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Contents:

(Illustrated articles are marked with an asterisk.)

SPECIFIC HEAT.

When a substance is heated, it expands, and its temperature is increased. It is evident, therefore, that heat is required both to raise the temperature and to increase the distance between the particles of the substance. The heat used in the latter case is converted into interior work, and is not sensible to the thermometer; but it will be given out, if the temperature of the substance is reduced to the original point. Thus, while heat is apparently lost, it is only stored up, ready to do work, and the substance possesses a certain amount of potential energy, or possibility of doing work. It would be easy to convert this potential energy into dynamic energy, or in other words make it do the work of which it is capable; and if we could measure all the actual and possible energy in the universe, we should find that the sum of the two was always constant, although each might vary in amount at different times. We may say, in passing, that ignorance of or unbelief in this principle has caused many to waste their lives in vain endeavors to construct perpetual motions, or to create force.

Now as different substances vary greatly in their molecular constitution, expanding and contracting the same amount with widely differing degrees of force, it is to be expected that the quantity of heat that will raise one substance to a given temperature may produce a less or greater degree of sensible heat to another; and we find in practice that such is the case. On the material theory of heat, this was explained by saying that one substance could contain more of something called caloric than another, and hence the term "capacity for heat" is still occasionally employed. But, adopting the mechanical theory of heat, we say that different substances require different amounts of heat to raise them to the same temperature, because the amount of interior work differs in each case, and because one body has more particles to be heated, for the same volume, than another. On this theory, we use the term "specific heat" instead of "capacity for heat," and define specific heat to be the number of units of heat required to raise the temperature of a unit of weight (say one pound or one ounce) of a body one degree. By a unit of heat, we mean the amount of heat required to raise a unit of weight of water, at its maximum density (about 39·1 Fahrenheit), one degree in temperature. The unit of weight is ordinarily taken as one pound. Very careful experiments have been made by Régnault on the specific heat of water at different temperatures, and a law has been determined for its variation: Specific heat at temperature 39·1° (T)=1 (C). Then $C=1+0{\cdot}000000309\times(T-39{\cdot}1)^2$, or the specific heat of water at any temperature, indicated by Fahrenheit's thermometer, is unity increased by 0·000000309 times the square of the difference between the given temperature and 39·1°. EXAMPLE: What is the specific heat of water at a temperature of 80°? Answer: $C=1+0{\cdot}000000309\times(80^\circ-39{\cdot}1^\circ)^2=1{\cdot}00052$.

The specific heat of many solids, liquids, and gases has been determined experimentally, by methods which we propose to explain. The values obtained in this way are average approximations, since the specific heat of a substance varies with the temperature. If a pound of water and a pound of mercury be heated to the same temperature, and allowed to cool, it will be found that the mercury cools about 30 times as fast as the water; hence we say that the specific heat of mercury is about one thirtieth (more accurately, 0·03332). This means of determining specific heat, called the method by cooling, was used by Régnault in many of his investigations on this subject.

Another method of determining the specific heat of a substance is that by fusion of ice, observing the amount of ice that is melted in cooling a given weight of the substance a certain number of degrees.

The method by mixture is readily available, and gives very accurate results if carefully conducted. As some of our readers may like to experiment a little in the subject of specific heat, we will give a few details of this process. It is conducted on the principle that, if definite weights of any substance and water, at given temperatures, are mixed together, the temperature of the mixture will depend upon their respective specific heats. The vessel in which the water is placed should be surrounded with non-conducting materials to prevent the radiation of heat, and should contain a sensitive mercurial thermometer, finely graduated. The substance, if a liquid, can be heated in another vessel; if a solid, in some heated liquid; and if a gas, it can be heated in a closed vessel and plunged into the water, a correction being applied for the heat imparted to the water by the containing vessel.

It is evident that when a heated substance is immersed in the water, all of the heat lost by it is not given up to the water, some being absorbed by the metal of which the vessel containing the water is composed, and some being absorbed by the mercury and glass of the thermometer. The weights of these substances can be reduced to equivalent weights of water, and added as a correction. Thus, let W = weight of water employed, P = corrected weight, A = weight of mercury in thermometer, a = specific heat of mercury, B = weight of glass in thermometer, b = specific heat of glass, C = weight of vessel containing the water, c = its specific heat. Then $P=W+(A\times a)+(B\times b)+(C\times c)$, or the corrected weight of the water is equal to the actual weight increased by the products of the other materials absorbing heat multiplied by their respective specific heats. By using this corrected weight in the calculations, we take account of all the heat absorbed by the materials of which the instrument is composed. We will now show how to calculate the specific heat of a solid or liquid, from data obtained by experiment. Let M = weight of substance, s = its specific heat, t = original temperature of water, m = temperature of the water after the heated substance has been immersed in it, T = temperature to which the substance is heated. Then the number of units of heat lost by the substance, when it is put into the water, must be the weight of the substance multiplied by the number of degrees of heat lost multiplied by the specific heat of the substance, or $M\times(T-m)\times s$, and the number of units of heat gained by the water will be its weight multiplied by the degrees of heat gained, or $P\times(m-t)$; but as what the water gains is just equal to what the substance loses, we must have $M\times(T-m)\times s=P\times(m-t)$, or $s=[P\times(m-t)]\div[M\times(T-m)]$; hence we say that the specific heat of a substance is equal to the product of the corrected weight of the water multiplied by its increase of temperature, divided by the weight of the substance multiplied by its loss of temperature. EXAMPLE: Suppose that we have 2 pounds of water in a copper vessel weighing 0·5 pounds, and that the mercury of the thermometer weighs 0·1 pounds, and the glass, 0·3 pounds; also that a solid or liquid (weighing 0·75 pounds, whose specific heat we wish to determine), when heated to 180° and put into the water, raises the temperature of the latter from 60° to 70°. The specific heats of the copper, mercury, and glass, will be found in any table of specific heats; and applying the rules, we find that $P=(2+0{\cdot}1\times0{\cdot}03332)+(0{\cdot}3\times0{\cdot}19768)+(0{\cdot}5\times{\cdot}09515)=2{\cdot}110211$ pounds, and $S=(2{\cdot}110211\times10^\circ)\div(0{\cdot}75\times110^\circ)=0{\cdot}25578$.

Te find the specific heat of a gas, it must be enclosed in a vessel and heated, so that the heat imparted to the water is received not only from the gas, but also from the containing vessel. If we call E the weight of the vessel, and e its specific heat, we shall have the equation $M\times(T-m)\times s+E\times(T-m)\times e=P\times(m-t)$, whence $s=[P\times(m-t)]\div[M\times(T-m)]-[(E\times e)\div M]$, or the specific heat of a gas is equal to the quotient of the product of the corrected weight of the water and its gain of temperature divided by the product of the weight of the gas and its loss of temperature, diminished by the quotient of the product of the weight of the vessel containing the gas and its specific heat, divided by the weight of the gas. EXAMPLE: If we have 0·25 pounds of a gas enclosed in a copper vessel weighing 0·5 pounds, which (on being heated to 200° and put into the water, the instrument being the same as in the last example) raises the temperature from 60° to 68°, what is its specific heat? By the rule: $S=[(2{\cdot}110211\times8^\circ)\div(0{\cdot}25\times132^\circ)]-[(0{\cdot}5\times0{\cdot}09515)\div0{\cdot}25]=0{\cdot}19968$. There is one other correction, of which we have not spoken. Some of the heat is lost by radiation, though this will be very slight if the apparatus is properly constructed. The amount can be ascertained, however, by experiment: heating the water, and observing how long it takes to lose a given number of degrees of heat. Tables of the specific heat of various elementary and compound substances will be found in most modern text books on physics.

CAMPHOR.

A correspondent, who has suffered from the undue use of camphor, asks for information concerning its usual effects upon the system. It should be known that the physiological action of camphor is not yet understood; but judging by the symptoms that follow the taking of a moderate dose, we are justified in calling it a nervous stimulant. It is somewhat like opium and alcohol, therefore, in its action, when given in small quantities; but when taken in large doses, it causes excessive irritation to the nervous system, producing convulsions and death.

Camphor has another action, more important to be mentioned because many people, depending on this medicine to cure all the trifling pains of life, are constantly taking it; this action is to irritate and congest, and finally to inflame, the mucous lining of the stomach, causing in the milder cases a form of dyspepsia, and in the more aggravated, ulceration of the stomach. From these two actions, namely, that of nervous stimulant and of local irritant, come all the good and evil of its use. As to its constant employment, the same reasoning will apply as to the use of other stimulants. However beneficial opium or alcohol may be in sickness, every one will acknowledge that opium eating or tippling is dangerous to health. Moreover, investigation has established the fact that the constant use of stimulant, of whatever kind it may be, results in degeneration of nervous power. If we remember, also, that camphor produces local injury to the stomach, we readily see how unsuited this drug is to be a household remedy.

Let us add a word for the benefit of those who depend on their "bottles of medicine" for good health. There can be no greater harm done to the constitution than to take medicine unnecessarily If a person is not sick enough to ask advice of a physician, he is not sick enough to need medicine, and he will recover quite as rapidly by leaving the feeling of *malaise* to the cure of the great physician, the natural renovating power of his system.

CRUDE PETROLEUM FOR FUEL AND FOR ILLUMINATING GAS.

To the Editor of the Scientific American:

I find two recent articles in your paper which I think demand some correction or modification. I refer to the editorial entitled "The Flowing Oil Wells of Pennsylvania," etc., and to an article copied from the *Journal of Gas Lighting* entitled "Mineral Oils for Gas." Through the courtesy of a friend, recently, I was invited to go to the shops of the Philadelphia and Baltimore Central Railroad Company, located at Lamokin, Pa., to witness experiments in burning crude petroleum as a fuel for stationary engines. I found, upon a careful examination into the process, that it was being successfully and economically done. In starting the fire, a pan containing two or three gallons of benzine is placed immediately under the burner and cylinders, and ignited; and when consumed, the cylinders are sufficiently heated to turn on benzine, into the inside cylinder, which rapidly vaporizes. When the cylinders are cherry red, and ten pounds of steam are obtained, the benzine is turned off and the steam and crude oil turned on. It was found necessary to use benzine until the cylinders were properly heated, as crude oil would not all vaporize unless the cylinders were red hot. After that is attained, there appears to be no difficulty in burning crude oil; and on an examination of the cylinders after the experiment was made, there was no evidence of carbon; but on the contrary, they were as clean as when they left the hands of the machinist. [The vaporizing apparatus, we understand, consists of a burner, an iron cylinder in which steam is superheated, and another iron cylinder in which the superheated steam is brought into contact with the crude petroleum.—EDS.]

In a conversation with the Master Mechanic of the road, Mr. Danfield, he informed me that, although he doubted its practicability before the experiment was made, he was now thoroughly convinced of its adaptability for steam purposes; and it being against his previous convictions, he had used all the appliances that the shops afforded to break down its power, but without effect.

However, what I particularly wish to get at is the economic view. You state that, "in markets where coal is worth $6 per tun, petroleum must be supplied at 3½ cents a gallon or $1 per barrel, in order to compete as a fuel with coal." In actual experiments made in the above case, at Lamokin, Pa., seven gallons of crude oil per hour was consumed on an average for four days, at a cost of forty cents per hour. When wood or coal is burned, the cost is from seventy to eighty cents per hour, in the same engine. This would seem to leave a wide margin between your ideas and the actual experiments made.

In the article on "Mineral Oils for Gas," the writer admits that, if the carbon could be got rid of, there would be no doubt that mineral oils would be found a most useful substitute for coal in the production of gas of a high illuminating power. This process to my mind most effectually disposes of the carbon objection. The carbon is not only got rid of, but is actually made fuel to the flame. Mr. Kendrick, the inventor, claims that he can make a pure fixed gas by this process at 60 cents per 1,000 feet, with oil at 8 cents per gallon.

These facts, or rather experiments, seem to be at variance with your editorial and the article in the *Journal of Gas Lighting*. I have for many years been a reader of your valuable paper, and I am constrained to write to you these facts as they came under my observation, for the purpose of getting your opinion upon them. If the process which Mr. Kendrick employs in burning crude oil is not practical, will you oblige me by pointing out its defects?

Locomotive No. 4 on the Baltimore Central Railroad is now being fitted up with one of Mr. Kendrick's oil vaporizers and burners for the purpose of running with oil as a fuel. It will be complete in about ten days from this writing, when further developments will, no doubt, be made. I understand that it is the opinion of the officers of that road that it will prove a success, not only in point of economy but in getting rid of the handling of coal, smoke, sparks, etc., that are so annoying to passengers.

Norristown, Pa. HENRY L. ACKER.

REMARKS BY THE EDITOR.—Our correspondent has omitted to give the exact quantity and cost of coal and wood, as delivered at the place of trial. He has also failed to say

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whether the fuel used in converting the water into steam, before the latter is superheated in the apparatus, is included in his statements of cost. It is very evident to us, from the alleged difference in the resulting costs per hour, that our correspondent has been misinformed on that head, and we need the full data in order to point out the error.

Making the ordinary allowance of 4 pounds of coal per horse power per hour, the amount consumed by the 40 horse power engine would be 160 pounds per hour. The expense, according to our correspondent, was 80 cents, which is half a cent a pound, or $11.20 per tun. This appears to us to be a high price for coal in Lamokin, Pa., which we believe is on the railway and only fourteen miles from Philadelphia, where coal is selling for less than $5 per tun. It appears to us that coal ought to be obtainable in Lamokin at a price not exceeding $5 per tun, at which rate the cost of running the engine in question would be 36 cents an hour. The comparative calorific values of crude petroleum and coal are as 2 to 3. That is to say, 2 pounds of petroleum are equal to 3 pounds of coal. Hence, if it requires 160 pounds of coal per hour to run the aforesaid engine, it ought to require 106⅔ pounds of crude petroleum to do the same duty, or a little more than 15¼ gallons of petroleum, allowing 7 pounds to the gallon. Our correspondent, however, states that the cost of running the engine, when petroleum was used, was 49 pounds or seven gallons of oil, costing 40 cents per hour; which would make the cost of the crude oil, delivered at the establishment he refers to, $2.40 per barrel. It may be that, in the present depressed state of the crude oil market, the article can be delivered in Lamokin at $2.40; but if so the price is exceptional.

We have stated the relative calorific values of the oil and coal at 2 to 3, which gives the oil 50 per cent greater heating power, weight for weight, than coal. This is a result deduced from the chemistry of combustion and from the records of careful engineers, after many trials, allowing every possible point in favor of the oil. But if the information furnished by our correspondent is correct, then they get, at Lamokin, more than one hundred per cent more of heat from petroleum than from coal, a statement which we can hardly credit. We hope that our correspondent will give us the exact data as to the respective costs of oil and coal, at Lamokin, and such other information as may assist the elucidation of the real economics of the subject.

In respect to the manufacture of illuminating gas from crude oil, our correspondent gives us no information further than the statement of the inventor, which, we understand, is not based upon actual experience in the manufacture of permanent illuminating gas, but is an opinion he has formed, judging from the ease with which he produces combustible gases by his apparatus. We think it probable that he will find it more difficult to make permanent illuminating gas than to run a steam boiler with crude petroleum. We shall be happy to receive and chronicle any new facts concerning either of the foregoing subjects.

RESCUE OF THE REMAINING SURVIVORS OF THE POLARIS.

The good news comes to us from Dundee, Scotland, of the safe arrival there in good health of all the remaining survivors of the Hall arctic expedition; consisting of Captain Sidney O. Buddington and twelve others. After leaving their encampment on the Greenland coast, which they did in the latter part of June, 1873, in open boats, they sailed southward, encountering many dangers and exposed to the severest hardships. They landed at various points and searched everywhere for cruising whalers. On the 20th of July, 1873, they had the good fortune to fall in with the Ravenscraig, a Scotch whaler, on board of which they were hospitably received, and subsequently conveyed to Dundee. They return to the United States at once.

Captain Buddington reports that, after that fearful night which separated him and his vessel from his comrades upon the ice, he never saw them again. It was with difficulty that the Polaris was kept afloat that night, and they momentarily expected she would go down. But they finally reached the shore, where the vessel was beached, and the party wintered in a hut on the land, being supplied with skins and walrus meat by the natives.

The incidents and results of this latest and most eventful polar expedition may be briefly summed up as follows:

On the 29th of June, 1871, the steamer Polaris, Captain Charles F. Hall, sailed from New York on a voyage of arctic exploration. In August, 1871, she had reached latitude 82° 16′, the highest point ever attained by any vessel. Soon after this the ship went into winter quarters at Polaris Bay, latitude 81°38′, and Captain Hall organized sledge and boat expeditions with a view to further northerly explorations. Soon after his return from one of these expeditions, he was taken ill and died, on November 8, 1871. He was buried on shore, and there his remains rest, near the north pole which he so ardently endeavored to reach.

On the death of Captain Hall, Captain Buddington, previously second in command, became master. On the opening of the ice in August, 1872, Captain Buddington, finding further progress northward impossible, determined to return home, and the ship started for the south. She was now unfortunately caught in the ice, and drifted down helplessly for two months, receiving injuries which caused her to leak badly. Such was the continual crushing of the ice against the vessel that Captain Buddington caused a portion of the provisions and a part of the ship's company to be landed on the ice, expecting that all the others might at any moment be obliged to follow. On the night of October 15, 1872, a terrible storm and utter darkness set in, during which the Polaris broke away from her icy moorings, leaving the hapless party of nineteen persons on the ice. They had provisions, boats, and clothing. Next day they saw the steamer, but were themselves unseen by those on board. Days and weeks passed, and still the little party waited for relief, clinging to the ice cakes, exposed to the most extraordinary perils, washed by the seas, drenched by the rains. Their supplies of food were swept away, but one or two guns were still retained, with which they occasionally succeeded in killing seals and bears, and this preserved their lives. On the 30th of April, 1873, after 6½ months dreary drifting, they were descried upon the ice by the British sealing steamer Tigress, rescued, and safely landed at St. John's, Newfoundland.

The recent rescue and landing of their former companions at Dundee completes this remarkable arctic narrative, which for thrilling adventure and extraordinary incident has no parallel in the previous records of fiction or fact.

THE FAIR OF THE AMERICAN INSTITUTE.

Judging from the number of articles already in position in the Hall of the American Institute, and from the fact that, as we are informed, the applications for space are in excess of the accommodations provided in the large area, the forty-second Fair has every prospect of surpassing in no small degree its predecessors of last year. The exhibition of 1872, though in many respects a decided improvement (especially in mode of management) on previous displays, was deficient in number and variety of new devices entered, a fact probably due to the attention of the people being diverted by the excitement of the political campaign; while such defects as existed in the conduct of its affairs may with fairness be ascribed to official experience in endeavoring, for the first time, to put in operation many radical and much needed reforms.

We have already noted several changes in the organization of the management. So far as we understand the latter, the occupation of the managers, save as a body, seems gone, and the personal control with which departmental committees have heretofore been invested, regarding the articles in their respective sections, is given to one general superintendent, Mr. Charles W. Hull. A board of directors, regarding whose duties no official whom we have yet met seems to have any very clear idea, has been organized: while the sub ordinate officers, clerks, etc., remain as before. The post of superintendent of machinery, a position invented last year and ably filled by Mr. R. H. Buel, has been rechristened as chief engineer, and is in the hands of Mr. John T. Hawkins, an engineer and inventor quite generally known.

Several alterations for the better have been made in the interior of the building. A large amount of space in the passage from the main hall to Third avenue has been converted into rooms for exhibitors, judges, and the press, affording accommodations both necessary and ample. The silvered monstrosity, supposed to be a statue, which surmounted the soda water fountain is conspicuous by its absence, and we are also pleased to note that the badly distorted and much confused Goddess of Liberty, which, accompanied by an impossible category of implements, formed a scenic decoration on the main arch facing the entrance, has been removed to a less conspicuous position. The work of art substituted is a shade better, representing a more appropriate subject; but as a production, it would be difficult to discover one in which every law of perspective or drawing is more systematically set at naught. We can only repeat, in this connection, remarks already made to the effect that, while such admirable decorative artists as Gariboldi and others who might easily be named are within access, it is hardly creditable to the Institute to exhibit second rate efforts ostensibly as the best representatives of the progress of this branch of art.

It is hardly possible to forecast with much accuracy the nature of the coming display as regards numbers of especial articles. There appear to be fewer sewing machines than ordinary, and more heavy articles in the machinery department; but, as yet, arrays of empty cases are more prominent than complete exhibits. Space, we understand, will not be reserved, no matter how long ago bespoken. It is the intention to fill up the building as quickly as possible, and exhibitors who imagine that they can come long after the Fair is in progress, and thus avoid waiting through the first few weeks and slim attendance incident to that period, will, we fear, find themselves debarred altogether.

In noticing the various entries, our custom of occasionally strolling through the building and commenting briefly on such as strike us as novel, ingenious, and interesting, will be as heretofore followed. Mere lists of exhibits are doubtless very entertaining to the proprietors as gratis advertisements, but, to the general reader for information, they are excessively dull.

KNITTING AND WEAVING MACHINERY

is represented in quite full force. At present Lyall's positive motion loom and corset weaving apparatus are in operation. The last mentioned device is one of the most important and interesting in the Fair; but as we desire to obtain some further particulars regarding it, the detailed explanation which it deserves is deferred to next week's notes. Messrs. Tiffany and Cooper, of Bennington, Vt., exhibit two knitting machines, one of which is in operation. The invention is designed to manufacture ribbed tops for stockings or cuffs. Briefly, there are two sets of needles, upon one of which, standing vertically, the thread is placed. The second set are barbs, and come down from above, catching the stitch. Then a presser, acting against the point of the barb, presses it in, making an eye, over which and the old loop it drives the stitch. The thread leads from bobbins above to horizontally moving guides. One set of the latter operate until a sufficient length of material is knitted; a bell then rings, and a second series of guides, carrying a lighter thread, come in play, thus marking a space for the division of the fabric. The cuffs or bottoms are turned out with perfect welts, slack courses, and splicing threads, all put in without stopping the machine. By using different colored yarns on the two sets of guides, fancy articles may be produced. From three to ten rolls of fabric are knitted at a time. The mechanism is remarkably well contrived; and, as exhibited, works to a charm. From twenty-five to thirty-five dozen ribbed tops, we learn, can thus be made in a day.

THE MAIN ENGINES

this year are one of 125 horse power, built by Jerome Wheelock, of Worcester, Mass., and driving a 22 inch belt; and, on the other side of the passage, a Hampson & Wheelock machine, of 20 horse power. The large engine is somewhat on the Corliss plan and is a fine piece of workmanship. The valves are nearly underneath the cylinder, and are of the ordinary slide description, but are made to taper outwards in their box, so that the pressure from inside keeps them tight, thus obviating the necessity of stuffing boxes. There is a variable cut-off, arranged in the chest just between the valves, which communicate with the governor.

THE DELAMATER HOISTING MACHINE

is a gigantic affair, capable, we are told, of lifting 15,000 pounds two hundred feet per minute. The engine is a 40 horse power Rider horizontal, which connects with a main fly wheel, 8 feet in diameter and 14 inches in face. The mechanism, though large, is quite simple. The drum, which is five feet in diameter, is loose on the main shaft, and is operated by gearing on a smaller shaft which communicates with the main shaft by friction pulleys. The latter are thrown into or out of gear by moving the small shaft by a toggle joint and lever; so that the drum is either rotated by the cog gearing or left to revolve loosely in the contrary direction for lowering, its motion being then controlled by a suitable brake.

A SILK-MEASURING APPARATUS,

known as Dunn's patent, is an ingenious little arrangement for determining the length of thread or silk, and thus detecting any fraud in case the same is purchased by the pound. It consists of a light wheel, fitted on a sliding pinion, traversing the surface of the spooled thread, and is connected with clock work moving two registering dials. The thread is thus measured after it is spooled, while the operation of spooling is not interfered with. Another form of the same device is exhibited for the use of consumers who desire to test the length of thread already spooled. A crank and spindle wind the thread on a new spool, and dials indicate the amount reeled off. This operation is usually so tedious that a small machine, which seems to perform its work very quickly and accurately and which can be readily attached to the corner of a counter or table, will doubtless prove acceptable to both dealers in and consumers of thread. While this device winds the material, another machine is exhibited for roughing out the spools. In fact, the invention makes almost any small wooden article, in the way of bungs, spool blanks, pill boxes, etc. Mr. J. T. Hawkins is the inventor, and the apparatus was described about a year ago in our columns.

MAKING BUTTON MOLDS.

At present, however, a novel attachment has been combined with it, in order to make button molds of the large size usually worn by ladies on redingotes. The improvement is a revolving steel head, in a cavity in which are arranged cutters and a small drill. The stick of wood, squared to suitable size, is fed by an ingenious appliance into this opening. There it encounters, first, a pair of cutters which turn off the edges, and then another set which give its end a convex form. Meanwhile the drill pierces a small hole in the center. A cam arrangement then comes in play, and carries the wood over against a circular saw which cuts off the mold. The stick then returns, and the same operation is repeated. The speed of the machine is at the rate of 5,000 revolutions per minute, and a mold is finished every second. Three hundred gross, we were told, can be turned out in a day.

Among the small inventions, so far exhibited, is a

SEWING MACHINE ENGINE,

which consists of a little oscillating cylinder attached to the table, having a driving pulley in line with the small wheel of the machine. A boiler holding enough water for a day's work supplies steam, and occupies a small space on the floor in rear of the apparatus. The throttle valve regulates the supply of steam and is connected with the treadle of the sewing machine, so as to be governed with the foot.

New Exploration of the Amazon River.

Among the most recent exploring expeditions is that undertaken during the present year for the exploration of the Amazon river, by Professor James Orton, the well known naturalist, of Vassar College. We have just received our first instalment of correspondence from him, the publication of which we shall begin in our next issue. Our latest advices from this enterprising traveler are dated August 19, 1873, at which time he had paddled one thousand miles up the Great River, taking notes and making surveys and observations *en route*. He had an immense distance yet to go before reaching the Cordilleras, which he expected to cross, and to reach home *viâ* Panama.

The letters of our correspondent are full of interest concerning the marvelous region which he is exploring. He speaks of unbroken forests covering a space eleven hundred miles in diameter, and other equally astonishing revelations of Nature.

THE Neapolitan papers state that, from observations taken on Mount Vesuvius, new earthquakes are expected.

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