a packing ring fashioned from hard fiber generally known as indurated or vulcanized fiber, and split so that it can be sprung upon the piston, the ring tending to spread against the walls of the cylinder, owing to its own normal resiliency.

DIE FOR PRESSING SHEET METAL.—C. F. STEIBER, New York, N. Y. The improvement refers to dies such as are used for pressing sheet metal to produce certain ornamental designs or patterns. The die is intended especially to be used for forming the risers of metal staircases. The die can be used so as to form a number of different patterns, differing materially in their general form or artistic effect.

GRAPPLE.—C. L. SIMMONS, Spokane, Wash. The object of the present invention is to provide a grapple for hoisting concrete blocks and other articles, and having adjustable and reversible means to permit the use of the grapple for hoisting small and large blocks, and for grappling a block either outside or inside. It relates to grapples, such as shown and described in Letters Patent of the U. S., formerly granted to Mr. Simmons.

CHURCH-OFFERING ENVELOP. — J. H. EARLE, Richmond, Va. This invention is distinguished by the form of the blank from which the complete envelop is made, by the arrangement of the different sections of the blank so that they are to fold and form opposite pockets which are placed back to back and sealed together and have separate and opposite sealing flaps. The general form of the blank is such that it may be cut economically from large sheets and the complete envelop is of less dimension than those originally used.

DAYLIGHT DEVELOPING APPARATUS.—J. W. MEEK, 32 Albert road, Stroud Green, London, England. The invention consists in providing a container with a detachable spool box which is adapted to receive the exposed spool direct from the camera, and from which the film is wound into the container at same time as the apron, the spool box being then removed so as to enable the container, inclosing both apron and film, to be placed in a developing tank.

VENTILATOR.—J. JACOBS, Akron, Ohio. The aim of the inventor is to provide a form of ventilator for roofs, adapted to be opened and closed and at all times protect the opening from rain and snow, and when closed, make a very tight connection. It is of the type employed in ventilating shafts or flues of warehouses, factories, etc.

FIRE-ESCAPE.—T. R. ANDERSON, Oklahoma, Okla. The purpose of the invention is to provide details of construction for an escape of the inclined slideway type, which afford a safe device that is foldable at the side of a building for protection from the elements, and which may be quickly placed into position for service as occasion may require.

GAGE AND MARKING DEVICE. — A. VEITCH, Canton, N. Y. The invention is for employment by woodworkers for marking outlines of mortises or open recesses in casement-jambs and door stiles, to receive hinges; and it is especially well adapted for the purpose, and it may also be used as depthening and outlining gage for forming recesses in other constructions of wood or metal.

HORSESHOE-CALK.—H. W. SCHOEN, Scranton, Pa. In this case the improvement has reference to horseshoe calks, the more particular purpose being to provide a shoe having its calks detachably secured in position so that they may be readily removed from or replaced upon the shoe.

PAINTING APPARATUS.—G. A. PRICE, Chelhalis, Wash. An object of the invention is to provide a device having manually operable paint brushes adapted to be provided with paint supplying means, flexible pipes for connecting the paint supplying means of the brushes with the portable tanks, and means for placing the paint in the tanks under pressure to effect a forced feed to the brushes.

EYEGLASS-CLIP.—W. G. KING, New York. N. Y. The invention relates to eyeglass clips, the more particular purpose being to provide an improved construction offering various advantages of adjustment, strength, durability and ease of manufacture. The means provided enable the glasses to be adjusted to fit upon the nose without difficulty.

SQUARE.—T. C. HOWLAND, Lock Arbor, N. J. One of the separable arms is provided with a longitudinal slot isolated from the outer edges thereof and provided with a groove at one side extending from the slot through the inner side edge, the slot being relatively wider at side of square having the groove than the opposite side, the other arm having an end portion to fit into the slot and groove, and screws and similar devices carried by one of the arms and having heads movable into engagement with the other arm and thus locking the two together.

TAILOR'S MEASURE.—M. CIERVO, New York, N. Y. The invention consists of a supporting stand, an upright arm offset from and vertically adjustable on the stand, an approximately horizontal square adjustable transversely on the arm, a height gage adjustable on the square, having a horizontally adjustable rule or gage vertically adjustable thereon, and tapes respectively carried by the post and squares with the tape carried by the square adjustable thereon.

WINDOW STRUCTURE.—R. LINKLETTER, Jersey City, N. J., and J. H. DE FREITAS, New York, N. Y. The invention relates to window structures, the more particular object being to provide a number of improvements for use in facilitating the lighting and ventilating of a building or portion thereof, in so far as these objects can be accomplished by aid of window structures.

FOOD-WARMER.—R. W. MUNN, Troy, N. Y. The aim of this inventor is to provide a warmer, more especially designed for use on tables in seaside restaurants and like places, in which open-air dining predominates, the arrangement being such that the warmer takes up comparatively little space on the table and allows carving and dishing of the food without removal of the dish containing the food from the warmer.

HOSE-PIPE.—W. R. CALVERT, Chickasha, Okla. Mr. Calvert's invention is an improvement in hose pipes, and relates particularly to hose pipes comprising sections of metal pipe united by flexible connections. The sections may be of uniform diameter throughout, or they may be tapered at their ends to facilitate the application of the coils.

Hardware.

FARRIER'S TOOL.—A. I. MERRIFIELD, East Lebanon, Maine. In the present patent the invention has reference to certain improvements in farrier's tools, and more particularly to a special tool for use in trimming the front portion of a horse's hoof to form a curved recess into which the clip on the horseshoe may extend.

OPERATING ATTACHMENT FOR SCREW-DRIVERS, ETC.—P. S. PETERSON, Ephraim, Utah. In this instance the invention pertains to improvements in operating attachments for rotatable tools, such as, for instance, screw-drivers, bits, reamers, drills, or the like, but is especially adapted for screw-drivers, as it may be employed for turning the driver in either direction.

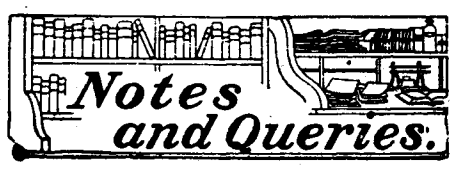
Heating and Lighting.

HEATER.—S. KELTONIK, Johnstown, Pa. The object of the inventor is to provide an improved heater, arranged to directly radiate a portion of the heat generated by the burning fuel into the room in which the heater is located, to utilize a portion of the heat for heating air to be conducted to other rooms, and to provide an escape for the dust arising from the ash pit.

LAMP.—C. M. DANIELS, Paris, Ill. The invention refers to improvements in incandescent lamps, and more particularly to that type of lamp in which a liquid fuel is vaporized and mixed with air before being delivered to the burner. It involves certain improvements in the vaporizing and mixing chambers and means for regulating the same.

GRATE FOR STEAM-GENERATOR FURNACES.—R. A. TARR, Melville Terrace, Bedminster, England. The special feature in this case is that the grate is composed of rocking bars which turn the fuel over several times during its passage through the furnace. The fuel is thus broken up and a light open fire is produced, whereby practically perfect combustion is obtained. The stoker thus accomplishes all that can be effected by the best hand stoking by the constant use of the slicing box.

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.



Kindly write queries on separate sheets when writing about other matters, such as patents, subscriptions, books, etc. This will facilitate answering your questions. Be sure and give full name and address on every sheet.

Full hints to correspondents were printed at the head of this column in the issue of March 13th or will be sent by mail on request.

(12116) H. B. says: Would you kindly tell me whether a sewing machine motor run on the New York city lighting circuit would run on a 110 volt alternating current? Would you also kindly tell me whether the dynamo described in SUPPLEMENT No. 1558 would run as a motor on alternating current if the armature windings were all connected in the same way, or rather making the polarity of the armature magnets the same, provided it was wound with heavy enough insulation to stand the current? Have any transformers, suitable to be constructed at home, been described in the SUPPLEMENT for changing alternating current at 110 volts pressure to steady current? A. A direct-current sewing-machine motor is not likely to run on an alternating current, although some direct-current motors will run with the alternating current if brought up to speed before the current is thrown on. In large portions of New York city the alternating current is used. If your motor were used in one of these regions, it is all right for the current you name. We do not consider the little alternator of SUPPLEMENT No. 1558 well adapted for use as a motor. Much better forms can be bought for a moderate price nowadays. We have not published any plans for a rotary converter to change an alternating current to a direct current.

(12117) E. F. W. asks: Will you kindly give a solution for removing paint from window glass? Also the amount of weight that two pieces of leader pipe, galvanized, 10 feet in length and 3½ inches in diameter, will support in salt water with ends closed without being more than half submerged. A. To remove paint stains on glass, take 3 parts of potash and 1 of unslaked lime. Lay this on with a stick, and let it remain some time, when the paint may easily be scraped off. Two pieces of pipe 10 feet long and 3½ inches inside diameter will displace 1 1/3 cubic feet of water submerged, or 2/3 cubic foot when only half under water. 2/3 × 62.4 pounds (weight of a cubic foot of water) = 41.6 pounds, which is the weight the pipes will sustain when half submerged, including their own weight.

(12118) D. H. says: In your issue of June 5th is an article headed "Auroras; Some Recent Theories." In this article appears the expression "a tropical month (27.3 days)." I have heard that expression before, but do not know just what it means. A. The time you name as a tropical month, 27.3 days, is the time required by the moon to go around the heavens from a star till its return to that star again. It is the synodic period of the moon, while a lunation is the time from new moon till new moon again, which is a little more than 29.5 days. The word tropical in this sense refers to the tropic in the sky, as the Tropic of Cancer or Capricorn, and not to a zone of the earth.

(12119) B. P. asks: I wish to know the difference between iron and steel. A. Steel is differentiated from iron by the amount of carbon it contains, but the distinction is complicated by the fact that whereas any kind of steel contains more carbon than wrought iron, cast iron contains more carbon than any kind of steel. The qualities of hardening and tempering, which formerly distinguished steel from iron, now no longer apply, since soft steels are produced, which by ordinary blacksmith's tests will not harden. All products of the Bessemer, crucible, and open-hearth processes are described as steel. Cast steel contains from 0.06 to 1.5 per cent of carbon, according to the purpose for which it is to be used, the dividing lines between soft, mild, medium, hard, and semi-steels not being well defined.

(12120) A. L. D. asks: We have at our plant a concrete and cement reservoir six feet deep, ten feet wide, thirty feet long, but which is not waterproof, and when half full of water allows the water to seep through the pores of the cement walls. Will you please advise whether there is a preparation that can be used as paint on the inside of the reservoir which would close up these pores and keep the water from forcing through the walls, and at the same time withstand the action of soda ash and lime, which we use in the water. Kindly give us what information you have or refer us to the proper authorities. A. No ordinary cement concrete is perfectly waterproof and much of it both absorbs water like a sponge and lets it through like a sieve, a fact which builders are insufficiently aware of or refuse to recognize, many of them claiming to put up waterproof concrete and the market being flooded with waterproofing compounds for mixing dry with the concrete ingredients, most of which are of no use whatever. Concrete can only be waterproofed by external treatment, and then with difficulty and uncertain success.

The best method for your purpose is the Sylvester process: into each gallon of hot water required to cover the surface shave ½ pound of castile soap; let it dissolve, but do not make suds, and apply to the dry concrete surface boiling hot, using a wide soft brush such as a whitewash brush. After the soap solution has dried, apply lukewarm a solution of ½ pound powdered alum to each four gallons of water. Two repetitions of this process should close all pores and render the concrete waterproof; if not, try a further coat or two. There is no reason why the above preparation should be affected by soda, but if it is unsuccessful you might try a coat of water glass or write to the Concrete Association of America, 225 Fifth Avenue, which has conducted a number of valuable experiments in connection with varied uses of cement and is glad to give information.

NEW BOOKS, ETC.

A Portfolio of Portraits of Eminent Mathematicians. Edited by David Eugene Smith. Chicago: The Open Court Publishing Company. Portfolio containing 12 plates with descriptive text on tissues. Price, $3.

The portfolio before us contains some admirable selections and reproductions of portraits of many mathematicians, such as Descartes, Pythagoras, Archimedes, Fermat, Leonardo of Pisa, Euclid, Cardano, Leibnitz, Napier, Viète, Newton, Thales, and the collection would make excellent illustrative material for the classification of mathematical industries. The portrait of Descartes is particularly fine.

How to Identify the Stars. By Willis M. Wilhelm, Ph.D. New York: The Macmillan Company, 1909. 8vo.; 38 pp.; plates. Price, 75 cents net.

The ability to recognize the important brilliant stars and to locate the more conspicuous constellations is both an interesting and a useful acquirement. The number of people who have a real interest in popular astronomy and a fair acquaintance with the stars and constellations is strikingly increasing, and they will find a real pleasure in this information. The object of this little book is to enable the latter persons to identify the various constellations and stars. The method here followed and the material presented is essentially the same as that used in the course of descriptive astronomy in Williams College.

Light and Sound. A Textbook for Colleges and Technical Schools. By William S. Franklin and Barry Macnutt. New York: The Macmillan Company, 1909. 8vo.; 344 pp. Price, $1.60.

There always seems to be a field for a good book on the very important subjects of light and sound. The literature is already vast on these subjects, but the authors have succeeded in presenting some phases in an entirely new light. There is an entire absence of the time-honored illustrations which have been copied from book to book. The diagrams and illustrations are very numerous and are well executed. The book will prove of value to all physicists.

The Rise and Progress of the British Explosives Industry. Published under the auspices of the Seventh International Congress of Applied Chemistry by its Explosives Section. London: Whittaker & Co. New York: The Macmillan Company, 1909. 4to.; pp. 418. Price, $5.25 net.

This very enlightening book gives an exceedingly interesting history of British explosives, reproducing many curious engravings. This is followed by chapters on the concussion caps, safety fuses, military fireworks, and pleasure fireworks. Then comes an excellent bibliography and a chronology from 1242 to 1700. The existing government and private establishments are then described. The work is highly technical, but will prove of great interest to those whom it concerns.

Through the Yukon of Alaska. By T. A. Rickard. San Francisco: Mining and Scientific Press, 1909. 8vo.; 392 pages. Price, $2.50.

This book records observations made in the course of a journey in the Yukon Territory in the District of Alaska during the summer of 1908. The sections devoted to the development of mining methods are particularly valuable, and the book should prove of interest to everyone who has ever been to Alaska and the Yukon Territory or is thinking of doing so. We are particularly taken with the 175 illustrations, which are admirably executed. The book is well printed and bound.

Exporters' Encyclopedia for 1909. New York: Exporters' Encyclopedia Company, 1909. 12mo.; pp. 655. Price, $5.

The present volume contains full and authentic information relative to shipments for every country in the world. The Exporters' Encyclopedia is now in its fifth year, and is a recognized standard authority among export shippers, and has the strongest indorsement of all the transportation lines and export houses, manufacturers, etc., engaged in export trade. It gives exactly the information which exporters require to enable them to ship their goods with the minimum of expense and trouble. It is a valuable compendium for anyone who is at all interested in export trade.

Legal Notices

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Furnace, C. F. Diller 928,907
Furnace oven, removable, N. E. Storms 928,816
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Fuse lighter, C. C. Myrick 928,685
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Garment supporter, G. Barfus 928,421
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Gas burner valve, L. L. Carnahan 928,497
Gas engine, H. M. Yager 928,299
Gas extinguisher and lighter, J. A. Matonsek 928,776
Gas furnace, J. Bueb 928,494
Gas, generating producer, H. F. Smith 928,808
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Gas lighting appliance, Dier & Primeau 928,505
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Gas, treament of acetylene, James & Watson 928,867
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Gear wheel, N. D. Levin 928,676
Gearing, changeable speed, W. Scott 928,705
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Gearing, variable speed, W. A. Widmer 928,568
Gearing, variable speed, J. S. Barnes 928,894
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ORVILLE WRIGHT'S RECORD FLIGHTS AT FORT MYER.

(*Concluded from page 88.*)

Mr. Wright naturally tried to follow and obliged him to make a turn to the right in order to circle around the stake balloon at Alexandria in the right direction. Upon the return trip, after passing over the top of Shuter's Hill—a high hill near the turn—a strong downward current drove the machine toward the earth, and the aviator was obliged to set the horizontal rudder sharply upward in order to regain his proper elevation. After doing this he flew steadily back to the starting point and crossed the line 14 minutes and 42 seconds after first passing over it on the outward journey. Deducting the time of the turn at the far end of the course, the time for the 10 miles was 14 minutes and 12 seconds, which corresponds to a speed of 42.25 miles an hour. This means that the Wrights will receive a bonus of $5,000 in addition to $25,000 they bid for supplying a 2-man machine. The flight was made with Lieut. Benj. D. Foulois as passenger, and, save for the points mentioned above, was uneventful according to Orville Wright. The precision with which he maintained his level while flying over a valley 200 feet or more in depth on the outward trip was remarkable, and had not the downward wind current caught him on the return trip, he would have accomplished this just as well. The undulation and veering out of the course owing to the wind doubtless made a slight diminution in the speed. Had there been no wind the brothers might have made faster time and obtained a greater bonus. But, on the other hand, a flight under such conditions as obtained was a far better demonstration of the possibilities of the machine for war purposes, and the Signal Corps may well be proud of its first war aeroplane, which is without doubt the premier machine of the kind in the world to-day.

THE FIRST SUCCESSFUL CROSS-CHANNEL FLIGHT.

(*Concluded from page 88.*)

when the motor slowed down and stopped and he again came down in the Channel. Although his monoplane struck the water rather more gently than on the previous flight, Latham's nose was broken and his head cut open by his broken goggles, so forcibly was he thrown against some of the guy wires of his machine. Nothing daunted, however, he has announced that he will again make the attempt as soon as he recovers. Thus has been opened a new era in aviation—the era in which the flying machine is to be used for traveling from one country to another, be it over land or sea.

The triumphant 25-mile flight of Bleriot across the English Channel, which was accomplished in 37 minutes, or at the rate of about 40 miles an hour, is the culmination of a large number of more or less lengthy, yet successful flights that have been made by this aviator with his "No. XI." machine since it was first brought out last January. Some of the more recent of these flights we mention herewith.

During the past two months, M. Bleriot has been experimenting almost daily with either his "No. XI." or "XII." monoplane. The former of these he has kept at Issy-les-Molineaux, while the "No. XII." machine has been at Douai. On June 8th he made two excellent 500-meter flights with the latter at Issy-les-Molineaux, the first alone, the second with his mechanic as passenger. On June 11th he made several short flights of from 500 to 600 meters in length, keeping the machine close to the ground; and afterward a magnificent flight of fully a mile, which was terminated by a double S turn at a height of 15 feet. With M. Guyot as passenger, another flight of 1½ kilometer (nearly 1 mile) at a height of 7 meters (23 feet) was accomplished. The following day M. Bleriot made a straight-line flight of about 250 meters (820 feet) with Santos Dumont and A. Fournier as passengers. This was the first time that three people had flown in an aeroplane. The same day several other flights were made with one passenger, the longest of these being about a mile in length at a height of 20 feet. By himself, Bleriot afterward flew about 3 miles.

On June 14th Bleriot made some more flights with his "No. XII." monoplane. After a short flight of 4 kilometers (2½ miles), he landed to repair his magneto. As soon as this was accomplished he made a magnificent flight of 10½ minutes duration, in the course of which he turned his machine in all directions and executed various maneuvers that demonstrated thoroughly its stability. Several times he took his hands off the steering wheel. The next day, after making a 5-minute flight at a height of 20 feet, he flew with a passenger, but the flight was stopped by the breaking of a connecting rod of the 8-cylinder motor.

On June 18th, Bleriot began flying again his "No. XI." monoplane, fitted with a 3-cylinder Anzani air-cooled motor of about 25 horse-power. He made a flight of 4 kilometers (2½ miles). On the 21st he made flights of 3 and 6½ minutes, the motor stopping from lack of oil. Just as he was starting on a third flight, the exhaust from the motor set fire to the gasoline in the carbureter, due to the latter being placed too near to the exhaust pipe. The flames were quickly extinguished with sand.

On June 25th, he took out his machine about 7 P. M., and, notwithstanding a quite heavy wind, he flew for 15½ minutes, making about 12 circuits of the parade ground and showing perfect stability in spite of the violent wind gusts. Each time he passed over the aeroplane shed he took his hands off the steering wheel. The flight was terminated because of too much oil, which fouled the spark plugs. The flight was officially timed by M. Ernest Zens. At 7 A. M. the next day Bleriot made a record flight consisting of 20 circuits of the parade ground in 36 minutes 55 3/5 seconds. In the early evening he made three more circuits.

On Monday, June 28th, Bleriot started making flights at Douai with his "No. XII." machine. He won the first of five prizes of $400 each in a magnificent 1½-mile flight at a height of 65 feet. In a second flight made on this day, he carried a passenger once around the field.

On June 30th, he tried to break his previous record at Issy with his "No. XI." machine, but after flying only 650 feet, the engine stopped on account of too much oil. Shortly after, he remedied this trouble, and then made four excellent circuits of the parade ground at a speed of over 37 miles an hour. The time of the flight was 6 minutes, 11 seconds. There was a gusty wind of from 15 to 20 miles an hour. More lubrication trouble was the cause of his alighting.

On July 4th Bleriot set up a new record at the Aerodrome at Juvissy. This record was made at an aeronautic meet for the benefit of the many people who suffered from the recent earthquake in the south of France. The flight this day was made with the "No. XI." machine. After making one circuit of the course, Bleriot started upon his long flight. This flight lasted 50 minutes and 8 seconds. It was brought to a close through trouble with the gasoline feed. The flight was made at a height that varied from 50 to 80 feet, and it was the best Bleriot had made up to that time.

On July 9th and 10th, at Douai, he made several flights before 20,000 spectators; but his greatest performance prior to that of July 25th was his cross-country flight of 25 miles on July 13th. This flight from Etampes to within 8 miles of Orleans was accomplished early in the morning and was broken by a descent in a field near Barmainville. The flight was for the "Prix de Voyage." While it was not necessary to make a descent, Bleriot chose to do this so as to show

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the practicability of his machine. Soon after he started up again, Bleriot passed Toury and Dambron. As he came in sight of Artenay, which was the half-way point of the cross-country flight last year, a rather strong wind from the west caused him to make a semi-circle. He flew sufficiently high to clear the telegraph wires and then came to earth on the selected spot at Croix-Briquet-Cheville. The start was made at 4:44 A. M. and the landing took place at 5:40. Deducting the 11-minute stop, the net time was 45 minutes and the distance 41.2 kilometers (25.58 miles). The average speed was therefore 34.1 miles an hour. In making this flight Bleriot received a prize of 5,000 francs as pilot and 4,000 francs as constructor. The motor manufacturer received 3,000 francs and the designer of the propeller 2,000 francs. All these prizes are conditional upon the performance not being beaten before the first of next January. The practicability of Bleriot's machine is shown by the fact that 35 minutes after he had alighted the machine had been taken apart and shipped back to his factory at Neuilly, near Paris.

M. Bleriot's two latest aeroplanes have been illustrated and described heretofore in our columns, but it would perhaps be well to give the particulars of these machines again at the present time. The spread of the "No. XI." is 7.8 meters (25.58 feet) and the length of the body 7 meters (22.96 feet). The lifting surface is 14 square meters (150.69 square feet). The machine is equipped with a 3-cylinder Anzani air-cooled motor which weighs 60 kilogrammes (132.27 pounds) complete in running order. A 2.1-meter (6.88-foot) diameter Chauviere wood propeller is driven direct from the motor. Complete with Bleriot (whose weight is said to be 195 pounds) and with fuel sufficient for a two-hour run, the "No. XI." machine weighs but 300 kilogrammes (661.38 pounds). It rises in the air at a speed of 55 kilometers (34.17 miles) per hour when the surfaces are loaded to the extent of 22 kilogrammes per square meter (4.46 pounds per square foot). This is about double the weight carried per square foot of surface by most bi-planes. It is probable that this machine, which is the smallest and lightest that Bleriot has built, is able to raise even a greater weight. It might perhaps carry an extra passenger, although this has not yet been tried. The plane is said to be warpable, somewhat similar to those of the Wright bi-plane. Consequently, there are no wing tips. The "No. XII." monoplane, on the other hand, has rectangular balancing planes attached to the body framework just below the aviator's seat. It is somewhat surprising that planes so near the center of the machine will work satisfactorily for this purpose, but photographs of the "No. XII." making a turn show that it tips very little. Bleriot has two vertical surfaces on each side of the body at the front end and he has also covered the framework about half way back to the rear end and placed a fin keel above it. As a result of all this vertical surface the machine does not tend to skid very much in making a turn, and consequently it does not have to be tipped inward to counteract the effects of centrifugal force.

The "No. XII." monoplane has a spread of 9 meters (29.52 feet) and a surface of 22 square meters (236.8 square feet). It is equipped with an 8-cylinder V-type E. N. V. motor of 30-35 horse-power. The total weight of the monoplane in running order with water in the radiator, but without fuel, is 350 kilogrammes (771.61 pounds). With Bleriot, Santos Dumont, and A. Fournier on board, and with 16 kilogrammes (35.27 pounds) of fuel, the total weight was 560 kilogrammes (1,234.58 pounds). Therefore this machine, which weighs only 350 kilogrammes (771.61 pounds) carried a dead weight of 210 kilogrammes (462.97 pounds). The total weight lifted per square foot in this instance was 5.21 pounds—an altogether unprecedented amount. The machine rises at a speed of 55 kilometers (34.17 miles) per hour with 25 kilogrammes per square meter (5.12 pounds per square foot) loading of its single surface. The weight lifted per horse-power varies from 35 to 41 pounds, according to whether the motor is taken as developing 35 or 30 horse-power. This monoplane is therefore by far the most efficient aeroplane flying machine that has ever been constructed.

After his record flight M. Bleriot was presented with a gold medal by the Aero Club of Great Britain and also by the Aero Club of France. A few days before, he and Gabriel Voisin had been awarded the Osiris prize, which is given every three years to the men who make the greatest advance in science. He was also decorated with the ribbon of the French Legion of Honor, as were the Wright brothers. In addition to winning the prize of the London Daily Mail ($5,000), Bleriot also won a prize of $2,500 offered by a French wine firm two years or more ago. The Alaska-Yukon Exposition has put up a prize of $25,000 for a race between Bleriot and the Wright brothers.

ELECTRIC LAMPS IN THE MAKING.

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the bulb are then joined together. The operation is known as "tubulating," and the tube thus made temporarily a part of the bulb furnishes the means for the removal of the air inside at almost the final stage in the manufacture of the lamp.

With the filament now made and the bulb washed, cleaned, dried, and tubulated, the filament-bearing stem and the bulb proper are assembled at one machine. The operation of sealing these two parts can best be likened to inserting a stopper in a bottle; the bulb being the bottle, and the stem the stopper. A girl inserts this stem into the neck of the bulb, and both parts are revolved on the sealing machine into jets of flame, where they melt together. Knowing the exact amount of glass that must be melted away and the shape the molten glass will assume when it cools, the operative is able to unite the stem and bulb skillfully.

Then the bulb goes into another tray along with other bulbs, and is taken to a girl in the vacuum room. This girl is seated before an earthen pot in which there is a bubbling liquid—phosphorus in a liquid state—which is kept stirred by a jet of water. She takes the bulb, and with a brush hardly larger than a knitting needle coats the air-extraction tube with a phosphorus solution.

After this the bulb is ready for the exhaustion of the air and final sealing. Already the air has been drawn from the bulb several times in the processes of manufacture, but each time the bulb has been left unsealed. It is now ready for the final air test. The tube at the big end of the bulb, through which the air is withdrawn by a most ingenious pump, is to be sealed by melting.

When the bulb is placed in position for exhausting the air, the wires running through the neck are connected with an electric current, which causes the filament to glow. If it were allowed to glow more than a few seconds with oxygen present in the air, the filament would burn up and collapse So, while the tube is connected with the vacuum pump, the operative touches it with a blue flame spray which melts bulb and stem apart, and the melted end next to the bulb draws up and closes automatically, leaving the little point seen in the finished bulb over your desk or table. Before the sealing is completed the light within the bulb has a bluish cast, and this reveals the fact that all the oxygen has not yet been withdrawn from the bulb. It is then that the coating of phosphorus in the air extraction tube plays its part. The heat upon the tube converts the phosphorus into a phosphorescent gas, and this gas, entering the bulb, neutralizes the oxygen in the bulb. Almost instantly the color of the bulb changes from blue to white. In this manner the operative

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knows that the effect of the oxygen has been overcome.

The bulb is next taken into the photometer room for the purpose of making final tests. It is a large dark room divided into several small stalls. In each stall is an induction coil, from which the bulb is held about two feet away. The induced current from the coil passes through the body of the operator to the bulb, and causes the filament to glow faintly. If the glow is bluish gray, it shows that there is still a leak somewhere; although it may be so infinitesimal that it can scarcely be measured by mils. If the glow is of a purplish hue, it shows that there is air still within the bulb and that the bulb must be further exhausted. This means an operation involving many more handlings.

The next process is the measurement of the bulbs for voltage, a work of the greatest possible delicacy. Two girls, working together, do the measuring. One places the bulb in connection with a current that lights it, and the light from it shines through a small aperture upon a white paper screen. In the center of this screen is a faint star-shaped spot. It requires a certain voltage in the light to bring out this spot.

When bulbs pass the tests and measurements successfully, they are then ready for the appliances with which they are attached to the current-carrying fixtures in general use. They are taken to another part of the factory, where a girl places them in a tray. Threaded brass collars are placed about the necks, and the space between the collars and the necks is filled with plaster cement. The tray revolves through a heating oven that bakes the cement into a hard and holding mass. The ends of the wires running through the necks are cut off; small round brass plates are placed on the ends, the wires are soldered fast, and the lamp is completed.

Once more there is a sort of farewell test for leakages that may have escaped notice or may have developed from the last handlings. This final test is very quick and simple. The sealed ends of the bulbs are held against two electric poles. If the lights are white and perfect, the lamps are considered ready for the last cleansing of the glass, classification, and shipment. Throughout the entire process of development of the bulb into a perfect lamp there are scarcely ever any broken. This is really remarkable when it is remembered that the bulb is not only picked up many times and placed in machines, but is heated and cooled many times.

THE FIGUREHEAD AND ITS STORY.

(*Concluded from page 92.*)

other meaning of the word dragon denotes watchfulness, so that it is not surprising to find that the *drakkars*, or dragon ships of the Vikings, generally belonged to their chieftains and were the largest ships in their fleets. The next largest were generally *esnekkers* or "long serpents" with snake figureheads. In both cases the hull of the vessel played the part of the monster's body, the stern often terminating in a representation of its tail. But although the dragon and serpent were the favorite devices they were not the only ones that did duty at this period as figureheads. When Sweyne, King of Denmark, made a descent on the Norfolk coast in 1004, his own ship "The Great Dragon" was made in the form of the animal whose name it bore, but the bows of the other vessels of his squadron were adorned with the figures of lions, bulls, dolphins, and men, all made of gilded copper.

After the Norman conquest the figurehead disappears from view for some centuries, and it is not until the reign of Henry V that we again find references to its use. Images of the saint after whom a ship was named used, it appears, to be sent on board in the time of Edward III, but there is no record of their having been utilized as figureheads. The reason of their temporary disappearance was the gradual changes in the status of navies and in the build of the ships of which they were composed. The fast oar-propelled long-ship, built only for speed and for war, gradually gave place to the round-ship, relying on her sails and built primarily for commerce and the conveyance of mail-clad nobles and their men-at-arms to the country where they intended to carry on a campaign. Fierce sea fights certainly took place from time to time, but for this purpose any ships that could be assembled together were utilized and prepared for action by the addition of stern and fore castles, built-up stages or platforms which overhung the actual stem and stern of the ships and left no place for a figurehead. In process of time the square bow platform or forecastle became triangular and its foremost extremity once more offered a suitable position for the figurehead. Gradually, too, the king became possessed of a certain number of ships of his own, the nucleus of a royal navy. These vessels, though occasionally hired out as merchant ships, were more or less elaborately decorated, and among other decorations the figurehead reappeared. Thus in the year 1400 the "Good Pace of the Tower" had a large golden eagle with a crown in his mouth as figurehead, and in representations of ships during the fifteenth century little, insignificant figureheads are here and there to be met with. The famous "Henri Grâce à Dieu," built in 1514, had a squatting lion as figurehead, while the big French man-of-war "Grande-Françoise," built at St. Nicholas de Leure in 1527, was decorated forward with a salamander above which was placed a statue of St. Francis. The Elizabethan men-of-war seem generally to have been ornamented with figureheads, but with some exceptions they were neither very large nor very noticeable. At this time a long, almost straight projection ran abruptly out from the bow of the ship a little way below the bowsprit. It was very different from the gracefully curved stem which in the seventeenth and eighteenth centuries replaced it and would not, in all probability, support any very great weight at its extremity. Still it often carried a figurehead of sorts. Thus the "Ark-Royal," Effingham's flagship in the Armada fight, had a mild-looking bird as figurehead. The "Bonaventure" and others had dragons on their beakheads; others had lion figureheads, one, at any rate, being gilded. The "Mary Rose" had a unicorn, the "Swiftsure" a tiger, while the "White Bear" was adorned with "an image of Jupiter sitting upon an eagle with the cloudes." In Holland the "Finis Belli," the earliest ironclad, bore the figure of a man in armor at her bow. About the time of James I equestrian figures were introduced as figureheads, and in succeeding reigns these were surrounded with other figures, forming a most elaborate bow decoration. Thus the famous "Sovereign of the Seas," launched in 1637, had on her beakhead the figure of King Edgar on horseback trampling upon seven kings. The figurehead of the Commonwealth ship "Naseby" was equally exuberant, consisting as it did of the Protector on horseback "trampling upon six nations." It was evidently a colorable imitation of that borne by the "Sovereign of the Seas." Curiously enough this was the ship in which Charles II returned to England at the Restoration. In honor of this she was renamed the "Royal Charles." She was fitted with a new figurehead, which is now in the museum at Amsterdam, the ship having been captured by the Dutch when they came up the Medway. Furtenbach in his "Architectura Navalis," published a few years earlier, gives an engraving of a very peculiar figurehead which terminated the beakhead of a Turkish pirate brigantine of a class known as *caramunzels*. It is probably intended to represent a drag-

(*Continued on page 102.*)

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Inquiry No. 8868.—Wanted to buy nickeloid for buttons.

COMMERCIAL COMPANY in Chicago will consider the manufacture of inks, mucilage, pastes, sizings or other profitable specialties. Bank references furnished, Address Chicago, Box 773, New York.

Inquiry No. 8918.—For manufacturers of "Wydt's Electro-Catalytic Sparking Plug."

WILL GIVE AN INTEREST in a vending machine of international use to parties who will pay the patent filing fees in foreign countries. For particulars address P. C. Petersen, Box 173, Perth Amboy, N. J.

Inquiry No. 8922.—Wanted the address of Worthington Boiler Co.

PATENTS FOR SALE.

FOR SALE.—Patent No. 896,792. Safety brake for elevators. For further information address C. F. Bath, Abilene, Kansas.

Inquiry No. 8921.—For the manufacturers of gilt paper.

FOR SALE.—Pateut No. 899,381. Self-threading sewing machine needle. Threaded instantly by anyone. No openings to catch in material. Outright or on royalty. A. G. Bradley. 324 E. Park St., Edwardsville, Ill.

Inquiry No. 8931.—For parties who manufacture the Western Stump Borer for boring stumps.

FOR SALE.—Patent No. 922,274. Latest and best glass front post card rack. Saves its price in preventing cards from being soiled and stolen. Address Alva Post Card Co., Alva, Oklahoma,

Inquiry No. 8941.—For manufacturers of machinery for making fly screens.

FOR SALE.

FOR SALE.—Specialty for manufacturers. Dental floss holder, patented May, 1909. For further particulars apply direct to inventor. T. A. Tubbs, Seattle, Wash., care H. S. Emerson Company.

Inquiry No. 8960.—For the address of the Windsor Mfg. Co., manufacturers of waterproof collars and cuffs.

HELP WANTED.

LOCAL REPRESENTATIVE WANTED.—Splendid income assured right man to act as our representative after learning our business thoroughly by mail. Former experience unnecessary. All we require is honesty, ability, ambition, and willingness to learn a lucrative business. No soliciting or traveling. This is an exceptional opportunity for a man in your section to get into a big paying business without capital and become independent for life. Write at once for full particulars. Address E. R. Marden, Pres., The National Co-operative Real Estate Company, Suite 378. Marden Building, Washington, D. C.

Inquiry No. 8966.—Wanted the address of the Cobendet Motor Co.

YOUNG MAN, graduate of some school in mechanical engineering, for position in woodworking plant in small Tennessee town. Good opportunity for advancement. State experience, if any, and salary. Answer "Position," Box 773, New York.

Inquiry No. 8969.—Wanted machines that make accordion dress plaiting (steam).

WANTED.—Good man who thoroughly understands making surveying instruments. For full particulars and further information address Wissler, 611 N. Broadway, St. Louis, Mo.

Inquiry No. 8974.—For address of firms interested in fishing reels.

WANTED.—First-class machinist who can invest $5,000 in an old established business in Denver, Colo. Good salary to right man. Address 1522 Wazer Street. Denver, Colo.

Inquiry No. 8977.—For manufacturers of machinery for manufacturing denatured alcohol.

SALESMEN WANTED.

SALESMAN WANTED to handlean exceptionally attractive real estate and timber proposition, which can be sold on annual, semi-annual or monthly installments. We furnish inquiries and strong literature. Capable, aggressive, energetic man can make desirable connection with largest and strongest house in its line in the country. Sacramento Valley Imp. Co., St. Louis, Mo.

Inquiry No. 8978.—Wanted the address of manufacturers of dry pans or crushers to grind sand for plastering and cement works.

MISCELLANEOUS.

TOBACCO HABIT CURED OR NO COST.—Harmless home treatment. Ni-Ko Works, Wichita, Kansas.

Inquiry No. 8980.—For the address of manufacturers of mortars and pestles that are used by druggists.

LISTS OF MANUFACTURERS.

COMPLETE LISTS of manufacturers in all lines supplied at short notice at moderate rates. Small and special lists compiled to order at various prices. Estimates should be obtained in advance. Address Munn & Co., List Department, Box 773, New York.

Inquiry No. 8984.—Wanted the address of the manufacturers of Cypress wash tubs.

A LIST OF 1,500 mining and consulting engineers on cards. A very valuable list for circularizing, etc. Price $15.00. Address Munn & Co., List Department, Box 773, New York.

Inquiry No. 8987.—Wanted, the manufacturers of the Van Winkle, Woods & Sons, and the Weber power meters.

Inquiry No. 8990.—For information regarding shoes not made of leather but similar to the same and are as durable.

Inquiry No. 8996.—Wanted addresses of manufacturers of machinery for working orange wood manicure sticks.

Inquiry No. 8997.—Wanted the address of the manufacturers of bread or cake boxes.

Inquiry No. 8999.—For manufacturers of combined clothes and clothes pin receptacle.

Inquiry No. 9001.—For the address of progressive manufacturers of fruit jars.

Inquiry No. 9003.—For the address of parties who make "Invar" or other metals having a low coefficient of expansion.

Inquiry No. 9004.—Wanted to buy machinery suitable for grinding, sifting and preparing cooked cereals; also packing same in cartons.

Inquiry No. 9005.—For the address of manufacturers of 4 oz. cylindrical paper boxes.

Inquiry No. 9006.—Wanted to buy a machine that will sew or clamp a thin two-ply wood cover on to the top of a bushel basket, wiring and sealing it quickly by power machinery.

Inquiry No. 9007.—Wanted, a tin churn for churning milk that has a wire spring at top and bottom of churn and operated by pressing the wire springs.

Inquiry No. 9008.—For manufacturers making a pecialty of match boxes.

Nailing machine, Evans & Cherry 928,645
Nut, lock, J. J. Fifield 928,436
Nut lock, I. N. Anderson 928,577
Nut lock, S. L. Smith 928,811
Nut lock, E. G. Brightful 928,845
Nut tapping machine, R. J. Rodd 928,333
Nuts, dies and punches for making, G. Dunham 928,509
Nuts, making, G. Dunham 928,508
Oar lock, bow facing, H. Hinken 928,449
Oil burner, C. D. Wright 928,620
Oil ring retainer, F. P. McBerty 928,784
Oil, separating water from, J. W. Pittock. 928,280
Oiling device for pulleys or wheels, self, J. D. Oliphant 928,688
Ore classifier, F. G. Janney 928,455
Package, R. W. Belson 928,423
Package box, collapsible, M. Orzali 928,689
Packing and making same, T. Murphy 928,875
Pad. See Manifolding pad.
Padlock, J. J. Murphy 928,684
Paint or color disperser with locking device for the valve operating lever, Mikorey & Wagener 928,682
Painting machine, Ford & Taylor 928,374
Paper bag machine, J. Rogers 928,885
Paper cutter, J. Dahly 928,636
Pattern for garments, block, E. H. Peterson 928,691
Pavement cutter, Wiseman & Hedden 928,488
Pawl and ratchet mechanism, W. Trewhella 928,892
Pen, fountain, L. H. Lloyd 928,312
Pencil attachment, M. E. Danahay 928,852
Pencil, mechanical, E. Bergquist 928,733
Photographic film packs, adapter for, H. M. R. Glover 928,379
Photographic plate or film, flexible, M. Hausen 928,914
Photographs, method and means of making, panoramic, E. N. White 928,724
Piano, F. C. Ott 928,277
Picture lanterns, safety shutter for moving, W. N. Selig 928,804
Piling clasp, L. E. Edmunds 928,641
Pipe hanger, E. E. Taft 928,711
Pipe joint, L. Bille 928,896
Pivotal connection, F. R. Kunkel 928,772
Planter attachment, wireless check row corn, J. W. Trader, Jr. 928,822
Planter, check row corn, R. Chamberlain ... 928,358
Planter, corn, L. E. Waterman 928,293
Plaque cleaning machine, A. L. Bausman .. 928,730
Plow, beet, L. Brenneis 928,736
Plows, sweep stock attachment for, J. H. Hewitt 928,653
Plumb bob, L. O. Sloggett 928,477
Plural jet burner, C. M. Lungren 928,527
Pocket, safety, D. Traxler 928,920
Pole, wagon, Spillman & Barnes 928,708
Polishing device, electrical, T. H. Rodman 928,702
Power transmitting mechanism, coupling for oil well, Shiray & De Forest 928,805
Press, W. Klocke 928,609
Printing machine, Smith & Woodward 928,887
Printing machine, yarn, N. Costikyan 928,631
Printing press, F. H. Van Loozen 928,525
Pulley, P. D. Skahen 928,338
Pulley, U. T. Gaba 928,746
Pulverizer and planter, combined, J. B. Houghland 928,452
Pump, centrifugal, H. A. Prindle 928,327
Pump, deep well, B. Dewoody 928,639
Puzzle, O. H. Rawitch 928,540
Puzzle, A. J. Zschokke 928,833
Quilting frame, C. E. & L. A. Ashby 928,418
Rack, L. Hunt 928,650
Radiator attachment, E. J. Glackin 928,255
Rail connection, F. Metejka 928,393
Rail fastener, J. E. Ogden 928,276
Rail joint, F. Mihalik 928,683
Rail splice, C. G. Gates 928,747
Rail tying mechanism, W. F. Andrews 928,301
Rails, automatic cleaning device for tramway, J. Sandoz-Sutter 928,543
Railway block system, G. W. Nistle, et al, 928,271, 928,273, 928,274
Railway crossing, J. W. Baldwin, Jr. 928,238
Railway crossing gate, J. W. Noel 928,788
Railway, elevated suspended track automotor, F. E. Felts 928,435
Railway rail fastener, M. L. Byers 928,496
Railway selective apparatus, Wright & Deible 928,571
Railway selective signaling device, S. R. Wright 928,570
Railway signal, W. J. Rader 928,328
Railway sleeper, reinforced concrete, with special fixing device, B. Sani 928,617
Railway switch, T. W. Cox 928,632
Railway switch, B. Rubbaum 928,704
Railway switch, automatic, I. A. Call 928,738
Railway switch locking system, G. W. Nistle, et al 928,272
Railway tie, J. Staats 928,479
Railway tie, D. Stevens 928,480
Railway tie, H. Cockell 928,499
Railway tie, G. A. Starkweather 928,814
Railway tie, G. Whitaker 928,827
Railway tie and rail fastener, H. A. Olson. 928,791
Railway tie, concrete, J. B. Pope 928,472
Railway tie, metal, Mecbling & Smith, 928,467, 928,529
Railway tie plate, L. Dilworth 928,429
Range finder, W. H. M. Christie 928,902
Ratchet wrench, F. E. Walden 928,719
Razor blade stropping device, O. Kampfe .. 928,664
Razors, device for stropping double edged safety, F. Mitchell 928,318
Receptacle, adjustable attachment, L. P. Benson 928,841
Refrigerating apparatus, J. Schneible 928,546
Refrigerator cars, floor construction for, J. Strain 928,406
Relay, electrical, E. E. Clement 928,360
Relay, frequency, D. J. McCarthy 928,531
Resistance cup, F. Gottschalk 928,652
Rheostat, Meston & Finch 928,394
Ring travelers, holding and delivering means for, L. S. Burbank 928,303
Riveting machine, J. A. Mosher 928,783
Rock cutting apparatus, F. W. Allan 928,574
Rolling mill, H. Keitel 928,768
Roofing nail, J. Conway 928,630
Rotary engine, L. L. Driggs 928,506
Rotary motor, M. Naeder 928,270
Rubber spading boot, Van Denburgh & Glismann 928,718
Rudder, jury, W. Manwaring 928,612
Safety device, W. Cooper 928,903
Safety stop signal, automatic, W. E. Adams 928,834
Sash balance, adjustable, E. M. Erb 928,644
Sash lock, A. A. Solaway 928,339
Sash lock, R. Taube 928,408
Sash operating and locking mechanism, R. H. Jones 928,767
Sash support, window, N. H. Conger 928,362
Screen. See Glass shade screen.
Screen, N. Ellwart 928,643
Screw thread cutting mechanism, Allen & Henry 928,489
Scythe snathe, J. N. Radcliff 928,883
Seal and lock, window or door, C. E. Lahart 928,466
Sealing device, bottle, R. V. Lyon 928,872
Sewing machine ruffler, W. R. Parsons ... 928,792
Sewing machine tuck creaser, F. W. Beckert 928,838
Sewing tool, C. E. Betts 928,424
Shade and curtain pole bracket, adjustable, A. L. & C. L. Renzenbrink 928,329
Shade bracket, H. Wittmann 928,829
Shade bracket and curtain pole support, combined, R. B. Jefferey 928,522
Shade fixture, window, D. Hoyt 928,864, 928,865
Shampoo tray, C. B. Lovett 928,313
Sharpener, file, J. C. Rink 928,331
Sharpening, file, J. C. Rink 928,331
Sharpening machine, saw, G. H. Robinson .. 928,332
Sheet feeding device, F. B. Davidson 928,637
Sheet metal structures, uniting the component parts of composite, A. F. Rietzel 928,701
Sheet metal wheel, sectional, J. F. Craven. 928,633
Shingles from paper pulp, apparatus for making, J. T. Collins 928,501
Shoe polishing machine, E. F. Stratton 928,341
Shoe rack, W. F. Atwood 928,419
Shovel, A. Schultze 928,283
Shuttle operating device, G. Schwabe 928,802
Sign board structure, M. P. O'Brien 928,534
Sign, illuminated letter, C. H. Hulse 928,309
Signal, Kennedy & Gleason 928,666
Silicon nitrid, manufacturing, A. Sinding-

on's head, and flames are shown spouting from its mouth. It seems possible that some kind of a gun may have been mounted inside the beakhead with its muzzle concealed in the monster's mouth.

The French were always noted for the excellence and beauty of their warships, and it is not to be supposed that their ornamentation was a whit behind that of their English contemporaries. As a matter of fact they were, if anything, the more elaborately decorated of the two, and often expensively gilded.

The lion about this period became as favorite a figurehead in the French and English navies as was the dragon among the Vikings. Sometimes he was rampant and fierce, at others he assumed a calm and majestic attitude. The lion went out of fashion in the French fleet after a short time, but was retained rather longer in the British service and adopted very extensively by the Dutch navy. The "Vreyheid," Admiral Winter's flagship, had a lion figurehead. Later full-length figures, often of a classical nature, emblematic of the name of the ship they ornamented, quite ousted the king of beasts, and these lasted right up to the beginning of the ironclad period between 1860 and 1870. There were a few exceptions to the lions and the full-length figures that succeeded them, notably the figurehead carried by the "Britannia" of 100 guns in the reign of William III, which was an elaborate representation of the royal arms embellished with scrollwork and other devices, and that which adorned the "Victory" at Trafalgar, which was also the royal arms with the figures of a seaman and a marine as supporters. Some years afterward these were transformed into a pair of cherubs. But the full-length—or more often the three-quarter length—figure continued to ornament the bows of all classes of men-of-war right up to the beginning of the ironclad period.

The French were ahead of everyone in launching the first seagoing ironclad—"La Gloire." She had no figurehead, but the "Warrior" and the "Black Prince," a pair of sister ships, which England constructed in reply, were ornamented with two of the finest figureheads that have ever been made. But both these ships had overhanging or "swan" bows, while their successors had the ram bow, which did not lend itself so well to this style of decoration, and a shield or coat of arms surrounded with more or less elaborate scrollwork became the vogue for the bows of an ironclad. There were exceptions, of course, especially in ships of low freeboard. Thus, the figurehead of the old "Royal Sovereign" turret ship (which by the way, was an old wooden line-of-battle ship cut down) was unique in having a lion standing at the top of the stem above the medallion of Queen Victoria, which was below it. The "Rodney" and "Centurion" both had bust figureheads illustrative of their names, while the French battleship "Brennus" was decorated in the same way with a very fine piece of wood carving. At this period there were plenty of small craft among the warships of the world which still preserved the swan bow, and with these the older style of figurehead still preserved its supremacy. H. M. S. "Iris," for instance, had a beautifully designed angel, while the unfortunate gunboat "Serpent," wrecked off the Spanish coast, bore a snake. Toward the end of the nineties the figurehead began to disappear altogether from the British and the French man-of-war. The principal reason alleged for the abolition of the figurehead in England was that it got in the way when rigging out the torpedo-net defense, which on its part often damaged the ornamentation, necessitating an expenditure on repairs. Probably the initial cost was also thought to be an extravagance. But the practical and economical Germans have retained the

(Concluded on page 103.)

figurehead in their new and formidable navy and have evolved some very handsome specimens despite the ram bow. What, for instance, could be more decorative and appropriate than the fine figure of Germania on the bow of the "Deutschland," one of their very latest battleships? The scrollwork on the cruisers "Bismarck" and "Eber" is also very artistic. The probability is that the German Admiralty regards *esprit-de-corps* as a very valuable and practical asset and thinks that nothing is ill-spent which in any degree serves to stimulate this feeling. Certainly in the old days seamen venerated the figurehead of their floating home in much the same way that a regiment adores its special and distinctive badge. "So, now, my lads," said Capt. Hall when in command of a frigate on board of which there was an epidemic of bickering and quarreling among the ship's company, "if this be not put an end to, and hearty good-will restored, I'll blacken your figurehead and put the ship in mourning." The threat had a most salutary effect, and the handsome bow-ornament shone resplendent to the end of the commission.

In the far East the Japanese and Chinese have one uniform bow decoration for their men-of-war, the former using a conventional representation of the Imperial chrysanthemum and the latter the national dragon with the head of a camel, the horns of a deer, the eyes of a rabbit, the ears of a cow, the neck of a snake, the belly of a frog, the claws of a hawk, and the palms of a tiger.

In the United States the figurehead has followed much the same lines as in Europe. That of the "Chesapeake," famous for her duel with the "Shannon," can be seen in the gardens of Ashford House in Woolmer Forest. That of the "Delaware," representing the Indian chief Tecumseh, is in the grounds of the naval academy at Annapolis, and is saluted by every cadet when he passes it, lest haply the omission to do so should bring him ill-luck in the passing-out examination. Though not on so elaborate a scale as in the German navy, the United States ships, even of the newest types, are still decorated with scroll-work at the bow and in some cases a new departure has been made in placing a handsome full-length figure or figures of bronze on the foremost turret between the two bow guns. The "Massachusetts," for instance, has a most handsome and decorative figure of a Winged Victory which was presented to her by the State whose name she bears, while the "Kearsarge" and "Alabama"—whose former namesakes fought so desperately with each other off Cherbourg in 1864—have similar decorations symbolizing in the figures the North and South clasping hands, a reunited country.

This seems an excellent idea and one that might well be followed in all navies. A bronze figure on the foremost turret would more than replace the figurehead of former days. It would, unless destroyed in action, be practically everlasting and be passed on from one ship to its successor of the same name. It would be a far better and more appropriate heirloom than the services of plate which it is becoming the custom to present to various ships. Being carried inboard instead of outboard it can be seen and admired day after day by the ship's company, which was not always the case with the figurehead even in its palmiest epochs. May we in conclusion express a hope that the time-honored figurehead may in this form rise "phœnix-like from its ashes" and be once more promoted to a place of honor in the world's war navies?

A 7-foot flywheel upon a Russel engine went to pieces the other day at the station of the Allegheny Valley Lighting Company, at Creighton, Pa., causing about $3,000 worth of property damage, but no personal injuries.—Power and the Engineer.

Larsen	928,476
Single phase commutator motor, V. A. Fynn	928,438
Sink, washtub, and similar article, F. H. Caldwell	928,425
Skate, J. E. Martin	928,528
Skirt gage, J. D. Ball	928,239
Skiving machine attachment, G. A. Henderson	928,755
Smoke producing device, H. & R. Pinegar	928,695
Snow plow for sidewalks and highways, W. W. Cowan	928,363
Sound producing instrument, F. Gottschalk	928,651
Sound reproducing machine, J. Wellner	928,567
Sparker, G. A. Weidely	928,484
Speaking tube, W. F. Simpson	928,554
Speed changing mechanism, W. O. Foss	928,648
Speed controlling mechanism, A. M. Wolf	928,727
Speed indicator, Dahl & Martin	928,635
Speed mechanism, variable, A. G. Mather	928,679
Spinning or twisting machine, W. P. Wood	928,830
Square and bevel, combined, E. A. Williams	928,569
Stamps to lecters, device for affixing postage, A. Tebbit	928,713
Stave formed structure, machine for tying bands in, D. E. Vanvactor	928,290
Stave punching machine, D. E. Vanvactor	928,289
Steel toughening, S. S. Wales	928,347
Stove attachment, gas, H. Knudsen	928,770
Stove, heating, E. R. Cahoone	928,737
Straightening machine, E. A. Lane	928,672
Strainer, sink, A. W. Andrews	928,236
Stud or button, E. L. Anderson	928,622
Suit case handle connecting device, G. W. Wood	928,619
Surface indicator, F. Brink	928,492
Suspenders, J. Weis	928,722
Sweeping machine, J. O. Johnson	928,456
Swing gate, Kendrick & Carroll	928,387
Tanks or cans, safety attachment for, N. B. Ippolito	928,660
Tapper, beer, R. B. Spikes	928,813
Tare weight, J. W. Ford	928,745
Telegraph and telephone wires, guard for, C. J. Elliott	928,431
Telegraph pole, W. H. & H. R. Smalley	928,478
Telegraph sounder intensifier, R. W. Crawford, et al	928,589
Telephone system, D. W. May	928,680
Telephones, sanitary guard for, S. E. Florsheim	928,373
Telephonic apparatus, E. A. Graham	928,862
Telescope mounting, F. L. Smith	928,555
Tent, folding, H. G. Hergelroth	928,448
Tent pin or anchor, J. F. Miles	928,469
Textile fabric, J. G. Elliott	928,642
Thread, spool of, J. J. Drury	928,507
Tie plate, J. H. King	928,869
Tile, H. C. Moore	928,320, 928,321
Tile and sewer outlet protector, drain, O. A. & J. A. Tenold	928,481
Tins or canisters for preserves, apparatus for flanging, A. Wilzin	928,618
Tire armor, pneumatic, C. E. Evans	928,433
Tire, non-skid, E. Kempshall	928,868
Tire setter, H. M. Lourie, et al	928,264
Tire signal, pneumatic, Silverman & Trahan	928,553
Tire, vehicle, W. A. Koneman	928,611
Tire, vehicle, M. Behrer	928,731
Tire, pneumatic, R. J. Ruths	928,334
Tires, gaiter or patch for repairing pneumatic, H. Marles	928,678
Tires, etc., hose connection for wheel, E. J. Rohrbacher	928,797
Tires, valve for pneumatic, G. De Vigne	928,411
Toilet case, E. B. Pike	928,694
Tongs, A. G. Carlson	928,849
Top, Gropper & Schmidt	928,257
Towing post, W. F. Johnstone	928,766
Toy, O. S. Meyer	928,777
Toy, figure, W. H. Fisher	928,744
Traction wheel, N. Campbell	928,848
Train stop, time limit, W. Brewer	928,355
Trains, means for controlling the operation of, J. F. & J. F. Webb, Jr.	928,350
Trap, J. C. Wood	928,352
Trap, D. Morgan	928,395
Trolley, F. Kompe	928,668
Trolley base, C. E. Gierding	928,442
Trolley pole controlling means, C. E. Cozzens	928,306
Trolley pole for electric railway cars, T. Oliver	928,879
Trolley switch plate, E. Bell	928,839
Trunk, J. Finzler	928,743
Trunk lock, H. W. Cottrell	928,904, 928,905
Tube cleaner, W. S. Elliott	928,432
Tubes, bottles, etc., closure for collapsible, Pike & Hayne	928,692
Tumbling apparatus, Patterson & Boax	928,399
Turn table, M. J. Leonard	928,675
Typewriter, telegraphic, E. Burlingame	928,581
Typewriting machine, C. Delvigne	928,591
Typewriting machine, A. T. Brown	928,627
Typewriting machine, J. C. Doane	928,856
Typewriting machine, H. S. McCormack	928,876
Typewriting machine, J. C. McLaughlin	928,877
Typewriting machine, E. L. Pfunder	928,882
Umbrella, folding, J. Charlesworth	928,426
Umbrella window, G. R. Livergood	928,774
Valve, C. G. Harcourt	928,751
Valve, J. Stevison	928,815
Valve, D. F. Morgan	928,874
Valve, automatic intermittent flushing, H. A. Kieselhorst	928,459
Valve, gas, J. Melnik	928,316
Valve operating mechanism for internal combustion engines, S. Loffler	928,390
Valve operating mechanism, furnace, J. W. Seaver	928,403
Valve, regulating, H. C. Benwitz	928,732
Valves, disengaging device for motor driven, Ward & Yerrick	928,720
Vault, burial, S. E. Burke	928,847
Vaults, mold for concrete burial, M. J. Demorest	928,638
Vehicle, B. Tippmann	928,564
Vehicle cushion wheel, F. Groff	928,601
Vehicle spring, Bollbach & Waindzioch	928,242
Vehicle top, foldable, W. S. Butler	928,584
Vehicles of any kind, antivibration device for, G. Huysmans	928,520
Vehicles, stalk cutting attachment for, R. B. Human	928,759
Velocipedes, pumping device for, P. G. Larsson	928,919
Vessel lid holder, R. M. Dixon	928,855
Vessels, apparatus for elevating submerged, G. Pino	928,536
Vinegar, making, W. Antoni	928,578
Wagon box, drop, A. T. Cyr	928,503
Wagon, dumping, G. M. Head	928,753
Wagon jack, A. A. Roon	928,587
Washing machine rake, A. C. Sargent	928,336
Water closet fastening device, J. F. Kelly	928,523
Water cooler, W. G. Eads	928,908
Water distributer, W. C. Johnson	928,386
Water gage, C. Carlson	928,304
Water heater, F. A. Knapp	928,261
Water heater, H. S. Humphrey	928,310, 928,311
Water heater, J. W. Ellebrecht	928,859
Water heater, automatic, R. Hoffman	928,757
Wedge, ax and tool handle, G. P. Morrill	928,322
Weighing machine, K. Bottcher	928,491
Wheel attachment furrow, L. J. Hamilton	928,446
Wheel lock, hand, Ward & Yerrick	928,893
Whetstone, blotter, and ruler, combined, E. B. Pike	928,963
Whip socket, J. C. Feickert	928,370
Windlass, C. H. Richardson	928,336
Window and door screen, A. C. Davis	928,366
Window, flexible, W. E. Walsh	928,349
Window pane fastener, A. E. Cherry	928,359
Window screen, W. A. Loper	928,526
Wire rope clamp, C. C. De Witt	928,367
Work clamp, H. Howell	928,657
Wrench, A. Frick	928,375
Wrenches, pipe-gripping attachment for monkey, F. Gorman	928,444
Yarn, W. P. Wood	928,831

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

Canadian patents may now be obtained by the inventors for any of the inventions named in the foregoing list. For terms and further particulars address Munn & Co., 361 Broadway, New York.