SCIENTIFIC AMERICAN

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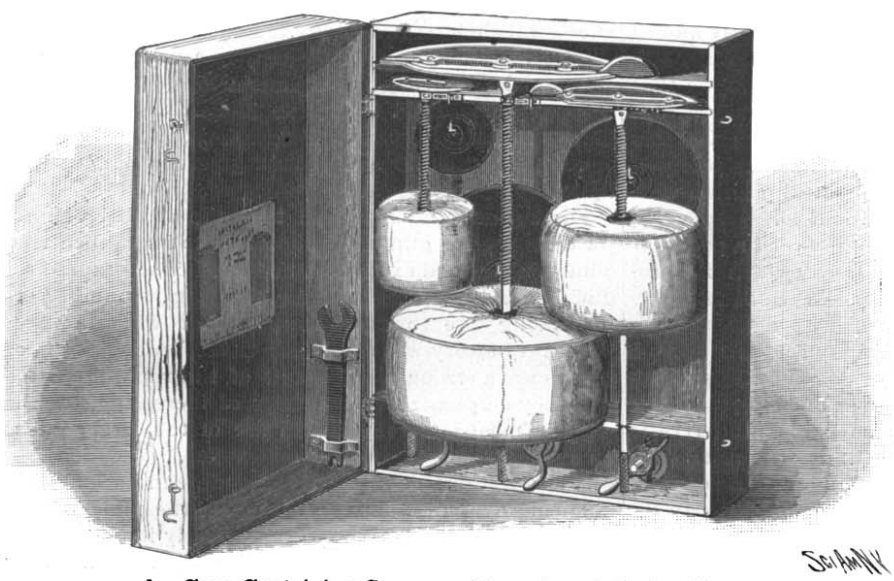
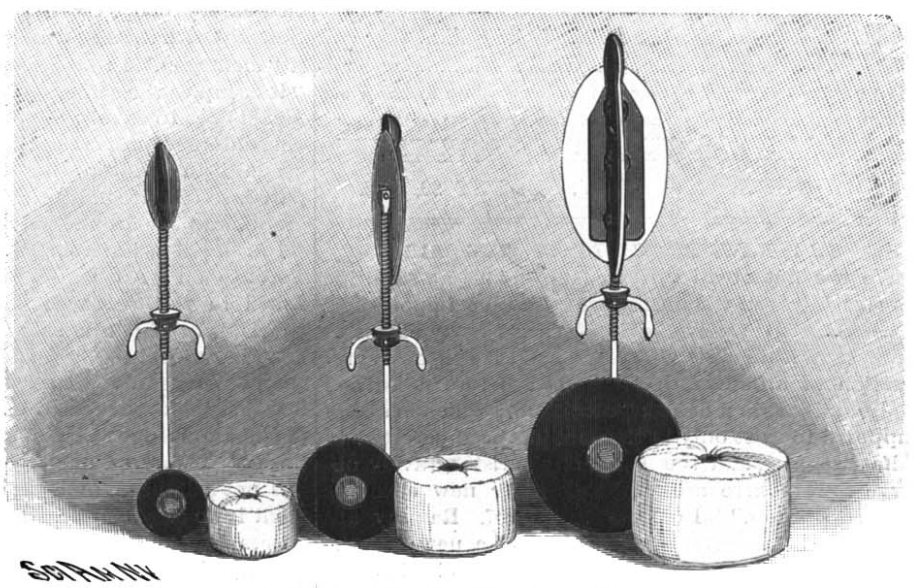
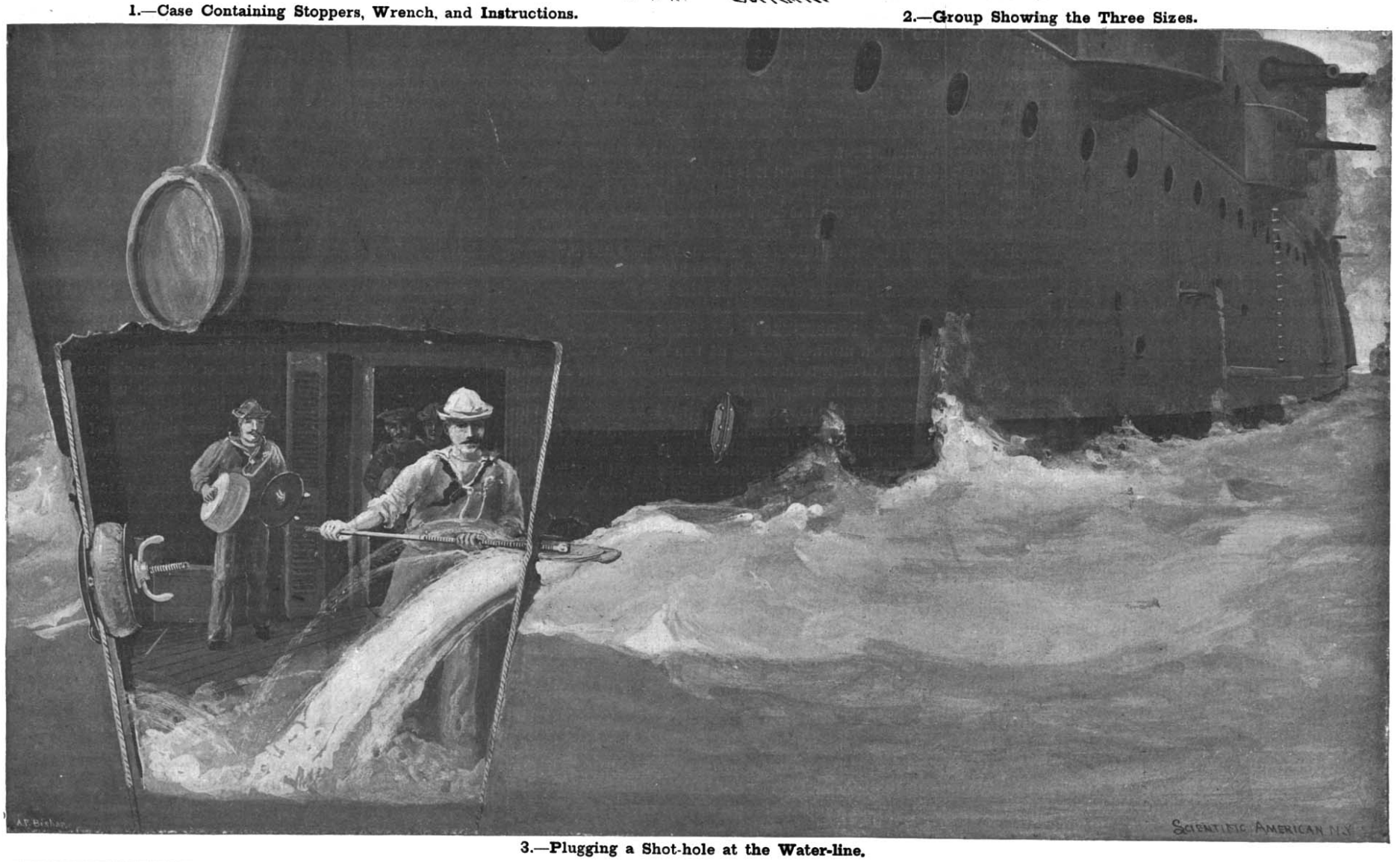


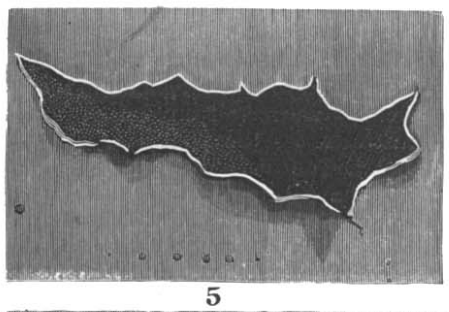
1.—Case Containing Stoppers, Wrench, and Instructions.



2.—Group Showing the Three Sizes.



3.—Plugging a Shot-hole at the Water-line.



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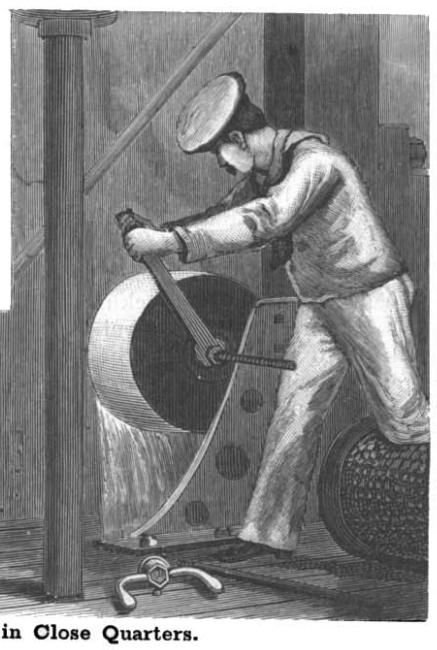
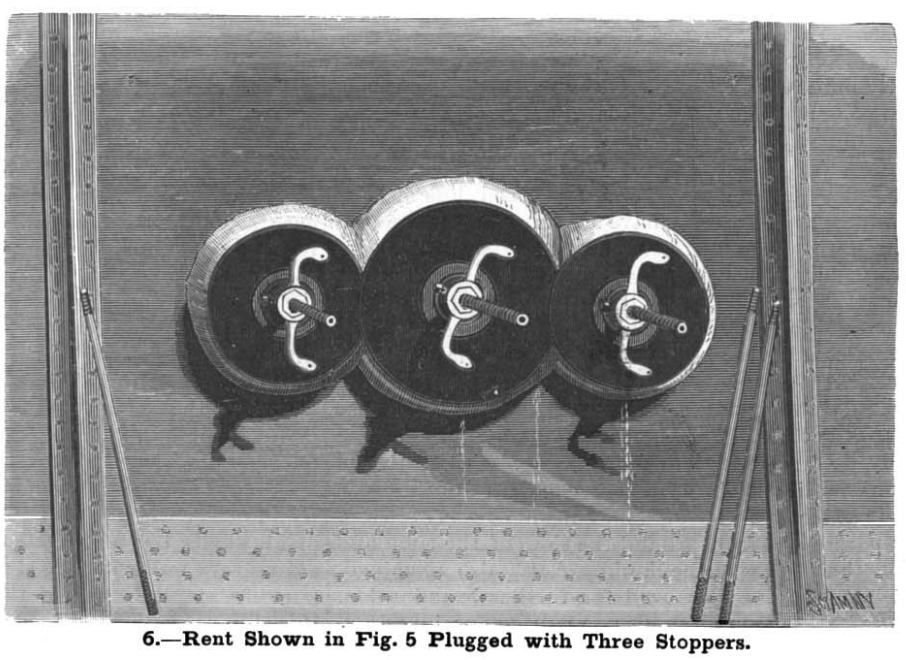


4.—Using the Wrench in Close Quarters.



6.—Rent Shown in Fig. 5 Plugged with Three Stoppers.

THE COLOMÉS STOPPER FOR CHECKING LEAKS AT SEA.—[See page 119.]

THE COLOMÉS LIFE AND SHIP PROTECTOR.

The Navy Department showed its usual progressiveness and foresight in the readiness with which it adopted the now famous cocoa cellulose for protecting the hulls of its ships in the region of the waterline, and the cellulose plug or stopper for closing shot holes which forms the subject of this article. We were one of the first nations to see the great value of these devices, and they now form an important feature in the protective arrangements of our battleships and cruisers. An improved form of cellulose, manufactured from corn pith, has taken the place of the cocoa product in our latest vessels; but a waterline belt of one or the other of these substances, together with the cellulose stopper, are to be found upon all but the very earliest vessels; that is to say, upon all those which were designed after the new water-excluding material made its appearance.

The Navy Department always stands ready to investigate and adopt any device that will increase the efficiency of its ships, and it is largely as the result of this progressive policy, and the thoroughly efficient and up-to-date character of the ships, that the navy has more than answered every demand that has been made upon it in the present war. In addition to the devices above mentioned, we might suggest the admirable sights in use upon our guns, the range finders, improved ammunition hoists, and a thousand and one other up-to-date conveniences which only come to light during a careful inspection of the ships themselves.

The Colomés stopper illustrated on our front page is a protective device of the cellulose type. It has given good service in the present war, notably at the Santiago engagement, where one of the stoppers was used to close a shot hole made by a large shell from one of the Spanish cruisers in the bow of the battleship "Iowa." The incident is described in a letter from an eye witness on the "Iowa." After particularizing the details of the fight, the writer says: "A shell struck our starboard bow, about one foot above the waterline. It went through the coffer dam, struck a steel hatch, and burst. It started a fire, which was quickly put out. The deck was flooded, but a patent stopper was put in, and we were as good as ever."

The Colomés leak stopper, as will be seen from the engravings, possesses that *sine qua non* of all emergency apparatus: simplicity. It goes without saying that all devices for the swift prevention of disaster and the saving of life in the presence of impending peril must be at all times within easy reach, must be easily understood and capable of rapid manipulation, and must be absolutely certain in their action. It was the possession of these qualities that led to the adoption of the Colomés device by the navy. Our readers will be interested to know that before that admirable and justly popular ship the "Oregon" started on her long and perilous trip from the Pacific, she received a consignment of ten cases of stoppers (see Fig. 1), which were distributed throughout the ship in positions where they could be readily assembled for plugging waterline shot holes.

Both the cellulose and the Colomes leak stopper are French inventions. For the former we are indebted to Admiral Pallu de la Barriére, of the French navy, and the latter is named after the inventor, a Frenchman who is widely known in the French scientific world. Cellulose is prepared from the husks of the cocoanut. It is treated to remove its glutinous portions and any elements which would render it unhealthful, or offensive in odor. It has the property of absorbing water and swelling up rapidly as the result. The corn-pith cellulose is prepared from the pith of cornstalks, and it presents the same obturating qualities, though in a much greater degree, as the cocoa cellulose.

The cellulose was introduced into this country by Ostheimer Brothers, of New York and Philadelphia, who established a plant for its manufacture in the latter city. We are indebted to the courtesy of these gentlemen for assistance in the preparation of the present article on the Colomés stopper; the same firm having been responsible also for the introduction of the latter admirable device into our navy and being now engaged in its manufacture in Philadelphia. Although the Colomés apparatus is best known as an emergency repair for the round shot holes on warships, it has a wide field of usefulness in the merchant marine, where, as we shall show in this article, it is equally efficacious, when several are used together, in closing the narrow, jagged rents in a ship's hull which may be caused by collisions with other vessels or by running upon sunken rocks.

As will be seen by reference to Fig. 2, the device consists of a threaded brass rod, to one end of which a stout cross-piece of malleable iron is hinged at its center. The forward half of the cross-piece is weighted, so that when the rod is held in the horizontal position for thrusting into a hole, as in Fig. 3, the cross piece will lie horizontally, but as soon as the rod is given half a turn, the weighted end will cause the cross piece to swing into a horizontal position, at right angles to the rod, when the whole contrivance will have the appearance of a pickax, as in Fig. 1. A thin sheet of flexible spring brass is riveted to the cross piece. It is elliptical in shape, its longer axis being parallel to the threaded rod. The rest of the apparatus consists of a cylindrical canvas bag, filled with cellulose, a steel washer, slightly less in diameter than the bag, and a nut, provided with two handles for its adjustment. The stoppers are made in three sizes, the cellulose bags being 6, 9, and 13 inches in diameter respectively. They are put up complete, in sets of three, in a hinged case, as shown in Fig. 1, and in the lid of each case is a book of instructions and an illustration showing the method of inserting the stopper in a leak. The cases are placed in convenient positions throughout the ship.

In closing a hole, the operation is as follows: One of the stoppers, corresponding approximately to the size of the hole, is taken from the case, relieved of its cellulose bag, and thrust through the hole, care being taken to hold it so that the weighted end of the "pick" will cause it to lie horizontally along the threaded rod. As soon as it is thrust through the hole, it is given half a turn, when the pick with its attached brass plate falls into the vertical position. It is at once pressed closely up against the outside plating of the hull, by the inrushing water, where the brass plate serves to cover the hole and partially stop the flow of water. The cellulose pad, the steel washer, and the nut are then slipped over the inboard end of the rod, and the nut is screwed home, pressing the bag closely against the hole and effectually sealing the opening. The cellulose bag fits into all the irregularities of a jagged hole, and the powerful pressure of the nut, aided by swelling effect of the water on the cellulose, insures a remarkably tight closing of the hole. For ordinary cases, the hand nut can be used; but when the framing of the ship interferes with this, as shown in Fig. 4, the nut is screwed home by a wrench which is provided with each case.

For the closure of ordinary shot holes, a single stopper proves sufficient; but in cases of collision, such as occur in the merchant marine, it more often than not happens that the hole is long and narrow. This is often the case in the slighter collisions (see Fig. 4), when the plating may be torn by a sharp projecting point of rock, or cleanly cut by the stem of another vessel that is moving slowly at the moment of collision.

Such holes may be readily closed by using several stoppers side by side, as shown in Fig. 5, which represents an experiment carried out by a board of French naval officers at Toulon. The hole was rough and jagged at the edges and lay 4 feet 8 inches below the surface of the water. It was plugged by two No. 3 stoppers with one No. 2 stopper between them, and the inflow of water was arrested in 120 seconds. Other tests by the same board gave the following results: A 2½-inch hole was stopped in 10 seconds, and the flow completely arrested in 30 seconds; a 4-inch hole, 6 feet below the surface, was completely stopped in 25 seconds; and a 7½-inch hole, also under a 6-foot head, was completely closed in 35 seconds.

As may be readily seen from the large engraving on the front page, when the stopper is once in place, securely clamped to the shell plating of the vessel, it cannot be displaced and may be trusted to do its work until the ship has been brought safely into port. Moreover, special value attaches to the system on account of its extreme simplicity, any ordinary seaman being competent to insert the stopper. This fact we consider to be of the highest importance. There is no necessity to send for the expert mechanic.

It is this simplicity, coupled with its small bulk and ease of stowage, that renders the device specially adapted for use in the merchant marine, where it promises to find a field of usefulness as broad or broader than it now occupies in the navy.

Finding the Stars.

A correspondent in St. Louis, who has a two-inch telescope mounted on a tripod stand, writes for information as to how he can find the place of a star with such an instrument when the place is expressed by hours of right ascension and degrees of declination north or south. He also asks what is meant by right ascension and what is the meridian.

In order that a star may be found by means of its right ascension and declination as given in a star catalogue, the telescope should be provided with an equatorial mounting having graduated circles. Without such a mounting the best method of finding a star whose place is given in right ascension and declination is with the aid of a chart of the stars (such, for instance, as Klein's Star Atlas), whereon the position of the object sought can be noted with reference to other conspicuous stars.

Suppose, for instance, that the observer wishes to find a double star, or a telescopic comet, by means of its right ascension and declination. Taking his atlas, he will see along its upper and lower margin the hours and minutes of right ascension indicated. Correspondingly, on the right and left hand margins of the chart he will see indicated the degrees of declination north or south of the equator. With the aid of these indications let him, with a pencil, mark the place which the object he is seeking should occupy upon the chart. If it is a double star, more than likely it will be found there already. In any case, having thus ascertained its position with reference to the bright stars in its neighborhood, he can then turn to the heavens, find those stars, and recognize the particular object he is seeking from its situation with reference to the others.

All this, of course, requires more or less familiarity with the constellations, a kind of knowledge that is not as widespread as it should be, but which is not very difficult to acquire.

By the meridian is meant an imaginary line drawn from the north to the south point, or through the poles of the heavens, and passing directly overhead. Every place on the earth has its own meridian, and the sun is said to be on the meridian at the instant of true noon. Similarly, a star is on the meridian when it is directly north or south, or somewhere on the imaginary line running through the sky from north to south, and passing by the point directly overhead, which is called the zenith.

By right ascension is meant the distance of a star or other celestial object east from a particular meridian of the heavens which has no reference to any special spot on the earth, and which crosses the celestial equator at a point among the stars known to astronomers as the first point of Aries. Right ascension is measured by hours and minutes. There are twenty-four hours in the entire circuit of the sky. Consequently, an object which is precisely at the first point of Aries may be said to be in right ascension 0 hours, or right ascension 24 hours, according as we think of the beginning or the end of the circle. An object diametrically opposite to this would be in right ascension 12 hours. One hour of right ascension is equivalent to 15 degrees.

GARRETT P. SERVISS.

Physical Training in Public Schools.

The care of the body has been, up to comparatively recent years, strangely neglected in the public schools of this country. It has been considered a quite sufficient educational training for the young to cram and overload their brains with a quantity of matter difficult to digest, and in too many instances even when assimilated of little use in after life. Numbers of delicate, highly strung children have broken down under the strain, and the dreary daily grind of the monotonous cramming system, undergone in unhealthy surroundings, has developed many of the nervous diseases to which the present generation is so peculiarly susceptible. What does knowledge profit a man, if in the gaining of it he loses the still more precious gift of good health? The nations of the old world, notably Greece and Rome, understood and appreciated much more clearly than do the people of these times the harmfulness of unduly forcing the mind to the lasting hurt of the body. The gymnasiums of ancient Greece probably reached, in their methods of training the young, a higher ideal than have any of the educational systems now in vogue. In the face of this condition of affairs, it is pleasing to note that the people of America are rapidly becoming alive to the pernicious effects of developing the mind at the expense of the body. The more rational mode of educating the young would appear to be that of so training the body and mind that both advance as far as possible at an equal rate. Thus, if a child is of weak constitution but possessed of unusual mental capacity, it should be the aim of his teacher to strengthen his physical powers, and until that object is accomplished to let the mind take care of itself; on the other hand, if the reverse is the case, to adopt contrary methods. The individuals should be studied separately, and children should not be lumped together in a body and put through the same course without regard to their different temperaments, dispositions, and constitutions. It is now about ten years since German gymnastics were introduced into public schools of this country. Since then physical training has held a place in the curriculum of almost all the large cities of the East. The report of the director of physical training in public schools of Washington has lately been published. According to this report, the beneficial results of systematic daily exercise have been marked; but, as the writer of the paper truly remarks, "It is impossible to test the full measure of success or failure of our efforts. It is in the remote future, with school days long past, that the lasting influence of such work will be felt by the individual child." However, one thing seems certain, viz., that the introduction of physical training into the public schools of America is a step in the right direction, and, if intelligently carried out, should result in producing a stronger race mentally and physically. The fact should not be forgotten, though, that physical training may be abused. Gymnastics should not be permitted to take the place of play, but rather the two should go hand in hand.—Medical Record.

A CURIOUS disparity is evident in the authoritative estimation of the heat of the sun. Pouillet places it at 1,400° to 1,800° Celsius (Centigrade), Ste. Claire-Deville at 2,800° Lord Kelvin and Professor Langley at 8,000°, Sir Robert Ball at 18,000°, Sporer at 3,700°, and Pater Leodie at 10,000,000°.—Technische Berichte.