of light but gas is rigorously excluded, and to supply the thousands of gas burners, and the various motors and appliances domestic and otherwise, it was necessary to lead in one 8 inch and two 6 inch gas mains for the main floor exhibit and the various side exhibitions shown in the basement.

The lighting of the great building is accomplished by a dozen large crowns of gas light suspended from the roof, and by two continuous lines of light which completely encircle the building, the upper line being placed on the gallery front and the lower line on the balcony front. The latter effect is particularly beautiful; the jets being arranged in clusters of seven in frosted globes, and arranged in the position common in the seven-candle candelabra of the cathedrals. The illumination is further assisted by the myriad lights of the various exhibits, in the center of which and dominating them all is the lofty, spire-like tower erected by the Tiffany Glass and Decorating Company, of New York, from the designs of Mr. Louis C. Tiffany.

The tower, soaring 60 feet in the air, the height of a five story building, is composed of eight sections, representing as many periods in the development of the gas illuminating industry. All of these divisions, rising one out of the other, diminishing in size as they ascend, are ornamented with arches, crockets, finials and canopies, all on purely Gothic lines. Colored glass is worked in here and there throughout the entire construction. The pinnacle of this tabernacle of light, the section representing the decade of 1816, is of yellow, passing into a deeper yellow at the commencement of the section which stands for 1836, then passing into an orange, and from an orange to a light red, and from a deep red into a blue.

On the exterior of the construction there are 2,251 lights, while on the interior there are 688 lights, and all arranged so as to form part of the ornament and to illuminate the various colored glasses, and throw the colors upon jets, fountains and showers of water which are flowing through the tower, the water finally passing into steam, escapes from the upper section, and in its turn catches the reflection of the various colors of the glass.

On entering the Garden the most conspicuous exhibit is that of the Welsbach Light Company. It is in two parts, the booths standing on each side of the main aisle. Like the tower, they are from designs by Mr. Tiffany. The walls consist of an open framework which contains groups of mammoth gilded torches, whose flame consists of a bunch of thirty-one or fifty-two Welsbach lights. Adjoining the right hand booth is the exhibit of the Welsbach Street Lighting Company, in which a large number of street lamps of various and generally artistic design are shown. The Welsbach light is, as was to be expected, abundantly in evidence, and its ability to give at once a soft and powerful illumination is seen to good advantage in all parts of the exhibition.

Undoubtedly the most complete and creditable exhibit is that shown by the United Gas Improvement Company, of Philadelphia, which contains a complete model plant for the manufacture of water gas. The company also shows an historical exhibit, in which is traced the evolution of the water gas process, and close at hand is a rack showing the fractional distillation of gas-making oils. In addition to the model above mentioned, the exhibit contains a full-size water gas producing plant consisting of a generator, carbureter, superheater, oil heater, scrubber and condenser, oil pumps, blower, and every detail of this interesting process. In a smaller exhibit of the same firm will be found a complete analytical laboratory for the analysis of gases, a bar photometer for determination of candle power, and a meter prover.

The E. P. Gleason Company, who claim to have made the first brass gas burner manufactured in America, show a handsome assortment of gas fixtures, from the simplest burners to full sized street and hall lamps resplendent in polished metal and colored glass. Near at hand is the stand of the Continental Iron Works, where three gas gate valves, ten, fifteen and twenty five inches in diameter, are shown, which are fitted with a double screw that enables the valve to be opened and shut with greater speed. An excellent design of self-closing mouthpiece for gas retorts is shown side by side with one of the old type. The old mouthpiece consisted of a separate plate, which was held in place by a screw operating through a cross bar held in hooks attached to the mouth of the retort. The joint was made with lime, and considerable time was occupied in the operation. The new mouthpiece is swung open on a side hinge, and the joint is formed by making a coned face to the door and its seating.

Gas engines are shown by the Pennsylvania Iron Works Company, known as the makers of the "Globe" engine; by Fairbanks, Morse & Company and others. The Safety Car Heating and Lighting Company show Pintsch compressors, buoy lights, etc., and other exhibits worthy of special notice are those of William M. Crane & Company, the Parker Russel Mining and Manufacturing Company, and Hartlett, Hayward & Company.

Taken altogether, the exhibition is well calculated to impress the public with the vast extent of the gas industry and the high degree of perfection which has been reached, both in its manufacture and application to industrial and domestic purposes.

It is shown in operation in every imaginable kind of stove, whether for cooking or heating, and some very tasteful designs of radiators are exhibited. The gas motors range in size from diminutive engines, suitable for light household work or the amateur workshop, up to the powerful machine for shop use.

The basement has been given up for supplementary exhibits, such as from their nature could not be accommodated on the main floor. Conspicuous among these is a full sized representation of a coal mine, complete with tracks, coal trucks, and the various appliances used in up-to-date mining. The concert hall is used as a lecture room, in which the householder will be startled with facts and figures going to show the wastefulness of cooking by coal and the net saving per year to be realized by using the more cleanly and economical gas stove.

THE STEAM TRIALS OF THE LARGEST CRUISER IN THE WORLD.

The great English cruiser Terrible, a sister ship to the Powerful, the details of whose trial trip were given in our issue of January 2, has also completed her trials and has shown very excellent results, maintaining 22·4 knots on a four hours' trial. She was built from the same plans as her predecessor, and is in every way identical except that the propellers of the Powerful are made of Admiralty gun metal, and those of the Terrible of manganese bronze; by using which it became possible to reduce the thickness of the blades considerably and give their surfaces a fine polish, thereby considerably reducing the loss due to propeller resistance proper.

These two magnificent ships are of such exceptional size and power that they have attracted widespread attention, and the interest has been increased by the fact that they were to be equipped entirely with water tube boilers, whose aggregate horse power was to be 25,000. They are the first war ships to exceed a length of 500 feet, and they are built in agreement with the tendency of naval designers to increase the all around dimensions of naval vessels, and especially that of length. The Russian cruiser Rurik was the first to reach the limit of 400 feet, and she was followed by the United States cruisers Columbia and Minneapolis with a length of 412 feet.

The Powerful and the Terrible are 538 feet long, 71 feet beam and 43 feet 4 inches in depth to the upper deck. Their displacement is 14,200 tons and designed speed 22 knots. On a four hours' trial against a head sea the Powerful averaged 21·8 knots an hour, and on her recent trials the Terrible made 22·4 knots. They have a complete protective deck from 3 to 6 inches thick, which is reinforced with many feet of coal protection. The armament consists of two 9·2 inch guns mounted in barbettes, twelve 6 inch quick-firing guns, twelve 3 pounders and nine machine guns. There are four torpedo tubes.

At the launch of the Terrible it was stated by her builders that she was designed for the purpose of being able to maintain a continuous rate of high speed at sea in any weather. She was to be capable of catching the largest and swiftest ocean steamers, and it was considered that the only way to insure this result was to give her the great length, weight and power of an Atlantic liner. Experience has shown that in heavy weather the longer and larger ship will maintain the best rate of speed, other things being equal. Her greater momentum will cause her to be less affected by the concussion of the waves, and her greater freeboard will carry her over the seas with a dry deck.

In the first of the trials of the Terrible, 14 of the Belleville boilers out of the 48 were used. The horse power was 5,000, coal consumption 2·27 pounds per indicated horse power hour, and the corresponding speed 13·3 knots. The trial at 18,000 horse power lasted for 30 consecutive hours. The coal consumption was 1·7 pound per horse power hour and the mean speed was 21 knots per hour, which, considering that she was only working up to about 70 per cent of her maximum power, was an exceptionally fine performance. In the four hours' full power trial the steam pressure in the boilers was 229·6 pounds per square inch, the mean vacuum in the condensers 26 inches, the mean revolutions 112 per minute, and the indicated horse power 25,572, the mean speed being 22·4 knots an hour.

The enormous coal supply—3,000 tons—carried by these ships would enable them to travel 4,200 knots at a speed of 21 knots an hour.

The Chicago Bicycle Show.

The bicycle exhibition which was held at the Coliseum, at Chicago, last week, shows that in the majority of machines no radical changes have been made, although many new ideas have been incorporated in the structure of the wheel. It must be said, however, that these changes have very largely been introduced by the smaller and less known manufacturers. In general, the wheels are slightly heavier than last year, very few being shown which weigh less than twenty pounds. The frames are practically the same as those used in last year's model. Many of them have ingenious flush joints. The treads are narrower and hubs are larger as a rule. The improvement in the bearings is most noticeable, a large percentage of the wheels being dust proof or nearly so. They are fitted in many cases with ball retaining devices, the balls themselves are larger and the cones are constructed so that the friction is reduced. The crank hanger has a greater drop than last year, and the tendency seems to be toward the simplification of both crank and sprocket. There seems to be a desire on the part of many makers to return to the old form of crank construction, the round crank apparently giving way to the square crank. The easily detachable sprockets and movable bearings are much in evidence. Many of the exhibition wheels are provided with gear cases. Adjustable handle bars still seem to retain their popularity and a number of different grips are on exhibition. The wooden handle bar is also popular.

The desirability of large tires seems to have been demonstrated by the season just passed, and they are provided for in many of the new wheels by proportionately large fork side clearings. A number of puncture proof and non-slipping tires are exhibited.

Tandems and other combination machines are shown in considerable variety, and one of the novelties is the hydrocycle designed for use on the water. Among the sundries, of which there are a large number, lamps are specially noticeable. An acetylene gas lamp is shown, as well as a number of electrical lamps. All kinds of oil and vapor lamps are exhibited, but there are few radical improvements.

The Discharge of the St. Lawrence.

Professor C. H. McLeod, of the McGill University, Montreal, has recently conducted an inquiry as to the discharge of the St. Lawrence River some forty miles below Montreal. The level of the St. Lawrence has been falling for some years past, and last year reached a point below all existing records. It was therefore of interest to ascertain what was the corresponding change in the discharge as ascertained some ten years ago by Mr. Sproule for the Montreal Flood Commission. The section of river selected for the experiments was 3,000 feet long, the width being about the same. A series of tube floats were prepared, ranging from 2 feet to 42 feet 6 inches in length, and the time taken for each to cover the full course of 3,000 feet noted. The path of each float was traced by taking numerous observations of its position, and in all cases proved to be very regular. The cross section of the stream at the time of Mr. Sproule's experiments worked out to 115,298 square feet, and the discharge to 311,101 cubic feet per second. The lowering of the water level in Professor McLeod's experiments had reduced this to 105,432 square feet, and the discharge to 216,621 cubic feet per second. These latter experiments were, however, made in November, when the water stood 10 inches higher than at the end of October, so that apparently the minimum discharge would be about 196,000 cubic feet per second. From the above, it would appear that the mean velocity of the stream is about 2·06 feet per second, and from this it follows that the energy stored in the water passing per second is no less than 895,000 foot pounds per second at the time of Professor McLeod's observations. This would be equivalent to over 1,600 horse power, but, of course, there is no possibility of ever utilizing industrially the flow of such a stream.—Engineering.

An Improved Bunsen Gas Burner.

Dr. K. Bierbach, of Berlin, has made a material modification of the ordinary Bunsen burner, says the Progressive Age. The Bunsen burners now in use suffer from too great rigidity of form, which makes it impossible to use the burner for certain purposes. A lateral heating of apparatus can be accomplished by the ordinary Bunsen burner with difficulty only, while in some cases it is entirely out of the question. Yet it is frequently a necessity, for instance, in the distilling of liquids possessing a very high boiling point, or of those which are violently agitated by boiling; or it is desirable for other reasons to place the burner not under but beside the apparatus. The improved burner is so constructed that its flame can be moved in every direction like the stream of a fire engine. The burner consists of a mixing tube for gas and air bent in a right angle so as to form a long shank and a shorter one. The long shank is so arranged in a ring provided with a screw that it can be turned and moved in the ring. The ring can be turned around the axle of a vertical joint which rests upon a flat plate-shaped foot. By this triple action the knee tube can be put into any position desired and the mixture of gas and air can be conducted through it in both directions by means of an adjustable rubber tube. When the gas is conducted through the lower shank the burner can be placed under the lowest apparatus, when it flows into the shorter shank the position of an ordinary Bunsen burner is obtained; by inclining it lateral heating can be accomplished.