Accordingly an appropriation was made by Congress to change the driving machinery, and the Mallory propeller was substituted. The tests now being made are chiefly to determine the efficiency of the new system. With the Fowler wheel but seven knots were made. With the Mallory propeller a speed of eleven knots has been attained, two of the four boilers being used, and her commander, Lieut. R. M. G. Brown, expresses the opinion that twelve knots can easily be accomplished—in plain English, about two thirds the speed a vessel of this character ought to have to make her effective against modern war vessels.

As a steering apparatus the propeller is evidently a success. The vessel can be stopped without reversing the engine, and can be made to spin as upon a pivot. Whether the lack of speed is due to the plan of the vessel or to lack of power in the propeller does not appear.

The Alarm is 172 feet long, including a 32 foot ram. Her beam is 26 feet 6 inches, and drawing 11 feet of water she displaces about 700 tons. She is intended to fight bows on, and in addition to her ram and torpedo equipment she carries one large gun in the bow. It is an ordinary 22 ton smooth-bore. The Alarm is intended chiefly for coast defense, and if her speed were increased fifty per cent., and her cannon changed to a heavy breach-loading rifle, she would be really formidable. Her torpedo equipment appears to be entirely satisfactory.

MR. LAWSON'S BOILER EXPLOSION.

BY S. N. HARTWELL.

In the year 1835, at the request of the Secretary of the United States Treasury, a series of experiments was undertaken by a committee of the Franklin Institute to ascertain causes of unexplained boiler explosions. A small plain cylinder boiler, set in brick, having in each of its flat cast iron heads a small glass window supported by a metal grating, through which to observe the effect of certain manipulations that were supposed to contribute to destructive boiler explosions.

The first experiment was "*to ascertain whether, on relieving water heated to or above the boiling point from pressure any commotion is produced in the fluid.*" In the report of the committee on this experiment is the following:

Experiments were made which showed that on making an opening, even when the pressure did not exceed two atmospheres, a local foaming commenced at the point of escape, followed soon by a general foaming throughout the boiler, the more violent in proportion as the opening was increased. This small boiler (12 inches diameter by 34 inches long, half full of water) "was completely filled with foam by opening the safety valve, which was placed in the middle of the top, and the water violently discharged through the opening of the valve." In regard to the effect on the gauge, they say "the gauge fell always on making the opening."

The committee used also fusible disks of much larger area than the safety valve, by which, on fusing, an aperture 0·95 inch in diameter was suddenly opened. The effect even at low temperatures was the violent discharge of the scalding contents against roof of the boiler house.

A number of experiments followed until the water was entirely exhausted, and the boiler was allowed to attain a red heat, and trials were repeated by injecting water directly upon the hot surface. They say "the result was uniformly a diminished elasticity of the steam."

The interesting and valuable experiments of Mr. Daniel T. Lawson, of Wellsville, recently made and described in vol. xlv., No. 2 (July 9), of the SCIENTIFIC AMERICAN, seem to be a supplement to those of the Franklin Institute made 46 years before, and they add one more to the practical demonstrations of theory.

Probably no well-informed engineer who has given the subject proper attention doubts that Mr. Lawson's experimental boiler would explode as described on suddenly letting out the steam through a two-inch pipe, when the pressure had risen to 380 pounds per square inch. The questions that arise in this connection Mr. Lawson may not be able to answer until more experiments are made. The estimated strength of his boiler being, as he says, about 600 pounds to the square inch, at what steadily increasing pressure under his practical conditions would it have exploded had no shock been produced by the artificial means applied to liberate the steam? And at what pressure would it have given way under conditions of the cold hydrostatic test? At 350 pounds pressure his first experiment failed to explode the boiler, while it did explode at 380 pounds on a second trial. How many shocks equal to the one produced in the first trial would have sufficed to explode the boiler? And how many would have destroyed the boiler? And with what proportional results at lower pressures, say down to practical everyday examples of boilers supposed to be working under one-fifth their breaking load? The term superheated, used by Mr. Lawson in describing his experiment, is, however, calculated to mislead those who are not familiar with boiler temperatures. Water that discharges steam from its surface, or boils under a pressure of 380 pounds per square inch, has a temperature not far from 440° Fah., about the melting point of tin. But according to the accepted meaning of the term this water is not superheated. Its temperature is normal to the conditions, the same as 212° is to conditions of atmospheric boiling.

Superheated water is that having a temperature higher than the boiling point at the given pressure; but to bring it into this very unstable condition experimentally requires very delicate manipulation. Professor Douny, of Ghent, many years ago succeeded in doing so, but it is probable that nine out of ten of his imitators have utterly failed in their attempts to prevent circulation of the water and to exclude air and other impurities. Heat applied to a limited surface of a steam boiler invariably induces circulation, a condition destructive of the desired effect. Perfectly still and perfectly pure water, perfectly deaerated, may be superheated so that a slight disturbance will cause explosive ebullition. But pure deaerated water in motion is not explosive unless the pressure is suddenly removed from its surface, when a sudden escape of contained heat, causing violent action, is the result of the lowering of the boiling temperature. Thus water at 212°, if suddenly introduced into a vacuum, will practically explode, and for an instant fill the vessel with a heavy foam, which will again mostly become "solid water" as soon as its temperature falls to the boiling point under the new condition of pressure. The greater the change of pressure suddenly effected the greater, of course, will be the shock of the disintegration or explosion of the water. Probably a correct estimate of the velocity of the flight of the water at 440° Fah., every particle of which is, in regard to the new condition, surcharged with heat, and springs with lightning speed, would show that the explosive action very nearly resembles that of a fair quality of gunpowder.

In regard to one of the questions suggested above the late experiment in the boiler yard of Sidebotham & Powell, in Philadelphia, an account of which was published in the SCIENTIFIC AMERICAN of July 23, 1881, may be considered another of those valuable practical things that form a common-sense basis for determining the strength of modern structural material, and it throws light on the subject of boiler explosions, which will no doubt dispel some of the vapors that have been raised around the late occurrence at Gaffney's dyehouse. We need more of this sort of thing and less theoretical prediction.

PIONEER CANNING.

BY H. C. HOVEY.

The first successful attempts at canning fish, fruit, and vegetables were made at Eastport, Me., about the year 1840. The honor of this pioneer work (as I am informed by Mr. D. I. Odell, British Vice Consul, Eastport, Me.), is to be shared between Mr. Charles Mitchell, who brought the idea with him from Scotland, and Mr. U. S. Treat, who employed him and furnished the requisite capital to carry on experiments. After working for Treat four or five years, Mitchell was associated with a Mr. Underwood for thirty-six years in canning lobsters at various points from Portland to the Gulf of St. Lawrence, and finally settled down at the Grand Manan.

The original Eastport firm, formed in 1841, was "Treat, Noble & Haliday." At first they canned salmon, clams, and lobsters. Then they put up, in a similar manner, beef, mutton, fowl, corn, etc. At one time large quantities of ox-tail soup were thus hermetically sealed and sent to market. To supply the material ox-tails in great numbers were brought on from Boston to Eastport in crates.

When the firm broke up, which it did in 1844, Noble went to St. John, N. B., and Haliday to Halifax, N. S., each to engage in the fish business. But Treat kept on canning. He bought an island, that bears his name, in Passamaquoddy Bay, where, besides the business already mentioned, he established a large trade in smoked herring, fish oil, and fertilizers, having a steam mill for the purpose. He made heavy shipments, principally to ports in Connecticut. It is satisfactory to our sense of justice to know that each member of this enterprising firm amassed a competent fortune, and enjoyed a fair share of public recognition.

Mr. Treat's superior knowledge and experience becoming known to Hon. S. F. Baird, of the Smithsonian Institution, the latter secured for him an appointment in Japan, at a salary of $5,000 a year, to develop the fishing and canning enterprises of that empire. There he remained for three years, at the expiration of which period he removed to California; where, at the advanced age of seventy-five years, he is associated with his two sons in his old business of canning salmon.

When Mr. Winslow Jones, of Portland, had his celebrated law suit, some years ago, with certain parties in Chicago, who, as he claimed, had infringed on his patent process of canning corn, the defense summoned Mr. Treat as a witness to prove that the process had been in use long before the Winslow patent had been procured.

It is also claimed for Mr. Treat that he originated the canning of oysters at Norfolk, Va., being employed by dealers for that express purpose.

The canning of various products, chiefly marine, is still extensively carried on at Eastport. What is known as "The Eastport Packing Company" is mainly engaged in putting up lobsters, which are caught in immense quantities from Cutter to Point Lepreau. They pack only the claws and tails, grinding up the bodies and shells for use as a fertilizer; thus wasting nothing. One hundredweight of live lobsters, costing the company but one dollar, will make eighteen one pound cans, selling in New York at one dollar and a half per dozen.

Men who learned the art of canning in what is geographically, but not otherwise, "the last town in the United States," conveyed the mysteries of the business to the remotest portions of the land; until now the trade in canned goods has become one of the most lucrative and important branches of industry in America, furnishing employment for thousands of people.

GALVANIZATION OF AN ENGINE PISTON.

Mr. P. Paul, an engineer, makes known through the columns of our French contemporary, *Le Genie Civil*, a curious accident which happened in 1880 in the shops of Fleury's Boiler Works at Cette. The feed water of the steam generator depositing a large amount of incrustation, Mr. Fleury was advised to throw into the boiler fragments of zinc, the disincrusting property of which is well known. After a few days the motor, notwithstanding its frequent lubrication, began to work with difficulty. The iron piston griped strongly, and before long it became almost impossible for the engine to work at all. On taking the mechanism apart to examine into the cause of the trouble the piston was found to be coated with a heavy layer of copper, which, upon turning the piston in a lathe, was found to be thickest in those parts that had been submitted to friction.

The explanation offered by Mr. Fleury is quite plausible. The boiler was connected with the engine by copper pipes. The particles of zinc carried along by the steam constituted, then, with the metal of the pipes, an infinite number of small galvanic couples; hence the transportation of the copper by the piping to the piston, which principally attracted it because of its continual motion exerting an attraction as a mass upon the molecules, the fixation of the latter being facilitated by the heating produced by friction.

Mechanics' Fair in Boston.

From the statement of Mr. Charles Slack, at a recent meeting of the Massachusetts Charitable Mechanics' Association, it appears that its various enterprises are getting on well, and that the mason work on the new exhibition building, which was begun on March 1, is now completed, and goods will be received as per programme. It is arranged that among the other interesting exhibits there will be one of special interest by "the Boston Manufacturers' Mutual Fire Insurance Company. They will exhibit a large collection of apparatus for saving and protecting property at fires, and of articles which have been through fire. Small brick structures will be erected outside the building for the practical trial of some fire-proof materials. Altogether, the managers of the exhibition are well satisfied with the prospect."

William S. Hudson.

William S. Hudson, locomotive engineer and inventor, died at his residence near Paterson, N. J., July 20. Mr. Hudson was born in Derbyshire, England, and served his apprenticeship with Robert Stephenson, builder of the "Rocket." Soon after coming to this country he was employed to begin the manufacture of locomotives at the Auburn State Prison, but the project failed for lack of competent workmen. Mr. Hudson then became master mechanic of the Attica and Buffalo Railroad, afterwards merged in the New York Central.

In 1852 he removed to Paterson, to take charge of the Rogers Locomotive Works. Very many important improvements in locomotive construction are due to Mr. Hudson's skill and inventive faculty.

The Need of a Hand Reel for Silk.

Some months since the attention of inventors was called in this paper to the growing need of a light hand reel for unwinding silk cocoons. The president of the Women's Silk Culture Association (1328 Chestnut street, Philadelphia) informs us that the demand is still unsupplied and urgent. A rough model of a reel is now at the rooms of the association, and inventors are desired to develop the idea of it into a satisfactory machine. A large number of persons have taken up the work of raising worms, and a proper reel for unwinding the cocoons would meet with a ready and growing sale. The reel should have a wheel 72 inches in circumference, and should be compactly built. It must also be inexpensive to meet with favor from the class now becoming interested in the culture of silk.

The association has established a school for teaching the art of raising and feeding silk worms, and they believe that if the industry were properly introduced silk culture would not only prove of great importance to our manufacturing interests but would furnish remunerative employment to thousands of poor families, particularly women. The demand is chiefly for reeled silk, and the lack of a suitable hand reel is the only drawback to the good work.

Italian Poison Antidote.

M. Bellini, of Florence, advocates the use of iodide of starch as an antidote for poisons in general, and, as it has no disagreeable taste and is free from the irritant properties of iodine, it can be administered in large doses; also, without fear in all cases where the poison is unknown. It will be found very efficacious in poisoning by sulphureted hydrogen gas, the alkaloids and alkaline sulphides, ammonia, and especially by alkalies, with which iodine forms insoluble compounds; and it aids in the elimination of salts of lead and mercury. In cases of acute poisoning an emetic is to be given before the antidote is administered.

IT is reported that a considerable deposit of specular iron ore has lately been discovered near Acworth, Ga. It is said that scientific men pronounce it to be of high grade, free from phosphorus and sulphur, and strongly magnetic, while the bed is well located for treatment of the ore on the premises, as well as convenient for shipment to market.