with a pattern printed in a white opaque ink with a pearly luster. Colored wall papers are rarely used, except for halls and vestibules. This wall paper, like other Japanese papers, is made only in small sheets.

The imitation leather, or leather paper, is made of a special kind of paper, *tozasenka-gami*, of which several layers are employed to give the requisite strength. The inner layers are saturated with oil, *ye-no-abura*, from the fruit of the *Celtis Wildenowiana*, giving the material softness and flexibility. The morocco-like surface is obtained by pressure from an engraved wooden block, and finally the whole is covered with a varnish of lacquer.

"Herr Von Brandt, formerly German Minister to Japan, in a paper* read before the German Asiatic Society, gives a very minute and interesting account of the method of making crape paper, from which I condense the following description: The paper to be craped, ordinary Japanese paper, with some colored design printed upon it, is dampened and spread in a pile on a large slab of wood, in such a way that the edges of no two sheets shall be parallel. Alternating with these sheets are pieces of ordinary white paper, placed between the colored sides of two printed sheets, and sheets of *takanaga* paper. The whole pile is then tightly rolled on a smooth stick, and covered with a long band of dampened linen, rolled diagonally and tightly over the whole. The stick with its roll of paper and cloth is then pressed longitudinally in a rude lever press. The arms of this press are provided with holes through which the ends of the round stick may pass, so that the roll of paper alone receives the pressure. The *takanaga* sheets are made of strong paper, composed of several thicknesses of ordinary paper fastened together with rice paste, which have been previously creased in regular parallel corrugations by a similar process, and which serves to impart the desired regular creasing to the colored sheets when they are together compressed as described. After the first compression, the paper is unrolled from the sticks, and the sheets are separated. The *takanaga* paper is smoothed out, and the pile made up as before, but in such a way that the creasing may come at an angle to the former fold of each sheet. The process is thus repeated seven times, and the sheets finally dried. The paper thus treated resembles crape very closely both in texture and in elasticity.

"The Japanese paper, excellent as it is, does not supply all the wants of the people; and this account would be imperfect did I not allude to the manufacture of paper from rags, after foreign methods, which is now being conducted on a large scale in several parts of Japan. In Tokio alone there are three or more papermills, fitted with the most approved American and English† machinery, and capable of turning out large quantities of paper. The government consumes large amounts of foreign writing paper; the newspapers use foreign printing paper; and the educational institutions require, in addition to these, drawing paper, book paper, etc. All of these are now made in Japan; and it seems likely that the rude and expensive process of making paper by hand, which I have described in these pages, is soon destined to disappear before the power of machinery, which makes a better paper, at less cost, from inferior and less expensive material.—*Henry S. Munroe, E.M., in American Chemist.*

* "Die Aufertigung des Krepp papiers, Tshirimeng mi," Mittheilungen des Deutsches Gesellschaft, 5tes Heft, Juli, 1874, s. 5.

† See Engineering, vol. XXI. pp, 400, 422.

Correspondence.

The Centennial Excursion by the Pennsylvania Railroad.

To the Editor of the Scientific American:

President Thomas A. Scott recently extended to the Centennial judges and many of the foreign commissioners an invitation for a trip over the Pennsylvania Railroad and some of its branches, so planning the same that it should combine, with a practical examination of the line and its auxiliaries and resources, all the features of a pleasure trip as well. By the courtesy of other roads the train ran into New York State to see Watkins Glen, Genesee Falls, and Niagara.

This excursion, occupying five days, was made by about 175 gentlemen, representing the various nationalities of the world, and was in every respect a most delightful affair. The party was conveyed by special train, ample in its accommodations, and represented the convenience of modern travel, including the luxury of elegant lunches while running at fifty miles per hour. The company had provided accommodations along the route at the best hotels, and each evening brought a banquet to crown a pleasant day. While traversing the superb roadway of the main line, occasional stops were made to allow an inspection of some of the fine iron bridges designed by Mr. Wilson, the engineer in charge of these structures. At Altoona the extensive shops of the company were visited; the various methods in the transforming of raw materials into engines, cars, and the various items pertaining to the outfit of a railway were examined with great interest. There was much careful note-taking by the foreign visitors; and indeed a fair field for observation is presented here, as operations are on the largest scale, and the assemblage of mechanical appliances is something marvelous, from the giant derrick that picks up a whole locomotive as if it were a baby, and moves it tenderly to any desired point, to the delicate scroll saw that cuts dainty designs in birdseye maple. The testing of axles was very interesting, as showing the extreme care exercised by the company; one could hardly witness it without an increased feeling of security.

One hundred axles are made from a given melting, and from that number, five are selected promiscuously, as fairly representing the quality of the metal. These are separately laid between heavy blocks which support the extreme ends, and a wedge-shaped iron, weighing 1,640 lbs., is dropped upon the middle, from hights varying from 25 to 40 feet. If they break, the whole one hundred are returned to the furnace; if not, the ninety-five are used; only the five are remelted, these having, of course, been strained by the severe test. Several were thus tried before the visitors, not one breaking. The great steel works of the Cambria and Pennsylvania Companies were also visited, and afforded much valuable information as to the improved method of manipulating iron. On the grounds of the last named, a steam hammer, striking blows of 200 tuns weight, was seen in operation.

At Williamsport, an opportunity was afforded to see one of the largest lumber mills of the country, a huge monster that drags up the helpless logs from the river and, with a roar and a rush, turns them into a million and a quarter of marketable boards per week, feeding itself on the sawdust which is led automatically under the boiler. Rather monotonous food, though it be "fine board," as some one remarked.

The visit to the oil regions was a very interesting feature of the trip, this industry being so peculiarly American. The sight of derricks innumerable, scattered over a strip of country 150 miles long, some working, others silent and abandoned, was suggestive of the singular history of this most singular traffic. It is now conducted upon a methodical and paying system. Thorough investigation was made of the processes by which the petroleum is pumped from depths of 1,400 feet to the tanks of the different owners, whence, after being gaged, it is drawn by union pipe lines, as they are called, and sent through iron veins, nine miles or more, to the railway station, where, loaded into iron cars, it is dispatched on its mission of lighting the world, and reducing the price of gas. During the visit to this strange region, an incident, not in the programme, occurred; a tank containing a million gallons oil was struck by lightning and burnt, causing a scene very impressive, though not without special pleasure to a gas director. The latest decision of Science is that petroleum is not a distillation from coal but from immense masses of coraline deposit. Fossil coral is found overlying the spongy sandstone in which the oil occurs.

The scenery through the diversified valleys of New York and Pennsylvania was greatly admired; while the romance of Watkins Glen and the grandeur of Niagara each contributed their peculiar enjoyment to the party, and the distinguished gentlemen returned to Philadelphia, enthusiastic over the trip. Colonel Scott was unable to accompany them, but was happily represented by his subordinates, who not only illustrate, in the highest sense, the rare abilities necessary to the best type of modern railway management, but are thorough gentlemen, understanding how to exercise republican hospitality with a grace which called forth the admiration of the foreign and the pride of the native born guests. It is not too much to say that their courteous consideration put hunger, thirst, and discomfort out of the question, and rendered the trip, from beginning to end, a continual holiday.

One very delightful fruit of the excursion was the evident fraternal feeling produced among the gentlemen of different nationalities, brought together under circumstances so favorable to the development of pleasant sentiment. Its expression was frequent and earnest; and when, after a superb dinner at the Cataract House, Niagara, they joined voices in singing with the band each others' national airs, it seemed as if one of the noblest results to go out from our Centennial observance was already in part realized, the quickening of the sentiment of universal brotherhood. Honor to Colonel Scott for conceiving and carrying out so delightful and so useful a scheme. G. S. D.

Aerotherapy.

To the Editor of the Scientific American:

In your issue of July 29, it is stated anomously, that aerotherapy in medical treatment by compressed air is new. I saw it in 1857 at Benn Rhydding, in Yorkshire, England, at a great hydropathic establishment, where there was an apartment of iron, very handsomely fitted up, for the purpose. And in 1875 I saw another, which had been in operation for many years at the Townsend House, the spacious and elegant establishment of Dr. Grindrod, at Malvern, Herefordshire, England.

Portland, Me. NEAL DOW.

Logwood Inks.

Logwood inks have been much employed for several years on account of their cheapness and the beauty of their tint; the greater part of the so-called copying inks are prepared at the present time from this coloring matter. Both the rasped logwood and the commercial extract are subject to falsifications; it is well, therefore, to make use of the whole logwood, and rasp or grind it as required; it is necessary, also, to consider the presence of an excess of moisture and of foreign substances, which may be used to adulterate it, as insoluble substances, cutch, etc.

The inks prepared from logwood are of four classes: 1. Inks with logwood and chrome; 2, inks with logwood and alum; 3, inks with logwood and copper; 4, inks with logwood and iron

Runge, in 1848, discovered that a dilute solution of the coloring matter of logwood, to which had been added a small quantity of neutral chromate of potassium, produces a deep black liquid, which remains clear, does not deposit, and may be employed as an ink. Perfectly neutral litmus paper is not affected by it; it does not attack pens; it is very cheap, and so easily penetrates writing paper that it cannot be removed by washing even with a sponge—in a word, it has all the properties of an excellent ink. On exposure to the air in the inkstand, it sometimes decomposes very rapidly, its coloring matter being deposited in the form of large black flakes, which leave a colorless liquid above them. This gelatinization is a great defect in this ink, particularly as one does not know the precise conditions which determine it. Different means have been proposed to prevent this action; the best seems to be that of the addition of carbonate of sodium recommended by Böttger.

The author has used an ink prepared in this manner for upwards of two years, and has not observed any decomposition, although this may to a considerable extent be due to the fact that the inkstand employed was one which allowed but little exposure to the air.

To prepare this ink, take extract of logwood, 15 parts; water, 1,000 parts; crystallized carbonate of sodium, 4 parts; neutral chromate of potassium, 1 part.

Dissolve the extract of logwood in 900 parts of water, allow it to deposit, decant, heat to ebullition, and add the carbonate of soda; lastly, add, drop by drop, with constant stirring, a solution of the neutral chromate in 100 parts of water. The ink thus obtained has a fine bluish black color; it flows well from the pen and dries readily. The chrome ink powder of Platzer and the acid ink of Poncelet are imitations of the original ink of Runge.

An ink obtained from a decoction of logwood and chrome alum is not to be recommended; the characters written with it have little depth of color, and are of a somewhat greyish shade.

Decoctions of logwood to which alum has been added give a reddish or violet color, which darkens slowly, particularly with ink prepared from the wood and not the extract. Such inks prepared with alum alone are costly, because to obtain a sufficiently deep tint one is obliged to employ decoctions or solutions of the extract in a very concentrated condition. It is otherwise when a metallic salt is added along with the alum. Alum produces a reddish purple color in decoctions of logwood, while metallic salts produce in the oxidized solution of the coloring matter a precipitate of a black or bluish black color. These inks are analogous to the so-called alizarine inks; the ink is colored by the tint produced by the alum. Under the influence of air there is produced between the metallic salts and the coloring matter a reaction which determines the formation of a bluish black precipitate. To prevent as much as possible this action of the air upon the ink before it is applied to the paper, there is added, as in the case of alizarine inks, a trace of sulphuric acid, designed to dissolve the precipitate which maybe produced. This acidity of the ink has several disadvantages; it attacks the pens used for writing with it unless they are either of gold, platinum, or gutta percha. Sulphate of copper or sulphate of iron may be the metallic salt used in such inks—the former is preferable. One of the best formulas for this kind of ink is the following, given in proportions for a manufacturing scale: 20 parts, by weight, of extract of logwood are dissolved in 200 parts of water, and the solution clarified by subsidence and decantation. A yellowish brown liquid is thus obtained. In another vessel, 10 parts of ammonia alum are dissolved in 20 parts of boiling water; the two solutions are mixed, there being also added $\frac{1}{5}$ part of sulphuric acid, and finally $1\frac{1}{2}$ parts of sulphate of copper. The ink should be exposed to the air for a few days to give a good color, after which it should be stored in well corked bottles.

Böttger gives the following formula: 30 parts of extract of logwood are dissolved in 250 parts of water; 8 parts of crystallized carbonate of soda and 30 parts of glycerin of density 1·25 are added; and lastly, 1 part of yellow chromate of potassium and 8 parts of gum arabic, reduced to a powder and dissolved in several parts of water. This ink does not attack pens, does not mold, and is very black.—*E. U. Viedt.*

Facts and Simple Formulæ for Mechanics, Farmers, and Engineers.

Two hundred and seventy cubic feet of new meadow hay and 216 and 243 feet from large or red stacks will weigh a tun; 297 to 324 cubic feet of dry clover will weigh a tun.

Laths are $1\frac{1}{4}$ to $1\frac{1}{2}$ inches by 4 feet in length, are usually set $\frac{1}{4}$ of an inch apart, and a bundle contains 100.

A tarred rope is about one fourth weaker than untarred white rope. Tarred hemp and manilla ropes are of about equal strength. Wire rope of the same strength as new hemp rope will run on the same sized sheaves; but the greater the diameter of the latter, the longer it will wear. One wire rope will usually outlast three hemp ropes. Running wire rope needs no protection; standing rigging should be kept well painted or tarred.

The coefficient of friction of leather belts over wooden drums is 0·47 of the pressure, and over turned cast iron pulleys 0·28 of the pressure.

A mixture of 9 parts phosphate of soda, 6 parts nitrate of ammonia, and 4 parts dilute nitric acid is a freezing compound which will cause a fall in temperature of 71° Fah.

Three fourths of a cubic foot of water evaporated per hour will produce 1 horse power.

Cold blast iron is stronger than hot blast. Annealing cast-iron diminishes its tensile strength.

The safe load in tuns which an iron chain will withstand equals the square of the diameter divided by 9.