

A SIGNIFICANT FACT.

During the week ending December 1st., there were filed in the Patent Office 255 applications and caveats. During the same week 103 applications and caveats were entered upon the records of this office. Inventors fully understand where their interests are best served.

THE ENGINES OF THE "WAMPANOAG."

So much has been written about the engines of this ship, that what I have to say may seem superfluous, but still it may interest a few. Commodore Alden, in his report, finds fault with the engines on account of their want of "head" plates, supposing that English engines, of large size, are provided with that part, and attributes the heating of the journals of the *Wampanoag* to their deficiency.

The English ship *Warrior* has been often compared with the *Wampanoag*, both as regards engines and speed. Now this ship, free as she may be from hot journals, has not the sign of a head plate; therefore it is not possible that the good working of the *Warrior's* engines can be attributed to head plates.

The engines of the *Warrior* are of the double-trunk variety, consequently the connecting rod acts directly from the piston to the crank pin, thereby making the engines much shorter across-ship, when the distance is measured from the center of the crank shaft to the center of the pistons at half-stroke. This being so, the framings are naturally reduced in length. At the ends of the framings, in the *Warrior*, three in number, come the condensers, firmly bolted to all of them, or at least connected by a short distance piece. The cylinders are bolted close together, within a few inches of one another, and form a combination almost as solid as a single casting. To the two cylinders the framings are bolted directly and in the strongest manner. It is evident, that, by the adoption of this plan, a stiff and rigid combination must be the result. The framings being connected together at one end by the two cylinders, and at the other by the condensers, forms, in itself, almost a solid mass. Diagonal strains cannot affect this engine in any appreciable manner, and it would be difficult for the shaft to have its journals thrown out of line, running as it does, through the bearings in the frame between the cylinders and condensers.

Let us now look at the general plan of the *Wampanoag's* engines. The two cylinders are placed on one side of the shaft, but are not bolted directly to one another, the large surface condensers being interposed, but this is not an element of weakness. In looking at the framings and comparing them with those of the *Warrior*, we notice this difference, that those of the English ship are firmly connected at both ends, while those of the *Wampanoag* are secured only at the end where the cylinders are placed, and in this difference of design the reason for the hot journals may be found. Where the front of the condensers are in the *Warrior*, we find, in the *Wampanoag* the engine shaft, the screw shaft being mounted in bearings placed on the top of three of the frames, and in about the middle of their length. In front of the condensers come the immense gear wheels by which the power of the engine shaft is communicated to that of the screw. As these frames are bolted directly to the timbers of the ship, any diagonal strains coming upon the engines must of necessity elevate one end of the framings, and it will naturally be the weakest part that is moved, and that happens to be exactly where the shaft bearings are placed. The framings being long and disconnected, are susceptible of a small amount of spring—very small it must be—but sufficient to throw the journals enough from their proper line to cause them to heat. If, as in the *Warrior*, these frames had the additional support of the condensers, this thing would not happen, as the strength of the engines would be increased materially. The engines are heavy enough without the weight of an immense head plate to perform an office, which, in the *Warrior*, from the advantageous position of the condensers, is performed in the most perfect manner.

ENGINEER.

The Iron Works of Chicago--Fifteen Thousand Men Employed--A Business of \$25,000,000 a Year.

The Chicago *Times* publishes a very long and elaborate descriptive article showing the extent of the iron business, and giving the name and size of, and the amount of capital and labor employed, and work turned out by, each of the foundries and workshops in that city. From this article the following interesting facts and figures are taken:

The iron interest of Chicago employs fifteen thousand men, to whom is paid the yearly sum of \$12,000,000 for their labor: \$15,000,000 is invested in the manufacture of iron, which does a business of about \$25,000,000 per annum. The number of iron establishments in the city amounts to one hundred, which are engaged in the manufacture of boilers, cutlery, derricks, engines, farm implements, gages, gearing, lathes, lightning rods, mining machinery, needles, nails, ordnance, plate and pig iron, quadrants, ranges, stoves, tanks, utensils of all kinds, size and value.

The "Eagle Works" are situated in the west side of the city, and their different buildings occupy different sites on five streets, 370 feet on Clinton street, 150 feet on Madison street, 300 on Washington street, 168 on West Water, and 210 on Canal. The principal articles manufactured in these works are engines, boilers, flouring mills, gang mills, circular sawmills, stamp mills, ore and rock crushers, and general running machinery. This establishment employs in the neighborhood of one thousand men, whose annual pay-roll exceeds \$300,000. The estimated value of the property, including machinery and buildings, is \$500,000.

The "Northwestern Manufacturing Company's Works" are run upon the co-operative system, and with a capital of \$450,000, employ 375 men, and do a business of about \$700,000 per annum. This establishment has also a branch called the "Northwestern Pipe Works," which has a capital of \$50,000, and employs 35 men.

The "Barnum and Richardson Manufacturing Company"

make castings and car wheels. Their works cover more than an acre of ground. They employ 75 men, have a capital of \$150,000, and do an average yearly business of \$400,000.

"McCormick's Reaper and Mower Works," is perhaps the most interesting manufacturing establishment in Chicago.

The buildings cover an area of 400 by 500 feet, in the business center of the city. The business began here in 1846, twenty-two years ago, and since that time 100,000 harvesting machines have been manufactured in these works. Fifteen years ago 1,000 machines per annum were considered a big undertaking, and predictions were then made that at that rate the country would soon be over-supplied. But now 10,000 machines per year do not begin to supply the demand, which is greatly increasing, and now already overmatches the capacity of the works. 500 men are constantly employed.

Each machine contains not less than 1,000 separate pieces of wood, iron, steel, brass, copper, tin, and zinc, making the enormous number of 10,000,000 pieces which have to be made, counted, assorted, inspected, classified, packed, and shipped in one year's business.

The following is the amount of raw material worked up in this establishment during the year: Lumber, 25,000,000 feet; pig iron, 3,000 tons; bar iron, 1,500 tons; paints, 100,000 pounds; oils, 5,000 gallons; zinc, 125,000 pounds; steel and other metals, 150,000 pounds, and 2,000 tons of coal. The item of scrap lumber, the cuttings left after sawing out the peculiar shaped pieces needed in a harvesting machine, amounts to nearly 500,000 feet of lumber per annum, which provide about all the fuel necessary to make steam for the works. Everything in this establishment is done by machinery, whether of wood or iron. In the blacksmith shops, the bar iron, of large and small sizes, from five and a half to four and a half inches round, is cut up by machinery like so many pipestems. Even the forges are supplied with a steady blast of air from a large fan driven by steam. The machine shops contain one hundred lathes, drills, boring, keyseat-cutting, screw-cutting, and planing machines, worked by an almost endless arrangement of belts and pulleys. In the sickle shop of this establishment is an ingenious machine for cutting the teeth in the sickle edge, which does the work of two or three men, and much more accurately.

The machine shops of the Illinois Central Railway are also in Chicago. They employ 800 men in their establishment, whose monthly pay amounts to \$60,000. Their entire works, including their car shops in the south end of the city, cover about sixteen acres of ground. The cost of construction of the machine-shops alone amounts to \$150,000. The road has 4,000 cars, and 168 locomotives. They have on the stocks, and nearly finished, four of the largest engines ever built in the West, each one weighing about thirty-one tons. The amount of raw material these works have on hand is valued at \$300,000. They use up 2,200 tons of coal per annum, principally Lehigh and Illinois.

Some Facts About North Carolina.

The *Plaindealer*, published at Wilson, North Carolina, quotes at large from our article entitled "Let Us Have Peace," published on page 329 of the present volume, and while cordially approving the views therein set forth, and testifying in the most flattering manner to the estimation in which the SCIENTIFIC AMERICAN is held throughout the South, asks us to aid in the dissemination of some facts in regard to the above State.

It states that in its immediate vicinity and throughout the State, as clear a criminal record can be shown since the close of the war as in any area of equal population to be found in any State north of Mason and Dixon's line. At least it is so far as the white population is concerned. The laws are faithfully administered and sacredly obeyed. Property is as safe as in any civilized community to be found anywhere. It says:

"We invite Northern gentlemen to come among us, putting aside all feelings of animosity, 'burying the past,' and we pledge them a cordial welcome, and a safe field for the investment of their capital, which will bring them handsome returns."

It is with the greatest pleasure that we accede to the request of the *Plaindealer*, to assist in the dissemination of such welcome information to us and to our readers, and we think we can safely assure the people of North Carolina that when these facts become generally known an influx of capital can be relied upon. Let the Southern people remember, however, that capital is proverbially timid, and possess their souls in patience until the happy time, sure to come, when mutual confidence shall be fully restored.

Wooden Railways.

The feasibility of laying wooden railways in districts where the traffic does not require a high rate of speed, and where there is an abundance of hard and durable timber, has been recently made the subject of discussion by our Canada exchanges, and by letter we are informed that the method is proposed for Australia, a kind of timber being found there which is very hard and particularly adapted to the purpose. A. M. F. P. Mackelcan, in a communication to the Perth *Expositor*, gives a favorable opinion as to their utility based upon practical experience.

The cost of such railways being so much less per mile than those of iron, the shortening of distances by deep cutting or filling is obviated. The natural features of the district through which it passes can be complied with. The low rate of speed renders the erecting of very expensive bridges unnecessary, and as light locomotives only are proposed, the wooden rails are sufficiently strong for perfect safety.

In many parts of Canada, movements looking toward the construction of such roads are on foot, and an exchange informs us "that \$96,000 have been voted by different interested townships in aid of the Toronto, Grey, and Bruce Railway, and the Toronto City Council has passed a by-law granted \$250,000 for the same purpose. These sums, it must be borne in mind, are bonuses in aid of the road."

The *Kingston News* says that among the notices of application to Parliament appearing in the *Official Gazette*, is one relating to a wooden railway from Kingston to Loughborough and adjoining townships. "The projected railway is destined

to be realized as a fact, and will prove the adaptability to the wants of the back townships of Canada. The people of Kingston are of course very much interested in the success of an enterprise so well calculated to improve the fortunes of the city, and we feel sure they will do all in their power to promote the passage of the company's charter, and to otherwise aid them in the important work." In many other places these railways are talked about. In his communication above referred to Mr. Mackelcan says:

"I would like to caution those who may patronize or push forward this new system, against making things too great and too grand, under plea of suiting the future, for in this way the present and the future are both destroyed. That which will help Canada to grow into a thickly peopled, well cultivated, and prosperous country, is a net work of cheap conveyance, created in the country by its own industry and with its own capital, and costing so little as to pay for itself in a few years."

The estimated cost of such roads is from \$4,000 to \$5,000 per mile, which seems to us to be ample. We are inclined to think much more favorably of these practical ideas than the visionary project of a British American Inter-oceanic Railway, alluded to by us in a former number. We hope the plan may be well tested, and feel quite confident it will ultimately succeed.

Analysis of Lava.

M. Silvestri's analysis of the lava recently thrown out from Vesuvius shows that it closely resembles common wine-bottle glass. A considerable variety appears to prevail, however, in the constitution of lava, not merely when we compare specimens which have come from different vents, but when the comparison is instituted between masses of lava poured forth from the same vent at different epochs. The lavas which flowed from Vesuvius before the mountain had fallen into the state of quiescence described by Strabo contain disseminated crystals of leucite, a mineral which is very rarely found in the modern lava from this vent. And in general the latter are less crystalline than the old forms of lava. Indeed, the old lavas which flowed from Vesuvius (or Somna, as the ancient volcano was named) indicate a decided tendency to a columnar structure, corresponding to what is seen in the Giant's Causeway, the Isle of Staffa, and elsewhere.

It is a remarkable fact that the lavas of Vesuvius contain a greater variety of minerals than, perhaps, any others in the world. Haüy mentions that out of three hundred and eighty simple minerals known to him, no less than eighty-two have been found on Vesuvius; and of these several are peculiar to the locality. Sir Charles Lyell expresses the opinion that these have not been thrown up in fragments from some older formation, through which the gaseous explosions have burst, but have been sublimed in the crevices of lava, "just as several new earthy and metallic compounds are known to have been procured by *fumeroles* since the eruption of 1822."

A Huge Mud Digger.

An Eastern exchange says: The largest mud excavator in the United States has just been completed in Portland for a Boston party to be used in excavating the South Boston flats. The digger is eighty feet long and forty feet wide. It has double dredger with twenty-nine large iron buckets on each elevator. The elevators are placed on the sides of the scow and can be worked singly or together. Its operation is as follows: Two large scows are anchored ahead and astern of the digger, about 200 feet apart. These scows are secured by timbers that are driven into the mud, and raised, when necessary, by machinery. Two chains run through the digger and are attached to the anchored scows. When the engines are in operation they move a shovel, which is held in position under the dredger by an arm, one of these shovels being attached to the lower end of each elevator. As the dredger moves along between the two anchored scows, the shovels stir up the mud and the buckets on the elevator scoop it up and deposit it in a scow secured to the forward part of the dredge. The elevator runs by two engines, with cylinders six by eight inches, acting independent of each other. There are two main engines for running the machinery and moving the dredger, with cylinders fourteen by twenty inches.

Saving Trees Girdled by Mice.

At the February meeting of the Northern Illinois Horticultural Society, D. B. Weir, of Lacon, read a paper "On Saving Girdled Fruit Trees." He said he had over a hundred trees, seven years planted, completely girdled by mice. There had been for some time a heavy snow on the ground; and mice being plenty and in a starving condition, with nothing else to eat, they ate all the bark from the trees as far as they could reach; some of them for a foot up and down all around; and portions of the sap wood in some places half an inch deep. As soon as the damage was discovered, which was on the first thawing days, he banked the snow around the trees, and as soon as the soil thawed he banked that a foot high about the trunks.

This was all the attention they received; and to-day they have all the damaged parts covered by almost as thick a coating of bark as the uninjured portion of the trees. When the girdling is done high up on the trees, banking with soil will be impracticable. If the wounded parts are too high to reach by banking, clay may be bound on with a bandage. The sooner the surface is protected after injury the better. The death of the tree is caused by the seasoning of the sap-wood.