proved. The interval between the ends of the divided nerves varied from three to ten centimeters; but the distance did not seem to affect the result.

In nine cases the transplanted parts were from the sciatic nerves of dogs, three from rabbits, one from a kitten, and one from the spinal cord of a rabbit, and in five from recently amputated limbs. In one case a sciatic nerve which had been excised was itself transplanted. In nine cases catgut was used to unite the implanted segments of divided ends; in three, silk; and in one, kangaroo tendon. No case recovered entirely, but generally the cases were very much improved. The average time in which sensibility appeared after the operation was about ten days, and motion returned in two and half months.

PREVENTION OF COLLISIONS AT SEA.

The recent marine disasters on Long Island Sound and near Sandy Hook, New York harbor, where serious collisions in a dense fog occurred, forcibly bring to the attention of the traveling public the need of some simple method of determining with a reasonable degree of accuracy the relative positions of the respective vessels.

There is no doubt, now, in view of the practical development abroad of wireless telegraphy, an opportunity for the owners of several vessels in one line to equip each steamer with a set of wireless telegraph instruments arranged to communicate with each other.

That being the case it will only be necessary for each vessel to have an operator skilled in the use of the instrument, whose duty shall be, in the event of thick weather, to send out prearranged caution signals at certain regular intervals, and at the same time watch the receiving instrument for replies. When a return signal is received, then communications as to the location and course of the vessels can be easily made and a prospective collision avoided.

It has been shown by the experiments across the channel between France and England that the distance the electrical waves will travel varies with the height of the conducting terminal above the water level. According to W. H. Preece, a conductor 20 feet high will signal well to a distance of one mile, 40 feet to 4 miles, 60 feet to 9 miles, 100 feet to 25 miles. He also states that the electric waves travel over water with greater force than over land.

As the average height of a large steamer mast above this level is 100 feet, the electric waves should be effective for a probable distance of 25 miles.

Such an arrangement would be more certain than the usual fog siren, for the effectiveness of the latter is varied in certain instances by the force and direction of the wind. Wind or stormy weather do not interfere with the working of the electrical waves.

Taking the case of the collision of the steamers "C. H. Northam" and the "Richard Peck" on Long Island Sound a short time ago as an example, the captains of each vessel were brothers; they were on their night trips from New York to New Haven, and vice versa. After starting a dense fog quickly arose. They knew at about a certain time in the night they would pass each other. When that time arrived they were unable to determine each others' whereabouts definitely or to communicate as to the course each was taking, and it happened that the "Richard Peck," which was the stronger vessel, plowed transversely through the bow of the "Northam." She was barely saved from sinking. Had each vessel been supplied with the simple wireless electric instruments, and had they been put in operation as soon as the fog appeared, the vessels would have been able to have communicated with each other within a distance of say 15 miles, and thus easily have avoided a collision.

It seems to us that the interests of the great steamship and transportation lines demand that they should be quick to adopt every known scientific device that can effectually serve as a safeguard against the perils of dense fog or thick weather.

What line or combination of lines will be the first to adopt such safeguards?

METHOD OF TRANSFERRING PHOTOGRAPHIC FILMS.

Several years ago a special transferotype paper was made by which the developed film or picture could be removed and transferred to any desired object or onto glass or a gelatine film.

With the advent of the celluloid and other transparent films the manufacture of the transfer paper ceased.

The celluloid films and similar films are not wholly free from pits, miniature semitransparent dots, brush marks, etc., which magnify seriously when an enlargement is to be made or even when a lantern slide is made by contact with the film.

For the purpose of proving this and securing images of absolute clearness and perfectness, Mr. W. Jennings, of the Photographic Society of Philadelphia, discovered a plan of readily removing the picture gelatine film from the supporting celluloid or transparent support. His explanation of how it is done is as follows:

Dip the film for about half a minute in a 10 per cent solution of alum and water, then lay it on a plate of glass and at the upper corners proceed to roll back the gelatine film gently with the fingers. It readily separates from the support, and in this rolled-up condition it is washed in running water for about five minutes, to take out the wrinkles and eliminate the alum. Then place a clean plate in a tray containing a 10 per cent solution of glycerine and water.

Next take the separated film and spread it out (printing side up on the glass plate in the tray), then lift up the plate and place the film on the plate under slowly running water. This will drive out the bubbles. Use the finger or the tip of the tongue for a squeegee. The film will dry perfectly flat and free from grain. When dry it may be intensified, reduced or retouched as usual. This is an excellent way to save film negatives having joints in the celluloid. I have no trouble in transferring fifty 4 by 5 films in an hour in this way

Positive pictures can just as well be transferred from this supporting film onto other things than plates of glass as one's fancy may choose.

WATER-TUBE BOILERS FOR OUR WARSHIPS.

BY LIEUT. G. L. CARDEN, U.S N.

The Navy Department has decided to introduce in a number of new warships of this country the Niclausse type of water-tube boiler. It was this form of boiler which was employed on the late Spanish warship "Cristobal Colon," and from what can be learned of its workings, good results are expected. The main objection heard against the boiler by engineer experts is the feature of the horizontal tubes. Whether this objection will prove a valid one, experience alone can tell, but in the opinion of the naval officials in Washington, the reports from abroad are all in favor of the new generator.

The Niclausse boiler is of French design. Various types of French water-tube boilers have proved eminently successful, particularly the Belleville and Normand types, and within late years the British Admiralty have made liberal use of these French designs. The British cruisers "Powerful" and "Terrible," the largest protected cruisers in the world, each carry forty-eight Belleville boilers, arranged twenty-four on a side.

In this country recourse has been had both to foreign and domestic designs of water-tube generators, and American warships are now using in a number of instances the Yarrow, Thornycroft, Ward, Du Temple, and other types.

It is the expressed view of leading engineer officials that the troubles experienced from time to time with water-tube boilers have been largely due rather to unfamiliarity with the type in general than to any inherent or ineradicable defects in their design or construction.

In the hands of experienced and alert engineers, water-tube boilers have thoroughly demonstrated their fitness for deep-sea work. It has only been necessary to prove that water-tube boilers are reliable for general cruising purposes to insure their adoption in place of the Scotch marine types. It is the saving in weight afforded by the tubular boiler that so strongly appeals to the naval architect, and in the case of warships the economy thus secured is of more importance than it is in the merchant marine.

The new warship "Maine," building at the yards of the Cramps, will be the first of the new battleships to carry Niclausse boilers. Her sisters, the "Missouri" and "Ohio," will each carry, it is understood, Thornycroft boilers. The design of the "Maine," as finally settled upon, calls for twenty-four Niclausse boilers, arranged in three groups of eight boilers each. Each group will be subdivided by the center line bulkhead, and each boiler will have fifteen elements of twenty-four tubes, the whole number of elements being 360 and the number of tubes 8,640. The "Maine's" boilers are designed to carry steam at a working pressure of 250 pounds per square inch above the atmosphere.

The announcement is now made by naval officials that the water-tube boiler will hereafter be exclusively used in United States warships. In the case of the "Maine" and her sisters the particular type of boiler to be selected was left to the contractors, subject to the approval of the Navy Department. The Cramps selected the Niclausse, and the Union Iron Works and Newport News establishments the Thornycroft. Rear Admiral Melville, chief of the Engineering Bureau, is the authority for saying that it has been definitely decided to adopt water-tube boilers for all our new warships. It is known that Admiral Melville was anxious to incorporate water-tube boilers in the battleships authorized prior to the last group, but it was impossible, it was found, to do so at the last moment, since no hull changes would be permitted.

In the British navy the Belleville water-tube boiler has been adopted for all vessels larger than torpedo craft.

According to the statements of leading British officials, the charges brought against the Belleville boiler have narrowed down to a low efficiency in fuel consumption. The official reports of the engineering departments do not, however, bear out the indictment. The big armored cruiser "Terrible," on her trial trip, recorded a consumption of 1·71 pounds of coal for each horse power exerted for an hour. On the trial of the British cruiser "Diadem," which trial lasted for thirty hours, the coal consumption per indicated horse power per hour was 1·59 pounds. This consumption was the equivalent of 13·9 pounds of coal per hour per square foot of grate surface. On the eight hours full-power trial of the "Diadem," when the coal burnt was increased to 20·8 pounds per hour per square foot of grate surface, the coal was only increased to 1·76 pounds per indicated horse power per hour. Steam was maintained at the engines during the thirty hours and eight hours runs, respectively, at 245 and 249 pounds per square inch.

The announcement of the official adoption of water-tube boilers for the vessels of the United States navy is regarded in engineering circles as a most important one. Briefly summarized the resulting advantages are lightness, ability to raise steam quickly and accessibility for repairs. No trouble is experienced in raising steam to 250 pounds pressure from cold water in much less than an hour's time, instances being recorded of 23 minutes only being consumed. In the case of the cylindrical boiler from six to twelve hours are required. The danger formerly apprehended of tubular boilers breaking down is no longer seriously entertained. Tube boilers like cylindrical boilers must be cared for, and good judgment must be shown in handling them. If this is done there is no reason, in the opinion of naval engineers, why they should not always respond when called on for hard service.

MEETING OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

The Forty-eighth Annual Meeting of the American Association for the Advancement of Science will be held at Columbus, Ohio, August 19 to 26, 1899. The Association headquarters will be located in Room 10, University Hall, Ohio State University, and the hotel headquarters of the Council of the Association will be at the Chittenden Hotel. A meeting of the Council will be held at noon on Saturday, August 19, at the hotel headquarters.

The opening session of the Association will be held at 10 o'clock A. M., on Monday, August 21, in the Chapel, University Hall.

The officers of the Columbus meeting are as follows: President, Edward Orton, Ohio State University, Columbus, Ohio. Vice Presidents: Mathematics and Astronomy, Alexander Macfarlane, Lehigh University, South Bethlehem, Pa.; Physics, Elihu Thomson, Lynn, Mass.; Chemistry, F. P. Venable, University of North Carolina, Chapel Hill, N. C.; Mechanical Science and Engineering, Storm Bull, University of Wisconsin, Madison, Wis.; Geology and Geography, J. F. Whiteaves, Geological Survey of Canada, Ottawa, Canada; Zoology, S. H. Gage, Cornell University, Ithaca, N. Y.; Botany, Charles R. Barnes, University of Chicago, Chicago, Ill.; Anthropology, Thomas Wilson, Smithsonian Institution, Washington, D. C.; Social and Economic Science, Marcus Benjamin, United States National Museum, Washington, D. C. Permanent Secretary, Dr. L. O. Howard, Cosmos Club, Washington, D. C. General Secretary, Frederick Bedell, Cornell University, Ithaca, N. Y. Secretary of the Council, Charles Baskerville, University of North Carolina, Chapel Hill, N. C.

The affiliated societies which will meet with the American Association are the American Forestry Association, the Geological Society of America, the American Chemical Society, the Society for the Promotion of Agricultural Science, the Association of Economic Entomologists, the American Mathematical Society, the Society for the Promotion of Engineering Education, the American Folk-Lore Society of America, the Botanical Society of America, and the American Microscopical Society.

It is expected that the Columbus meeting will be of great importance and interest, and attractive excursions will be arranged, and the usual receptions will be held.

ARMOR PLATE FOR BANK VAULTS.

A Pittsburg trust company has lately erected a vault, composed of steel armor plates, which possesses some novel features. It is 19½ feet by 16½ feet by 9½ feet. The entire front of the vault is of a single plate of armor 8 inches thick. This is reinforced by a nickel-steel plate of the same size, only 6½ inches thick. Therefore the total thickness is 14½ inches. The door is in the front, and the bolt-work of the door radiates from the center, like spokes from a hub. The armor plates are dovetailed together, and clamped from the inside. If desired, plates 22 inches thick can be used, thus avoiding the use of bolts. It is thought that armor plate vaults possess remarkable advantages over the old laminated plates. Other banks are about to adopt the new system.