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(Illustrated articles are marked with an asterisk.)

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THE SCIENTIFIC AMERICAN SUPPLEMENT,

No. 327,

For the Week ending April 8, 1882.

Price 10 cents. For sale by all newsdealers.

THE STEERING AND PROPELLING GEAR OF THE ALARM.

The report of the Board of United States Naval Engineers, on the Mallory steering and propelling gear as applied to the torpedo boat Alarm, develops results likely to have much influence in determining the conditions of future naval warfare.

The peculiar design and construction of the Alarm have already been described and illustrated in these columns, (SCIENTIFIC AMERICAN, March 17, 1877). The vessel, it will be remembered, is intended as a harbor and coastwise cruising torpedo boat, carrying in the bow one heavy gun and a torpedo spar of special construction. The single gun has no carriage in the ordinary meaning of the term, the vessel as a whole serving as a carriage, while the training of the gun in azimuth is effected by the steering and propelling gear, the boat moving with the gun so as to fight always "bow on."

For this purpose steering gear of great capacity and delicacy was needed, so as to hold the vessel steady while at rest, and to make her movements always prompt and thoroughly controllable, as well when backing as when progressing. The maneuvering qualities desired were first obtained by means of a horizontal feathering wheel, which failed, however, to give the requisite speed without too great a cost in power. Accordingly the propelling and steering gear invented by Colonel Wm. H. Mallory was substituted. The stern of the Alarm was ill-adapted to the use of the Mallory propeller; and such seems to have been to some extent the case also with the machinery used for driving the propeller; still in the opinion of the board of engineers the tests showed the system to be satisfactory in all respects. In their own words, "the results of the experiments show the durability, reliability, and practicability of the Mallory propelling and steering screw, and the efficiency of its application to vessels of at least the size of the Alarm, and its entire appropriateness for all the purposes to which a cruising torpedo boat carrying a heavy gun can be employed."

The Mallory system consists of an ordinary screw propeller combined with actuating mechanism for changing its axis with respect to the axis of the vessel so as to absolutely control the speed and direction of the vessel's motion, while the propelling machinery remains in permanent connection with the screw and unchanged in its movement. The shifting of the axis of the propeller is effected by a pair of auxiliary steam cylinders called steering engines, whose action is controlled by the commanding officer on deck. By means of the steering engines, the screw as a whole, together with its horizontal shaft, can be turned horizontally entirely around the axis of a vertical shaft, on which it is supported either while it is being revolved by the motive engines or when the latter are at rest. When driven by the motive engines it is a propelling screw; moved by the steering engines it is a steering screw; and it may be either or both together at will. The screw as a whole can be turned horizontally around the axis of its vertical supporting shaft with the motive engines either at rest or in motion. Neither the motive engines nor the steering engines are ever disconnected from the screw. The horizontal screw shaft does not extend into the vessel, but is supported in two pillow blocks situated in and forming part of a hollow brass vertical shaft, the lower end of which is made into a journal and held in a lignum vitæ vertical bearing secured on the upper side of the shoe at the stern of the vessel. The upper end extends into the overhanging counter of the vessel, and to it is secured a horizontal worm wheel of phosphor bronze, the lower side of which is supported by and revolves upon the face of a casting firmly bolted to the hull. A wrought iron worm is engaged in this wheel, and the horizontal shaft of the worm is rotated by the steering engines in the usual manner by means of cranks. The steering engines thus rotate the hollow vertical brass shaft and all it contains about its axis. The total weight of the apparatus, with a ten foot propelling screw, was a little overten tons. To obviate certain difficulties developed in steering at high speeds with large powers, Colonel Mallory has invented an improved system, which employs two duplicate screws, having their axes in the same vertical and horizontal planes, but situated on opposite sides of the vertical hollow shaft and revolved in opposite directions by means of a system of beveled gear within the vessel, the power of the motive engines being applied through the gear, instead of through a crank, to the engine shaft. By this improvement the steering is done as easily when turning in one direction as when turning in the other, and with the same power when the motive engines are working at their maximum speed as when they are absolutely at rest.

In summing up the results of the trials the board mention as demonstrated several important advantages to flow from the use of the Mallory apparatus on gun boats. It enables such a vessel of small dimensions to support a gun of the largest size, and to use it with a promptness and precision of aim not otherwise attainable. The vessel can be kept bow on to an enemy when in advance, when at rest, or in retreat; and it can be maneuvered as efficiently when backing as when advancing. The turning power of the screw is unrivaled, and it may be so operated as to apply the entire motive power with the best possible leverage.

The maneuvering of the vessel is entirely in the hands of the commanding officer, who can, by the movement of a handle conveniently placed on deck, direct his vessel as he will, the motive engines always continuing to work at uniform speed in the same direction. "The vessel can thus be steered, stopped, backed, turned completely around on its center of lateral resistance, laid crosswise to its course, and maneuvered in every conceivable manner, all by the power of the motive engines." The importance of this ready and efficient handling of a vessel, especially in the case of torpedo boats, small rams, and gunboats, is beyond question.

The superior capacity of the Mallory propeller is necessarily attained by a considerable increase in complexity and cost of the propelling and steering gear, which must also be somewhat less reliable and durable than simpler mechanism; nevertheless the board are satisfied that its advantages enormously outweigh its disadvantages, certainly for the smaller naval craft. "With this system of propulsion and steering," they say, "the torpedo boat becomes a certain as well as a dreadful factor in naval warfare, and a gunboat of minimum size is able to carry the largest gun and train it in azimuth with a rapidity and accuracy not possible with any separate gun carriages," and the gun's crew may be no more than is necessary for loading and firing. For coast and harbor defense, where no large coal-carrying capacity is required, the heaviest guns may, by this system, be floated upon boats too small to be hit at long range; and when operated with the Mallory gear such boats can be handled with a celerity and precision which must make them formidable antagonists even for the heaviest ironclads.

The failure of the Alarm to make any creditable record for speed is attributed by the board to the exceedingly foul condition of her bottom, which was found to be covered with barnacles a quarter of an inch high, and overgrown in spots with sea grass four or five inches long.

VIRCHOW ON SOUPS AND BROTHS.

This distinguished German professor and politician has been accused of being the chief opponent of soup. He says that this is not true, for he had merely said that meat broths are neither nutritious nor "substantial." That if all the meat which one uses should be boiled and soup made of it the meat would become for the greater part indigestible, and the soup would not be a substitute for it. Broth, he says, is an article of luxury which only the comparatively well-to-do can afford. A family that can only just make both ends meet should learn to deny themselves this luxury, since they have a similar one in their coffee. A rich man can afford to eat soup; while the sick sometimes must have it.

Ordinary meat broth or bouillon in its pure form can only be recognized as a condiment. By the addition of eggs, flour, fat, and other things it may acquire a certain nourishing and heating value. It is, primarily, only a very dilute aqueous solution of substances that are in part of low value as heat producers, such as gelatine, and in part of the stimulating aromatic parts of the meat. Taken warm it is of nearly the same value as coffee or tea, but is inferior to wine, schnapps, or beer; it only stimulates the nerves. It has one advantage over every other condiment, namely, it contains no poisonous substance, it is incomparably milder, hence much better adapted to feeble persons, and finally it can be very conveniently combined with substances that are actually nutritious, and imparts to them an agreeable and "substantial" taste.

It must be admitted that these stimulants (soup and coffee), because they are stimulants, have more significance than mere condiments. By their stimulating power they awake the slumbering energies. So long as power is left to exert this energy these stimulants are able to vitalize these forces. Hence it produces the impression of being itself strengthening. It has not of itself this power; it can only awaken other forces already present, but cannot create them. A tired organ, a tired laborer, can find new strength in a stimulant because it arouses within him certain powers which would not otherwise have come to his aid. In this lies the secret, and at the same time the beneficial effect, of many stimulants, so that they are, of course, more than mere condiments or flavors, and become, to a certain extent, tools. Used in moderation they can do much good in this direction. But it must not be forgotten that they are not food, and that every energy brought forth by stimulants requires a double influx of substance to replace that consumed, so that it may not result in exhaustion. Condiments can never take the place of nourishing food.

A large portion of our food, it is true, acts at the same time as a condiment, and even as a stimulant. By this is not meant those natural mixtures of nutritive and stimulating substances so frequently found combined in vegetables, nor yet those artificial compounds prepared by skilled cooks, but rather food which has been eaten refreshes and strengthens a person long before the real digestion has been finished. A laborer, who is tired and hungry, has set before him a meal of meat and potatoes, and as soon as his meal is eaten he feels refreshed and ready for work again. Nevertheless it is three or four hours before the meat is dissolved and absorbed into the blood, and even if a portion of the potato starch is converted into sugar or glucose while he is chewing it, it is decidedly the smallest portion. The feeling of strength which the man is sensible of cannot possibly come from the assimilation of his food into the tissues. Its direct effect upon the surface of the organs of digestion and a very slight absorption of the material into the blood exert sufficient stimulus to overcome or relieve the weary condition. It is only on this ground that we can explain why a drink of fresh cool water, a sip of wine or beer, seems to be as invigorating as, or even more so than, a piece of roast beef, although not to be compared with it in permanent effects.

The first invigorating effects that we experience after a meal is either due to the action of the condiment or is the result of those properties of food which place them on the same

footing with mere condiments. Afterward the true digestion takes place, the replacing of the material consumed in work, and with it the sensation of permanent strengthening.

It is this point of view which is often lost sight of by the new school of physiologists who treat of nurture and sustenance. The confusion that exists in regard to the best method of giving nourishment is a natural result of the very one-sided treatment of the whole question, from a purely chemical view, and the error is increasing rather than otherwise. Chemical investigations have a very subordinate importance in recognizing the exciting power of real food and of condiments; the physiological view must here be taken. Virchow, therefore, attempts to restore to the latter science, physiology, its old rights, and hopes to protect scientists and laity from that one-sidedness which always supplants one error by another, and which has nowhere led to more visible results than in this important and interesting domain.

The words of so careful a writer and so thorough an investigator deserve the attention of thinking men on both sides of the question.

Water from Lake George to New York City.

Surveys have been made for an aqueduct 225 miles long to bring to this city and the towns along the Hudson a supply of water from Lake George. The lake is about 34 miles long, and averages from 1⅔ to 1¾ miles in width, and has an area of about 50 square miles. By a short turn at the head of Dunham's Bay, the report says, a new outlet can be made toward the south. The lake has a little more than 3,000 square miles of watershed. It is assumed that by a short canal the surplus waters of the upper Hudson tributaries may be conducted into Lake George to re-enforce the reservoir.

It is estimated by Col. J. T. Fanning, the chief engineer of the projectors of the scheme, that a daily average of 1,500,000,000 gallons of exceptionally pure water would thus be made available for city supplies. It is proposed that the conduit shall be at the first construction an open canal, with a capacity of 500,000,000 gallons a day. At Lake George it will be 322 feet above mean tide water, at Yonkers 213 feet, and above the Harlem River 200 feet. It is anticipated that the entire canal will be covered in time, and its capacity thus increased in midsummer by the consequent reduction of evaporation, and in winter by reduction of thickness of ice. It will be paved its entire length and the smoothness of its sides improved, and thus the rapidity of flow and capacity of the canal enhanced. Short tunnels will be required in several instances along the route to reduce the length of line that would be required to pass around prominent spurs, as, for instance, at Fishkill Mountain and Anthony's Nose. Siphons will be required in several instances, and where the pressure exceeds twenty feet they will be of boiler iron in a series of 72-inch diameter riveted tubes, in number according to the required delivery of water. These tubes will be placed side by side, and the number will be increased as the demand for water increases. Stop gates, waste weirs, and waste sluices will be introduced as the topography of the line and other conditions shall make it desirable. The canal from the river to the lake will be larger in section than the conduit, so as to provide for the rapid storing of water when the flow of the river is above the average. From the terminus of the canal, near High Bridge, the water may be conveyed into New York, Brooklyn, Jersey City, and adjacent towns by iron pipes.

The approximate estimate of the cost for 210 miles of canal is $26,250,000; 7 miles of tunnel, $4,900,000; 10 miles of siphon, $10,000,000; and the Hudson dam and canal, engineering, land and water rights, and roofing and paving 10 miles of the canal, will bring the whole cost to $49,475,000. It is estimated that three years would be required for the construction of the entire works.

A Church Steeple Thermometer.

The Meteorological Society have placed one of Siemens' electrical thermometers on the summit of Boston Church, in Lincolnshire, which is 270 feet high, and situate in a flat country near the sea. Ordinary thermometers have been placed on the belfry roof, 170 feet from the ground, and also in the churchyard. The electrical thermometer is connected by wires to a galvanometer and battery at the base of the tower. The instrument is read by depressing a key, which causes the needle of the galvanometer to deflect; a pointer or vernier (moving a contact rolier upon a wire in a circular groove) is then pushed to the right or to the left upon a divided scale until the needle remains stationary on the zero point, when the electrical resistance of the wire is measured upon the scale. The number indicated by the vernier is then read off, and, by referring to a table of equivalents, the actual temperature in degrees of Fahrenheit is readily ascertained. Simultaneous readings of the electrical thermometer at the summit of the tower and of the dry bulb thermometer in the churchyard will be made frequently during the day by the verger of the church. The society hope by this means to throw light on such questions as the vertical decrement of temperature, the rate of ascension of vapor, etc.

The Six Companies.

Kwong-Ki-Chin, late a member of the Chinese Education Commission in the United States, says that the object of the Six Companies (of whom so much is heard in connection with Chinese immigration) is not mercantile but protective. The word "association" would better characterize them. They are not stock companies organized for trade or profit, but associations, rather, for the sake of looking after the interests of Chinese who are away from home, such as adjusting differences and deciding questions and claims one with another and securing justice between parties without going to law if possible. They are not peculiar to America, but are established wherever Chinese emigrate or settle, as in Australia, Singapore, French colonies in Cochin China, etc Three of the Six Companies, so called, belong to three different districts in China; two of the other three represent together several districts, and the last, or sixth, represents all China. Cases of injustice or difficulty of any kind which occur will, on complaint to the company, be investigated and assistance rendered. Each company has two presidents, one of whom must be a good Chinese scholar, and the other must understand English well. They are chosen by the merchants of the company, and hold office for a period of three years. These, with necessary clerks and servants, comprise all the officers of the company. The committees of the company are merchants. They, in conjunction with the presidents, act in cases requiring interference of the company. The expenses of the company are met by the payment of $10 or $15 by each merchant or laborer on his way to China; so it is not a cooly importing company at all, but a mutual benefit association.

Malarial Germs.

M. A. Laveran has found, in the blood of patients suffering from malarial poisoning, parasitic organisms, very definite in form and most remarkable in character; motionless, cylindrical curved bodies, transparent and of delicate outlines, curved at the extremities; transparent spherical forms provided with fine filaments in rapid movement, which he believes to be animalcules; and spherical or irregular bodies, which appeared to be the "cadaveric" stage of these, all marked with pigment granules. He has also detected peculiar conditions in the blood itself. During the year that has passed since he first discovered these elements, M. Laveran has examined the blood in 192 patients affected with various symptoms of malarial disease, and has found the organisms in 180 of them, and he has convinced himself by numerous and repeated observations that they are not found in the blood of persons suffering from diseases that are not of malarial origin. In general, the parasitic bodies were found in the blood only at certain times, a little before and at the moment of the accession of the fever; and they rapidly disappeared under the influence of a quinine treatment. The addition of a minute quantity of a dilute solution of sulphate of quinine to a drop of blood sufficed to destroy the organisms. M. Laveran believes that the absence of the organisms in most of the cases (only 12 in the whole 192) in which he failed to find them was due to the patients having undergone a course of treatment with quinine.

Burnishing.

By burnishing the roughness of an object is flattened down until the surface is smooth and polished like a looking glass. Burnishing is an important operation for electro-deposits, which consists of a multitude of small crystals, with intervals between them, and with facets reflecting the light in every direction The deposited metal is hardened, and forced into the pores of the underlying metal, and the durability is thus increased to such an extent that, with the same amount of silver, a burnished article will last twice as long as one which has not been so treated. The instruments employed for burnishing are made of different materials, and must be of great hardness and a perfect polish. Such are hardened cast steel, agate, flint, and blood stone. For metallic electro-deposits steel and blood stones are especially employed. There are several qualities of blood-stone; its grain should be close, hard, and without seams or veins; it should leave no white lines on the burnished parts, nor take off any metal, and its color should be of an intense black red. The steel must be fine and close grained, and perfectly polished. Should the polish of any burnishing tool alter by use, it is restored by friction upon a skin or leather attached to a wooden block, which is fixed to the bench. The leather is covered with polishing rouge in impalpable powder, or, preferably, with pure alumina, obtained by calcining ammonia alum in a forge fire. Venetian tripoli, rottenstone, tin putty, emery, or many other hard substances finely powdered may be employed. The burnishing tools are of various shapes, such as a lance, a tooth, a knife, a half sphere, or a dog's tongue, and a considerable stock is necessary. The burnishing is divided into two distinct operations. The first consists in roughing, and the second is finishing. The tools for the first have a sharp edge, while for the second operation they have a rounded surface. The tools for the hand or the lathe are fixed by copper ferrules into short round wooden handles, so that the hand is not influenced by their weight. The tools for the arm or vise are fastened to wooden handles sufficiently long to rest their slender part upon the arm or shoulder. The stouter lower portion is grasped by the hand. The burnishing tools and the objects must be frequently wetted by certain solutions, some of which facilitate the sliding of the instrument, or with others which have a chemical action upon the shade of the burnished articles. Of the first are pure water, solutions of soap, decoctions of linseed, and infusions of the roots of marsh mallow or licorice. The second includes wine-lees, cream of tartar, vinegar, alum in water. When burnishing gold applied upon electro deposits of copper, as is gilding with a dead luster by that method, use pure water, for fear of producing a disagreeable red shade. A solution of green soap is sometimes preferred by operators, although when old, it imparts an unpleasant tinge, owing to the sulphides of the liquor When the burnishing is completed, the surface is wiped longitudinally with a soft and old calico rag. The polish obtained by burnishing is called black when it reflects the rays like a mirror; and should the presence of mercury or a bad deposit prevent the tool from producing a bright surface, the object is said to be greasy. Articles which have been previously polished, and which generally receive a very trifling deposit, are not burnished, but rubbed with chamois leather and the best polishing rouge. Too thick or too rapid electro deposits cannot be burnished, but must be polished by rubbing with a leather and a mixture of oil and powdered pumice stone, tripoli, or tin putty. Coarse powders are used at the beginning, and impalpable ones at the end of the operation. Polished silver deposits are more agreeable to the eye than burnished ones, but the hardening of the latter renders them more durable.

A Three-Story Nest.

To the Editor of the Scientific American:

Since my article upon the summer yellowbird and its two-story nest appeared in the SCIENTIFIC AMERICAN of March 18, I received Part IV of "Bright Feathers," in which Mr. Rathburn describes and illustrates a three-story nest that was found upon a honeysuckle. I mentioned the fact of three-story nests being sometimes found, but this one described by Rathburn is an interesting specimen, from the fact that the second compartment is said to have contained one cow blackbird's egg and one of the legitimate eggs of the D. æstiva. According to Baird Mr. Nuttal says that "where the parasitic egg is laid after her own, the summer yellowbird acts faithfully the part of foster parent." But from the specimen described by Mr. Rathburn we must be led to believe with Mr. Baird that the yellowbird will not act the part of foster parent, and rather than do so will sacrifice her own eggs with those of the obnoxious cow blackbird.

Yours truly, DANIEL C. BEARD.

New York, March 28, 1882.

Remarkable Brain Wound.

Coroner Merkle was called, March 29, to the Eye and Ear Infirmary, at Second avenue and Thirteenth street, to hold an inquest in the case of Lewis E. Avery, aged 18, a resident of Gilman's Depot, Sullivan County, N. Y., who died at the infirmary from the effects of an accident which occurred on September 18, 1881. While out shooting near Forrestburg, Sullivan County, the breech of his fowling piece blew off, and the breech pin entered the head through the orbital plate of the skull over the right eye and embedded itself in the anterior lobe of the right hemisphere of the brain. Dr. M. J. B. Messemer, Deputy Coroner, made an autopsy, and found the breech pin—a piece of iron 1⅜ of an inch in length and half an inch in thickness—embedded in the anterior lobe of the right hemisphere of the brain. Death resulted from exhaustion due to the injury of the brain. The case is a peculiar one from a surgical point of view, owing to the long time the patient lived with the breech pin embedded in his brain.

This case was noticed in this paper a few weeks ago. The patient appeared to recover from the wound in about a month after the accident; but his eyes began to trouble him last January, and he came for treatment to the infirmary in this city, where he died.

Metallic Designs on Glass Obtained by the Aid of Photography.

An ingenious method of obtaining mirror-like designs on glass has been devised by Leclerc. The glass, having been silvered by the chemical process, is coated with a thin and uniform layer of sensitive bitumen, and this is exposed under a transparency, the next step being to wash away the unaltered bitumen with oil of turpentine, so as to leave the bituminous design on the silvered glass. The application of moderately strong nitric acid removes the silver, excepting where it has been protected by the bitumen, so that the metallic design shows like a mirror from the reverse side of the glass. The plate may be backed by paint or any other suitable material.

Water Works for Havana, Cuba.

The same firm in this city which furnished the city of Havana with gas works last year, have contracted to construct works for supplying that city with water. One of the contractors states that the system will resemble that of New York city. The water will be brought from mountain springs, about six miles from Havana, to a central reservoir, from which it will be distributed over the city. The pumping engines and machinery will be supplied from this city, and the work will be done by a corps of American engineers.

The Fastest Ocean Trip.

The steamship Alaska, of the Guion Line, now stands at the head of the list of fast ocean vessels. The recent trip across the Atlantic was accomplished in 7 days 6 hours and 43 minutes actual time. She sailed from this port on March 21 and passed Fastnet at 5:20 P.M. on the 28th. The fastest voyage which had been made previous to this was by the famous Arizona, also of the Guion Line, which crossed the Atlantic in 7 days 7 hours and 48 minutes. The weather is not reported to have been unusually fine.