

ing of the chimney. Other heated products, consisting of combustible gases and hot air, pass into the mixing apparatus, where they are mixed with steam and fresh air entering from the chimney. This mixture enters the ash pit, and part passes through the burning fuel and part enters the flues leading to the combustion chamber. Air from the outside enters the chimney by the side doors, and, after passing up the side flues, enters the central opening, down the outside of which it is drawn by the mixer. This furnace takes the combustible gases from the hot air chamber, and, after adding steam and air, forces them into the combustion chamber.

This invention has been patented by Mr. George Hasecoster, of Fifth and Chestnut Streets, St. Louis, Mo.

Good Advice.

The *Manufacturers' Gazette* relates of a Western railway company which gives the following advice to its employes gratis. It is applicable to employes in all parts of the country: "The servant, man or woman, who begins a negotiation for service by inquiring what privileges are attached to the offered situation, and whose energy is put chiefly in stipulations, reservations, and conditions to 'lessen the burden' of the place, will not be found worth the hiring. The clerk whose last place was 'too hard for him' has a poor introduction to a new sphere of duty. There is only one spirit that ever achieves a great success. The man who seeks only how to make himself most useful, whose aim is to render himself indispensable to his employer, whose whole being is animated with the purpose to fill the largest possible place in the walk assigned to him, has in the exhibition of that spirit the guarantee of success. He commands the situation, and shall walk in the light of prosperity all his days. On the other hand, the man who accepts the unwholesome advice of the demagogue, and seeks only how little he may do, and how easy he may render his place and not lose his employment altogether, is unfit for service; as soon as there is a supernumerary on the list he becomes disengaged, as least valuable to his employer. The man who is afraid of doing too much is near of kin to him who seeks to do nothing, and was begot in the same family. They are neither of them in the remotest degree a relation to the man whose willingness to do everything possible to his touch places him at the head of the active list."

**NEW FRENCH CRUISER
TONNANT.**

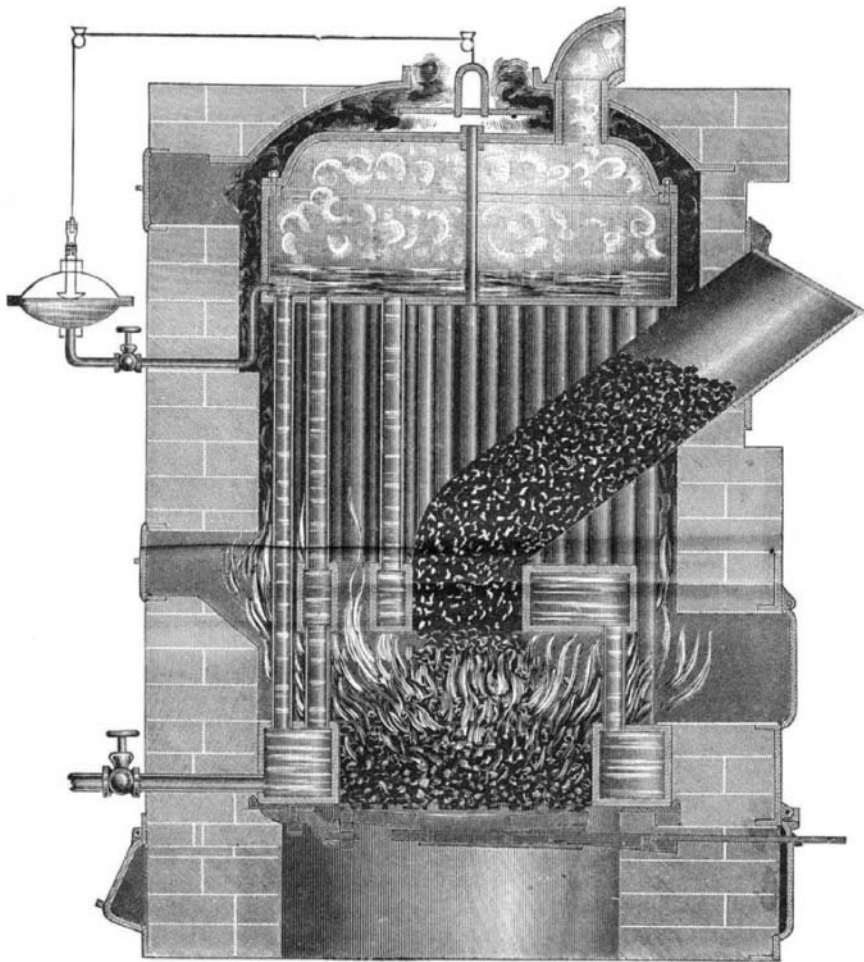
The illustration, which we take from our contemporary of Paris, *L'Illustration*, represents one of the newest types of French cruisers. It was launched at Rochefort in 1880, and is now quite completed and is ready to undergo its trial trips. Its armament consists of one heavy gun of 14 in. caliber in the turret and four smaller guns mounted on its forecastle. This formidable man-of-war measures 248 ft. at the water line; beam, 58 ft., with a depth of 18 ft., and having a draught of 16 ft. 8 in. Its displacement is 4,523 tons. Its armor amidships is 13 in., 10 in. forward, and 9 3/4 in. aft. The turret is also incased in armor, 14 in. in thickness. The Tonnant carries a crew of 197 men.

According* to the new classification adopted for the ships of the navy, the fleet comprises 9 new cruisers, of which the Onondaga is the oldest, and dates from 1863. The Tonnant is the newest, and is the most perfect of all.

"In the great fire which burned Murrey's Opera Hall, on Sept. 27, one large door, which was painted with H. W. Johns' asbestos fireproof paint, was the only wood that was not consumed."—*Albany, Wis., Vindicator.*

Metallic Ties.

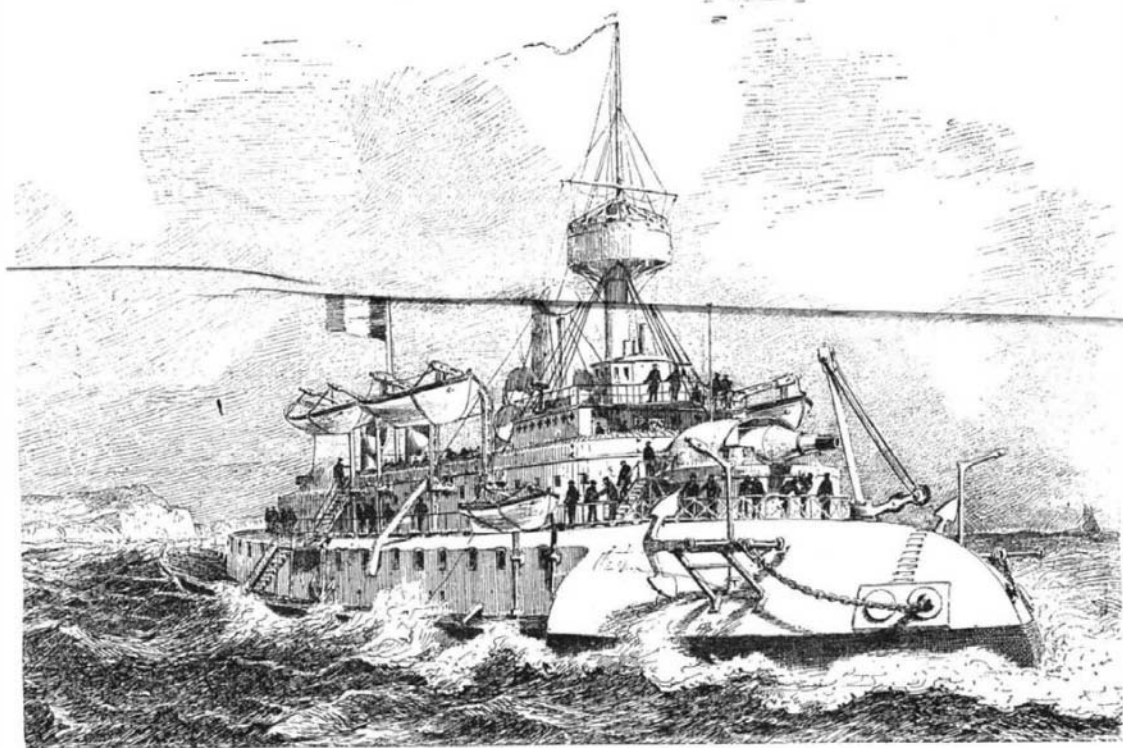
The Vera Cruz railway, in Mexico, began using steel ties in 1884, and has now some 20,000 of them on its bed. So satisfactory has the experiment been, that 40,000 have been ordered from England for use this year, and it is proposed to put in from 40,000 to 50,000 per year hereafter. The "life" of a steel tie is considered as indefinite, but it may safely be set at from 30 to 50 years, the former being an American



BRONSON'S MAGAZINE BASE-BURNING STEAM HEATING BOILER.

estimate by a competent metallurgist. The steel tie is now produced in England—where the manufacture has been so extended as to make the production very much cheaper than formerly—for five shillings apiece, or \$1.25 gold. By chartering its own vessels, the Vera Cruz company can land its steel ties at a cost which permits their extensive use. It may be set down that the outside cost will not exceed \$2 each, Mexican silver. The wooden ties which the steel ties are replacing on the

from all other systems in the fact that all its parts and movements are controllable by electricity. On this trial the speed of the car was made to vary from 23 miles an hour to a bare crawl. It stopped, switched, and reversed satisfactorily. No brake was used, the car being stopped by electricity. Stopping turns the motor into a generator, thereby saving much of the loss of electricity which happens in other systems. The electricity was supplied by two wires from a house half a mile away. Three tracks were employed, one wire being attached to the two outside tracks and the other to the middle track. The potential used was 600 volts. Mr. F. J. Sprague is the inventor of the new motor. His machine weighs only a ton, while the steam locomotives now in use weigh 20 tons. The motor is attached to each car thus dis-



THE TONNANT—NEW FRENCH WAR STEAMER.

Vera Cruz line range in price, according to the quality of wood, from 90 cents to \$1.62, silver. The latter price is paid for the zapote tie, a very hard and durable wood. The best white oak ties last from five to six years, the red oak about three years. In India the steel tie, sent out from England, is displacing even the teak tie, one of the best woods, and the change is being made on the score of economy. In using the steel tie, expense of spikes is saved.

thoroughly air-slaked, for if any dry particles be left they will swell and eventually break the joint. It is stated that this mortar is equal in strength to Portland cement, and that the latter may probably be improved by the addition of sugar, or perhaps even of treacle. A number of small experiments which have been made have proved entirely successful, and it now remains to see whether the material offers advantages in actual work sufficient to pay for its extra cost.

IMPROVED STEAM HEATING BOILER.

The accompanying engraving represents a steam heater possessing many features deserving attention. In the top of the heater, which is walled in, as clearly shown in the cut, is an annular water chamber, from the top of which leads the steam supply pipe. The fire pot is formed of an annular water chamber, which is connected with the upper one by an outer circle of tubes. Just above the lower chamber, and directly over the grate, is a third water chamber, which is connected by pipes with both the top and bottom chambers. The tube forming the coal magazine, which is inclined as shown, passes through the center of the middle chamber. This construction insures good steaming qualities, as every part of the pipes and chambers is exposed to the direct action of the heat, which, in its passage from the grate to the chimney at the top, is compelled by the arrangement of the pipes and chambers to take a circuitous route. This construction also provides a very perfect and rapid circulation.

Further particulars regarding this steam heater can be obtained from the inventor, Mr. William C. Bronson, of 676 Broadway, Saratoga Springs, N. Y.

Another Electric Motor.

A Third Avenue elevated car, brilliantly lighted with Edison incandescent lamps, recently made trips on the Thirty-fourth Street branch of the elevated railroad in this city. The car was filled with a crowd of interested electricians, for the Sprague electric motor was on trial. Notwithstanding the unfavorable condition of rain and a rusty track, the test was a successful one, and the fact that the car was both lighted, heated, and propelled by electricity, and that the station platforms were similarly illuminated, seems to show that comfort and rapid transit are both to be increased by the use of electricity.

The Sprague motor is carried on the truck of the regular car, and differs

Sweetened Mortar.

A letter in the *London Times*, by Mr. Thomson Hankey, points out that cane sugar and lime form a definite chemical compound, which has very strong binding qualities, and forms a cement of exceptional strength. Equal quantities of finely powdered lime of a common kind and of good brown sugar, mixed with water, form a mortar which has been found to join stones and even glass with great success. It is important that the lime should be