time engaged at these works, and about 80 engines turned out, chiefly for the Chicago and St. Louis, the New Haven and New London, the Buffalo and Corning, the Canandaigua and Elmira, the Orange and Alexandria, the Camden and Atlantic, the New York and Erie, and the Marietta and Cincinnati railroads. The establishment has not been in operation since the Fall of 1857.

The Danforth Locomotive Works commenced operations in 1853, under the superintendence of John Cooke, formerly manager of the Rogers' works. Since then 160 engines have been turned out, principally for the New York and Erie, the Delaware and Lackawanna, the Camden and Amboy, the New Jersey Central, the Morris and Essex, the Mobile and Ohio, and the Ohio and Mississippi railroads. This concern now comprises, in addition to the cotton factory, a foundry with 100 men and boys engaged; a machine-shop with 175; and a locomotive, boiler and blacksmith-shop, with 230 employees. The last has a capacity of 35 engines per annum, and will complete nearly that number the present year. The foundry casts about five tons daily. For the past fifteen years the machine-shop has turned out over 10,000 spindles per annum, principally of the Danforth patent. The entire sales of the establishment have averaged half a million dollars annually for some years. Mr Danforth is a native of Bristol county, Mass. His patent, since improved, has been extensively introduced into England, where the invention is known as the "American Spinning-frame."

The growth of locomotive building in Paterson led, in 1852, to the formation of a company to carry on the business of forging axles, tires, frames, and other heavy engine work. Under the title of the Paterson Iron Company, a charter of incorporation was obtained, and their buildings completed in the following year. The works are driven by a steam-engine of 40-horse power, and are furnished with four powerful trip hammers (three of them Kirk's patent). Up to the present time this company has imported nearly 7,000 tires and manufactured forgings for 1,700 locomotives. The shops have facilities for turning out annually 1,800 tires, and forgings in proportion. In the rolling of tires a machine has been invented by the superintendent, which makes them round and true; consequently, they require no boring before being put on the wheels. The number of men now employed is about 40; annual consumption of Cumberland coal, 2,500 tuns. F C. Beckwith is president, S. Jaqua, superintendent.

The manufacture of flax, hemp, silk, and other machinery, was commenced by Todd & Mackay (now Todd & Rafferty) in 1847. Four years afterwards they purchased the Holseman Mill (since enlarged to double its former size), and put up a new foundry. Nearly all the rope machinery in the United States and Canada has been made by this firm, together with heavy orders filled for Great Britain and Russia. The proprietors lately "bearded the lion in his den" by dispatching a considerable quantity to London that had been ordered from their works. Two years ago they added to their business that of building stationary engines, furnished with Uhry & Luttgin's cut-off. These have already been sent to all parts of the country, as well as to Cuba, Mexico and South America. The whole number of hands now employed by them is 135.

John E. Van Winkle entered upon the business of making machinists' and engineers' tools in 1849. His work is mainly executed to order, and employs 25 hands. Mr Van Winkle has just moved into a new shop, giving him many additional facilities.

In the early part of 1851 the firm of Wm. G. and J. Watson commenced making machinery in the Henry Clay or Nightingale Mill. Since then they have also enlarged their works by the erection of a new foundry, and now employ 70 hands, mostly on tools, millwright work and general jobbing. Their products have gone to Mexico and South America, as well as the principal places in this country. At this concern, a pair of bevel wheels, nine feet in diameter, with four inches pitch, eighteen inches face and weighing seven tuns, were lately made for Higgins' carpet factory in New York. A large Corliss steam-engine, and several turbine wheels, were also built there.

The Machinists' Association, consisting of seven practical mechanics, was also formed in 1851, each member contributing $200 in money and a portion of his time. Their *debut* was made in an apartment of the Star Mill, where they have continued to the present, engaged on cotton, wool, flax and silk machinery, with millwright works, &c. Two years afterwards the mill was burned down, involving them in a heavy loss. Nothing daunted, however, they made a purchase of the ground and rebuilt the mill (a large four story brick edifice) A new foundry has also been added. Probably this has been one of the most successful examples on records of the results of associated labor. The establishment was this season assessed at $25,000, clear of all obligations. Much of the work turned out has gone to the southern States. About 100 men and boys are employed. All the members, foreman included, follow their usual avocations.

In 1856, T. C. Simonton & Co laid the foundation of the Paterson Steam-engine Works This concern has since been enlarged to double its former dimensions, by the erection of a new foundry, smith-shop and boiler-shop, and has now a force of 140 men engaged, chiefly on stationary engines. Great numbers of these have been sent to the South and West, also to Mexico and South America. The proprietors execute orders for millwright work, silk machinery, braiding-machines, and the like. They are now building a Blanchard boiler, with patent cut-off, for the Essex Mill, claimed to effect a saving of 50 per cent in the consumption of fuel. Steam power is used to drive the machinery. The value of work turned out annually is about $100,000.

[To be continued.]

MANAGEMENT OF BOILERS AND KITCHEN RANGES.

MESSRS. EDITORS:—When I consider the great number of vessels propelled by steam-power, also the great many factories, shops and hotels in which steam-boilers are employed for working engines and for heating purposes, I am surprised that we do not have more accidents from explosions. I make this statement from a knowledge of the fact that many persons are employed to superintend boilers, without regard to their abilities as sober and skillful engineers; the consideration of their engagement being cheap labor. Those who employ skillful, experienced and temperate engineers deserve honor and praise for their sagacity and prudence, as they save more per annum by the care exercised in economizing fuel and in saving repairs.

In managing a gang of boilers every engineer knows how difficult it is to maintain the water at the same hight in all of them. I believe the only safe arrangement is to have a hand valve to each, and to pump and maintain water separately in each of them. In this manner any number of boilers may be managed as safely as one.

By the following formula the effect of an extra pressure, in any boiler, of one pound on an inch, is plainly shown:— As 1 cubic foot (1728 cubic inches) of water weighs 62.5 lbs. therefore 1 lb. of water will contain— $1728 \div 62.5 = 27.64+$ cubic inches, or a column of water standing upon a base of one square inch, over 27 inches in hight. We are now enabled to see the effect, in the case of one boiler producing more steam than another, and how the exerting of half a pound extra pressure would make the respective difference, in hight of water, to be more than 14 inches, enough, surely, in most forms of boilers, to produce a state of danger. The more defective the arrangement, the more skillful must the engineer be, to manage the case successfully,

I will now make some remarks in regard to explosions in kitchen ranges, a subject which I have never seen treated in any publication. In these the perpendicular hight of the feed water is the only pressure they are required to sustain. If the water is not drawn as soon as soon as it commences to boil, or before, steam will be generated, the feed water driven back through the pipe, and if the fire is active there will soon be a "tempest" in the kitchen. There seems to me to be great difficulty in explaining this kind of explosion, and also that of boilers blowing up under a low pressure, by the theory recorded on page 133, present volume of the SCIENTIFIC AMERICAN, where great pressure and the weakening of the boilers by heat, are assigned as the "true and only cause of all explosions." This I think is the direct cause of bursts and collapses, but it does not seem to account for those violent explosions under the small pressure of low steam. I recently examined a boiler which exploded, and the parts which gave way were not exposed to the fire at all, at were in contact with the atmosphere.

In regard to ranges if the steam becomes superheated, the pressure is not increased because the water recedes in the pipes, and the steam is constantly condensed as the supply pipes are buried in the ground.

My theory of these explosions is that the deposits of matter in the water-back, boiler, &c., are burned when the water gets low, and thus an explosive element is generated. The only safe way to manage a range is whenever the water is near the boiling-point, to commence drawing it off, even if it is not wanted for use, because this brings cold water into the *back*, and prevents the generation of steam.

At St. Luke's Hospital, corner of Fifth-avenue and Fifty-fourth-street, I am managing a set of 60-horse boilers erected (by Nason & Dodge, of this city) which are so well adapted to the work of warming, ventilating, cooking, pumping, &c., and so economical in the use of fuel, that I invite a call from all those who desire to see them and the noble institution in which they are placed.

J. G. WHITLOCK.

New York, Oct. 26, 1859.

BOILERS OF STEAMERS.

The United States steam-frigate, *San Jacinto*, is fitted with a Martin boiler and a flue-boiler, of about equal capacities; and as she is now upon a cruise on the coast of Africa, a good opportunity will be afforded of testing the relative qualities of each. In what is called the Martin boiler the tubes contain water and communicate with water-spaces above and below, while the heated products of combustion pass around them. This principle is not new, but a patent was obtained by D. Martin, chief engineer of the navy (U. S.), for some modification and arrangement of the tubes and flues, hence the name given to the boilers constructed under his superintendence. The tubes of the other boiler are smoke flues; the heated products of combustion pass through them while they are surrounded on the outside by the water. It is claimed that the evaporative effect of the water tubes is superior to that of the smoke flues, and this is a plausible claim inasmuch as a greater water surface is exposed to the heat. It has been stated that in a trial of 72 hours each, the Martin boiler evaporated 18 per cent more water with the same amount of coal. This is a very great saving in fuel; but on the other hand, it is asserted by some practical engineers that the water tubes in marine boilers wear out much faster than the flue tubes, that they are more liable to form scale, and that, although they may be more efficient when clean and new, they do not continue so efficient on a long voyage.

The *San Jacinto* left New York, on her cruise, on the 18th of July last, and reached the Cape de Verde islands on the 18th of August, having run all the time under steam. Word has been received that the Martin boiler exhibited a decided superiority during this voyage, but this short trial is not sufficient to settle all the questions involved in the issue. To marine engineers this is a subject of great importance, and the results will be looked for with much anxiety.

CHEMISTRY AND STREET DIRT.— The New York *Courrier des Etats Unis* states: "An ingenious French chemist at Lyons has just hit upon an expedient which promises to make the 'dusty highway' a dream of the past. It has already been tried with great success in two of the leading thoroughfares of the city of Lyons. It consists in sprinkling hydrochloric acid on the macadamized way. After a baptism of this sort in the morning, the soil of the Place Bellecour, at Lyons, although very light and gravely, is found at high noon to remain as solid and moist as if it had just been well watered, and the wind fails to fan it into that fine dust which is the Egyptian plague of all great cities in warm weather. Nor does it appear to be necessary that the application should be very often renewed. Once well saturated with the acid, the ground shows each morning very much the firmness and neatness which follow a hoar frost."

[Just think of sprinkling streets, with muriatic acid! Unless greatly diluted with water it would be a most desperate operation, involving a vast expenditure, and *burning up* the boot-heels of every one who dared to set foot on the pavement.—EDS.

The Wilmington (Del.) *Republican* ridicules the statement of the Philadelphia papers concerning the water-gas experiment. It says it was a decided failure—gave "a very poor light, and emitted a horrible odor!"