the Oregon's officers, that the strange sail was standing inshore on the port tack, with the wind over her port quarter, is untenable. For, if she were bound east, the west by north wind would have been dead astern for her; the most natural position for her sails, wing and wing; and her course exactly parallel with that made by the Oregon, though in the contrary direction. To say that a sailing vessel bound east, with the wind dead aft, was on the port tack, and heading N.N.E., would imply that her skipper had lost his senses.

If, on the other hand, the stranger was bound into New York, but instead of being at anchor, as suggested above, was really beating down the coast against wind and tide, she would seem, according to the position of the injury to the Oregon, to have been close-hauled on the starboard tack. She could not pay off her course without running into the steamer. All that was left her was to come up into the wind and go about on the other tack. Having the right of way, and time being short, she did neither, and the steamer, when too late, ported her helm to avoid running over her, and as a result struck her a glancing blow.

PRACTICAL DIRECTIONS FOR LIGHTNING RODS.

As the season of thunder storms is not far distant, a few practical directions for lightning rods may be found useful.

Quarter inch naked copper wire, such as is used for street electric lights, will do for the rods. Two of such rods are better than one, each rod to be continuous, or if jointed, the joints to be soldered.

Run the upper end of rod around the edges of the chimney, and the peaks and edges of the roof; bend so as to leave a looped point at each corner; points to be 6 inches high. Fasten the rod directly to the exterior of building with staples, no insulators. The bottom of each rod should be wound around the metallic street water pipe (or gas pipe, if there is no water pipe). Better solder the rod to the pipe.

By means of branch wires or rods connect the lower ends of the water leaders, also one end of each metallic gutter, also all metals and metallic roofing, if any, with the rod; solder the connections, and run rod to ground and around the water pipe, as before stated. Several separate rods may be used. The more the better, if properly grounded.

The essential rule of safety is to have the rods well connected with the earth. For this reason soldering to the underground water pipe is advised.

If no metallic water pipes or gas pipes exist, then dig a very narrow trench four feet deep, cone-shaped bottom, and fill into bottom a continuous layer of coal dust and lay the rod therein. Any kind of coal dust, charcoal, hard or soft coal will do. The trench with coal dust layer and rod therein should be say 100 feet long. Coal is an electrical conductor. The object of placing the lower end of the rod therein and extending the rod so far is to secure good ground conduction and connection for the rod.

The great majority of rods now erected are deficient in their ground connections, and consequently are practically useless. This is the reason we hear of so many instances of damage, even when buildings have rods. In general, the rod is simply stuck down two or three feet deep into dry earth, which is about the same as if the lower end of the rod were inclosed in a bottle; such rods are fatally defective. Now is the time to look to your rods. Correct the main defect, by making a first rate ground connection, as above described, or take down your rod. The only chance for safety is with a good ground connection. The risk of damage is less without a rod than with one badly connected to the earth.

WATERPROOF WRITING INK AND PAPER.

An incident connected with the loss of the steamer Oregon and her cargo calls attention to some much needed inventions.

A portion of her mail was saved before she sank, but the bulk went down with the ship. A considerable portion of this mail is reported to be of great value, containing securities, coupons, etc., amounting, as has been estimated, to over a half a million of dollars, besides drafts, letters of credit, etc., the value of which is unknown.

A wrecking company employed to inspect the wreck, and report upon the possibility of recovering the ship and the cargo, reported that the cargo and mail might probably be got out of the steamer, and the reconnoitering steamer also picked up some floating mail bags and brought them to New York, where their contents were dried previous to forwarding them to their ultimate destination. Much of this mail matter was, of course, badly damaged by wetting, and more serious injury is to be expected in that which, at the bottom of the sea, must be subjected to long soaking prior to its recovery, if ever recovered.

Now, to secure a mail, as far as possible, from injury by submergence in salt or fresh bodies of water there must be waterproof mail bags, waterproof paper, and waterproof ink.

Waterproof mail bags will not alone be sufficient, as in the process of handling or raising them from a wrecked vessel they are liable to be rendered leaky, and waterproof paper would be of no service unless it was accompanied by waterproof ink.

The mail bags need only be waterproof in the common acceptation of the term, and, if there could be certainty that they would remain so, nothing more would be needed to protect documents or anything else permitted in mail bags; but as holes are likely to be worn or torn in them, the only final resource is in the production of paper and ink that will resist the prolonged action of sea water.

There can be no doubt, we think, that if paper and ink which will meet this requirement can be furnished at reasonable cost, they would at once find a ready market throughout the civilized world, provided certain other requirements are at the same time complied with.

Waterproof paper and waterproof ink already exist. What is known as parchment paper will withstand the action of sea water indefinitely, and this can, of course, be written upon by certain carbon inks in market containing materials that, once dried, are thereafter practically insoluble. But that these do not meet the wants of the public for writing materials is proved by the fact that they are not universally employed for transatlantic correspondence. The materials required must not only resist the action of sea water, that is to say, the sodium chloride, iodine, and bromine held in solution, but they must be nearly or quite as convenient to use as ordinary paper and ink.

The paper should be light, flexible, and opaque, to economize postage; fold easily, and prevent writing from showing through. As for economy in foreign mails, it is essential that paper should permit writing upon and copying from both sides.

The problem is both mechanical and chemical in its nature, and the resources of modern chemistry and mechanics should be, we have no doubt are, equal to its solution. Any seeming incompatibility in the requirements named will probably vanish in a careful study of these resources.

The Gaskill Engine.

A new Gaskill pumping engine was added some months ago to the waterworks at Buffalo, N. Y. It has since been subjected to a three months' test, prior to its formal acceptance by the water commissioners. This probationary period ended on the first of March. The performance of the engine during these months has been very gratifying. It indicates a marked fuel economy, exceeding the guaranteed duty by about 11 per cent. Though now idle, awaiting the extension of the street mains, it will probably eventually be utilized for direct pumping, according to the Holly system, a portion of the city being at present but imperfectly supplied by the reservoirs.

Railway Practice in Italy.

Mr. S. Fadda, the Chief of the Department for Preliminary Studies of Rolling Stock in Upper Italy, contributes an interesting paper to the Transactions of the British Institution of Civil Engineers, descriptive of the methods of construction and operation of locomotive engines in that department. (Paper No. 2,081.)

The first line was built in that country in 1838, between Naples and Portici. In 1859 railways were opened in Parma and the Papal States. There are to-day 320 miles (15,000 kilometers) of road built, under construction, or authorized, about two-thirds of which are in operation. The engines are usually of English construction. Some of the more recent locomotives are from French, German, and Austrian establishments. Many of the gradients are very heavy, necessitating heavy engines.

The shells of the boilers, curiously enough, are of iron, the law forbidding the use of steel or of "homogeneous iron." The fireboxes are of copper, though steel has been tried unsuccessfully. The tubes are of drawn brass—70 copper, 30 zinc. They must bear a test pressure of 25 atmospheres, receive the ferrule without cracking, bear bending to a curve of 20 in. length and reversed shue of 2½ in. without injury, and must be uniform and true to gauge. Iron tubes in adjacent parts of Europe have been given up and replaced by brass. All wheels, as well as axles, are of wrought iron. The tires are of crucible steel or of Bessemer or Siemens tin metal. The frames are wrought iron, the cylinders of cast iron, the slide valves of gun metal, often, the rods of crucible steel. During late years, the number of engines placed on the principal lines has exceeded those so added in England.

The carriages are usually of the English type, but sometimes of the American form. An intermediate or composite type has of late been adopted, as suggested by the late Heusinger von Waldegg, in which a passage is provided at one side the line of compartments, along which the guards can traverse the carriage and the train from end to end, the communication between carriages being effected by the use of platforms at the ends, as in American cars. This removes one of the great dangers and inconveniences attendant upon the use of the English style of carriage, and gives both the safety and convenience of communication of the American design and the privacy in each compartment enjoyed in the Continental system. In case of trouble, it becomes easy to notify the guard, and to secure his presence and aid.

Italy is still far behind the other countries of Europe, generally, in all that relates to the useful arts, and the introduction and maintenance of manufactures seem to find but little encouragement or success. The writer of this paper hopes to see a change in this respect in the future, but evidently finds no great evidence of progress at present.

PHOTOGRAPHIC NOTES.

A Soda and Ammonia Developer.—Mr. W. Jerome Harrison in a recent number of the *Photographic News* speaks of using the following developer with considerable success in the development of lantern slides and negatives. He uses the pyrogallic acid in solution with citric acid and sulphite of soda, termed sulpho-pyrogallol, essentially a 10 per cent solution of pyro. He says: I have made many slides with this soda ammonia developer, and without a single failure; while the wonderfully steady and uniform manner in which the image is built up allows full density to be obtained and development to be stopped at exactly the right time. The small quantity of ammonia appears to act as a "whip," starting development, and the soda then carries on and completes the work.

With the use of sulpho-pyrogallol the development may be prolonged without staining the film.

The normal developer is:

Water	1 ounce.
Pyro	2 grains.
N. H. 4 Br	1 grain.
Carbonate of soda (washing soda)	100 grains.
Ammonia	1 minim.

The ammonia used is in the form of a 10 per cent solution.

Use of the Polariscope in Photographic Lenses.—In the *Br. Jour. of Photo.* Mr. J. Vincent Elsden speaks of the advantage which the polariscope has, when inserted between the lenses, of preventing the injurious effect on a plate of the strong reflection and glare which sometimes occurs when the lens points toward a window or a large body of water.

He took a small Nicol's prism from a microscope, out of its brass mounting ring, and fitted it into a cork rim; he then inserted it between the two lenses of a rapid symmetrical, so as to occupy the position usually taken by the diaphragm.

Owing to the small size of the prism, it acts as the diaphragm itself.

The exposure in comparison with the use of the smallest stop had to be twice as long.

By the use of the prism he was able to obtain a little more detail in certain parts of the picture, where there had been a strong reflection. Photographers have often to deal with awkward cases of reflection from shining surfaces, such as tombstones, oil paintings in a room, sheets of water, and similar things, and the ease with which a polariscope can be fitted to a lens suggests the advisability of at least trying its effect in diminishing the glare, especially as but little harm can result, except an increase in the length of the exposure.

Scranton Bessemer Steel Work.

The Scranton Steel Company, of Scranton, Pa., reports the following figures as the result of its December work:

Number of 12 hour turns worked	25
Number of heats made	1631
Total tonnage (gross)	7220
Average tonnage per turn (gross)	288·80
Average number of heats per turn	65·24
Average tonnage per heat (gross)	4·43

The number of heats per turn, 65·24, is very remarkable, and is due to the small size and convenient arrangement of the vessel plant.

Freight Cars Drawn by Electricity.

Mr. John C. Henry, of the Henry Electric Railway Company, Kansas City, Mo., writes us as follows:

"On January 29 I hitched our electric car Pacific No. 1 to a K. C. F. S. & G. coal car, weighing 17,000 pounds, and took it up a 2½ per cent grade. Yesterday I coupled the same motor car to C., B. & Q. box car 19,178, weight 24,500 pounds, and started it without jerking, on a 3 per cent grade. I claim the distinction of being the first to haul regular standard gauge freight cars by electricity, and would be pleased to have you record it."

Zinc.

L. L'Hote in *Comptes Rendus* says: As to the inquiry if zinc free from any foreign metals decomposes water either on boiling or in presence of dilute sulphuric acid, experiment proves that such is not the case. Pure zinc heated with distilled water in a flask, so arranged as to receive the gases over mercury, gives off no hydrogen on prolonged boiling, nor is it attacked by dilute sulphuric acid. The presence of iron in proportions of from 3 to 5 in 100,000 enables it to decompose water. Traces of arsenic and antimony have the same effect.