THE
Scientific American.

MUNN & COMPANY, Editors & Proprietors.

PUBLISHED WEEKLY AT
NO. 37 PARK ROW (PARK BUILDING), NEW YORK.

O. D. MUNN, S. H. WALES, A. E. BEACH.

☞ "The American News Company," Agents, 121 Nassau street New York.

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VOL. XI. NO. 19....[NEW SERIES.]....*Twentieth Year.*

NEW YORK, SATURDAY, NOVEMBER 5, 1864.

Contents:

(Illustrations are indicated by an asterisk.)

FRUITLESS INVENTION.

If a man walking in the fields picks up a diamond and goes straightway and locks it up in his strong box it is commercially no better than a pebble, and might be one for all the benefit it confers upon its possessor. So with the inventor, who, after years of toil, suffers his inspiration to come to naught for want of energy in putting it before the public; his time is lost, his ingenuity has borne no fruit, and neither he nor the world is a whit the better for the discovery.

There are at this time, as there is at all times, countless instances where ingenious persons have machines locked up in closets which might as well have never been constructed if they are suffered to remain idle. If the wheels never move to some purpose, if the iron sinews and steel arms never save human muscle, and lighten the curse pronounced upon the race, the metals should be melted up again to serve some good end if possible.

A good invention unapplied—not a perpetual motion—is capital locked up, and it is the supremest folly for a man to spend his time in originating some improvement in the arts and straightway conceal it, so that no one receives any advantage therefrom. Such a case occurs to us at this writing. The inventor of a novel machine for a novel purpose, recently described in this journal, keeps said machine up in the garret of a house carefully enveloped in as many wrappings as Gliddon's mummy. Once in a while he explains it to some confidant, gloats over the fortune it would bring him if it were applied in practice, but takes no step toward securing that fortune beyond the possibility of losing it. In the meanwhile there is, doubtless, some other more enterprising inventor making long strides to circumvent our slow friend. Fortunes do not go begging now-a-days. Given—a mechanical problem and a certain reward for its solution, a hundred ingenious individuals stand ready to seize the prize.

If an invention is good for nothing but to lock up why ever make it? Experiments are good and necessary to the perfection of every invention, but there is an end to experiment and a time to strike out boldly into actual operations. "Once begun the battle is half done," says the proverb, and our old copy-books say "Procrastination is the thief of time;" let the wise reader who has an invention of merit see to it that he is not robbed of his time and money by his own foolish procrastination.

EXPLOSIONS—OUR CITIES IN DANGER.

In his last report the Secretary of War recommended to Congress the removal of all powder magazines from the vicinity of our large cities, but in the multitude of important matters demanding the attention of Congress the subject failed to secure attention. If one of our cities should be smashed into rubbish the members of Congress would doubtless proceed, with feelings of mingled awe and remorse, to comply with the Secretary's recommendation. We, however, ought not to need any further warnings to rouse our legislators to the importance of this measure. The recent explosion at Erith, in the vicinity of London, occurred not in a powder mill, but in a warehouse where powder was merely stored, and so thorough were the precautions adopted that the *Mechanics' Magazine* is led to an improbable theory of spontaneous combustion to account for the ignition. That explosion was the greatest that ever occurred in England, and one of the English papers says, that the buildings which recently covered some acres at Erith are heaps of tumbled earth and bricks and massive fragments of timber.

We have no doubt that in handling the powder in our magazines the most approved regulations are adopted and rigidly enforced by our intelligent army officers, but there is one danger against which it is probably impossible effectually to provide—that is lightning. It will be remembered that during the past summer a serious explosion of ammunition occurred from this cause in General Sherman's army in Georgia. From lightning also resulted the greatest and most disastrous explosion of gunpowder that ever took place in the world. In August 1767, a flash of lightning struck the church of St. Nazaire, in Brescia, Italy, setting fire to 100 tuns of gunpowder, which was stored in the vaults. The explosion destroyed one-sixth part of the city, and killed about 3,000 of the inhabitants.

No rules however rigid, and no precautions however complete can render safe the location of large magazines of gunpowder in the vicinity of cities. We hope that among the earliest acts of the next Congress will be the removal of these magazines to isolated positions where their explosion would not result in any considerable destruction of life and property.

BIRDS IN CENTRAL PARK.

We invite the attention of the Central Park authorities to the remarks of Dr. Trimble at the Farmers' Club, reported on another page. It seems that there is one effectual protection, and one only, against the ravages of that minute but most destructive class of animals, the insects that devour our fruits and crops. This protection is found in the insatiable hunger of insectiverous birds. To sweep away the measure worms, canker worms, and all others of this class of pests we have only to fill our trees and shrubs with flocks of singers and warblers.

The way to fill the trees of the Central Park, or the trees of any grounds with birds, we can point out from our own experience. It is only necessary to plant a few cherry trees. The reed bird and the robbin, especially, will flock into these trees in multitudes. As both the cherries and the birds would be protected in the Park, the success of the experiment would be assured. The one charm that is yet wanting to that beautiful pleasure ground is the air made vocal with the joyous songs of birds.

GALVANIZING IRON—A PRIZE TO THE INVENTOR.

In a report in *L'Invention* of the proceedings of the Societe d'Encouragement Pour l'Industrie Nationale, we find a report by M. Barral, in the name of the Committee of the Chemical Arts, on the prize founded by M. le marquis D'Argenteuil, in favor of the author of the discovery the most important for French national industry.

M. Barral says that the chemist Malouin in the middle of the last century proposed to substitute zinc for tin in protecting iron from rust, but when the manufacturers pointed out to him that some parts of the surface would escape being covered, and would consequently rust, he had nothing to reply to them. His discovery remained therefore a whole century unfruitful. But M. Sorel, enlightened by the great discovery of Volta that zinc places iron in conditions entirely different from its ordinary conditions, rendering it non oxidisable in the air, perceived that if the iron was in contact with zinc at a portion only of its surface, it would be protected from rust throughout its whole mass.

M. Barral also says that the process of galvanizing iron has been materially improved within the last six years, especially in regulating the thickness of the coating to just the quantity necessary, which has greatly economised the process.

The prize bestowed on M. Sorel is the fourth of these prizes that have been decreed. The others were to the learned engineer Vicat, the illustrious chemist Chevreul, and the celebrated mechanician Heilmann.

DEFINITIONS OF GEARS.

Cog wheels, as they are familiarly called, are of different classes and titles. The several varieties are here explained:—

A spur wheel has its teeth placed straight across the face of the wheel in line with the shaft, like the prongs of a spur.

A beveled wheel has the face inclined on one side at an angle of 45° with the shaft.

A worm wheel has its face hollowed to receive a screw, and the teeth are inclined to suit the spiral of the screw thread.

A ratchet wheel has its teeth all leading one way, like a circular saw.

Spiral wheels have teeth inclined at various angles with the side of the rim. Sometimes the teeth form a V across the face, or they may be of any shape to suit the whim of the designer.

Staggered gears, as they are sometimes called, have square teeth set diagonally across the face; the second row of teeth are not placed in line with the first but "staggered" or set opposite the space in the first row. These are often used for planing machines, or where motion in one direction is to be suddenly changed to an opposite direction. They are supposed to prevent lost motion, but are not efficient for this purpose except when new.

Backlash of gears is the rattling noise caused by one wheel moving at a greater velocity than the other, and being suddenly overtaken by it. The face of one tooth therefore strikes against the back of the other. Gears set too deep, or so that the teeth bottom will also make a heavy rumbling sound. Staggered gears do not prevent backlash except when new. The tooth, or teeth that take the heaviest strain, or backlash, will soon wear so as to lose it, and in time the system will accommodate itself to the work, so that no benefit will be realized from them or it.

Spur gears for communicating direct motion, are as good as any toothed wheel. They are cheap to make, run well when properly made, and with but little jar. It is a great fault to make small gears with large pitches. It is akin to making small bolts with coarse threads. The coarse teeth have to be deeper, so that they are sooner broken and make more noise. Respecting the form of the teeth there is much diversity of opinion. It seems to be a favorite plan for general work to make them of the same shape that they naturally wear to, but very many mechanics make the teeth the frustrum of a cone, or a regular taper from bottom to top. Gears with wooden teeth driven by wheels wholly of iron are coming more into use for large, heavy sizes. The best wooden wheels have the teeth made of young hickory, or lignum-vitæ boiled in linseed oil, and set with the grain end on, in the direction of motion. The body of the wheel is iron, and recesses are cast in the face, in which the wooden teeth are set and fastened by wooden keys. When well made they run a long time. Tallow and blacklead are employed to lubricate them. Beveled wheels are also thus made.

A sprocket wheel, as the English artisans call it, is our rag wheel. The wheels on chain pumps are sprocket wheels, and are used to carry machinery driven by chains. The teeth are placed a certain distance apart, so that the wheels are sometimes eight sided, or six sided, the chain links are of course a certain length; this is called by some a clip wheel.

It is not necessary that gear wheels should be perfectly round; they work well when made elliptic or oval. Of course two wheels running together must

be both of the same class, round or oval. When oval the longest diameter of one wheel gears into the shortest diameter of the other. Sometimes staggered gears are made by taking several spur wheels and keying them on the shaft so that the tooth of one comes opposite the space of the other.

MAN TRAPS AND SPRING GUNS.

It used to be common in England, in former times, to warn depredators off premises by putting up signs reading "man traps and spring guns," thereby hinting at a speedy and terrible fate to the evil-disposed. This practice was at any rate honest; but what shall be said of these persons in modern times who delib erately place man traps where the innocent and unthinking walk headlong into them?

The record of accidents from machinery is daily increasing. In looking over our exchanges it is painful to notice that the majority of the victims are women. Entangled by their skirts they are drawn around shafting and killed instantly. As many as twenty persons have been so killed within the past few weeks. Some of them were young women who ought to have been more careful, but this is no excuse for those who left the snare open. The accidents above alluded to were nearly all caused by shafting. One of them in particular was in a printing-office, where a shaft ran only a few inches from the floor; over this shaft women stepped continually in doing their work, until in an unlucky moment one of the females was caught by her skirts and dashed to pieces.

In these days of the universal adoption of machinery, shafting, pulleys, gearing, and belts are continually running in dangerous places. Children play about them; men and women pass and repass them daily; when suddenly one is taken and the rest left, but the cause of the tragedy is untouched. Men *will* blow their brains out with guns and pistols by carelessness, there seems to be no help for this, but people may and should be prevented from walking blindly into gears, or being carried around shafts. In a saleratus factory of this city a woman there employed went into the basement a few weeks ago for some purpose, and, being ignorant of the locality, walked straight into a set of heavy gears, running at great speed, and was swallowed up in an instant. After this "accident" it is reasonable to infer that the gearing was boxed up, but what utter recklessness on the part of those who left the wheels in such a condition? Is there not one life charged against them?

When belts run through floors they should be boxed up certainly waist high; a six-inch belt, running fast, will take a man's leg off as quick as a saw; and pulleys that buzz round within an inch of one's nose should also be boxed, or the thoroughfare made in some other direction. Gears must be cased with sheet-iron on the "running side"; wooden boxing shatters, and is liable to get caught and carried in. A man may put his head in the other side of the wheels with impunity. There are many belts now, many shafts at this moment in a condition to catch the first unwary passer by the heels and lay him low. Why not secure them, why not place them beyond the power for mischief? They should be boxed immediately.

THE GREAT MECHANICAL PROBLEMS OF THE DAY.

Is the revolving turret or the broadside the best system of making iron-clad ships? Is there practical economy in working steam expansively? Is cast iron, wrought iron, or steel the best material for heavy ordnance? Should large cannon be rifled for elongated shot, or made with smooth bores for balls? Will the pneumatic tube prove a practical system for the general conveyance of passengers? Will steam plowing come into general use?

In the world of mechanical science these are the most prominent problems at the present time, and a vast amount of thought, labor and money is being expended in their solution.

In all inquiries it is well to pause occasionally, and take a comprehensive view of the existing condition of the question, to see what principles bear upon it, what facts have been established, and what yet remain to be deter ined. Such a view we purpose briefly to take of each of the great mechanical problems of the day, beginning in this number with the question of revolving turrets.

REVOLVING TURRETS OR BROADSIDE SHIPS?

For protecting the face of land forts there is no limit to the thickness of iron that may be employed; if 8 inches is not sufficient to resist the force of any shot, 12 inches may be used, and if 12 inches is not enough there is no objection to the employment of 24. But for a ship that is to float upon the water, the great weight of armor plates imposes a limit to their thickness. If an old-fashioned three-decker were to be plated it would be necessary to make the metal so thin that it would be of no service whatever; but as the depth of the sides is reduced, of course the thickness of the plates may be increased. Consequently broadside armor-plated ships are made with only one gun deck, and even then it is impossible to make the armor plates more than 5 or 6 inches in thickness. A few years ago it was supposed that solid iron plates 4½ inches in thickness were practically proof against any cannon shot, but it is found that cylindrical steel bolts, and even shells, may be driven through 5-inch plates, and now the thickness is increased to 6 inches.

To reduce the depth of the sides to a minimum, Capt. Ericsson conceived the idea of cutting the vessel almost down to the water's edge, and then raising the guns to a sufficient hight to work by placing them in one or more revolving turrets on deck. As the area of the turrets' sides is inconsiderable when compared with that of the whole vessel, the walls of these turrets might be made of any thickness desired, and those on the *Puritan* and *Dictator* are 15 inches thick; though the old monitor turrets, with only 8-inch walls have never been penetrated by any kind of shot.

The prominent objections to turret vessels are the small number of guns which they can carry, and the uncomfortable quarters of the crew below the water line. The answer to the first objection is that one large gun is far more efficient than a whole broadside of little ones, and the soundness of this answer has been very fully confirmed in practice. The closeness of the quarters is remedied by artificial ventillation by means of fans. It is also objected that turret vessels will be poor seaboats, but the English turret ship, the *Royal Sovereign*, on her recent trial trip, behaved better in a rough sea than any of the broadside iron-clads. This question in regard to our own sea-going monitors will probably be settled by the first trip of the *Dictator* before these lines meet the eyes of our readers.

This is a general view of the present aspect of the great question of broadsides or turret ships. For our own part, while we do not regard the question as absolutely settled, we are now inclined to the opinion that the *Dictator* and the *Puritan* are the most powerful ships of war that have ever yet been launched upon the waters of this globe.

TRIAL OF THE 1,000-POUND CANNON.

Since our last mention of the 20-inch gun the carriage has been completed and the gun mounted, and on Wednesday, the 25th of October, this cannon was loaded and fired with the largest charge of powder and the heaviest shot that has ever yet been discharged from any piece of ordnance. The Armstrong gun has been fired with 90 pounds of powder, and a missile variously stated at from 330 to 600 pounds. The 20-inch gun was fired on the 25th ult. with 100 pounds of powder and a solid ball of cast-iron weighing 1,080 pounds.

The gun was first fired with a blank cartridge of 100 pounds. It was then loaded with 50 pounds of powder and a solid shot and fired point blank. The shot struck the water throwing up showers of spray as large as a ship.

For the last trial a charge of 100 pounds of powder was placed below a solid shot of 1,080 pounds, and the gun was elevated at an angle of 25 degrees. At the report the ponderous globe rushed up through the air with a hoarse roar, and sweeping its long ellipse fell a great distance—estimation 3½ miles—away into the sea.

The report of the gun was not perceptibly louder than that of moderately large ordnance, and the concussion produced no extraordinary trembling of the earth. There is no doubt, however, that the half tun of cast-iron which this gun hurls forth would have more effect in crushing in the sides or deck of an iron-clad ship than other missile that has ever been wielded by human skill.

We are in possession of facts, and shall soon give to the public full particulars of the trial of a wrought-iron gun of smaller caliber, for which we recently solicited a patent for a well-known engineer in this city. The result will probably far surpass those of any other gun yet brought before the public.

THE MARKET FOR THE MONTH.

The prominent features in the trade of the country during the past month are a considerable suspension of cotton manufacture in consequence of the great fluctuation in prices, and a panic in the city of Chicago. Unlike most other cities in the country, Chicago has gone right forward in building during the war, and it is not strange that there should be some unsafe extension of credits among a portion of her citizens. The small effects, however, resulting from the panic there show a stability in the condition of the traders which never existed before the war in any of the towns east of the Rocky Mountains.

By the fall in cotton from $1 80 to $1 60, many of our large cotton manufacturing establishments lost so heavily that they have determined to suspend operations till our currency is in a more stable condition. One of the worst evils of a largely inflated currency is its liability to these great and sudden fluctuations which render all business calculations uncertain, and thus exert a paralyzing influence on the industry of the community.

The trade of the country still continues on the cash system. Hardly any merchendise, even dry goods, is sold on a credit of over 30 days. The mercantile community of this country was never so free from the possibility of extensive bankruptcies as at the present time. There is a good deal of talk about a crash when the war is over, but men cannot "fail" to pay debts that they do not owe.

The limited supply of cotton has of course diminished the trade in fabrics made of this staple, but the trade still continues enormous even in calicoes of American manufacture. We are told by one of our domestic commission houses, that a few days since a leading jobber stepped into their store and bought a bill of ninety thousand dollars in the single article of American prints.

The following list shows the change during the month in the prices of the leading staples:—

	Price Sept. 27.	Price Oct. 26.
Coal (Anth.) ₩ 2,000 lb	$10 00	9 50@11 00
Coffee (Java) ₩ lb	45	45
Copper (Am. Ingot) ₩ lb	47	47@48
Cotton (middling) ₩ lb	1 20	1 22
Flour (State) ₩ bbl	8 30	890@925
Wheat ₩ bush	$1 80@ 2 50	$2 25@2 60
Hay ₩ 100 lb	1 30	1 30@1 35
Hemp (Am.drs'd) ₩ tun.	320 00 @360 00	$320 00@350 00
Hides (city slaughter) ₩ lb.	11½@ 12	10½@ 11
India rubber ₩ lb	1 20	1 10 @ 1 15
Lead (Am.) ₩ 100 lb	$14 00 @ 14 50	$13 87 @14 00
Nails ₩ 100 lb	$9 50 @ 10 00	9 50 @10 00
Petroleum (crude) ₩ gal	39	46½@ 47
Beef (mess) ₩ lb	$10 00 @ 13 00	8 00 @13 00
Saltpeter ₩ lb	24 @ 30	24 @ 30
Steel (Am. cast) ₩ lb	20 @ 24	18 @ 33
Sugar (brown) ₩ lb	15 @ 23	18 @ 21
Wool (American Saxony fleece) ₩ lb	95 @ 1 05	90 @ 1 00
Zinc ₩ lb	20	20@21
Gold	2 00	2 16