THE WAY BANKS ARE MANAGED IN NEW YORK.

To persons who have nothing to do with banks except to receive and pay away their bills, it naturally seems that furnishing these bills for use as money is the principal function of banks; it is in fact an incidental and comparatively unimportant part of their operations. Banks are companies of money lenders, who associate for the purpose of getting larger revenues from their capital, and with greater safety, than they could if each loaned his funds separately on his own account. The principal advantage of the association is the better credit obtained with the community by the large amount of paid-up capital, and the publicity which is given in relation to the bank's condition. This credit is advantageous in two ways.

First, it enables the bank to get the use of a large amount of capital without paying anything for its use. In every civilized community there are at all times persons having money on hand which they wish to deposit temporarily in some safe place where they may be sure to find it when they want it. Banks offer to receive such funds, and to return them promptly when called for; their whole capital being, of course, a pledge for the safety of the trust. Though each one of these deposits is liable to be called for at any moment, experience shows that others are constantly coming in, and thus a certain average amount, subject to some fluctuation, may be counted on with great confidence. A portion of this amount the bank officers consider it safe to loan to business men on good security, keeping sufficient funds on hand to meet any call of depositors likely to take place. The interest on this property of other people is, of course, a clear profit to the bank.

A second, but less important advantage of a good credit to the bank is the ability to pay out its notes and have them circulated in the community as money. As these notes draw no interest, while they are given in exchange for the notes of business men drawing interest, they are, of course, a source of profit.

Our joint-stock banks are all under the management of Boards of Directors—men selected from among the largest stockholders—those, therefore, who are most interested in managing the bank with profit to the owners. The directors choose a President from among their number, and hire a cashier and the necessary clerks; they then offer to merchants and other business men to open accounts with them, to receive their surplus funds on deposit, and to loan them a limited amount of capital. In paying large sums it is safer and more convenient to make the payment by a check on a bank than to count the bills; every man in active business, therefore, keeps an account in some bank, depositing with it all the money he receives, and making his payments by checks, which are simply orders to the bank to pay the amount stated in the check.

Banks in New York are opened at 10 o'clock, A. M., and closed at 3 P. M. Merchants having accounts with a bank generally make a deposit in the afternoon, as near as may be before the closing hour, of all the funds they may have received during the day. These are partly in bank bills, but mostly in checks, and they are sent to the bank by a trusty clerk. A list of the checks is sent with the funds, together with a little blank book, in which the receiving teller enters the amount of the deposit; this entry being the bank's official receipt for the funds. The receiving teller compares the checks with the list, counts the money, if there is any, and enters the amount in the little book, and also in a large account book in the bank. This work is done with great rapidity, as in the afternoon there is usually a long line of clerks awaiting their turn at his window.

To avoid the inconvenience both to the bank and the merchant of having several deposits made in a day, it is customary for the merchant to draw checks for whatever payment he has to make during the day, even if he has not sufficient funds in the bank at the moment to meet them; and the bank pays these checks, trusting to the honor of the merchant to deposit sufficient funds to make all his checks good before the bank closes. Occasionally a customer fails to make his checks good, and the bank suffers a loss from its misplaced confidence; but a conclusive proof of the general prevalence of mercantile honor is furnished in the fact that losses from this source are of very rare occurrence.

Twice a week the directors meet to loan the funds on hand at the time. Loans are usually made by discounting notes. A commission merchant, for instance, has notes of different jobbers to the amount of $20,000, payable two or three months in the future, and he wants the money for them now. He writes his name on the back of each, and sends them to the bank for discount. The directors examine the notes, and if the names are satisfactory and they have the funds to loan, the paper is discounted; the bookkeeper computes the interest on the several notes to the time they are due, deducts it from the principal, and carries the amount remaining to the credit of the merchant.

When capital in market is not worth more than seven per cent the main question in regard to discounting any paper offered is the certainty of its being paid, but when capital is worth more than the legal rate, a second question has quite as much influence in deciding who among the several applicants for loans shall have the preference—that question is, who keeps the largest deposit with the bank. If two merchants want each $20,000, and, on examining the books, it is found that one has an average deposit of $5,000, and the other of $10,000, loaning the $20,000 to the former is equivalent to loaning $15,000, while to the latter it is equivalent to loaning $10,000, receiving in either case the interest on $20,000. In one case the interest on the capital actually furnished is $9\frac{1}{3}$ per cent; in the other it is 14 per cent. Bank directors, like other men, generally accept the best offer, and the man who keeps the best account gets the discount. In this way bank directors always manage to get the market rate of interest for their capital, in spite of any usury laws, however cunningly devised, that any legislators can enact.

NITRO-GLYCERIN.

The last number of *Le Genie Industriel* has an article by M. Alf. Nobel, engineer, setting forth, at length, the advantages of nitro-glycerin over gunpowder for blasting rocks. The economy claimed is in the cost of drilling the rocks, as much smaller holes suffice, owing to the greater explosive force of nitro-glycerin. M. Nobel says that this force is in hard rocks from eight to ten times that of ordinary blasting powder, and in soft rocks from twenty to thirty times.

"Four principal causes contribute to its superior explosive force:—1st, its great specific gravity, which permits the introduction into a hole of nearly double the weight of powder which the same hole will receive; 2d, its perfect gasification, leaving no solid residue; 3d, its richness in oxygen, which produces com-plete combustion; 4th, its extraordinary suddenness of explosion.

"According to Regnault, gunpowder, in burning, forms, theoretically, 260 times its volume of gas, taken cold, but in practice, owing to incomplete combustion, it does not exceed 200 volumes. The formula of nitro-glycerin is—

$$C^6H^5O^3+5NO_3$$

which in burning would give—

$$6CO_2+5HO+5N+O$$

So that one volume of nitro-glycerin would produce about—

544 volumes of the vapor of water.
469 volumes of carbonic acid.
39 volumes of oxygen.
236 volumes of nitrogen.

1,288 volumes, taken cold."

[We give M. Nobel's formula but do not understand how he gets his NO_3. The formula of glycerin is $C_6H_7O_5,HO$, and the usual view of nitro-glycerin is that it is a substitution compound in which two atoms of hydrogen are replaced by two atoms of nitrous acid. making the formula of nitro-glycerin—

$$C_6H_62NO_4O_6$$]

"It is evident that gunpowder, the combustion of which is very incomplete, cannot produce an elevation of temperature so great as nitro-glycerin, of which all the carbon is transformed into carbonic acid, and all the hydrogen into water. This is proved in practice by the fact that a small addition of nitro-glycerin to powder communicates much more brilliancy to the flame. It is difficult to measure the heat of an explosive substance, but, in view of the above-mentioned circumstance, it will be admitted that the temperature of the flame ought to be nearly double that of gunpowder. We shall have then for powder 200 volumes, which, with a quadruple expansion, will be 800 volumes, and for nitro-glycerin 1,288—in round numbers 1,300 volumes—which, with an octuple expansion, will be 10,400."

Nitro-glycerin is made by dropping glycerin into a mixture of equal parts of strong nitric and sulphuric acids. It is a heavy oily liquid, its specific gravity being 1·6. It is insoluble in water, and the usual plan is to fill the hole above it with water in place of tamping, and then to fire it with a safety fuse, having a heavily charged percussion cap at its lower end. This mode of firing has been patented in France and other countries.

According to M. Nobel, nitro-glycerin does not explode by direct fire, decomposing itself with flame by contact with an ignited body, but being extinguished so soon as the hot body is removed. He also says that it detonates under a violent blow of a hammer, but only the part that is struck explodes: the fire is not propagated to the surrounding portions. A few drops spread on an anvil may, by repeated blows, produce a series of explosions. By the gradual application of heat it explodes at 180° Cent.—356° Fah. It is a very permanent compound, preserving itself indefinitely, and not being decomposed by either phosphorous or potassium.

THE ELECTRIC RAY OF THE ENGLISH CHANNEL AND OTHER ELECTRIC FISH.

[Translated from the French for the Scientific American.]

In a paper communicated recently to the French Academy of Sciences, by Mr. Charles Robin, occur the following statements regarding certain electric fish;—

"The varieties of these fish are but few in number; the *raya*, ray, or skate, the *gymnotus electricus*, or electric eel, and the *silurus electricus*. The *raya* belongs to the skate family, hence they are sometimes termed electric skates, while fishermen call them *tremblers*, or magic fish. This fish has a smooth, flat body and short tail, resembling somewhat an almost circular disk. There are several kinds to be found on the coasts of Provence, and the channel between France and England. If a ray be taken up in the hand a strong shock will at once be felt, so violent as to benumb and even paralyze the entire arm during several minutes. The sensation may be compared to that experienced from a violent blow on the elbow. The force of the shock is estimated as equal to that of a pile of 100 to 150 pairs charged with salt water. The discharges succeed each other with very great rapidity, as many as fifty discharges having been counted in one minute. A shock can be given to twenty persons simultaneously, if they stand touching each other in a circle, with the two persons at each end touching, the one the back and the other the belly of the ray. It has been discovered that the back of the fish emits positive and the belly negative electricity. After a fisherman has emptied the contents of his net into his boat, if he pours a large quantity of salt water upon the fish, should there be an electric ray among them, he is at once apprised of the fact by a shock in the hand he uses to pour out the water.

"Plutarch mentions this peculiarity as having been known to the ancients. The discharge from the ray emits sparks similar to those of an electric machine, produces magnetization and chemical decomposition, and gives marked signs of heat when passed through a thermo-electric pair.

"The electric organs are of three kinds, viz:—

"First, In the lower half of the body and at each side of the head there are several hundred small tubes (Hunter counted as many as 1,182) or membraneous, vertical prisms close together, like honey combs, and subdivided by horizontal partitions into little cells filled with mucus.

"Second, In the hinder part of the brain there is a lobe known as the electric lobe. Every time that this lobe is touched strong discharges are produced, even if the organ be separated from the brain and spinal marrow. All action upon the body of the ray, determining the discharge, is transmitted by the nerves from the irritated spot to the electric lobe of the brain.

"Third, Three very large branches of the fourth pair of nerves start from the above lobe and communicate with the electric batteries. If these nerves be cut or tied all electric phenomena cease; but in order to completely prevent any discharge they must all be tied or cut, for if they are only cut or tied on one side of the body the discharge will continue on the other side.

"The *gymnotus* is similar to an eel in appearance, and is commonly known by the name of 'electric eel.' These eels average about seven feet in length, and their skin is covered with a glue-like substance. They abound in the rivers and lakes in certain parts of South America. Their electric power is so great as to knock down men and even horses. Whenever a fisherman chances to catch a *gymnotus* and a young crocodile in the same net, when it is hauled in the latter reptile is generally found dead or paralyzed, while the electric eel shows no mark—the crocodile having been electrified before it could reach the fish.

"In certain sections of South America when it is necessary to enter a pond or stream of electric eels, wild horses are driven into the water infested by these formidable fish. Humboldt describes the method pursued. As soon as the eels hear the unusual noise caused by the plunging of the horses, they rise to the surface and attack the animals with their powerful electric batteries. The natives surround the pond or occupy the branches of trees overhanging the water, armed with harpoons and long reeds, and by their wild cries and reeds prevent the horses from landing. After a desperate combat, in which many horses are often killed and others paralyzed by the repeated and terrific shocks of electricity, the *gymnoti* being weakened by fatigue and loss of galvanic power, seek to escape in order to rest themselves and recuperate their electric strength, when the horses remaining drive them to the shore, where they are easily captured by harpoons attached to ropes.

"Professor Farraday has described the characteristics of the electric discharge from these fish. By the aid of two metal plates joined to the extremities of the galvanometer and applied to various points on the body of a *gymnotus* he succeeded in determining the direction of the discharge. He discovered that the anterior portion of the eel always formed the positive pole, and the posterior portion the negative pole, so that the direction of the current in the galvanometer was from the head to the tail. By causing the discharge of the *gymnotus* to pass over a wire arranged in a spiral, in the interior of which several needles were placed, he succeeded in magnetizing these needles in the required direction, by the direction of the discharge from the head to the tail of the fish. The same philosopher obtained chemical decomposition by the employment of iodide of potassium, and produced the electric spark by introducing into the circuit an electro-magnetic spiral, having a cylinder of soft iron in its interior.

"The electric apparatus of the *gymnotus* extends over the entire length of the back and tail, and consists of four longitudinal fasciæ, composed of a large number of membraneous laminæ, nearly horizontal, parallel, and very close together, and united by an infinite number of scales placed vertically and crosswise. The little prismatic, transverse cells formed by the junction of these laminæ are filled with a gelatinous substance. The whole apparatus is supplied with very large nerves emanating from the spinal nerves.

"The *silurus electricus* of the Nile is about two feet in length. Its mouth is provided with six fleshy tentacles. It is to be found chiefly in Egypt and Senegal. The Arabs call it RAASCH, *anglice*, thunder. Its galvanic power is considerable. Geoffroy Saint-Hilaire made many curious experiments upon this fish during the siege of Alexandria. The electric apparatus of the *silurus electricus* consists of a species of fatty cellular tissue extending over the whole body between the skin and the muscles.

"In conclusion, the phenomena presented by electrical fish may be said to be of the same order as those produce by our scientific apparatus, viz.: deviation of the needle of the galvanometer, elevation of temperature in conjunctive wires, magnetization, chemical decomposition, and, lastly, electric sparks."

THE Pacific Ocean covers seventy-eight millions of square miles the Atlantic twenty-five millions.

Correspondence.

Toughening Steel by Hot Water.

MESSRS. EDITORS:—I am a constant reader of your truly valuable journal, and have been since the first number; now it has become one of the indispensables, and I look with eager interest for each number. I am always instructed and often amused at the questions asked, and the answers to them by your numerous readers. I have been a worker in steel since 1815 for edge tools and machinery, and all other purposes for which it is used in this country, and am particularly interested in all I see written on the nature of that metal. Some time since I saw the question asked, "Why is a Razor Put in Hot Water?" I felt competent to answer the question, but not being accustomed to writing for the public prints, I felt a diffidence to appear before your hundreds of thousands of readers, and waited to see some one explain it. I will explain why a razor should be put into hot water before using.

Every degree of heat there can be put into a razor or any other tool, without injuring the temper, strengthens the steel. A razor has, or should have, the most delicate edge of all edge tools, and the highest or hardest temper; unless strengthened by heat, it would not stand the harsh usage that its delicate and hard edge is put to, as any man can prove by trying without heating it. He will find it broken out in notches wherever it has come in contact with the beard. The saw appearance of the edge, as one of your correspondents explains it, is caused by sharpening it. Any one examining a beautifully polished razor with a microscope is astonished at the rough and scratched appearance, and when examined carefully the scratches will be found to be cut through its delicate edge, producing a sickle instead of a saw edge. Hot water is the safest way to heat any tool and give it strength without danger of injuring the temper. All tools should be heated that are to be put to harsh usage, especially in cold weather. Most tools that cause great friction by use will produce the heat after they get to work.

Every wood-chopper does, or should, understand that if he attempts to work with a frosty ax he will break it, but when once at work the friction produces the necessary heat to strengthen it.

In my experience, the most difficult tool to make stand for the purpose intended, and the severest trial for steel, is a pick edge for cutting French burr-mill stones. These stones are the third hardest substance in nature, and a pick to answer has to be of the best steel, and must be the hardest temper of all tools whatever. In this case the hot water answers an admirable purpose, and is really indispensable in cold weather; in a great many trials and experiments I find it very beneficial, even in hot weather, as it allows the edge to be made very hard, and prevents the steel from flying if it is kept sharp by grinding.

I would say, for the benefit of millers, never use a pick so dull that it does not cut freely, as it should be made too hard to stand much hammering. If you use it dull it shatters the steel and is pronounced too hard, when the fault is improper usage.

D. C. STONE.

Kingston, N. Y., Nov. 4, 1865.

[Our correspondent need have no diffidence in writing to this paper. Some of the most valuable communications that we receive are from practical men, making known some fact that has come under their personal observation. While we leave communications with as little alteration as possible, we always correct grammatical errors, and if the matter is not new, or if we think it will interest few or none of our readers, we throw the letter into the wastebasket, and it gives us no trouble whatever. We frequently receive the same explanation or statement from several correspondents; then we generally publish the first received, and, of course, throw the others away.—EDS.

Negative Slip.

MESSRS. EDITORS:—In the SCIENTIFIC AMERICAN of the 21st October, page 257, "Negative Slip," of the screw propeller is noticed from an English publication, and variously, but I think erroneously, accounted for. This so-called "negative slip" gives a greater speed to the vessel than demanded by the rotation of the screw.

An article from the present writer, T. W. B., of Oct. 8, 1864, page 233, on "The Peculiarities of the Paddle Wheel," contains the following solution of the above phenomena:—"Experience shows an advantage of the screw propeller over the paddle wheel, of 10 to 15 per cent, and the cause of this superior efficiency may be found in the partially dead water against which the screw acts, and yet without drawing back the vessel, owing to the continued advance of the vessel beyond the immediate influence of the backward ejected water."

This saving effect attends the stern-wheel and screw steamers of the West.

THOMAS W. BAKEWELL.

Cincinnati, Oct. 27, 1865.

Power Required to Drive Machinery.

MESSRS. EDITORS:—I take pleasure in giving you my experience as regards the amount of power I obtained from a water wheel I put up two years ago. I was at that time manager of a wood-turning establishment. We were running four of Weymoth's patent wood-turning lathes, at the rate of 3,500 revolutions per minute, by a three-inch belt on each spindle, stretched to its utmost capacity. Also, a gage lathe, using two three-inch belts, running at about the same rate of speed; one common turning lathe; one two-foot circular saw, at 1,800 revolutions per minute; one twenty-inch circular, 2,000 revolutions; one sixteen-inch, 2,500 per minute, and one small eight-inch circular saw, 3,000, with a circular cross-cut saw, of twenty inches, for cutting slab, plank, etc. We were also running a muley saw rotary feed, put up in the best manner, cutting 1,500 feet of hard-maple boards, or 2,500 feet of pine boards in ten hours. The whole was driven by one water wheel, four feet in diameter, using 360 inches of water under an $8\frac{1}{2}$-foot head and fall. The wheel was one of my own make, and is what we call a "direct-action" wheel, with a reaction bucket attached underneath the direct-action floats. The wheel, with its upright shaft, only cost me $110 to build and put up, it being principally made of wood. It ran perfectly steady, and almost as even as a steam engine with a governor.

B. A. STRATTON.

Towanda, Pa., Nov. 1, 1865.

Tarnishing of Silver-plated Ware.

MESSRS. EDITORS:—In the SCIENTIFIC AMERICAN of August 19, 1865, you published correspondence on the causes of tarnish on silver plated ware. Your correspondent says, if it would be interesting to your readers, he could give the best modes of preventing the tarnishing of silver ware and of removing the same from silver-plated or solid silver articles.

There are a great many in the retail trade that would like to be informed of the best modes of doing the same—myself being one of them. Please ask "E. W. C." to be kind enough to publish the information on the subject, and he would oblige a great many of your readers in this section of the country.

H. P., Watchmaker.

Peoria, Ill., Oct. 23, 1865.

SPECIAL NOTICES.

Alfred Platt, Waterbury, Conn., has petitioned for the extension of a patent granted to him on the 13th day of January, 1852, for an improvement in buckwheat fans.

Parties wishing to oppose the above extension must appear and show cause on the 25th day of December next, at 12 o'clock, M., when the petition will be heard.

Byron Densmore, New York City, has petitioned for the extension of a patent granted to him on the 10th day of February, 1852, for an improvement in grain harvesters.

Parties wishing to oppose the above extension must appear and show cause on the 22d day of January next, at 12 o'clock, M., when the petition will be heard.

OBITUARY.—Chief Engineer Cushman, U. S. N., who was upon the *Kearsarge* when she cruised for and sunk the *Alabama*, died on Thursday last.