Picture Frames from Carton Pierre.

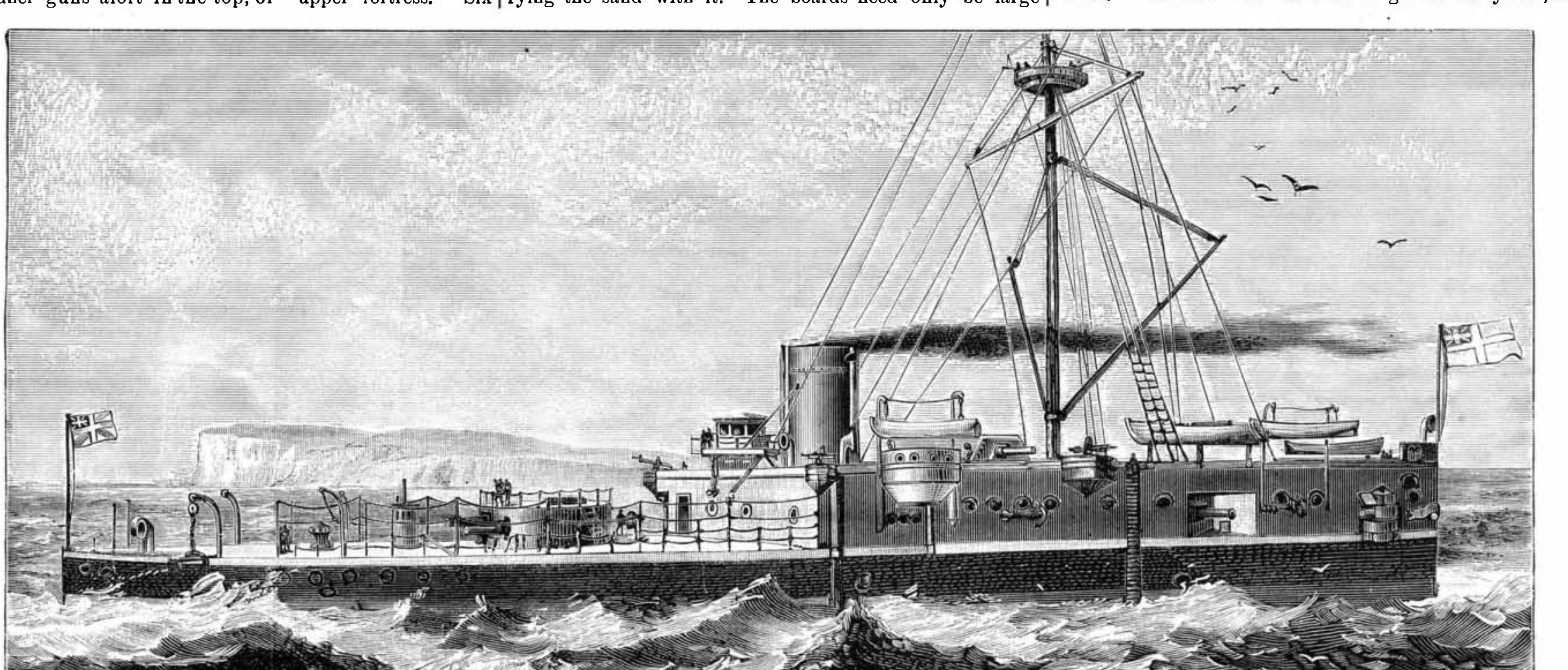
Prof. Meidinger gives the following description of a new method employed in the manufacture of gilded and bronzed picture frames. The composition employed consists of glue, chalk, linseed oil, and paper pulp. The glue is first dissolved and boiled, then silk tissue paper (such as comes between gold leaf is very excellent) is stirred in and rapidly disintegrated, then linseed oil is added, and finally chalk. While hot the mass forms a stiff dough, which is hard when cold, but softens between the fingers, and can be kneaded and pressed into moulds. In a few days it gets dry and is then almost as hard as stone. The paper imparts tenacity to it, so that it is less affected by blows than wood is. Separate pieces of this mass unite readily, and it is easily attached to wood. The proportions of the four constituents are not stated, except that the proper proportions are recognizable by the feeling; in summer more glue is added than in winter, as it readily decomposes (spoils). Owing to the glue, of course, it will not stand the wet, and could not be employed for articles exposed to the weather.

When hard the surface can be shaved off with iron, then polished with sand paper, and is finally coated with a size called "Poliment." This, says Meidinger, is a commercial substance consisting essentially of clay, with the addition of soap and fatty substances. For gilding it is used just as it comes, but for bronzing, only blue or gray shades are used, and some dark pigment must be added, either fine black or umber. The dry pigment would make it too dry, and hence it must be softened by mixing it with melted wax and rubbing it up fine on a stone when cold. One-third of this is mixed with the commercial gray or blue poliment. To make it adhere to the ground, liquid glue must be added. Three or four coats are applied until it is sufficiently covered.

For gilding it is painted over with dilute alcohol and the gold leaf immediately laid on and pressed down. For bronzing a brush is wet with dilute spirits and dipped in the bronze powder, which is applied nearly dry on the poliment. It dries quickly and can be polished at once with agate polishers. The gilding is done as soon as it is polished, but bronzing requires varnishing, so as to impart to it a uniform luster, especially in deep cavities that cannot be polished well, and also to protect the bronze from change of color caused by atmospheric influences. The difference between gilding and bronzing consists, first, in using a darker poliment, as it shows through the bronze, while it is completely hidden by the gold leaf; secondly, in applying the bronze avoiding too damp a brush and too strong alcohol; thirdly, in the final coating with varnish.

NEW TURRET SHIP CONQUEROR.

This ship, now fitting out in Chatham Dockyard, will be, when completed, one of the most formidable vessels in the British Navy. Her armament consists of two of the new 43 ton breech-loading guns, in a turret protected by 12 inches of compound steel-faced armor, four 6-inch breech-loaders, two of which are placed in recessed ports aft, and two on Vavasour carriages, behind shields, amidships on the upper deck. She also carries, says the *Graphic*, to which we are indebted for our engraving, seven Nordenfelds, and two Gardner guns aloft in the top, or "upper fortress." Six torpedo ports, three on either side, from which Whitehead torpedoes can be discharged, and a most powerful ram complete her means of offense. Her engines are by Messrs. Humphreys & Tennant, and a full boiler power propel the ship at a speed of 15·5 knots.

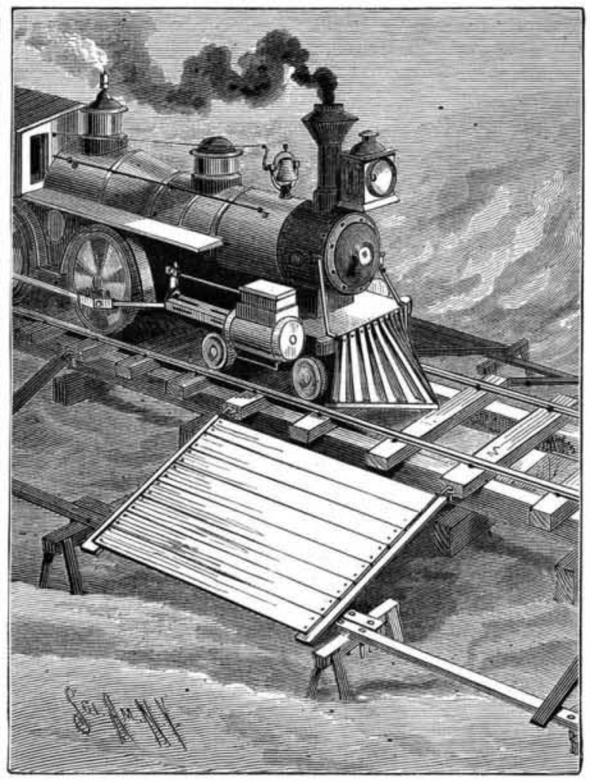


THE NEW STEEL TURRET SHIP CONQUEROR.

THE returns of the census taken on January 1, 1883, which have just been published, show that the Empire of Japan contained a population of 36,700,100, made up of 18,598,998 males and 18,121,000 females.

IMPROVED SAND GUARD FOR RAILWAYS.

The guard prevents sand which is carried along by the wind from accumulating on the tracks. It consists in a series of boards pivoted at the sides of the track and supporting other boards, under which the wind passes, sweeping over the track and carrying the sand along with it. The rails are spiked to ties, placed the usual distance apart, which rest on longitudinal beams supported on sleepers that



IMPROVED SAND GUARD FOR RAILWAYS.

are embedded in the ground, which must consist of gravel or some other earth that cannot be blown away. At the ends of some of the ties are loops for receiving hooks on the ends of boards, whose free ends rest on rails placed at the side of the track and parallel with it. These rails rest on horses placed at right angles to the track, and at the ends are provided with downwardly projecting pins, one of which is on each side of the top piece of a horse. On these rails are boards hinged to the ties or fastened in any suitable manner. The free ends of the boards may rest on the ground instead of on the rails supported by the horses. In sand storms the sand gathers in ridges on each side of the track, encroaches on the track, and finally stops travel. The horses are then placed on top of the ridges, and are pressed down until they have a firm bearing, when the rails and boards are placed on them, the latter having their outer edges a certain distance above the sand. The boards are so arranged that their outer edges will be toward the direction from which the sand blows. The wind passes under the boards and is conducted to the other side of the track, carrying the sand with it. The boards need only be large enough to direct the current of wind so that it will have the desired effect. They may be applied to either side of the track.

The invention was patented by Mr. T. W. Stapleton, of Portland, Oregon, who assigned it to Mr. John G. McBride, 523 Franklin Street, San Francisco, Cal.

AT Reddich, Germany, 14,000 persons are engaged in making needles. The total production of needles in the world is 200,000,000 per week, or 10,000,000,000 per year.

Paper for Uncle Sam's Currency.

The paper on which the United States currency is printed is manufactured at Dalton, Mass., and the Boston *Herald*, in a recent issue, gives the following particulars: Eighteen or twenty Treasury girls, who earn $3 a day, count the sheets, examining each one closely, and rejecting all imperfect ones. An automatic register at the end of the machine registers every sheet as it is cut off and laid down. The register man takes them away in even hundreds, and they are immediately counted in the drying room. In all the various processes of finishing every sheet is counted, and they are again counted on their receipt at the Treasury Department in Washington. The great protection of the government against counterfeiting lies in the paper here made. The distinctive feature is the introduction of colored silk threads into the body of the paper while it is in the process of manufacture. They are introduced while the paper is in the pulp, and are carried along with it to the end of the machine, where it is delivered as actual paper. This has been more fatal than anything else to the professional counterfeiters.

Hollow Magnets.

While Preece has found that there is no difference in the conducting power of lightning rods of various forms, Holtz has concluded that solid steel bars do not form so good permanent magnets as tubes, because the core acts as an armature joining the two poles. In experimenting to test his hypothesis, he magnetized rods and tubes to saturation, and found that the magnetism of the tube showed an excess of more than 50 per cent. After waiting six months, he subjected the same magnets to new tests, in order to find which retained the magnetism best. He found that the magnetism of the solid was to that of the hollow magnets, in one case as 1 : 2·5, in another as 1 : 2·9—*Weid. Annalen.*

Refrigerating Steamship for Carrying Fresh Meat.

The screw steamer Loch Ard, of Dundee, lately docked at Cardiff, is a fine vessel of 538 tons net register, and has been constructed specially for the purpose of carrying dead meat from the River Plate to London. The refrigerating chambers leading forward to the main and fore holds are lined with wood and charcoal, and an engine of novel construction draws the air out of the chambers. The air is then compressed and driven through the holds containing the dead meat, the temperature maintained being often 70° below zero. Messrs. David & W. Henderson, of Glasgow, constructed the engines under the patent of Messrs. Bell, Coleman & Co. The steamer will load for Montevideo, and thence take her cargo of meat for London. The voyage out and home will occupy about three months.

The Bottle-Nose Whale.

The *American Naturalist* asserts, on the record of Dr. Gray and Professor Flower, that the ordinary bottle-nose whale is only a variety of the spermaceti whale. According to information derived from a comparison of the bottle-nose with the spermaceti the former has all the characteristics of the latter in its yield of commercial material. Spermaceti is found in the head as in that of the well known spermaceti whale. The bottle-nose attains a length of thirty feet, and then yields two tons of oil and two hundredweight of spermaceti. It feeds upon small cuttlefish and in pursuit of them stays below longer than any others of its order, a fact which makes it difficult to kill. After running out 700 fathoms of line and remaining below two hours, an old male will come up so fresh as to require a second harpoon, and will attack the boats with head and tail. So strong are the muscles of this whale that he can not only leap clear out of the water, but can guide itself in descending so as to plung head first instead of falling helplessly sidewise like the larger whales.

The Science of Beef Tea.

In stewing, the juices are to be extracted more or less completely, and the water is required to act as a solvent as well as a heat conveyer. Instead of the meat itself surrounding and enveloping the juices as it should when boiled, roasted, grilled, or fried, we demand in a stew that the juices shall surround or envelop the meat. In some cases the separation of the juices is the sole object, as in the preparation of certain soups and gravies, of which "beef tea" may be taken as a typical example. *Extractum carnis*, or "Liebig's Extract of Meat," is beef tea (or mutton tea) concentrated by evaporation.

The juices of lean meat may be extracted very completely without cooking the meat at all, merely by mincing it and then placing it in cold water. *Maceration* is the proper name for this treatment. The philosophy of this is interesting, and so little understood in the kitchen that I must explain its rudiments.

If two liquids capable of mixing together, but of different densities, be placed in the same vessel, the denser at the bottom, they will mix together in defiance of gravitation, the heavy liquid rising and spreading itself throughout the lighter, and the lighter descending and diffusing itself through the heavier.

Thus, concentrated sulphuric acid (oil of vitriol), which has nearly double the density of water, may be placed under water by pouring water in a tall glass jar, and then carefully pouring the acid down a funnel with a long tube, the bottom end of which touches the bottom of the jar. At first the heavy liquid pushes up the lighter, and its upper surface may be distinctly seen with that of the lighter resting upon it. This is better shown if the water be colored by a blue tincture of litmus, which is reddened by the acid. A red stratum indicates the boundaries of the two liquids. Gradually the reddening proceeds upward and downward, the whole of the water changes from blue to red, and the acid becomes tinged.

Graham worked for many years upon the determination of the laws of this diffusion and the rates at which different liquids diffused into each other. His method was to fill small jars of uniform size and shape (about 4 oz. capacity) with the saline or other dense solution, place upon the ground mouth of the jar a plate glass cover, then immerse it, when filled, in a cylindrical glass vessel containing about 20 oz. of distilled water. The cover being very carefully removed, diffusion was allowed to proceed for a given time, and then by analysis the amount of transfer into the distilled water was determined.

I must resist the temptation to expound the very interesting results of these researches, merely stating that they prove this diffusion to be no mere accidental mixing, but an action that proceeds with a regularity reducible to simple mathematical laws. One curious fact I must mention—viz., that on comparing the solutions of a number of different salts, those which crystallize in the same forms have similar rates of diffusion. The law that bears the most directly upon cookery is that "the quantity of any substance diffused from a solution of uniform strength increases as the temperature rises." The application of this will be seen presently.

It may be supposed that if the jar used in Graham's diffusion experiments were tied over with a mechanically air tight and water tight membrane, brine or other saline solution thus confined in the jar could not diffuse itself in the pure water above and around it; people who are satisfied with anything that "stands to reason" would be quite sure that a bladder which resists the passage of water, even when the water is pressed up to the bursting point, cannot be permeable to a most gentle and spontaneous flow of the same water. The true philosopher, however, never trusts to any reasoning, not even mathematical demonstration, until its conclusions are verified by observations and experiment. In this case all rational preconceptions or mathematical calculations based upon the amount of attractive force exerted between the particles of the different liquids are outraged by the facts.

If a stout, well tied bladder that would burst rather than allow a drop of water to be squeezed mechanically through it be partially filled with a solution of common washing soda, and then immersed in distilled water, the soda will make its way out of the bladder by passing through its walls, and the pure water will go in at the same time; for if, after some time is allowed, the outer water be tested by dipping into it a strip of red litmus paper, it will be turned blue, showing the presence of the alkali therein; and if the contents of the bladder be weighed or measured, they will be found to have increased by the inflow of fresh water. This inflow is called *endosmosis*, and the outflow of the solution is called *exosmosis*. If an India rubber bottle be filled with water and immersed in alcohol or ether, the endosmosis of the spirit will be so powerfully exerted as to distend the bottle considerably. If the bottle be filled with alcohol or ether and surrounded by water, it will nearly empty itself.

The force exerted by this action is displayed by the rising of the sap from the rootlets of a forest giant to the cells of its topmost leaves. Not only plants, but animals also, are complex osmotic machines. There is scarcely any vital function—if any at all—in which this osmosis does not play an important part. I have no doubt that the mental effort I am at this moment exerting is largely dependent upon the endosmosis and exosmosis that is proceeding through the delicate membranes of some of the many miles of blood vessels that ramify throughout the gray matter of my brain. But I must wander no further beyond the kitchen, having already said enough to indicate that exosmosis is fundamental to the philosophy of beef tea extraction.—*W. Mattieu Williams, in Knowledge.*

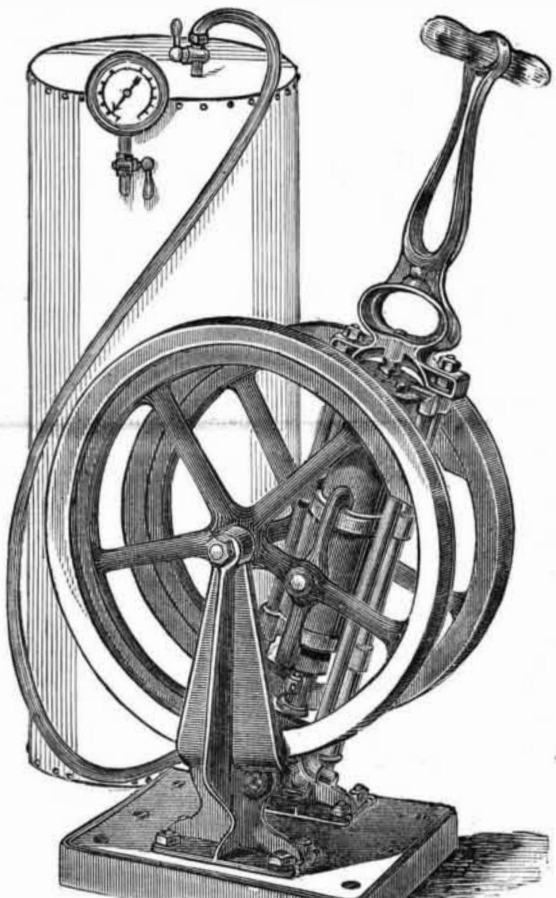
AN IMPROVED HAND AIR CONDENSER.

While no particular difficulty is experienced in pumping air against a pressure of two or three atmospheres, the number of really effective and reliable hand machines for obtaining higher pressures is limited. The great difference between the initial and the final pressures in the pump and the heat resulting from the high compression has a wearing effect upon the machinery, so that in a comparatively short time the cost of repairs will amount to more than its original price.

A power driven air pump, by the same inventor, was illustrated and described in vol. xlvii., SCIENTIFIC AMERICAN, September, 1882. Since then demands have been made for a compressor or condenser that could be driven by hand. The machine herewith illustrated is intended to fill that want.

In the pump shown in the engraving, which is intended to sustain a pressure of 120 pounds to the square inch, the lever holds on its upper end a cylinder of $2\frac{5}{16}$ inches diameter, with a stroke of $5\frac{1}{2}$ inches, and on its lower end a piston, $1\frac{5}{16}$ diameter, fastened to a hollow piston rod, through which the air or gas is expelled.

If we propose to start the pump with the large piston (connected with small cylinder) at its highest, it will, during one-half revolution, draw in the gas through the top valve in the large cylinder; during the next half revolution the filling of large cylinder will be compressed into the small one; the next half revolution will expel the already compressed gas from small cylinder into receiver, while the large cylinder fills itself with a new supply. The pump has no stuff ing boxes, and only three valves, both cylinders being single acting. A condenser can be kept continuously running against 160 pounds pressure without injury to the machinery.



IMPROVED HAND AIR CONDENSER.

This improvement is the invention of H. Weindel, 405 North Fourth Street, Philadelphia, Pa.

The Invention of the Telegraph.

We have received an extract from the ninth volume of the *Electrician*, which seems to show that the honor of having invented the electric telegraph really belongs to Edward Davy, a member of the medical profession who, at the advanced age of seventy-seven, is now living in one of the Australian colonies. Davy's original paper appeared in the *Mechanics' Magazine* for 1838. An original manuscript dated 1836, entitled "Outline of a New Plan of Telegraphic Communication, by which intelligence may be conveyed with precision to unlimited distances in an instant of time, independent of fog or darkness," has lately been discovered among Davy's papers by his nephew, Dr. Henry Davy, of Exeter; and this, as well as others, have been placed in the hands of Mr. J. J. Fahie, the author of the paper in the *Electrician*. The first idea was to use static electricity for transmitting the signals; but this was soon abandoned, and the electro magnetic properties of the voltaic current was the form of electricity upon which Davy ultimately relied, and the signals were made by the deflections of the needle of a galvanometer. His proposal was to use as many wires as there were letters in the alphabet, but these he subsequently reduced to half the number by making a deflection to the right convey one signal and to the left another. When Cooke and Wheatstone applied for their first patent in 1837, Davy entered an opposition, lodging with the Solicitor-General of the time a full description of his own apparatus; and in November and December of the same year a working model of Davy's apparatus was shown in a room adjoining Exeter Hall. An examination of Mr. Fahie's paper leaves no doubt on the mind that Davy had a very clear notion of the electric telegraph, but it would occupy too much of our space to go into the technicalities and details. It seems that Edward Davy was born in 1806, studied at St. Bartholomew's, and became M.R.C.S. and M.S.A in 1828. He soon gave up medical practice, and became a practical chemist, having a place of business in the Strand; and his ingenuity is evidenced by a "blow pipe," a "mercurial trough," and a "diamond cement," which bear his name. It is probable that he would have succeeded with his invention, just as Cooke and Wheatstone did, had he not lacked three necessary things: (1) backers with money, who believed in him and his inventions; (2) good men of business to advise him; and (3) "push," without which inventive genius is of no avail. Just as he had perfected his ideas, he left England and became one of the assayers to the Melbourne Mint. Had he remained at home to enforce his ideas with the necessary pestilent importunity, he might have reaped the reward of his genius. Davy had genius, but lacked another quality, needful but less lovely, and thus the story of his invention is the story, as Mr. Fahie says, of a "magnificent failure."—*Lancet.*

The Siren Fog Horn.

The Zuyder Zee was recently the scene of some interesting experiments with Professor Holme's siren fog horn. Two steam vessels, the one the Zwalaw, belonging to the Netherland Royal Steamship Company, the other the Hollandia, were each fitted with one of the fog horns, which, though well known in our navy, have up to the present time been used by the Dutch Government as lighthouse fog signals only. The object of the experiments was to ascertain if a small apparatus operated by steam could be used advantageously at sea for signaling on the Morse system of dot and dash. The two vessels left Rotterdam at 10 A.M., and, after passing through the sluice gates, and entering the Zuyder Zee, the smaller of the two ships ceased steaming, while the larger one put out to sea.

Telegraph clerks were employed to manipulate the apparatus, and although the distance eventually became so great that each vessel was invisible to those on board the other, yet the signals reached the ear distinctly, and were at once read off and understood. The unusual and unexpected sounds caused the captain of an outward bound steamer, the Willem III., to suppose the Zwalaw was in distress, and to hasten to her assistance. Upon getting alongside and ascertaining the true cause of the noises, he made no secret of his disgust and steamed away at full speed. After experimenting for about five hours, at distances varying from one to five miles, the signal "Come to us," was given from the Zwalaw, to which the Hollandia replied "We come," and was soon seen steaming toward her consort. There were present Mr. Reeringh, of the Marine Department; Colonel Steppens, Director of the Navy Yard; and the representatives of the various steamship companies. The results of the trials were considered to be in every way satisfactory, and to demonstrate the possibility of one vessel communicating intelligence to the other at sea although separated by a considerable distance. The experiments were conducted by Messrs. De Wit, engineers of Amsterdam, and Mr. C. Ingrey, C.E., the engineer of the Caloric Engine and Siren Company, of London.

How Salmon are Increased.

At Astoria, Oregon, all the offal of the salmon used for canning is thrown into the sea at the shore, the canneries being so situated that the great Pacific Ocean, at the mouth of the great Columbia River, receives all the rejected matter. According to the *Portland Oregonian*, this seeming wastefulness is a means of a constant reproduction of the salmon. The first operation in the canneries, he argues, is to relieve the fish of their entrails, fins, heads, and spawn, and these, in almost every instance, are dropped directly into the river. Much of the spawn, of course, is eaten by fish or destroyed, but a goodly share, he thinks, finds lodgment on the bottom, where in the natural process it hatches. It is a fact well known that the water about the canneries fairly swarms with young fish during the summer and fall.

A Result of Co-operation.

Workingmen managing a co-operative establishment, and performing their own labor, would undoubtedly experience seasons when they would be compelled to accept not only smaller dividends but lower wages, in order to have any dividends at all. Still it is well known that men when working for themselves will put up with privations, and hardships even, which they would not think of submitting to, if imposed upon them by others. One of the indirect advantages of co-operative production will be the cultivation of economy, saving, and thrift among the workingmen who engage in it. The interest in such an establishment would form a nucleus to which every honorable and ambitious workman would have a just pride in adding something every month.—*Western Manufacturer.*