sium, made by passing nitrous vapor through a solution of cobaltous nitrate to which potassic hydrate has been added. A remarkable series of compounds of cobalt with ammonia have been observed and studied by Genth, Gibbs, Frémy and others. The employment of cobalt salts in a laboratory for the detection of manganese, alumina, zinc, etc., by means of the blowpipe, is very important to the analyst. The sensitiveness of cobalt salts to heat and moisture has been utilized in the production of sympathetic inks, which are invisible at ordinary temperatures, but are rendered visible and legible on heating. For this purpose the chloride of cobalt, mixed with a small quantity of gum or sugar, is very well adopted. This "magic ink," as it is called, is rendered visible by holding against a heated surface. It has lately been recommended as very suitable for postal card messages, which would thus be exempt from curious inspection. The sensitiveness of cobalt salt to moisture, which is indicated by a change from blue to a pinkish tinge, has been suggested and employed in the construction of a hygrometer or measure of moisture. In Paris, a late scientific toy is a flower barometer, which is simply an artificial flower of white paper which has been treated with a solution of cobaltous chloride. These flowers when exposed to the sun and dry air become deep blue, but when the air is saturated with moisture they turn of a pinkish hue, thus affording an approximate estimate of the condition of the atmosphere. Landscapes have similarly been painted with cobalt and nickel salts, which on heating develop the characteristic shades of sky and grass. The above facts contain in briefly condensed form the chief features of importance presented by the metal cobalt from a technical standpoint.—*Journal of Applied Science.*

Communications.

Coal Dust as Fuel.

To the Editor of the Scientific American :

Thinking it might interest the readers of your valuable paper, and also call out the experience of some others, I send you the following items of the difference in cost between coal and coal dust as fuel for steam boilers, it being my habit of always keeping a record of the amount of fuel used, kind, cost of same, also number of hours run. This account only includes the actual time run; besides which I have always kept up steam to 40 lbs., all and every night except Sunday.

Boiler is horizontal, 3 feet diameter, 15 feet long, with 24 3 inch tubes running the full length of boiler, grate surface 16 square feet. It supplies steam to the engine, cylinder 9 x 18 inches, steam cut-off at three quarter stroke. It drives an elevator, hoist 40 feet, capable of carrying a safe load of 4 tons, 1 pair of heavy rolls, 1 large skiving machine, 1 McKay sewing machine, 1 No. 2 Sturtevant blower, 1 sand-paper machine, and 30 Howe and Wheeler & Wilson manufacturing sewing machines. It also supplies steam to heat the factory, which is a three story and basement, with 128 large windows, 5 outside doors, and 8 scuttles in the upper story. It furnishes steam to an office heater also. The comparison of coal is as follows.

Amount of coal burned........	94½ tons.
Cost of coal burned...........	$567.00.
Number of hours run.........	2,698.
Average cost per hour........	21c. and a trifle over.

Amount of dust burned	133¼ tons.
Bost of dust burned...........	$203.37.
Number of hours run.........	3,088.
Average cost per hour	6½ c.

The coal was used during the first 18 months the boiler was ever used, consequently everything was in the most favorable condition, while at the time I commenced to burn the dust, scale had accumulated to the thickness of at least 1-16 inch.

Another thing, I was allowed much more time to clean the boiler when burning coal, as the business was quite slack, as compared with it since using dust. I find that it takes no more time to fire with dust than with coal, if as much; but it is very dusty work and trying to the eyesight, while the heating surface of boiler requires double the care to keep it free from ashes and soot. The expense incurred in making the change did not exceed $200.

Milford, Conn. WALTER F. SAGE, Eng.

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Canceling Inks and Pads.

To the Editor of the Scientific American :

Noticing in the SCIENTIFIC AMERICAN of October 13 a receipt for marking ink for Post Office use, I give those used in my office for the last two years. I have tried printer's and a great variety of other inks, and find this the best. To one ounce of good sweet oil add, for black, an equal volume of lampblack, and mix thoroughly in a mortar. For blue, use Prussian blue in same proportions. For red, use 6 grains aniline red, dissolve in a small quantity of alcohol, say 1 drachm fluid measure, then add 1 ounce glycerin. To make a pad, take a piece of inch board, previously planed smooth, 5 inches square, cut pieces of any heavy cashmere goods the same size, and place them in layers, say an inch deep, on the block, and smear the ink on alternate layers of the cloth, then sew over all a piece of the same cloth, tacking around the edges of the block to hold the outside cloth firm. Postmasters will find the above excellent for postmarking letters. J. M. H.

Silverton, San Juan county, Col.

The Manufacture of Jewelry.

Fine gold, both on account of its higher value and its ductility, being more difficult to work by modern processes than when alloyed with other metals, has been almost universally succeeded by alloys of a lower grade. For diamond mountings and the better order of jewelry, 18 carat gold has found general acceptance, while for jewelry in general, 14 carat is used. Due to the present depression of business, alloys from 4 carat to 12 carat have been extensively employed for cheap ware. According to the relative proportion of silver and copper added in alloying, the yellow or red color of the gold is regulated. Fine gold being taken as 24 carat, 18 carat red gold consists of fine gold, 18 parts; fine copper, 5½ parts; fine silver, ½ part. Total, 24 parts.

The shade more or less red being regulated by the greater or lesser quantity of silver. For yellow gold, to the 18 parts of fine gold, even quantities of silver and copper are added, and the shade regulated by copper. Green gold is made by adding to the 18 parts of fine gold, silver alone; and blue gold, though very difficult to make, due to iron not making an intimate union with gold, is produced by adding 6 parts of iron to 18 parts fine gold. The alloys are melted in a crucible with the addition of borax as a flux, and cast into ingots—either as bars or plates. These are hammered or laminated according to the purpose for which they are intended. The diamond mounter, or jeweler proper (for the factory workman who works after given rules and patterns, and whose whole duty is to solder together the stamped parts that are given into his hands, scarcely merits the name), receives the crude metal and the design, generally in the form of a drawing, and the execution is left to him. We will select a design and follow him in its development, of two pearls and thirty-one diamonds given him. The main points to be kept in view are to show off the stones to the best advantage, and, if they are perfect, to have no more gold than is absolutely necessary, so that their effects may not be marred. It will first be necessary for him to make the "sittings" for the stones. For this purpose he works out a piece of gold about 3-16 inch high and at the bottom 1-16 inch thick. From this he bends the boxes for the pearl and five upper stones. Of these he makes the settings by scalloping them out, first from the top and then from the bottom, and then solders the small frame under them for a finish. The solder consists of gold of a lower grade, which, melting at a less heat, firmly unites the parts between which it flows. Having done this, he next makes the "cluster." Into a piece of gold about an inch in diameter, and ⅜ inch thick, he makes holes just so much smaller than the stones as to allow setting. Next the outer edge of the "cluster" is finished like a setting, and scalloped "bizzle" and frame soldered under. Now he makes the mounting for the other diamonds. A frame like the contour is made, which is scalloped, and upon which a thick plate is soldered, and into which the diamonds are afterwards carefully mounted. The "knife edge wire" is made from gold bent into the shape of the design and filed sharp at the top. The gold band for the enamel is so arranged that it can be secured after all the rest is finished, in order that the entire work need not go through the enameling fire. The small shot are made by melting particles of gold, which thereby assume a globular form and retain it upon cooling. And now all is ready for construction. This is done by placing the pieces upon a flat charcoal, applying borax and small pieces of finely cut solder to the places where the pieces are to be joined, and heating them by means of a gas jet and blowpipe till the solder "runs." After all the soldering has been completed the work is boiled in dilute sulphuric acid, to clean it of oxide and borax, carefully trued with files, all the file marks removed with a scraper and emery paper, and the task is ready for polishing. This is done first by means of tripoli and oil, and afterwards with rouge and alcohol. By means of gravers, rests for the stones are cut in the settings, and the gold securely pressed over their edges, and the brooch is completed. In the manufacture of the so-called "Etruscan ware," the delicate wire ornamentations are all bent into shape first and then soldered on the jewelry, according to the design. The neat fine gold-like appearance is produced by immersing the jewelry for a few minutes in a boiling solution of muriatic acid three parts, saltpeter two parts, salt one part. This eats out the alloy and brings the fine gold to the surface. Since it attacks copper more readily than silver, a finer effect is produced by alloying the gold with an excess of copper. A very praiseworthy attempt has of late been made to reproduce flowers in their natural colors and details; but, due to the amount of labor necessarily expended upon them, they command higher prices than is generally invested by the majority of purchasers. It is sincerely to be wished that they may gain the approval of the public. By the combination of platinum with red gold for seals, rings, and chains, many novel and very effective designs have been produced. In making plain linked watch chains, the links are wrapped about a mandrel having the exact shape that they are expected to assume. They are then cut apart at one end, hung together, and the joints soldered. Oxidized silver, so much in vogue a few years ago, is made by treating silver with ammonic or potassic sulphide. Enamel is a fusible glass melted into cavities in the gold. Niello, lately fallen almost entirely into disuse, is a black composition of gold, silver, copper, and lead heated together, and melted into a design prepared in the same manner as for enamel. The metal is then scraped and burnished, and produces the effect of a drawing in black upon a gold or silver ground.—*Herman T. Wolf.*

The Purification of Drinking Water.

Chief Engineer McFadden of the Philadelphia Water Works, in his recently issued annual report, gives the following information relative to the purifying of drinking water:

Water, though theoretically made up of only two elements, without perceptible taste, color, or smell, is never supplied by nature chemically pure. Analysis proves that it always contains, in a greater or less degree, foreign matter gathered from many sources. It is only where these impurities exceed a certain percentage that they become dangerous to the health of a community, and make a purifying process necessary to fit the water for domestic use.

These impurities may be classified under three general heads:

I. Floating *débris.*
II. Mineral sediment.
III. Organic impurities.

Impurities of the first class are confined mainly to the surface, and are made up of floating wood, leaves, etc. A properly arranged system of screens will arrest them and obviate this trouble.

The second class is made up of such mineral sediment as is derived from the abrasion of rock, and the washing of the different soils forming the river basin. Unless present in very large and unusual quantities, these impurities are seldom injurious to health, but society demands clean looking water, and the manufacturer often requires it; therefore it is well to get rid of this sediment whenever possible.

Subsidence or gravitation is the simplest plan to pursue, but requires a storage capacity of at least one week's consumption, to give the particles time to settle.

It is in the third class of impurities—those derived from organic bodies—that we find the elements most dangerous to the community; and while their removal is of vital importance, they present the most formidable obstacles to the engineer.

The principal source of organic impurities is decomposing animal and vegetable matter, sewage, dissolved fertilizers, waste from manufactories, etc. These matters remain in suspension until decomposition has removed so much of their volatile natures that the mineral components can sink, but their really dangerous elements frequently so unite chemically with the water that no artificial system of filtration can separate them, and under the guise of pure limpid water they convey the seeds of disease to the consumer.

Subsidence will only partially remove organic impurities; oxidation, by exposing the water in thin sheets to the action of the air, as in running it over weirs, is beneficial; but even an elaborate and costly system of filter beds will not eliminate all those deleterious particles held *in solution* by the water.

The only true method of furnishing pure water is to maintain the purity of the source of supply, by diverting from it as much as possible, all sewage, manufacturing refuse, etc. Economy and common sense should teach us that it is false in principle, to first pour all manner of filth into our water supply and then attempt to get rid of it by costly and seldom efficient processes. The advice of an eminent hydraulic authority is: "If any water intended for domestic purposes is found to be charged with organic matter *in solution,* the very best plan of treatment is *to let it alone,* and take the required supply from a purer source." The next best plan, when we have no available purer source, is to so perfect the system of sewers—the most fruitful sources of dangerous organic impurities—that they discharge their contents as far as possible from the stream from which we derive our water supply.

A very brief sketch of the methods of artificially purifying water for the use of a community may not be out of place.

Evaporation and the use of chemicals, though really the most effectual, cannot be applied economically to a large public supply. Simpler and cheaper methods must be relied upon.

Carbon, prepared in large plates, and so placed that the water must percolate throught it, especially reacts on all organic matter, but when the demand is heavy this process is very expensive, owing to the large area of filter made necessary by the slow rate of progress of the water through the carbon plates, 3,330 square feet of the *most porous* being required to supply 1,000,000 gallons of filtered water per day,

In England *magnetic carbide,* made by roasting hæmatite iron ore with granulated charcoal, is used in layers of from 2 inch to 12 inch, in a sand filter bed, and is said to give wonderful results in removing organic matter.

Infiltration basins are used in a number of our towns and cities. These are simply galleries excavated in the porous margin of a lake or river, or in water-bearing sand formation, as at Brooklyn. These galleries are sunk below the water level, and are supplied by percolation. They are usually formed of two side walls, say 8 feet apart, arched over, and of a length commensurate with the demand. The amount of water furnished by them depends on the porosity of the sand and gravel beneath and around them, and the head of water under which the filtration is maintained. When the location is favorable, and the volume required not too great, they are simple and effective.

Filter beds purify the water by passing it downwards through intercepting strata of sand and gravel into a clear water basin beneath, from which it is supplied by pumpage to the consumer. They are much used in England and on the Continent, but their first cost and the constant expense of maintenance have discouraged their use in this country.

The requirements of an efficient sand filter bed may be briefly set down as follows, quoting from the most successful and economical practice:

Kirkwood, in his "Report of the St. Louis Water Commission," recommends as of vital importance to the successful working of a filter bed, and as the first step in the system, the formation of a subsiding basin sufficiently large to hold at least one whole day's consumption of water, thus getting rid of the grosser particles by gravitation; this makes the filtration more economical, and is useful in time of flood and for storage.

The filter beds themselves are usually located at some convenient point on the river bank, or even in the river, if sufficiently protected from floods and from ice, but the great area required for a large supply, and the consequent expensive nature of the protecting works, renders the latter or river plan unadvisable to say the least.

The filter area is subdivided into beds averaging 250 by 150 feet each, and should be not less than 12 feet deep. The sides and bottom must be made impervious by puddle clay or concrete. There are many plans of arranging the interior of the filter bed, but perhaps the best and most economical is one in which the entire floor area of each individual bed is covered with ranges of small brick piers placed a short distance apart, and sufficiently high to form a storage basin for clean water. Upon these piers rests a flooring of rough flagging laid with open joints, and this flagging supports in turn the layer of cobble stone, coarse and fine gravel and sand, through which the water must pass by percolation. When the water flows into the filtering bed from the subsiding basin, all its impurities, except those in solution, are intercepted, and remain on the surface of the sand stratum which forms the uppermost of the filtering strata. The finer this sand the more perfect the filter, but at the same time the slower its action. The deposit of impurities on the sand clogs the filter, and must be removed at intervals of from one to eight weeks, depending on the condition of the water to be filtered. It is to make possible this cleaning process, without stopping the supply to the consumer, that the filter is divided into independent beds, but this at the same time requires a surplus area sufficient to keep one or more beds constantly out of service.

Filter beds should be covered over, to protect them from ice in winter and the heat of summer, which latter especially, acting as it would on shallow and still beds of water, would render the supply unpleasantly warm, and promote vegetable growth in many objectionable forms. Experience has proven that filtered water must be used at once. Unless kept protected it soon spoils, much more readily than turbid water.

Humbar, Kirkwood, and other hydraulic authorities all unite in saying that, to be cleansed of its impurities and made potable, water should not pass through the filter bed at a more rapid rate of *descent* than six inches per hour, or twelve feet per day, and in this simple fact lies the expensive feature of the system, for, to purify 1,000,000 gallons of water per day, requires, at the above rate, 13,500 square feet of filtering area; and as the *present* maximum demand of Philadelphia is 75,000,000 gallons a day, we should need more than 23 acres of filter beds, without counting the surplus area required for cleaning.

The above is a mere outline of the cheapest form of a sand filter. The actual cost of a perfect system of subsiding basin filter and clear water basin will vary with the nature of the site, the material, and the volume of clear water required. The constant expense of attending these basins is likewise a serious item, not to be lost sight of.

Dr. Medlock, of Amsterdam, strongly advocates the use of iron as a purifying agent. In experimenting in the canals of Holland, where the water is very impure, he found that iron gratings and strips of iron placed in the weirs reacted very energetically on water containing ammonia, or matter capable of yielding it, the organic impurities being precipitated by contact.

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Talc Mills in St. Lawrence County.

Among the great variety of minerals found in this country there is one which is fast becoming an important article of commerce. The mineral referred to is a hydrated silicate of magnesium known as talc. It occurs in foliated masses, has a soapy feeling, is fibrous but not elastic. Large beds of this mineral are found in various sections of the county. It is quarried, broken into small pieces and ground by means of attrition mills and bolted similarly to flour. It is used in the manufacture of writing paper, fifty per centum of the mineral with fifty per centum of cotton making a fine paper. Being, like asbestos, fireproof, it is used largely in the manufacture of roofing paper. There are at present three talc mills in the county, which are "turning out" daily about fifteen tons of ground material.—*Utica Herald.*

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Drawing Fine Platinum Wire.

M. Gaiffé states that microscopic examination of very fine platinum wire shows that the latter always breaks during drawing at points where no sign of injury exists before the wire is put through the draw plate. After drawing, however, spots appear on the metal surface which look like impurities. M. Gaiffé suggests that these are due to particles of dust which adhere to the metal as it is drawn, and which cut into it during the operation. By carefully excluding dust he has succeeded recently in drawing wire $\frac{1}{1170}$ inch in diameter with great ease, and he considers that with finer plates much finer wire can be produced.

Mixing and Melting Irons.

The foundryman cares little or nothing for a chemical analysis of iron, which merely shows the exact amount of different impurities it may contain; but the question that the foundryman asks, is: What irons can I work, and how can I mix them so as to produce a good, clean, strong and *cheap* casting? This is a question that it is almost impossible to answer, as it is impossible to give a complete vocabulary of all the impurities which iron may contain, with their effect upon the iron in different proportions, as these proportions may be varied in remelting and produce different results; and even if it were possible, the foundryman does not wish to go the trouble of making a chemical analysis of every lot of iron he gets in, to ascertain its impurities and to keep track of how it may be mixed with some other lot of iron. Little can be told by looking at an iron in the pig, whether it will run hard or soft when remelted and run into castings, or whether it will mix with another brand of iron. The foundryman, or an expert, may by actual tests become acquainted with all the iron and ores used in a certain locality, and, by looking at the iron in the pig, tell very nearly what it will do when run into castings; but the best expert in the country can tell little or nothing about an iron that he has not been accustomed to working, and he will often be deceived in those he has been accustomed to, by merely looking at the iron in the pig. True, he may make a good guess, and he may tell whether an iron will run extremely hard or soft, but that is all that can be told by the looks of the iron in the pig.

It is impossible to qualify the various kinds of pig iron brought into the market by local terms and marks. It would not, after all, be of any use, because the furnacemen may change their ores or their mode of charging the stock, and change the product of the furnace from a No. 1 iron to No. 2, or even No. 3 iron, which makes a great difference in its application in founderies; or a furnace may change its quality of iron without any change of the ores, and without any apparent cause for the change in the quality of iron. When operating at Lewisburg, Pa., last spring, I found a lot of pig iron that was made at the Dry Valley Furnace, Pa. This iron, when remelted and run into a cylinder head that was nearly two inches thick, was so hard that it could not be drilled, yet the iron in the pig was of a dark gray color with a large open crystal, and to all appearance was a No. 1 soft foundry iron. This iron was made from the same ores that the furnace had been using for years. In making a No. 1 foundry iron, no change had been made in the mode of stocking the furnace, and there was no apparent cause for the change in the quality of iron. This furnace, after it had been in blast for a short time, got to working so badly that it became necessary to blow it out. It was then found that, when putting the furnace in blast, it had scaffold on one side, which was the cause of the hard iron. If a blast furnace, with the fire only on one side of it, will change the nature of iron as this furnace did, then a cupola, with the fire or the blast all on one side of it, will change the nature of iron when remelted. I have seen two cupolas melting the same iron, and one produced good soft, strong castings, and the other produced hard or brittle castings. I have always found that the cupola that produced the hard or brittle castings either had the blast all on one side of it, or that the fire was not burnt up evenly, and that the stock was not charged regularly.

Cast irons admit of a division into three classes and seven grades. The three classes are: the red-short, the cold-short, and the neutral iron. The seven grades are the seven qualities or seven numbers of iron, as No. 1, No. 2, or No. 3. Red-short iron is an iron that has no strength when red-hot, and has a great deal of shrinkage. An extreme red-short iron will shrink as high as one fourth of an inch to the foot. Red-short iron, when used for casting pipe on their end, will cause the body of the pipe to shrink down and leave the bowl of the pipe before the iron has thoroughly set; and when used in other castings, such as grate bars, it will tear off and form cracks in the corners while hot: it will cause chill cracks on the tread of a car wheel, but they are not deep and do not injure the wheel. Red-short iron may be either hard or soft, and is liable to go to extremes either way. It never breaks from shrinkage when cold.

Cold-short iron is an iron that has no strength when cold, and has very little shrinkage; it will resist very little strain, and if the patterns are the least bit out of proportion the casting will break from shrinkage after it is cold; it will cause stove plates to crack under the sprews. Cold-short iron may be either hard or soft, and is liable to go to extremes either way; but it never breaks from shrinkage when hot.

Neutral iron is an iron between the extreme red-short and cold-short irons: it is made by mixing the red and cold-short irons together, A neutral iron is the best iron for foundry purposes, and furnacemen who make a business of manufacturing foundry iron make it a point to mix their ores so as to make as near a neutral iron as possible. Yet in some localities one ore may be cheaper than another, and it may be used to excess, which may make an iron inclined to be either red-short or cold short, yet not extreme either way. The foundryman that is using three different brands of iron may find at times that he has two brands of iron inclined to be cold-short, and one brand inclined to be red-short. If these three irons are mixed in equal proportions they will make a casting inclined to be extreme cold-short. Yet one fourth of the two brands and one half of the third brand, mixed together, may make a neutral iron and a good strong casting; or by leaving out one of the brands, and using one half of each of the other two brands, the same results may be attained. The only practical way to ascertain whether an iron is either red-short or cold-short is by actual tests in mixing and melting the iron in different proportions, and testing the strength and shrinkage. A neutral iron should not shrink more than one eighth of an inch to the foot. Stove foundrymen should be careful to use as near a neutral iron as possible, and to change their brands of iron as little as possible; as the changes of iron often change the shrinkage, and will make trouble in mounting the stoves when much odd plate is kept on hand. When new brands of iron are introduced, test bars should be made to ascertain the shrinkage, and the different brands of iron should be varied so as to keep the shrinkage as near alike as possible.

The same theory may be followed in mixing irons to make a soft iron, thus: three brands of irons, mixed in equal proportions, may make a hard iron, while any two of the same brands, mixed in equal proportions, may make a soft iron. Tests were made last fall at Perry & Co.'s stove works in melting the three brands of iron, namely: Crane, Hudson, and Jagger. These three irons were melted at the rate of fifteen per cent of Hudson to eighty-five per cent of Crane and Jagger together. This mixture made a hard iron. One third of each brand was then melted together, and made a hard iron. One half Hudson to one fourth Crane and one fourth Jagger were then tried, and the result was a hard iron. The Hudson and Crane were then tried together—one half each—and made a good soft iron. The Hudson and Jagger were then tried together—one half each—and made a good soft iron. The Crane and Jagger were then tried together—one half each—and made a hard iron. Thus the Hudson would neutralize either the Crane or Jagger separately, but would not neutralize them when put together in any proportion.

Iron will combine with almost all of the sixty-four known elements; and these elements, combined with irons in different proportions, will destroy the affinity of one brand of iron for another; and foundrymen, in mixing their iron, will generally use equal proportions of all the brands of iron that they are using; thus one half, one third, or one fourth of each brand. If the castings come hard, they will reduce the No. 2 and increase the No. 1 iron; and I have often seen foundries that were using all No. 1 iron, that were still troubled with hard iron. This was because they were using irons that had no affinity for each other, and would not unite so as to form a homogeneous iron; and throwing out the No. 2 iron gives only a temporary relief by the excess of carbon in the No. 1 iron, overcoming the non-affinity of the irons; and if the No. 1 iron happened to be a little poorer, one day than another, the iron was hard and uneven. I have often seen foundrymen that had one brand of iron in their yard that they had had on hand for years, and could not use it; and perhaps the next foundryman that I would meet would be using that same brand of iron, and could not get along without it. This was because the one foundryman was using other iron as a mix that had an affinity for that particular brand of iron; or the two foundrymen might be using the same iron as a mix, and mixing them in different proportions, which produced different results. Two poor irons can often be mixed together so as to make a good iron; as is the case in mixing the extreme red-short and cold-short irons, which forms a neutral iron that is superior to either the red-short or cold-short irons for foundry purposes. In mixing irons, I should recommend mixing them, and varying the mixture by the local brands or marks, and not by the numbers of the iron. To make a good iron, at least one third of No. 2 iron should be used; and if all No. 2 irons can be used and make a soft iron, they will make a superior casting to all No. 1 iron. In melting iron I should recommend melting it hot, and as fast as possible. A quantity of molten iron should be kept in the cupola, or in a large ladle, so as to give the different brands of iron a chance to mix. In most all the foundries at Wheeling, West Va., the cupolas are never stopped in from the time the blast is put on until the bottom is dropped. A large ladle is set on trestles in front of the cupola, in such a manner that the iron can run into it from the cupola, and be poured out into the smaller ladles at the same time. The iron is all run out of the cupola as fast as it is melted, and is mixed in the large ladle. I think this is a good way of mixing irons.—*From the Founding of Iron, by Edward Kirk.*

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To Brighten Iron.

The following method of brightening iron, which appears suitable for some of the less important parts of large clocks, is recommended by Boden. The articles to be brightened are, when taken from the forge or the rolls, in the case of such articles as plate, wire, etc., placed in diluted sulphuric acid (1 to 20) where they remain for about an hour. This has the effect of cleansing them, and they are washed clean with water and dried with sawdust. They are then dipped for about a second in commercial nitrous acid, washed carefully, dried in sawdust, and rubbed clean. It is said that iron goods thus treated acquire, without undergoing any of the usual polishing operation, a bright surface having a white glance. Care should be taken by any one using the nitrous acid not to inhale the fumes.

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PACKING paper may be made watertight by dissolving 1·8 lbs. of white soap in 1 quart of water, and in another quart 1·8 oz. of gum arabic, and 5·5 of glue. The paper is soaked in the mixture and hung up to dry.