PACIFIC MAIL STEAMSHIP "CONSTITUTION."

This noble specimen of American naval architecture, constructed by W. H. Webb, of this city, is now lying at the dock of the Novelty Works, receiving her machinery and having her interior fitted up. It is intended for the Pacific passenger trade, and will run between Panama and San Francisco. For this special service, it has been designed with great care, as but few, if any, of the steamships previously built in New York for the Pacific trade were suitably arranged for securing ventilation in that climate. The length of the *Constitution* is 360 feet; breadth of beam, 45 feet. The model is beautiful; we think she will be a very fast vessel.

The interior is designed with great skill and care for the comfort of passengers, and with a keen perception of the beautiful. Under deck it actually appears far more roomy than the *Great Eastern.* It is not cut up with bandbox saloons, like the giant iron steamer; it will have larger and more splendid upper and main saloons than any vessel afloat, and will accommodate about 1,000 passengers.

For securing proper ventilation, the state-rooms will be very large, and lattice work will be secured in every position to insure a full and free circulation of air in all the apartments. Imperfect ventilation has been the prevailing defect in former Pacific steamers; such evils are intended to be entirely remedied in the *Constitution.* The hatches and all the important openings are about double the size of those in most steamers, and ventilating hoods are to be put up to operate like atmospheric siphons, to remove the hot and take in a constant supply of cold air. Two very large blowers are also to be used for ventilation.

The machinery of the *Constitution* is now being fitted up at the Novelty Works. The cylinder is up, two boilers completed, and the other two are in a very forward state, as are also several of the other parts. The following are the dimensions of the engine:—

Diameter of cylinder, inches	105
Stroke of cylinder, feet	12
Diameter of piston rod, inches	11½
Diameter of crank pin journal, do	14
Length of crank pin journal, do	18
Diameter of beam center journals, do	15½
Length of beam center journals, do	21
Diameter of water wheel outside of buckets, feet	40
Length of buckets, do	18
Width of buckets, inches	24
Diameter of water wheel shaft journal, do	22
Length of water wheel shaft journal, do	30
Supplied with Sewell's surface condenser, fitted with 5,500 brass tubes 9 feet long, the condensing of which equals, square feet	8,000

She is supplied with four cylinder boilers with upreturn flues, two placed forward and two aft of engine, the dimensions of which are:—

Diameter of shell	13 ft. 3 in.
Whole length of boilers	32 ft.
Diameter of steam drum	8 ft.
Hight of steam drum	12 ft.
Diameter of smoke pipe	7 ft.
Hight of smoke pipe	41 ft.
Five cylindrical furnaces in each boiler, diameter	40 in.
Fire Surface in each boiler equal to	3,300 sq. ft.
Grate surface in each boiler equal to	115 sq. ft.

These statistics have been kindly furnished us at the Novelty Works, and Mr. Allen freely gave us all the information solicited. It will be observed that the *Constitution* is to have a single beam engine. It is of the same dimensions as that of the steamboat *Metropolis*, but much stronger. The cylinder is larger than that of any other steamship, and the whole machinery will be a credit to American engineering skill.

It will also be noticed that the engine is to be furnished with Sewell's surface condenser, so that pure water will be fed into the boilers. The condenser of Mr. Wm. Sewell, formerly engineer of the United States Navy, is similar to some other condensers excepting at the tube joints. These are secured by vulcanized india-rubber thimble rings, put on by hydrostatic pressure. They permit the joints to play without breaking or causing leakage. The water for refrigeration passes through the tubes of the condenser, and the steam is exhausted on the outside among the tubes. The character of this condenser stands very high.

Two bars of gold have reached London from Nova Scotia, being the first remittance from that quarter since the gold discoveries. It is described as of the average quality of Australian gold.

THE PENETRATION OF BALLS---THE BEST FORM.

The power of penetration which a ball possesses is proportional to the square of its velocity, hence when the object of firing is merely to penetrate, the greatest velocity should always be given. Thus in breeching walls the guns are first directed to cut grooves in the wall, in order to detach a portion from the mass, and this grooving action is best done by the greatest amount of penetration. When the grooves are cut to a sufficient depth in the wall, the portion designed for the breech is battered down by a heavy ball having a small velocity. In close naval engagements, balls having great velocities are not so destructive, as those which, having a small velocity, just pass through the side of the vessel, throwing splinters before them. To give a ball a double initial velocity, four times the quantity of powder is required. Thus a ball weighing one pound, discharged from a gun with two ounces of powder, has an initial velocity of 860 feet per second; with a charge of eight ounces, it has about 1,720 feet.

As regards the weight of shot for rifled muskets, Commander Dahlgren, U. S. N., says:—"The efficiency of musketry depends mainly upon the weight of the ball, and it may be a perilous experiment to err against this axiom. * * * While discussing the subject in England, the well-known persistency of the Duke of Wellington in opposing any reduction of caliber, notwithstanding the gain that might accrue to the movement of the soldier, or to the repetition of his fire, was often cited, and it cannot be denied that the opinions of so able and experienced a commander should outweigh all nice differences. * * * The light shot may be as fatal as the heavier, but the effect of its shock on many parts of the human frame is not equally capable of disabling an adversary." * *

"Conical shot have, perhaps, proportionally less power of shock than round balls, and are more liable to be diverted from their course when they come in contact with a resisting surface which is oblique to their direction."

As it respects the best form of shot for rifled muskets, Commander Dahlgren, says:—"The shot should not be very acute in front, as such form is more liable to have its apex displaced from the axis of the bore, and hence increased inaccuracy of flight; but it should be cylindric at the base, terminating with a conical front which ought rather to be rounded like the English than acute like the French. The latter presents less resistance to the air and substances which it may enter, but of these abundant properties it may well spare something in order to gain more power of shock."

INFLUENCE OF HEAT IN CHANGING THE PROPERTIES OF BODIES.

Heat is the great agent which produces so many wonderful changes in nature and the arts. We daily witness its effects in the visible world around us, and yet we seldom reflect upon the transformations which it effects. Take, for example, the clear albumen which surrounds the yolk of an egg. It is colorless —almost transparent—and is perfectly soluble in water. Now take this albumen and submit it to a temperature of 165° Fah. for a short period, and what a change takes place! The clear matter gradually becomes opaque; then hard, white, and insoluble. If we take glue, and submit it to heat, the effect is altogether opposite. This substance is scarcely soluble in cold water; but if we expose it to moderate heat, it dissolves rapidly. It is also remarkable that when the carbonate of lime crystallizes from cold solutions, it arranges its particles in the form of Iceland spar; but when it crystallizes from hot solutions, the particles arrange themselves in the form of arragonite. Although these two minerals are composed of exactly the same amount of lime and carbonic acid, they really possess very different physical qualities. But perhaps the most remarkable substance known, with regard to the effects produced by heat upon it, is cyanuric acid. It is crystalline; and Liebig states that it is soluble in cold water, and also capable of combining with metallic oxyds, forming salts. But when this substance is heated to a high temperature, in a hermetically sealed vessel, it becomes a volatile fluid, which, if brought in contact with water, is decomposed, and gradually becomes white, resembling porcelain, and is absolutely insoluble. Thus, the same constituents, in exactly the same proportions, when simply subjected to heat, totally change their character by a different molecular arrangement. Phosphorus, also, undergoes peculiar transformations. In its ordinary state, it is almost colorless, and dissolves in bisulphide of carbon in all proportions. In small quantities, it is very poisonous, and when exposed to moisture in the atmosphere, it oxydizes and forms a deliquescent acid. But if we take this substance, and heat it in a vessel from which the air is excluded, up to 482° Fah., it becomes red in color, does not change in moist air, becomes insoluble in the bisulphide of carbon, and is not so poisonous in small quantities.

Zinc is a brittle metal until it is heated to 210° Fah.; at this temperature, it becomes somewhat ductile, while, at 300° Fah., it can be rolled into thin sheets; but if the temperature is raised much above this, it again becomes exceedingly brittle, and will break with the moderate blow of a hammer. Increase the heat still further, and lo! it melts and becomes a gas which floats in the air. Such are some of the wonderful effects of heat, not very generally known.

PERSISTENT ACTIVITY OF LIGHT---MAGNETIC EXPERIMENTS.

The celebrated French photographer and chemist, M. Niepce de Saint Victor, has recently made some valuable discoveries regarding what he calls "the persistent activity of light." He exposed to the influence of bright sunlight for three hours a piece of porcelain plate, then he removed it and laid it upon a piece of paper which had been prepared with chloride of silver. Some parts of the paper were intentionally not laid under the porcelain, for the purpose of discovering what would be the difference, if any, between the covered and uncovered parts. After 24 hours had elapsed, the porcelain was removed, and the paper examined, when it was found that the silver salts were reduced in that part of the paper which had been placed under the porcelain, but no effect was produced in the paper which had not been covered. This led him to conclude that solar light communicated activity to some bodies, which they retained after exposure to the sun's rays. He then tried experiments with a steel plate, one part of which was polished and another part made rough on the surface with strong nitric acid, then washed with alcohol and dried. This plate was exposed to the sun's rays for three hours, and then one-half of the polished part of it, and one-half of the rough part, were placed under an opaque screen, with the other portions under a piece of transparent glass. The plate was then laid upon albumenized paper prepared with chloride of silver. After 24 hours' contact—the same time as with the porcelain—an impression of the unpolished portion of the steel plate, acted upon by the light, was obtained; but none from the polished part, nor from the unpolished portion which had been placed under the opaque screen.

A strip of glass ground or roughened on the surface, and cleaned with distilled water, gave the same results as the steel plate; but under a violet-colored glass, the light had less action than under a white glass.

In a paper upon this subject, M. Niepce de Saint Victor says:—

It has frequently been announced that light magnetizes a bar of steel; but after removing every source of error, I have found it impossible to make a needle, solarized for a very long time under the rays of light concentrated by a strong lens, attract another sewing needle suspended by a hair, whether the light was white or colored by being made to pass through a violet-colored glass.

I have also enveloped a needle in paper impregnated with nitrate of uranium, or with tartaric acid, and solarized; I have also suspended a needle horizontally in tubes containing solarized cardboard, and the results were invariably of a negative character, which proves that the activity of which I have spoken above is not due to electricity, as some experimentalists have pretended.

I afterward repeated the first experiments upon needles very feebly magnetized, to see if I could de-magnetize them; but the results were always negative.

From which I conclude that this persistent activity given by light to all porous bodies, even the most inert, in all my experiments, cannot even be phosphorescence. It is, therefore, most probably a radiation invisible to our eyes, which acts like a gas, since it does not pass through glass.

A test of the Sharp's rifle by the Navy Department having proved satisfactory, a large number has been ordered for that arm of the service. Com. Dahlgren's report states that twenty shots were fired in less than 1½ minutes.