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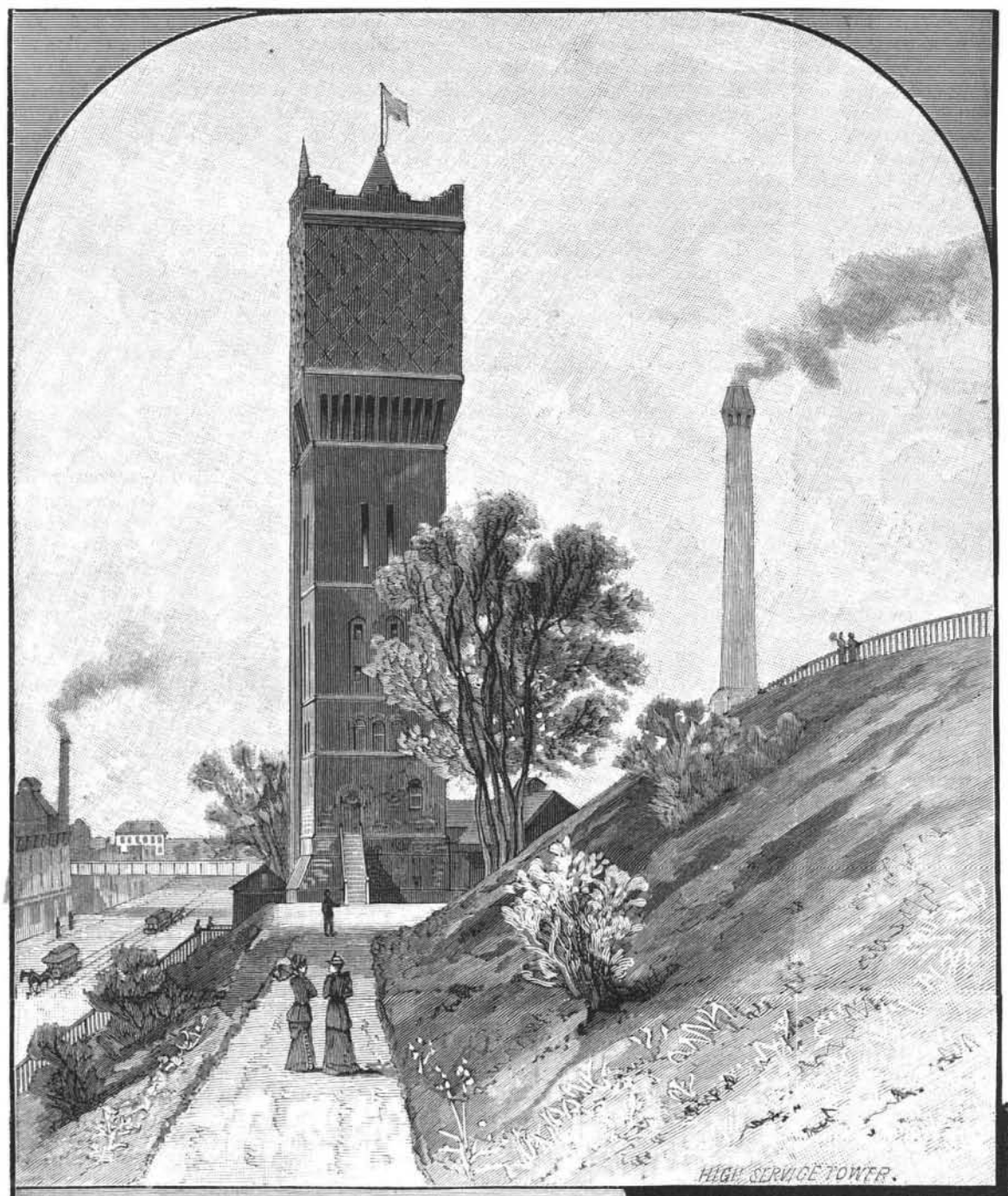

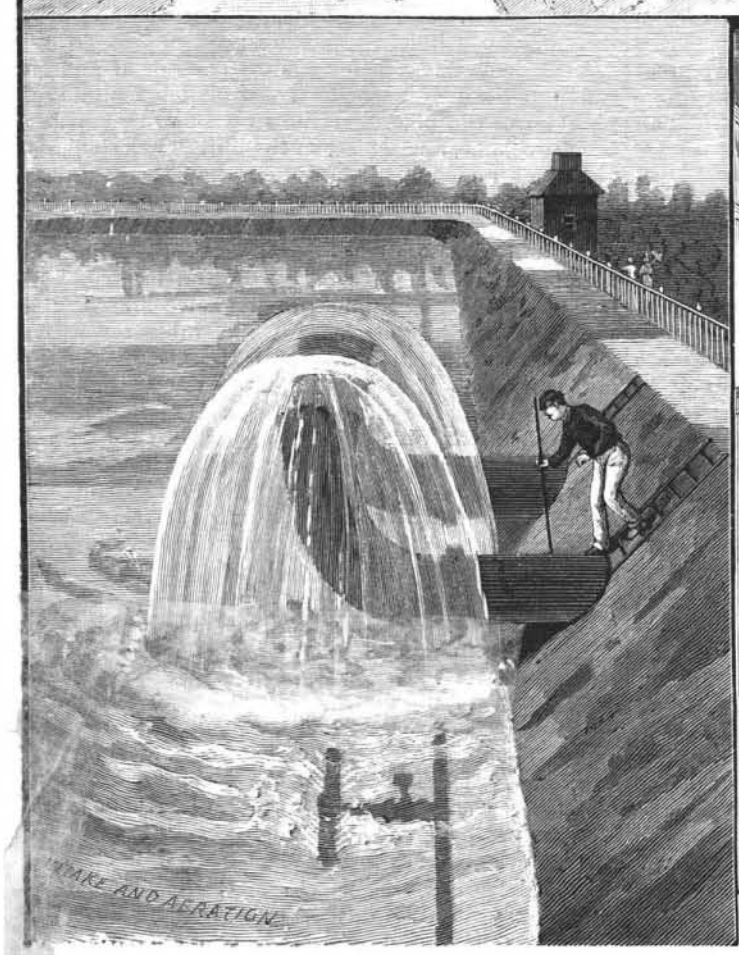

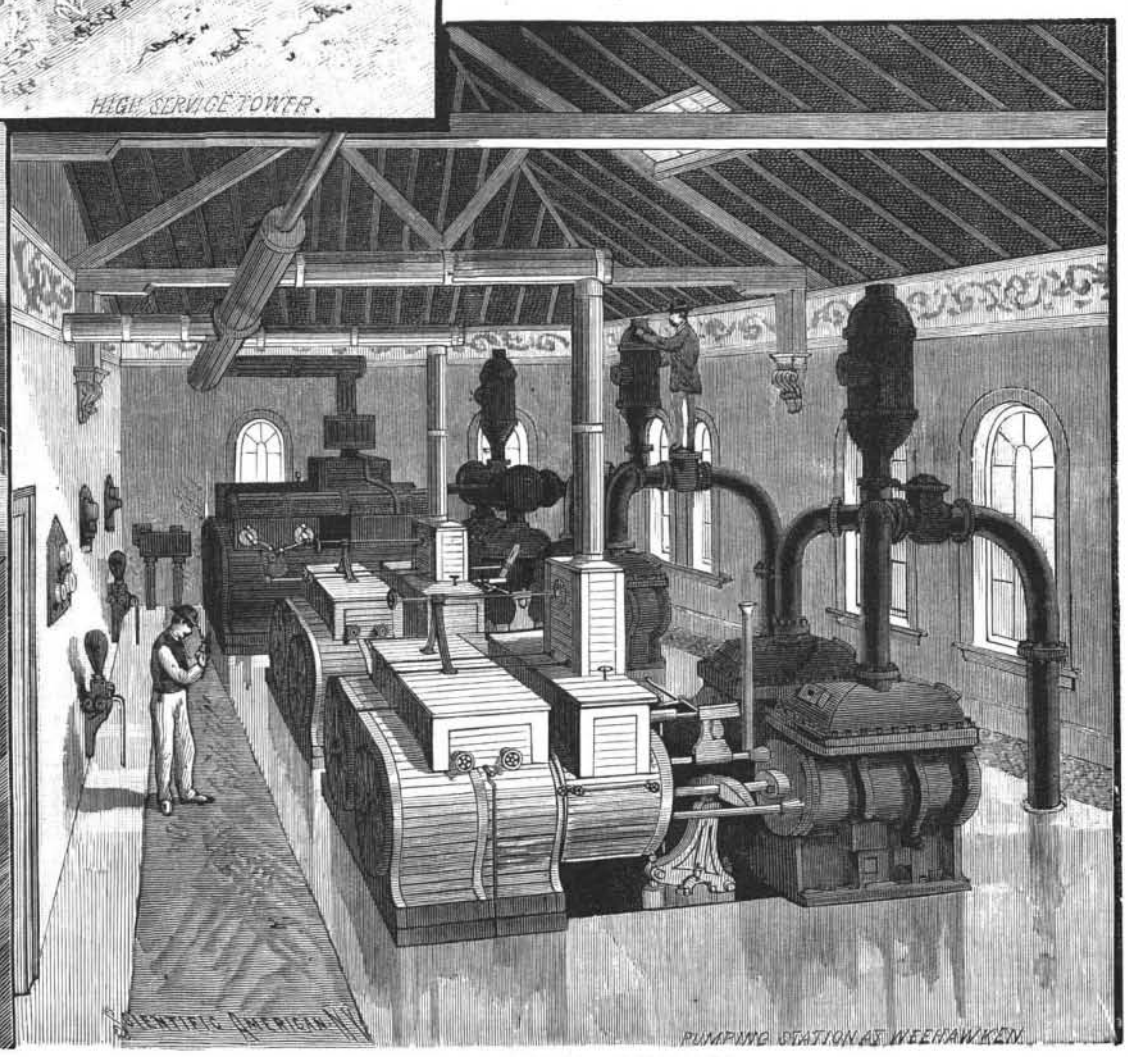

WATER SUPPLY SYSTEM OF THE HACKENSACK, N. J., WATER COMPANY.

THE HACKENSACK WATER COMPANY.

The Hackensack Water Company is a corporation for supplying water to cities, towns, and villages in Bergen and Hudson Counties of New Jersey. Hoboken, West Hoboken, Guttenburg, Ridgefield, Hackensack, Englewood, and Rutherford are among the places which its mains reach. It now supplies a population of over 100,000 people.

The intake is situated at New Milford, five miles above Hackensack, upon the Hackensack River. Here the river is crossed by a dam which shuts out all salt water. A branch or race leading from above the dam conducts the water into a settling tank and thence into a pump well. As there is a very large surplus of water, there is a constant overflow from the race.

One hundred and fourteen square miles of drainage area, including Rockland Lake and the southern portions of the Highlands in Rockland County, N. Y., are tributary to this supply. In different years the average daily flow of the river varies from 100 to 200 millions of gallons. With proper storage 50 to 60 millions of gallons can be obtained. The smallest daily flow on record is 14 millions of gallons. As the present consumption is about 6 millions of gallons, it will be seen that less than 5 per cent of the average flow is utilized. The drainage area is free from all pollution, and it is not believed it will ever attract factory interests or other sources of pollution.

Starting from the main pumping station at New Milford, two mains run to Weehawken, one 20 inch main going through Hackensack and another 24 inch main through Englewood. The mains come together at Ridgefield and thereafter run parallel to the main reservoir at Weehawken. Different branches are taken from them to supply some of the towns, while lines to other places run directly from the reservoir. As at present laid out, the town of Rutherford marks the termination of one set of mains. Eventually it is proposed to continue the lines therefrom back to the reservoir, thus abolishing all dead ends.

The New Milford station includes two batteries of steel boilers, supplying Worthington pumps. One six million gallon high duty and two three million gallon low duty pumps have been at work there for some time, and at present there has just been completed a ten million high duty pumping engine. In a recent

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THE HACKENSACK WATER COMPANY.

(*Continued from first page.*)

article in this paper* we gave a somewhat extended account of this highly efficient, direct-acting pumping engine, one which, by its performances, has fairly established an era in the history of pumping machinery. The cut which we present shows the general construction. It is a compound engine, with equalizing cylinders on the outer end of the pump rod. This construction is such as to maintain an almost even water pressure line without the necessity of any air reservoir, and also allows the benefit of high expansion of steam to be realized. Its general dimensions are as follows: High pressure cylinders, 30 inches; low pressure cylinders, 60 inches; diameter pump rams, 26 inches; length of stroke, 4 feet.

The New Milford pumps can force water into the main at a head equivalent to 300 feet above tide water. The main reservoir at Weehawken is 180 feet above tide water. In daily operation the back pressure at New Milford is never less than equivalent to 200 and sometimes to 250 feet above tide water. The total pumping capacity is 22,000,000 of gallons per day, and the two force mains can pass 12,000,000 of gallons per day.

We illustrate the delivery into the main reservoir at Weehawken, the water entering through upturned pipes. It was found some years ago that the water was liable to be contaminated by organic matter and a growth of algæ. Analyses indicated a deficiency of oxygen in the water. The whole difficulty was due to vegetable matter, as there is no sewage pollution in the drainage area. To cope with this trouble aeration under pressure was adopted. Air compressors were set up at New Milford, and air was forced into the water in the mains at a pressure of 125 pounds to the square inch. The main reservoir at Weehawken is also supplied with aeration pipes, which are shown in the drawing, by which the air can be introduced into the reservoir whenever required.† The difficulty was at once disposed of, and the water is now of a high degree of purity.

At Weehawken is also situated the high pressure service works. This includes a pumping station with two two million low duty and one four million high duty Worthington pumping engines, supplied with steam from six boilers arranged in two batteries. The high pressure tower is built of brick, is 25 feet square, 150 feet high, and has a tank in its top of 150,000 gallons capacity. One 10 inch pipe connects the tank with the mains, the tank acting merely as a static pressure equalizer, not as a reservoir.

Our thanks are due to Mr. Chas. B. Brush, chief engineer of the Hackensack Water Co., for courtesies extended to us in connection with this article.

FOR mending a plaster cast, mix scraped celluloid chips with chloroform.—*E. H. North, Items.*

* See SCIENTIFIC AMERICAN, Vol. 66, page 134.

† See SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 541, 583.

The Pennsylvania Railroad Shops.

A visit to the Pennsylvania Railroad shops at Altoona will repay one who may wish to see industry at home, or witness in operation the most improved tools and methods for doing the work of repair of old equipment and the building of new.

But when it is said that these shops are strung along the tracks for about two miles, it will be understood that a visit of one day is insufficient for any purpose except to get a general idea of the vast establishment. Several such visits or several days would be needed before one could begin to take in details for what they are worth. One of the first things to attract my attention was the clean condition of the windows of the different shops and roundhouses. Here, evidently, light is regarded as having a money value, for I noticed men engaged in cleaning windows that in some shops would be considered already unnecessarily clean. The importance attached here to an abundance of light for the workmen was impressed upon me again by hearing a criticism made upon a splendidly equipped shop to the effect that the traveling cranes did not permit of the arc lights used for illuminating after dark being hung low enough to give the workmen sufficient light.

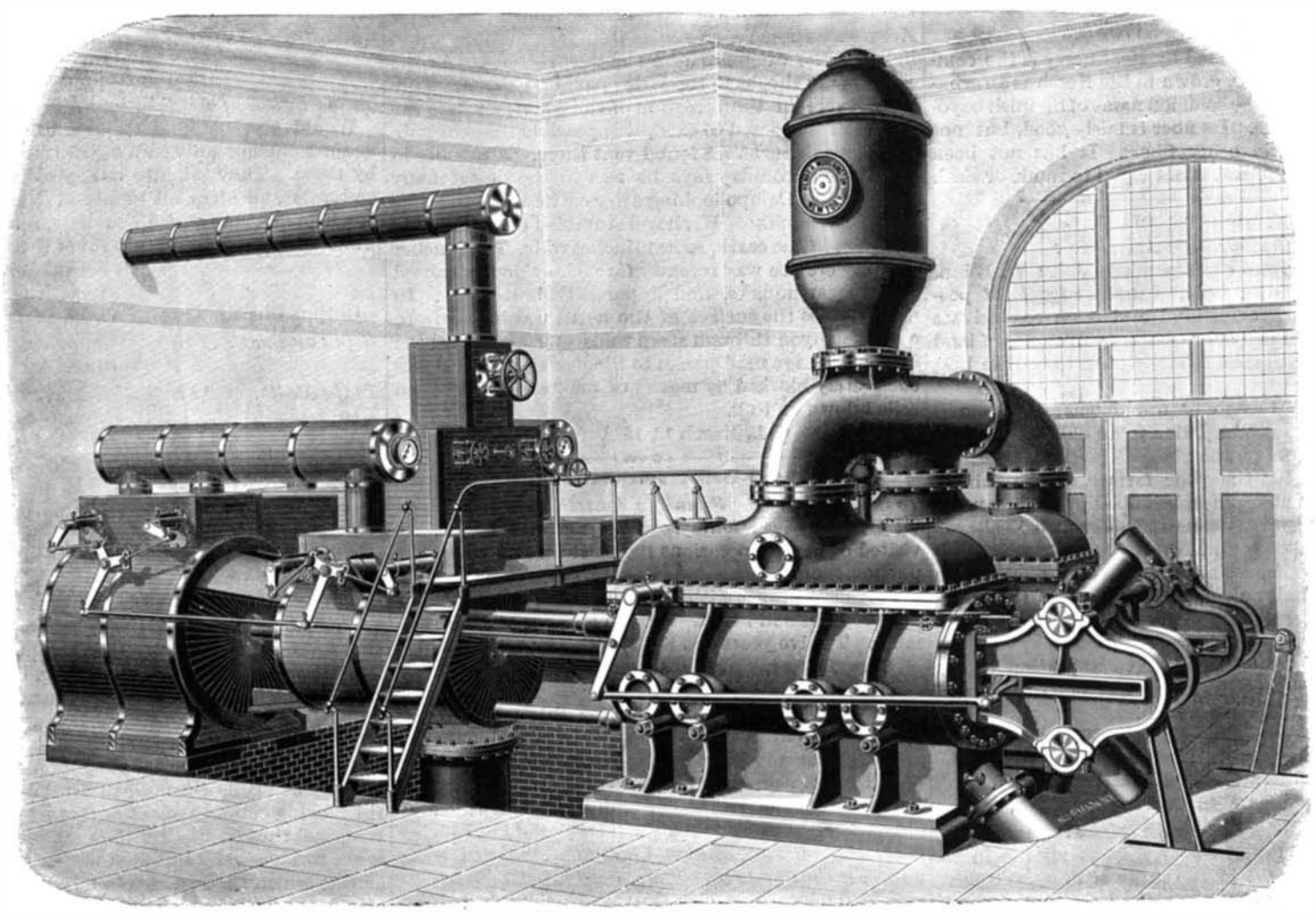
Cleanliness and order prevailed generally throughout the many departments of the works. The pattern store room, though crammed with thousands of patterns and much in need of space apparently, was in perfect order, with every pattern plainly numbered and catalogued as carefully as books in a well ordered library.

The laboratory, under Dr. C. B. Dudley's care, is well equipped with appliances for carrying on the wide range of tests that are necessary to protect the interests of the company in purchases and in solving many problems that have a direct bearing on the economy of moving traffic. One of the most recent branches of inquiry this department has undertaken is an investigation into the merits of the Holmes "lubricant bearing." This is a composition of graphite reduced to a fine powder, freed of all gritty matter, mixed with wood pulp and moulded to any desired shape. The Committee on Science and the Arts of the Franklin Institute recently recommended the inventor of this composition to receive the Institute's highest award, the Elliott Cresson gold medal, for the perfecting of a bearing "which possesses the requisite hardness to withstand the usual pressures, and also to offer a surface that, without the aid of oil or other lubricants, will reduce friction to a minimum." It has stood pressures of 50 pounds per square inch, and it is thought at Altoona that it may possibly prove serviceable for lining guides, crossheads, etc.

The new Juniata shops at Altoona, devoted to building locomotives, and under the charge of Master Mechanic H. D. Gordon, deserve a day's stay from the visitor instead of the half hour I was able to give. Here everything, from the automatic stokers in the furnace room to the traveling electric cranes that traverse the shops from end to end, is supplied and arranged to facilitate the building of locomotives; and everything, from the clean windows by day and the arc lights by night to the handsome lavatories, with double rows of porcelain-lined basins and clean brass cocks giving warm and cold water, is provided for the comfort of the workmen. I happened into the boiler shop just as a large boiler was ready to be put upon trucks to be taken to the erecting shop, where the frames and cylinders of the engine were in position to receive it. The traveling crane was moved rapidly into position for lifting the boiler, and within two minutes after the arrangements were complete for lifting it, the boiler had been raised, lowered upon the trucks, and was on its way to the erecting shop. It had about 15,000 feet of track to go over and two switches to make, yet, within twenty minutes of the time it had been picked up in the boiler shop, I saw it lowered to its place between the frames of the locomotive whose mainspring of power it was to be.

My interest in this engine did not stop here. The boiler was placed between the frames the last thing Monday evening, and the engine was sent to the roundhouse for service the next Monday morning. The actual number of working hours the engine was in the erecting shop was sixty-one. There were several annoying delays on this particular engine, that consumed several more hours than usual. The average time of one of these engines in the erecting shop is fifty-nine hours.

Both boiler and erecting shops have electric traveling cranes that get about with great celerity and that appear capable of the nicest adjustment in their movements. There are two of these in the erecting shop and one in the boiler shop. Those in the erecting shop are of 35 tons capacity each, and were made by the Morgan Engineering Company. The capacity of the one in the boiler shop is 15 tons, and was made by William Sellers & Co.—*Nat. Car. Builder.*



WORTHINGTON HIGH DUTY PUMPING ENGINE.

Arsenic in Wall Paper.

The report of the State Board of Health relative to arsenic in wall paper was submitted to the Massachusetts Legislature on the 10th ult. It was found that, of 1,018 samples collected in twenty cities and towns, 389 contained arsenic in appreciable quantities. About 3 per cent of the papers manufactured to-day contain more than one-tenth of a grain of arsenic per square yard, against 30 per cent, approximately, ten years ago. Between 60 and 70 per cent of the papers sold are free from arsenic, while about 6 per cent contain more than one-twentieth of a grain per square yard.

American Cars in England.

The luxury of American parlor cars has been introduced lately in England by the Southeastern Railway Company. A train having four parlor cars started from Charing Cross and traveled to Hastings and back, attracting much attention. The cars were made by the Gilbert Manufacturing Company, Troy, N. Y.