AN IRON WATER TOWER.

We present an illustration of an iron water tower which has recently been erected at Fort Dodge, Iowa, by the Chicago Bridge and Iron Company, of Washington Heights, Chicago, Ill. It is a good example of iron water towers which are in pleasing contrast with the ordinary ugly wooden tank. With a water tower like the present, the tank itself can be placed at such an elevation that the water is supplied at sufficient pressure for a reasonable fire duty. The tower is 116½ feet high from the foundations to the top of the tank. It is surmounted by a mast whose curved upper end supports an electric light at a distance of 147 feet from the ground. The diameter of the tank is 25 feet, and it is provided with a hemispherical bottom, supported at four points by the horizontal girder at the tangent point of the hemisphere.

The cylinder is 20 feet in height, so that the vertical height of the tank is 32½ feet, the capacity of the tank is 104,000 gallons. The tank is supported by four columns, each composed of two 15 inch channels, with horizontal struts of 7 inch channels. The brace rods are respectively 1, 1⅛ and 1¼ inches in diameter. The tower is

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40 feet square at the foundation. The cornice is of galvanized iron, and the roof is a cone of sheet metal. One objection which has been made to metal tanks is their liability to freezing, but it would seem that this objection was fully counterbalanced by the liability of the wooden tank to leak unless it is kept supplied with water. Tanks of this kind are considered by the makers to be very valuable for fire duty, as the same pressure can be obtained as with a stand pipe, with a smaller cost of maintenance. From an æsthetic point of view the iron tower has certainly marked advantages over the ordinary wooden affair.

The Fossils of the National Museum.

A catalogue of the types and figured specimens of fossil animals in the United States National Museum has been recently completed, says Science, and comprises type material representing 3,644 species, distributed as follows: Invertebrates, Palæozoic, 1,155; Mesozoic, 1,024; Cenozoic, 1,312; Vertebrates, 163. The fossil plants are not yet fully catalogued, but it is known that they represent more than 2,000 species, over 500 of them being contained in the "Lacoe Collection" alone. There are in round numbers 500 Palæozoic and 1,500 Mesozoic and Cenozoic species. Every type or figured specimen is made conspicuous by attaching to it a small, green, diamond shaped ticket, or a white ticket bearing the word type. Should any specimen be separated from its label, this ticket will draw attention to the fact that the specimen is a type and must be cared for.

Some Facts About Boilers.

An exchange says: What a tremendous force is struggling to tear a boiler to atoms! Take, for example, a horizontal tubular boiler of ordinary proportions, 60 inches in diameter by 16 feet long, containing 83 inch tubes. Such a boiler has a surface area of 40,716 square inches. Suppose this boiler is operated with a working pressure of 100 pounds per square inch, which is not at all uncommon. The boiler does, therefore, sustain a total pressure of 4,071,600 pounds, or more than 2,035 tons. Do we realize what this means? The boiler has resting upon it the equivalent of a column of granite 10 feet square, and 254·5 feet high, only 50 feet less than the height of the Statue of Liberty. Put it another way. The boiler is holding up the equivalent weight of 22,620 persons, all robust athletes, football players, each weighing 180 pounds. Let us look at the matter from a slightly different standpoint. The best authorities agree that the ordinary draught horse, working eight hours a day, exerts an average force during that time of 120 pounds. Now, this force acting to disrupt the boiler longitudinally is 226,200 pounds, so that to produce an equivalent stress, it would be necessary to hitch up to each end of the boiler a team of 1,885 horses. Who would drive such a tandem? Has the Jehu yet been found?

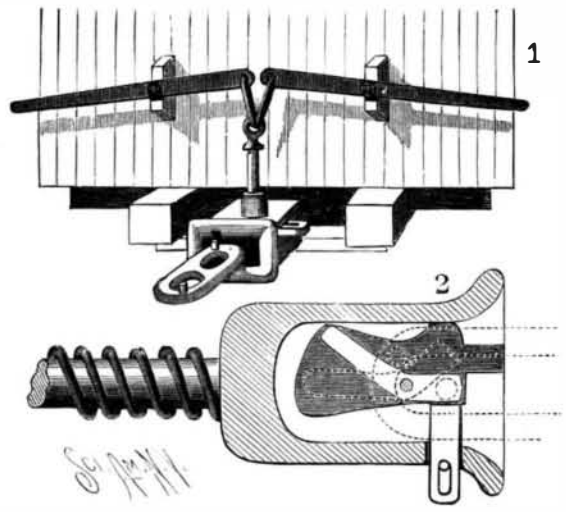
But when we investigate the energy stored up in such a boiler, the facts are still more astounding. Not long since, a boiler having dimensions substantially those of the boiler already referred to, exploded with disastrous results, and as it had been in use but a few years, and was in excellent condition, there was good reason to believe that the bursting pressure did not fall short of 500 pounds. Assuming this to be the case, and that the water level stood at the ordinary height, we find that the water had latent in it in the form of heat the enormous quantity of 299,834,371 foot pounds of energy, while the available energy in the steam is 16,821,499 foot pounds, in comparison with a negligible quantity. When the boiler let go, the heat was transformed into mechanical energy, which was expended in wrecking the plant. The immensity of these figures is beyond our limited comprehension, and the only way by which we can get some idea of their meaning is in making comparisons. How many pounds of gunpowder in exploding would liberate the same energy? The combustion of one pound of average gunpowder generates 250,000 foot pounds of energy. The energy set free, therefore, by the exploding boiler is only rivaled by the explosion of 1,290 pounds of powder.

The boiler weighed 9,000 pounds. If all this energy could have been utilized in projecting the boiler vertically, the resistance of the air being disregarded, it would have been driven to a height of 6⅝ miles, with an initial velocity of 4,760 feet per second, or 54 miles a minute. Our far heralded express trains, of which we boast so much, would be left out of sight. Imagine this energy expended in imparting momentum to a cannon ball weighing one ton and hurled vertically. It would rise 30 miles. Contrast the pressure at which boilers are usually worked with those exerted by great winds. A hurricane blowing at the rate of 100 miles an hour exerts a pressure of 49·2 pounds per square foot, while with steam boilers a working pressure of 100 pounds per square inch, or 14,400 pounds per foot, is considered quite ordinary. Why, then, should we wonder at the awful devastation wrought by a steam boiler explosion!

AUTOMATIC CAR COUPLING.

The automatic car coupling herewith illustrated has been patented by Mr. William Herrick, of Marshall, Minn., and for further information address Mr. Joseph Kent, at the same place.

The hollow coupling head has a recess formed in its upper side, in which is pivoted a horizontally swinging cam whose outer end can swing beneath, and from under, the lower end of the coupling pin hole. The coupling link is flat and has on one side of each end an upwardly extending lug or pin, so placed that when the link enters the coupling head the lug will enter a groove in the under side of the top wall of the head, and bear against the inner arm of the lever, throwing it into the position shown by dotted lines and allowing the pin to drop into locking engagement with the link. The pin is operated by a pair of vertical levers, fulcrumed at the end of the car, one on each side. When it is desired to release the coupling, the pin is raised by said levers and the link drawn out, which latter operation will cause the outer arm of interior lever to be thrown beneath the pin hole, whereby the pin will be held in the proper position

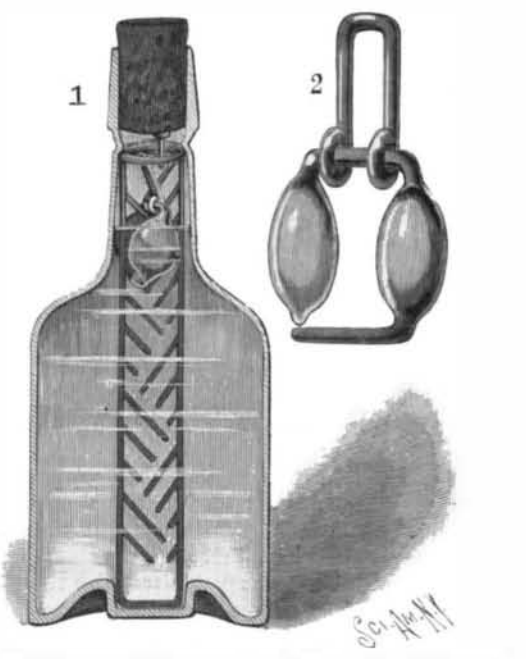


HERRICK'S AUTOMATIC CAR COUPLING.

ready for another coupling. When it is desired to leave the pin in the raised position, the car not being withdrawn, it is done by pushing slightly inward the sliding plate, which is operated through the side of the coupling head.

INDICATING DEVICE FOR BOTTLES.

The device shown in the accompanying illustration, whose object is to indicate with absolute certainty if anything has been added to the primary contents of a bottle or vessel, or if the same has been filled a second time, has been patented by Dr. Johannes Meyer, of 110 Pennsylvania Avenue, Brooklyn, N. Y. The bottle is provided with a floater and a guiding scale, preferably of glass, of the form shown in Figs. 1 and 2. The floater consists of two links, the lower of which is provided with two airtight bulbs, and the guiding scale is a lattice construction, consisting of a top ring to which is attached a long downwardly extending U-shaped strip, the base of which rests in a pit at the bottom of the bottle, the upper ring being held snugly beneath a circular inwardly projecting rim, formed in the neck of the bottle. The guiding scale, which may be made of any material, is provided with a series



MEYER'S INDICATING DEVICE FOR BOTTLES.

of downwardly inclined step bars of variable length, so arranged that a zigzag passageway is left between them from the top to the bottom of the scale. When the bottle is filled, the floater is placed in the scale and lies on the surface of the liquid. As the contents are withdrawn the floater will fall through the scale, and while it will pass easily downward, it will became entangled in the many bars of the scale should an attempt be made to withdraw it, either by pouring in additional liquid, or by shaking the bottle, or by introducing an instrument. It will thus be impossible to remove any of the original contents of the bottle without detection. To prevent the floater from rising to the bottom of the bottle, should it be inverted during shipment, a glass rod is attached to the bottom of the cork, which prevents the floater from entering the scale until the cork is removed. When the bottle is emptied the floater lies doubled up in the pit at the bottom of the bottle.