

erated by burning charcoal. But the two gases mingled in certain proportion produced a dangerous explosive mixture, and Dr. Hare was thus led to adopting the expedient of storing the gases in separate vessels, and bringing them together by tubes which met at the point of ignition.

Now followed one of the most important advances in steam navigation, although the fact was not recognized for years after. It was the practical demonstration of the efficacy of the screw propeller, by Colonel John Stevens of Hoboken, who in 1804 built a boat containing a Watt engine, a tubular boiler of his own invention, and the bladed screw. It was a pirogue some fifty feet long. The machine itself is still in existence, and was illustrated in these columns some time ago. During the same year, Oliver Evans ran an amphibious, stern paddlewheel boat on the Delaware and Schuylkill rivers. This was driven by a double action high pressure engine—the first of its kind—which rotated wheels when the craft was ashore, and operated the stern paddle when afloat. In 1806, Thomas Blanchard, of Massachusetts, invented a machine which made 500 tacks per minute, with perfectly finished heads and points. Soon after, he devised an apparatus for turning gun barrels throughout their entire length by one self-directing operation. This was the initial work which culminated, twenty two years later, in the magnificent invention of the lathe for turning irregular forms. Blanchard's inventions are now applied to many operations in making musket stocks, and comprise no less than thirteen different machines for making different portions of the weapon.

The following year, 1807, witnessed the triumphal voyage of Robert Fulton's steamer, the Clermont, from New York to Albany. Fulton at that time was already an inventor of repute, both in England and in the United States. He had devised a mill for sawing marble, machines for spinning flax and making ropes, an excavator for canals, and he had successfully tried, probably, the first submarine torpedo boat. It was in relation to the latter that he returned to this country from England. Here he received a congressional appropriation, and made some successful experiments in blowing up vessels; but ultimately Commodore Rodgers reported the system impracticable. Later, he obtained the exclusive right to navigate the Hudson river in his steam vessels. In 1814, Fulton built for the United States government the first steam war vessel, a heavy and unwieldy mass, capable of making about 2½ miles per hour. The war of 1812, in which she was designed to be used, terminated before her completion. Fulton died during the construction of the vessel.

During the year 1807, oil cloth for floors was invented and manufactured in Philadelphia, and John Bedford of the same city devised the first metal-bound boots and shoes. The first breech-loading military arms ever offered to troops, and likewise the first fire arm made on the interchangeable system, were invented by John H. Hall, of Massachusetts, in 1811. Some of these old weapons were captured at Fort Donelson in 1862.

In 1812, anthracite coal was for the first time successfully utilized. It appears that Colonel George Shoemaker, of Pottsville, took nine wagon loads of the "black stones" to Philadelphia, and there sold two wagon loads to Messrs. White & Hazard, wire manufacturers. White and his firemen worked faithfully for half a day, but the stones refused to burn; whereupon at noon they slammed the furnace doors shut in disgust, and went to dinner. On their return the doors were red hot and the furnace in danger of melting. Meanwhile the Colonel had sold his other seven loads to less successful experimenters, and was by them arrested as a swindler for selling them rocks for fuel.

During the war of 1812 but very few military inventions appear. Probably the most important was the columbiad, a long-chambered cannon capable of projecting shot and shell at high angles and with heavy charges. It was devised by Colonel Bomford. In 1813, Francis C. Lowell invented numerous important improvements in the power loom, notably the stop motion for winding on the beams for dressing, and the double speeder to regulate the movements of the fly frame in filling the spools. The first important American improvement in printing presses appeared in 1817, and was the Columbian press, invented by George Clymer of Philadelphia. The power was applied to the platform by a compound lever consisting of three simple levers of the second order. The first transatlantic voyage made by a steam vessel was accomplished by the Savannah in 1819. The vessel was of 380 tons burden, and was driven by paddles. In the year last mentioned, Jacob Perkins invented engraving on steel as a substitute for copper.

During the period from 1800 to 1820, just reviewed, the commerce of the country passed through a season of terrible stagnation, owing to the orders in council of England and Napoleon's Berlin and Milan decrees. In 1808, imports fell off to \$56,990,000 and exports to \$22,430,590. This decline continued to 1814, when an extraordinary impulse was given to trade, and imports went up to amounts excessive of the wants of the country. Subsequently, the average of imports and exports remained uniform at about \$78,000,000. From 1800 to 1810, only 1,086 patents were allowed; and from 1800 to 1,820, 1,748. The population of the country had, however, increased to 9,638,131, and with it the number and extent of manufacturing industries augmented, thus providing for the season of renewed prosperity which followed.

The rapid growth of this country in population, wealth, and culture since the year 1820 is now a just cause for pride and congratulation; and in our next two issues, we shall note the prominent incidents in this interesting and important era.

THE GRASSHOPPER SCOURGE OF 1876.

There is cheering news for Western farmers, conveyed in Professor C. V. Riley's recent statements, in the *Colorado Farmer*, relative to the probable numbers of the grasshoppers during the coming summer. Some one, it appears, has asserted that the soil of the region in the northwest portion of the country lying east of the Rocky Mountains is covered with prodigious numbers of grasshopper eggs; and this disagreeable announcement has gone the rounds of the press, through the length and breadth of the land. Professor Riley gives it its *quietus* in so characteristically effective a manner that we are half inclined to be grateful to the mendacious individual who set the story afloat, since it has been the means of obtaining such welcome intelligence from probably the best entomological authority in the country.

From personal observation, Professor Riley states, so far as Missouri and Kansas are concerned, the report is wholly groundless. In Minnesota, a State commission has determined that the eggs have mostly perished from excess of moisture, which dissolves the glutinous substance which normally protects and hold them together. In some parts of the high country lying east of the mountains, especially toward the north, eggs have been deposited in numbers by the swarms which left the lower and more fertile country devastated last spring; but in that region, such is the case every year, for it is the native home of the swarms which occasionally extend to the upper Mississippi valley. In Missouri, Kansas, and Nebraska, however, the number of eggs, laid by the few straggling insects that passed over those States last fall, will not equal that laid in ordinary seasons by indigenous species. In Colorado there is every hope that the protracted rains have destroyed the eggs.

Professor Riley gives it as his conclusion, in addition to the above, that, compared with other parts of the country, those States ravaged by locusts in last spring and early summer will enjoy the greater immunity during the same season of 1876, not only from locust injuries, but from the injuries of obnoxious insects, except the wood borers. In short, the people of the ravaged section have every reason to be hopeful rather than gloomy.

FIRE INSURANCE.

The address of Mr. H. A. Oakley, President of the National Board of Fire Underwriters, delivered before that body at its recent session in this city, contains many useful suggestions relative to fireproof building, which, however, here at least, appear to be "more honored in the breach than in the observance," and the speaker's impressions of European fireproof construction may well be contrasted with the way in which late edifices are built in this city. He remarked, he says, the universal use of concrete floors, of oak, and other hard woods instead of pine as finish, the entire separation of stories from each other, the absence of wooden or lath and plastered partitions, the solid backing given to the exterior of fronts, the thickness of division walls, the absence of wooden staircases, the isolation of flues from beams or woodwork, the height of the buildings (not exceeding sixty-five feet), and the covering of the roofs with iron and slate laid on beds of plaster. To compare this excellent *résumé* of what fireproof building ought to be with the flimsy affairs built in this country is to adduce at once the reason of the gigantic conflagrations with which even the best organized of fire departments are unable to cope. A building even now in process of erection on Broadway is exteriorly a mere shell of thin iron which towers above the adjacent structures, while within it is a network of wooden beams and partitions, its present exposed skeleton showing no trace of fireproof fittings. There are many other structures of the same description in New York city.

Mr. Oakley tells us that the solid character of its buildings alone saved Paris from destruction at the hands of the communists; and he states that he witnessed the burning of entire floors in houses, involving the destruction of everything in them, without perceptible damage to the stories of the same building either above or below those burned.

The percentages of losses paid to premiums received aggregates 47.16 per cent for 1875 against 42.50 per cent for 1874. The loss rate for the first three months of the present year is largely in excess of the like period in 1875; and generally speaking, Mr. Oakley considers that the outlook for the insurance business is not good. He further says that, despite all the modern appliances for the prevention of fires, the fact still remains that there is a steady increase in their number, and from causes too often within the control of the owners or occupants of the property. We pointed out this state of affairs some time since as one of the disadvantages of the insurance system, disadvantages sufficiently great to excite the question as to whether, after all, insurance is not more injurious than beneficial to the community. The carelessness on the part of owners, of which Mr. Oakley complains, seems to us the legitimate consequence of the risk of loss being taken off their shoulders; and for the same reason, they have little interest in availing themselves of the many new and useful inventions to protect their property.

Moreover, buildings have very often been burned, and life and adjacent property been imperiled, merely to obtain insurance money; and certainly few edifices are better adapted to the practice of this crime than those of the type which we have above referred to, the almost certain destruction of which effaces all evidence of the deed. It may be added that at the present time, when real estate has greatly depreciated in value, such incendiarism might well be most prevalent; and this is in significant accordance with Mr. Oakley's further statement as to the recent steady increase in numbers of fires.

PROGRESS AT THE CENTENNIAL.

Contrary to the general expectation, the Exposition will be nearly complete on the opening day. Nine tenths of all the exhibits are in place, and there is every indication that every department will be further advanced than has been the case on the first day of any previous World's Fair. Machinery, Agricultural, and Horticultural Halls will be filled; and from the rapid manner in which the work is now progressing, it appears that the Art Department will likewise be in readiness. The condition of affairs at the present time is in marked contrast with the disorder prevalent two weeks ago; and the wonderful celerity with which the thousands of contributions have been arranged is another instance of that peculiar American characteristic which delays matters to the last moment, and then accomplishes herculean tasks in incredibly short periods of time.

The Centennial Commission has likewise indulged in tardiness in disposing of some of the more important questions before it, and in making many material alterations in existing regulations. We allude elsewhere to its action in closing the Exposition and grounds on Sunday. The temperance question has recently been discussed, the point being whether to approve of the contracts, made by the Board of Finance, licensing the sale of intoxicating liquors in the grounds. The Commission arrived at no conclusion, and indefinitely postponed the whole subject, leaving the liquor men to sell their beverages under the concessions, and the temperance advocates to carry the matter, if they so elect, to the decision of another tribunal. Some important changes in the jury arrangements, we notice, have already been made. Owing to the immense number of applications for positions on the American Committee, some 4,000 in all, the names of appointees have been kept secret, and it is only lately that any of those who, it is desired, shall serve have been notified of the fact. The total number of jurors has been increased from 200 to 250; one half of the members are foreigners, to be chosen by the foreign commissioners, and the other half Americans. Ninety-six of the latter, we learn, have been selected, fifteen of whom are from New York, and fourteen from Pennsylvania, other States having a smaller representation. The pay of the American jurors has been reduced from \$1,000 to \$500, a proceeding of questionable wisdom, in view of the fact that elaborate professional reports are to be required, in lieu of medals or other more easily settled awards. There are not many experts who can afford the time and labor, which are involved in the careful examination and criticism of entries frequently during the coming six months, in return for a sum of money hardly sufficient to meet their necessary expenses. It would have been better to have abolished free passes, and increased the revenue in that way, than to have reduced the jurors' pay to such a small amount.

The Centennial Bank has been opened, and doubtless will prove a great convenience to exhibitors and visitors. Krupp's 1,600 pounder cannon has been removed from the steamer and set up in the grounds. A magnificent series of industrial art productions has recently arrived from Italy; and a boat load of young alligators, from Florida, are disporting themselves in one of the ponds.

The President of the Commission has issued the final address, or rather invitation, to the public. He says:

"The sanitary condition of Philadelphia is good; rational amusements have been provided; arrangements for protection from fire, thieves, etc., are as nearly perfect as it is possible in a great city. Within the Exhibition every precaution has been taken for the safety, comfort, happiness, and pleasure of the public. The buildings of the Exhibition are in order. The Exhibition will promptly open on May 10, and is an assured fact. All preparations have been made on a gigantic scale. Philadelphia and her citizens have spent millions in preparation for the reception and care of guests. There is no disposition to nor evidence of extortion. Increased business at usual rates is considered sufficient compensation for the vast amount of capital and labor expended. Living is as cheap as, if not cheaper than, in any large city in America. The accommodations are unsurpassed. All grades of society can be accommodated. Railroad and transportation facilities are unequalled."

There is no doubt, it now appears, of Philadelphia being able to entertain, at reasonable prices, 150,000 and possibly 200,000 persons. The hotels will charge from \$5 to \$1.50 per day, boarding houses \$1 to \$2.50, and the Centennial Agency will provide breakfast, lodging, and supper for \$2.50. By steam and horse cars, 20,000 persons per hour can reach the Exposition from any part of Philadelphia. One minute after the arrival of trains on all main lines, passengers can be within the Centennial Buildings. There is a good prospect of still further reductions to railway fares being made, in order that every one may visit the Exposition at a comparatively small expenditure.

By the time our next number is issued, the opening ceremonies will have taken place, and the long-looked-for Centennial will be fairly under way. We shall give full descriptions of the proceedings; and when the various departments are in a condition to admit of proper examination of their contents, we shall make our readers acquainted with whatever seems to us novel and interesting.

A SOLUTION of iodide of potassium is slowly decomposed by the action of light; but when some cane sugar is added, it turns yellow, owing to the liberation of iodine. If starch is present, a blue color is produced. If a sheet of starched paper is soaked in a solution of iodide of potassium and sugar in the dark, and then exposed under a photographic negative to light, a blue positive print is obtained, which is fixed by washing in water.