## IMPROVED VERTICAL BOILER.

We give herewith an engraving of a vertical boiler, exhibited at the recent exhibition of fuel saving appliances at Manchester, England. *The Engineer*, from which we select the illustration, states that the details of construction will be obvious at a glance. Fig. 1 and plan show an ordinary boiler; Fig. 2 and plan show a boiler in which the whole outer shell is enveloped in a smoke box which can be lifted off in a moment. Internally the boilers are nearly alike. Vertical water tubes are fixed in the fire box. This has been done before repeatedly, but not as in this case. The tubes, instead of being bent and fitted directly into the tube plate, are fitted into malleable castings, as shown, in groups. These castings are tapered and ground at the outer ends or legs, and these tapered ends are drawn into slightly conical holes in the fire box, by the bolts and nuts passing through the outer shell, as shown. Any tube, or rather any group of tubes, can be taken out by removing the nuts on the outside of the boiler, and, on withdrawing the bolts, allowing the group of tubes to descend into the fire box, whence it can be taken for repairs or renewal of tubes.

It will be seen that the arrangement is cheap and simple, and we understand that several of these boilers which are at work have given very satisfactory results. The malleable castings appear to stand very well, and give no trouble of any kind. The facilities for manufacture are obviously great, and the boiler deserves extended adoption.

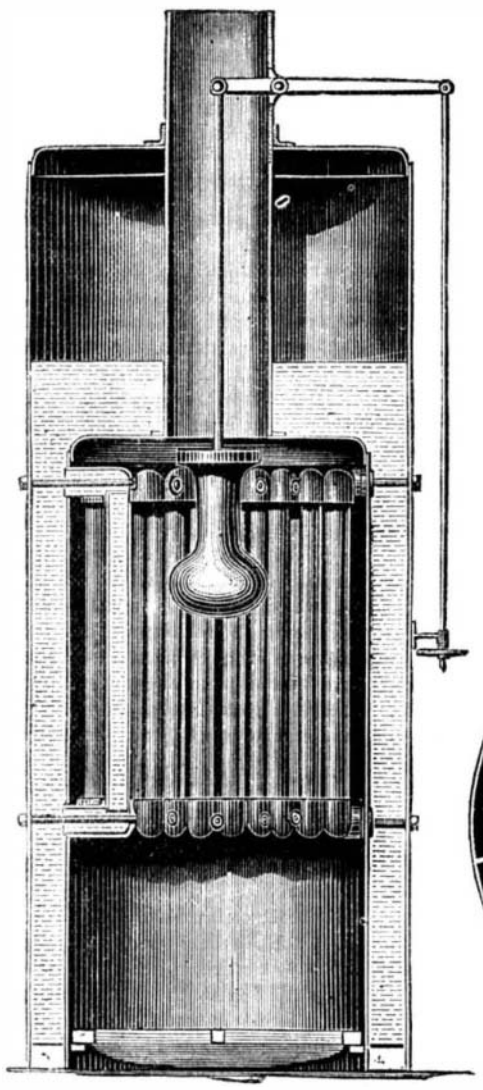
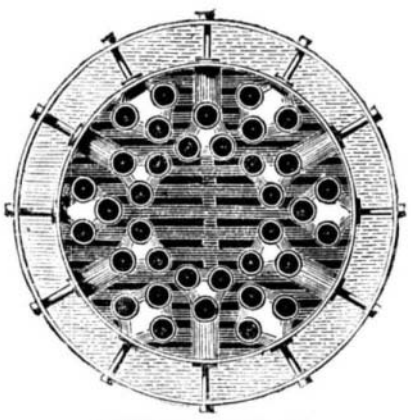
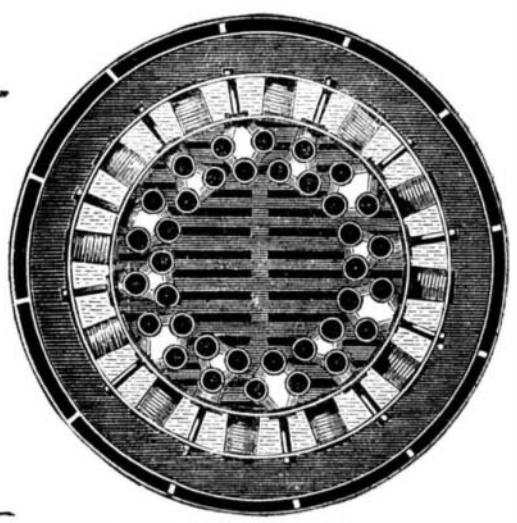


FIG. 2



SECTIONAL PLAN OF FIG. 2



SECTIONAL PLAN OF FIG. 1

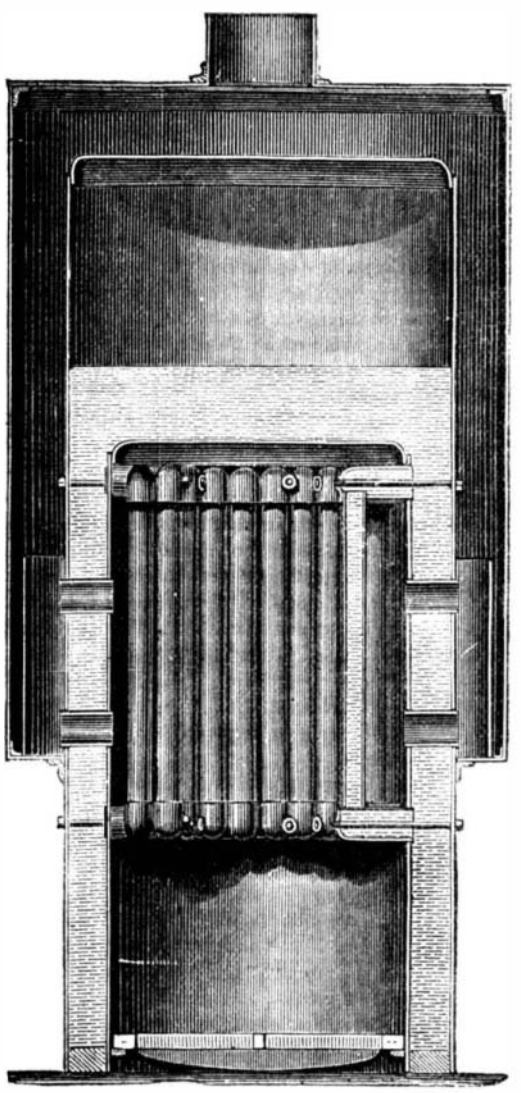


FIG. 1

## HILL'S VERTICAL BOILER.

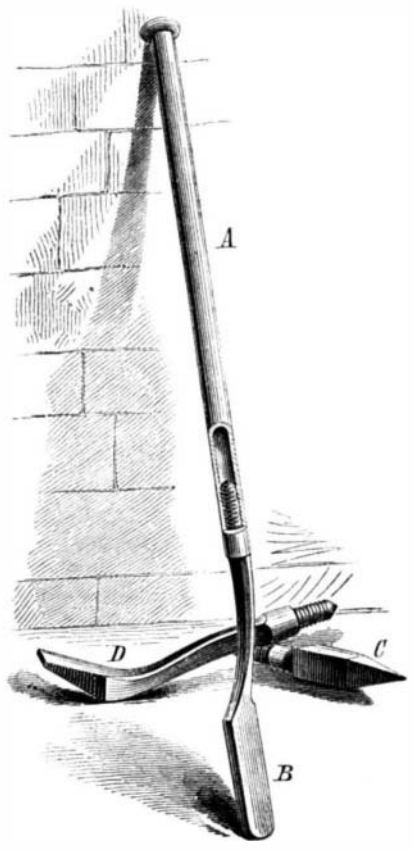
### English and American Railways Compared.

The French government some time ago directed M. Malézieux, chief engineer of roads and bridges, to prepare and submit a thorough report upon the condition, cost, operation, etc., of all the English railways. This work has lately been completed, and published in the official journal of the French Engineers, the *Annales des Ponts et Chaussées*. Its interest to American readers is enhanced from the fact that a couple of years ago M. Malézieux visited the United States, and compiled a report upon American engineering structures, and that in presenting this, his second report, he has drawn largely upon the knowledge gained across the Atlantic to institute comparisons between the railway systems of England and the United States. The results of his examination into the comparative cost of working shows that 57,040 miles of railroad in the United States produced, during the year 1872, an average gross receipt of $5,160, which sum is just half that gained in England. This amount is divided between passengers and freight in the proportion of 28 to 72, in place of 44 to 56 in the latter mentioned country. It will be noticed that the passenger travel in England is as exceptionally large as is the freight transportation in the United States.

The working expenses, which in England may reach 50 per cent of the gross receipts, in the United States are 65 per cent. The net earnings then are but 35 per cent in the latter country against 50 per cent in the former. This, however, represents 5·20 per cent of the expense of construction in the United States and but 4 75 per cent in England, which the author ascribes to the fact that the cost per mile averages $55·683 in the United States, while in England it is $170,645. These figures all refer to January 1, 1873. Of the capital 38 per cent is obtained by loan in England, and 48 per cent in America. Bondholders in the United States obtain an average revenue of 6·7 per cent against 4·25 per cent in England. Dividends distributed to stockholders represent in America but 3·91 of the capital obligations, in place of 5·14. The difference of these figures is considerable in view of the irregularity in value of capital in the two countries. But in America, says M. Malézieux, railroads give such additional value to land, mines, and natural resources that capitalists whose funds are engaged in the most varied enterprizes are content with the smallness of the revenue. But he considers that, without the aid of land subsidies and the contributions to loans to the roads by cities, the development of American railways would not have been so extraordinarily rapid.

### IMPROVED CROW AND TAMPING BAR.

To workmen who, in the course of their labor, find it necessary to transport a kit of heavy tools from place to place, the invention herewith illustrated will prove quite convenient, as its object is materially to reduce the weight of the implements, while, at the same time, causing them to be less expensive and to occupy less space. The inventors, Messrs. Allen Wright and Albin F. Tew, of Westfield, Chatauqua county, N. Y., propose making the handle part of the bar tubular and of sufficient diameter to suit the hand naturally. The tamping attachment, B, crow, C, and claw, D, are all provided with screw shanks, so that they may be readily attached to the handle. A head is secured to the upper portion of the latter either permanently or detachably, and serves the ordinary purposes.




### The Great Centennial Exhibition.

The Director of the Centennial Commission officially announces that the exhibition will open April 19, 1876, and close October 19 following, and has issued a circular containing the general regulations for exhibitors. Articles to be entered are divided into ten departments, as follows: 1. Raw materials, mineral, vegetable, and animal 2. Materials and manufactures used for food, or in the arts. the result of extractive or combining processes. 3. Textile and felted fabrics—apparel, costumes and ornaments for the person. 4. Furniture and manufactures of general use in construction and in dwellings. 5. Tools, implements, machines and processes. 6. Motors and transportation. 7. Apparatus and methods for the increase and diffusion of knowledge. 8. Engineering, public works, architecture, etc. 9. Plastic and graphic arts. 10. Objects illustrating efforts for the improvement of the physical, intellectual, and moral condition of man.

Application for space must be made to the Director General. There will be no charge for the same, but exhibitors must provide their own show cases, shelving, counter shafts, etc. Transportation, etc., is at the expense of the exhibitor. Goods will be received from January 1, 1876, and none will be admitted after March 31, 1876 For heavy articles requiring foundations, arrangements should be made as soon as the buildings are begun. Patent medicines, empirical productions of any nature, and dangerous substances are excluded. Sketches, drawings, or photographs of entries will not be permitted, except by joint assent of the exhibitor and the Director General. Goods must remain until the close of the exposition, but subsequently must be removed before December 31, 1876. All communications should be addressed to the Director General, International Exhibition 1876, Philadelphia, Pa.

### The New York State Agricultural Fair.

The New York State Agricultural Society announces that its thirty-fourth annual fair will be held at Rochester, N. Y., from September 14 to 18 next. Entries close on August 15. A very large number of premiums are offered, especially for fine cattle. Manufacturers of agricultural implements will doubtless find it to their advantage to exhibit, as the fair will attract a large gathering of farmers from all parts of New York, Ohio, and Canada. We notice that a gold medal is offered for a combination of machinery, driven by steam, for plowing or otherwise preparing the ground for sowing. The requirements are that such machinery shall do as good and as cheap work as is now commonly done by horse power, and shall be adapted for use in the State of New York.