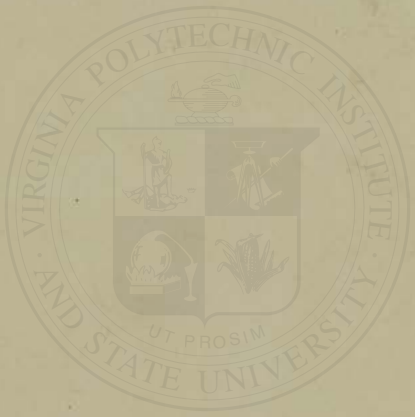

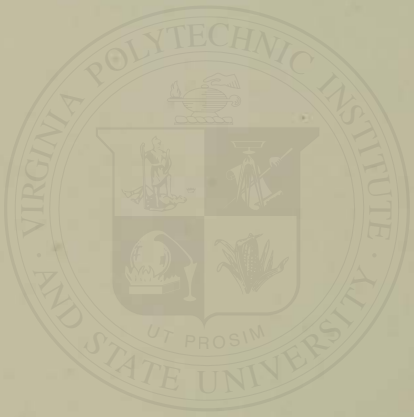

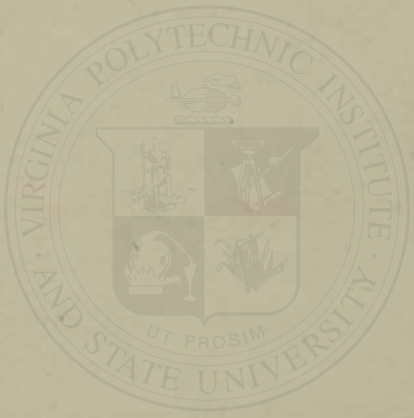

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PREFACE.

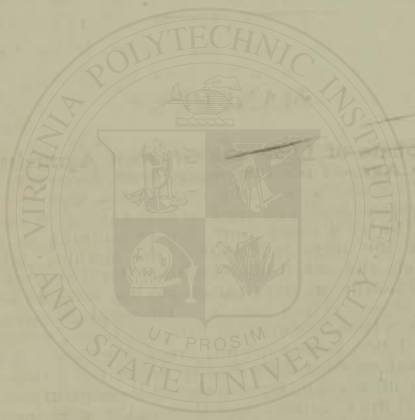
It is a fixed conviction in the minds of thousands, that it is much cheaper to manufacture the articles required by them for the purposes of trade than to purchase them from second or third hands, and pay the too often exorbitant prices demanded for them. Unfortunately it happens, in nine cases out of ten, that ignorance is the great obstacle in the way, which hinders men, who otherwise are very intelligent, from manufacturing those articles which are imperatively required in their business, and which can be made, not only much purer and better than those in the market, but often at not over one-quarter of their price. The Publisher has endeavored, in a certain measure, to remove this barrier out of the way of progress; and has spared no expense, in the way of purchase, travel, or experiment, which could facilitate the acquisition of knowledge of such a character as would be beneficial to mankind.

Perfection is not claimed for this work. If it were perfect, it would not be human. Liability to error is inevitably connected with all our undertakings; but it is claimed that among these Receipts there are many items of most valuable information, which are capable of being turned to a very profitable account in the every-day concerns of life. The spontaneous generosity of every candid examiner will always extend a magnanimous indulgence toward those mistakes which are errors of the head, but not of the heart.

This work was originated in England, the right and title were purchased by the present author, and many additions and improvements have been made by him as suggested by experience and new discoveries.

The Publisher acknowledges his indebtedness to several works published on both sides of the Atlantic, for valuable material furnished in the following pages. He also desires to express his profound gratitude for the substantial encouragement extended to him by the vast multitudes, who patronized the former editions of these receipts. This enlarged Edition will prove that their munificence has not been received in vain.

His thanks are also due to the thousands of manufacturers, mechanics, &c., with whom he has had intercourse, for their readiness to impart information, and the civility and urbanity always extended towards him, which make a stranger among strangers feel that those who possess and exercise such qualities are indeed, in a high sense, the true ornaments of their race. B. F. V.



FARMER'S DEPARTMENT.

MANURES.

Superphosphate of Lime, the Greatest Agricultural Discovery of the Age.—Take a large puncheon, large tub, or barrel, and put into it 100 lbs. water; add, very slowly and cautiously, 50 lbs. of pure sulphuric acid: you must be very careful, while handling this article, not to let it touch your skin or clothing, as it will instantly blacken the skin, and destroy the clothing, wherever it comes in contact; and, when mixed with water it engenders a very intense heat. Into this mixture throw 100 lbs. weight of bones, no matter how old or useless they may be. The sulphuric acid instantly attacks and enters into combination with the bones, reducing them to a pasty consistence, and completely dissolving them. Keep under cover, and turn them over occasionally, while the process is going on; and, when completed, dump out the whole contents on the barn floor or on a platform of boards, and thoroughly work into the mass four times its bulk of dry bog-earth or dry road-dust; mix and pulverize completely with a wooden shovel. The bog-earth acts as an absorbent or drier, retaining the fertilizing properties of the compound, and rendering it easy of uniform distribution. If whole bones are used, it will take six or eight weeks to dissolve them; if they are broken with an axe, they will dissolve in about three weeks; if they are ground in a bone-mill, four days will be sufficient. This manure is the most powerful fertilizer in existence; and, when made by these directions, it is the cheapest, as one ton is equal to thirty-two tons of barn-yard manure. For top-dressing grass-lands, use 300 lbs. per acre; for corn, potatoes, beans, turnips, etc., apply 450 lbs. per acre in the drill, mixing with the soil; for wheat, rye, oats, or barley, 400 lbs. per acre, harrow in with the seed; for buckwheat, 300 lbs. per acre.

Superphosphate in Twenty-four Hours.—Any farmer who has got an apparatus for steaming food for cattle, can make superphosphate in quick style by admitting steam from the boiler into the barrel containing the water, acid, and ground bones. The heat

thus generated quickens the dissolution of the bones in a wonderful manner; and, if the process is properly conducted, it will not take over twenty-four hours in any case. It is indispensable that the barrel be tightly covered to retain the steam.

Fertilizer for Tobacco.—Take and add 30 lbs. of the best Peruvian Guano to each 100 lbs. weight of the superphosphate made by the above receipt, and you will have one of the most powerful fertilizers for tobacco that can be made. If you do not have Peruvian Guano, use in lieu thereof 25 lbs. of hen-manure to each 100 lbs. weight of superphosphate.

Home-made Poudrette.—Few fertilizers are wasted with the prodigality of extravagance which attends the use of night-soil, while the exercise of a little care and attention is all that is required to secure one of the most powerful fertilizers in existence. Night-soil contains phosphate of lime, which is essential to the growth of animals' bones, and which is not supplied from the atmosphere like carbonic acid and ammonia. In order to receive the droppings in a manageable and inoffensive state, the vault should be provided with a large, tight box made of matched plank, placed to slide on scantling, so that it can be drawn out, by attaching a horse, whenever required. Provide plenty of dry, black loam from the woods or swamps; refuse charcoal, dry peat, or alluvial deposits answer first-rate. Keep them dry, in barrels or boxes on the spot, under cover; spread a thick layer on the bottom of the receiving-box, and at intervals of a few days throw in a liberal supply of these absorbents on the accumulating deposit. If a few handfuls of plaster are thrown in occasionally, it will suppress unpleasant odors, and increase the value of the manure. The emptying of slops and dish-water in the box should be strictly prohibited. When the box is filled, you can remove it, and convert it into poudrette. For this purpose it must be worked over with an additional quantity of muck, or other absorbent, in such proportions that it will form, with what has been previously added, about three-quarters of the entire compound. The working should be done under a shed, and the whole kept perfectly dry. It should be shovelled over and mixed several times at intervals, and finally screened, and made as uniform throughout as possible; the finer it is pulverized and the drier it is kept the better.

Home-made Guano of unequalled Excellence.—Save all your fowl manure from sun and rain. To prepare it for use, spread a layer of dry swamp-muck (the blacker it is the better) on your barn floor, and dump on it the whole of your fowl-manure; beat it into a fine powder with the back of your spade; this done, add hard-wood ashes and plaster of Paris, so that the compound shall be composed of the following proportions: dried muck, three bushels; fowl-manure, two bushels; ashes, one bushel; plaster, one and one-half bushels. Mix thoroughly, and spare no labor; for, in this matter, the elbow-grease expended will be well paid for. A little before planting, moisten the heap with water, or, better still, with urine; cover well over with old mats, and let it lie till wanted for use. Apply it to beans, corn, or potatoes, at the rate of a handful to a hill; and mix with the soil before dropping the seed. This will be found the best

substitute for guano ever invented, and may be depended on for bringing great crops of turnips, corn, potatoes, &c.

To Dissolve large Bones for Manure, without Expense.—Take any old flour barrel, and put into the bottom a layer of hard-wood ashes; put a layer of bones on the top of the ashes, and add another layer of ashes, filling the space between the bones with them; then add bones and ashes alternately, finishing off with a thick layer of ashes. When your barrel is filled, pour on water (urine is better,) just sufficient to keep them wet, but do not, on any account, suffer it to leach one drop; for that would be like leaching your dungheap. In the course of time they will heat, and eventually soften down so that you can crumble them with your finger. When sufficiently softened, dump them out of the barrel on a heap of dry loam, and pulverize and crumble them up till they are completely amalgamated into one homogeneous mass with the loam, so that it can be easily handled and distributed whenever required. You may rely on it, this manure will leave its mark, and show good results wherever it is used.

Substitute for Superphosphate.—If you have inch bone ground in a bone-mill, and cannot afford to purchase sulphuric acid to work it up into superphosphate of lime, you can reduce your bones into a fine, impalpable powder by simply using three barrels of loamy soil to every barrel of inch bones; mix them together. The bones will soon begin to heat and ferment, and continue so for some time; they will then cool off. You will then proceed to chop down and pulverize and work the mass thoroughly; it will begin to re-heat and ferment and cool down again; and you will continue working it over till the contents are brought to the proper state of fineness, when you will have a fertilizer of astonishing power. It is only a year or two since a statement appeared in the "Country Gentleman," of the experiments of a Mr. HASKELL with a manure prepared after this method, who fouud it even superior to superphosphate of lime.

How to Double the Usual Quantity of Manure on a Farm.—Provide a good supply of black swamp mould or loam from the woods, within easy reach of your stable, and place a layer of this, one foot hick, under each horse, with litter as usual, on the top of the loam or mould. Remove the droppings of the animals every day, but let the loam remain for two weeks; then remove it, mixing it with the other manure, and replace with fresh mould. By this simple means, any farmer can double, not only the quantity, but also the quality, of his manure, and never feel himself one penny the poorer by the trouble or expense incurred, while the fertilizing value of the ingredients absorbed and saved by the loam can scarcely be estimated.

Josiah Quincy, Jr., has been very successful in keeping cattle in stables the year through, and feeding them by means of soiling. The amount of manure thus made had enabled him to improve the fertility of a poor farm of 100 acres, so that in twenty years the hay crop had increased from 20 to 300 tons. The cattle are kept in a well-arranged stable, and are let out into the yard an hour or two morning and afternoon; but they generally appear glad to re-

turn to their quarters. By this process, one acre enables him to support three or four cows. They are fed on grass, green oats, corn fodder, barley, &c., which are sown at intervals through the spring and summer months, to be cut as required; but he remarks that his most valuable crop is his manure crop; Each cow produces 3½ cords of solid, and 3 cords of liquid manure, or 6½ cords in all. He uses twice as much muck to mix with it, making 20 cords in all. Five to eight miles from Boston such manure is worth five to eight dollars a cord. From this estimate, he has come to the conclusion that a cow's manure may be made as valuable as her milk.

Twenty Dollars' Worth of Manure for almost Nothing.—If you have any dead animal,—say, for instance, the body of a horse,—do not suffer it to pollute the atmosphere by drawing it away to the woods or any other out of the way place, but remove it a short distance only from your premises, and put down four or five loads of muck or sods, place the carcass thereon, and sprinkle it over with quick-lime, and cover over immediately with sods or mould sufficient to make, with what had been previously added, 20 good wagon-loads; and you will have, within twelve months, a pile of manure worth $20 for any crop you choose to put it upon. Use a proportionate quantity of mould for smaller animals, but never less than twenty good wagon-loads for a horse; and, if any dogs manifest too great a regard for the enclosed carcass, shoot them on the spot.

Fish Compost, Substitute for Bone-Dust. Manure from Fish Refuse, &c.—The fish owes its fertilizing value to the animal matter and bone-earth which it contains. The former is precisely similar to flesh or blood, consisting of 25 per cent. of fibrin, the rest being water; and their bones are similar in composition to those of terrestrial animals. As fertilizing agents, therefore, the bodies of fishes will act nearly in the same way as the bodies and blood of animals; 100 lbs., in decaying, produce 2½ lbs. of ammonia. Hence 400 lbs. of fish rotted in compost are enough for an acre. The great effect is due to the ammoniacal portion; for it renders the herbage dark-green, and starts it very rapidly. One of the best composts is made as follows: Dried bog-earth, loam, or peat, seven barrels; hard-wood ashes, two barrels; fish, one barrel; slacked lime, one bushel. Place a thick layer of the bog-earth on the bottom; on the top of this put a layer of the fish, then a sprinkling of lime, then a layer of ashes; on top of the ashes put a thick layer of bog-earth, loam, or peat; then another thin layer of fish, lime, and ashes, and so on till your materials are worked in; then top off with a thick layer of the absorbents, to retain the fertilizing gases. The decomposition of the fish will proceed very rapidly, and a very rich compost will be the result. It should be shovelled over and over, and thoroughly intermixed and pulverized. Put this on so as to have 400 lbs. of fish to the acre. It may be applied with the greatest benefit to corn, turnips, potatoes, beans, &c., in the drill; and broadcast on the grass.

Superphosphate can be made from pogy-chum, or the refuse of other fish, after the oil is expressed, by dissolving in sulphuric acid, and afterwards mixing with dry loam, precisely as directed for

making superphosphate with bones. Whale-oil, or the oil of any fish, when made into a compost with loam, and a little lime or wood ashes, yields a very powerful manure, merely mixed with absorbent earth, and applied at the end of the month. Impure whale-oil, at the rate of 40 gallons per acre, has produced a crop of 23¼ tons of turnips per acre; while on the same soil, and during the same season, it took 40 bushels of bone-dust to produce only 22 tons per acre.

Ashes from Soil by Spontaneous Combustion.—Make your mound 21 feet long by 10½ feet wide. To fire, use 72 bushels of lime. First a layer of dry sods or parings on which a quantity of lime is spread, mixing sods with it; then a covering of eight inches of sods, on which the other half of the lime is spread, and covered a foot thick, the height of the mound being about a yard. In twenty-four hours it will take fire. The lime should be fresh from the kiln. It is better to suffer it to ignite itself than to effect it by the operation of water. When the fire is fairly kindled, fresh sods must be applied; but get a good body of ashes in the first place. I think it may be fairly supposed that the lime adds full its worth to the quality of the ashes, and, when limestone can be got, I would advise the burning a small quantity in the mounds, which would be a great improvement to the ashes, and would help to keep the fire in.

Substitute for Barn Manure.—Dissolve a bushel of salt in water enough to slack 5 or 6 bushels of lime. The best rule for preparing the compost heap is, 1 bushel of this lime to 1 load of swamp-muck, intimately mixed; though 3 bushels to 5 loads makes a very good manure. In laying up the heap, let the layers of muck and lime be thin, so that decomposition may be more rapid and complete. When lime cannot be got, use unleached ashes,—3 or 4 bushels to a cord of muck. In a month or six weeks, overhaul and work over the heap, when it will be ready for use. Sprinkle the salt water on the lime as the heap goes up.

Sheep-Dipping Composition.—Water, 1 gallon; benzine, 8 ounces; cayenne pepper, 2 ounces. Mix; make what quantity you require, using these proportions. Dip your sheep and lambs in the composition, and it will make short work of the vermin.

Oat or Wheat Straw Made Equal to Hay.—Bring 10 gallons water to a boiling heat; take it off the fire, and add to it at once 3 gallons of linseed unground; let it remain till it gets cold; then empty the whole into a cask, containing 44 gallons of cold water, and let it remain for forty-eight hours. At the end of that time, it will be reduced into a thin jelly, like arrowroot. Spread out ½ ton straw, and sprinkle it over regularly with the whole of the liquid from the cask. The stock will eat it up as clean, and keep as fat on it, quantity for quantity, as they would do on hay.

Death for Vermin on Plants or Animals.—Pour a gallon of boiling water on one pound tobacco leaves, strain it in twenty minutes; for vermin, on animals or plants, this decoction is certain death.

Grafting Wax.—Rosin, 1 lb.; beeswax, 1 lb.; with tallow or lard sufficient to soften until it can be readily applied with the hand; melt.

HORSE MEDICINES.

Dr. Cole's King of Oils.—1 oz. green copperas; 2 oz. white vitriol; 2 oz. common salt; 2 oz. linseed oil; 8 oz. molasses. Boil over a slow fire fifteen minutes, in a pint of urine; when almost cold, add 1 oz. of oil of vitriol and 4 oz. of spirits turpentine. Apply to wounds with a feather. A very powerful liniment.

Sloan's Horse Ointment.—4 oz. rosin; 4 oz. beeswax; lard, 8 oz.; honey, 2 oz. Mix slowly, and gently bring to a boil; then add less than 1 pint spirits turpentine; then remove, and stir till cool. Unsurpassed for horse-flesh, cracked hoofs, human flesh, &c.

Mexican Mustang Liniment.—Petroleum, olive oil, and carbonate of ammonia, each equal parts; and mix. It is one of the best liniments in use.

Merchant's Gargling Oil.—Take 2½ gallons linseed oil; 2½ gallons spirits turpentine; 1 gallon Western petroleum; 8 oz. liquor potass; sap green, 1 oz. Mix all together, and it is ready for use.

Arabian Condition Powders.—Ground ginger 1 lb.; sulphuret of antimony, 1 lb.; powdered sulphur, 1 lb.; saltpetre, 1 lb. Mix all together, and administer in a mash, in such quantities as may be required. The best condition powder in existence.

Blistering Liniment.—1 part Spanish flies, finely powdered; 3 of lard; and 1 of yellow rosin. Mix the lard and rosin together, and add the flies when the other ingredients begin to cool. To render it more active, add 1 pint spirits turpentine.

For Strains and Swellings.—Strong vinegar saturated with common salt, used warm, is good for strains and reducing swellings. 1 oz. of white vitriol; 1 oz. of green copperas; 2 teaspoonfuls of gunpowder, all pulverized together, and dissolved in 1 quart of soft water, and used cold, rubbing in thoroughly, is one of the best applications known for reducing swellings.

Hoof-bound Wash.—Spirits turpentine, 4 oz.; tar, 4 oz.; whale-oil, 8 oz. Mix, and apply to the hoofs often.

To Toughen Hoofs.—Wash them frequently in strong brine, and turn brine upon the bottoms, and soak a few minutes each time.

Scratches.—Cut off the hair close, and wash the legs in strong

soap-suds or urine, or wash with warm vinegar saturated with salt, and afterwards dress over with a small quantity of hog's lard.

Cough. — Quit feeding musty hay, and feed roots and laxative food. Sprinkle human urine on his fodder, or cut up cedar boughs and mix with his grain; or boil a small quantity of flax-seed, and mix it in a mash of scalded bran, adding a few ounces of sugar, molasses, or honey. Administer lukewarm. If there should be any appearance of *heaves*, put a spoonful of ground ginger once per day in his provender, and allow him to drink freely of lime water.

Split or Broken Hoof. — Let the blacksmith bore two holes on each side of the crack or split; pass long nails through the holes, and clinch tight. After anointing with the hoof-bound liquid, it will soon grow together.

Colic Cure. — Bleed freely at the horse's mouth; then take ¼ lb. raw cotton, wrap it around a coal of fire, so as to exclude the air; when it begins to smoke, hold it under his nose till he becomes easy.

To Cure Distemper. — Take 1¼ gals. of blood from the neck vein; then administer sassafras oil, 1½ ounces. Cure, speedy and certain.

Founder Cured in 24 Hours. — Boil or steam stout oat-straw for half an hour, then wrap it around the horse's leg quite hot, cover up with wet woolen rags to keep in the steam; in 6 hours renew the application, take 1 gal. of blood from the neck vein, and give 1 quart linseed oil. He may be worked next day.

Cure for Staggers. — Give a mess twice a week, composed of bran, 1 gal.; sulphur, 1 table-spoonful; saltpetre, 1 spoonful; boiling sassafras tea, 1 quart; assafœtida, 1½ oz. Keep the horse from cold water for half a day afterwards.

Ring-Bone and Spavin. — Take sweet oil, 4 oz.; spirits turpentine, 2 oz.; oil of stone, 1 oz. Mix, and apply three times per day. If the horse is over four years old, or in any case when this is not sufficient, in addition to it, you will fit a bar of lead just above it, wiring the ends together, so it constantly wears upon the enlargement; and the two together will cure nine cases out of every ten, in six weeks.

Poll Evil and Fistula. — Common potash dissolved in ¼ pint of water, 1 lb.; add ½ oz. belladonna extract, and 1 oz. gum Arabic dissolved in a little water; work all into a paste with wheat flour, and bottle up tight. Directions: wash the sores well with Castile soap-suds; then apply tallow all around them. Next, press the above paste to the bottom of all the orifices; repeat every two days till the callous fibrous base around the poll evil or fistula is completely destroyed; put a piece of oil-cloth over the sores, and afterwards heal up with Sloan's Horse Ointment.

To Tame Horses. — Take finely-grated horse castor, oils of rhodium and cummin; keep them in separate bottles well corked; put some of the oil cummin on your hand, and approach the horse on the windy side. He will then move toward you. Then rub some of the cummin on his nose, give him a little of the castor on any thing he likes, and get eight or ten drops oil rhodium on his tongue. You can then get him to do anything you like. Be kind and attentive to the animal, and your control is certain.

Best Remedy for Heaves. — Balsam of fir and balsam of copaiba, 4 oz. each, and mix with calcined magnesia sufficiently thick to make it into balls; and give a middling-sized ball night and morning for a week or ten days.

Cure for Bots in Horses. — Give the horse, first, 2 quarts of new milk, and 1 quart molasses; fifteen minutes afterwards, give 2 quarts very strong sage tea; 30 minutes after the tea, give 3 pints (or enough to operate as physic) of curriers' oil. The molasses and milk cause the bots to let go their hold, the tea puckers them up, and the oil carries them completely away. Cure certain, in the worst cases.

Certain Ring-Bone and Spavin Cure. — Venice turpentine and Spanish flies, of each 2 oz.; euphorbium and aqua-ammonia, of each 1 oz.; red precipitate, ½ oz.; corrosive sublimate, ¼ oz.; lard, 1½ lbs. Pulverize all, and put into the lard; simmer slowly over coals, not scorching or burning; and pour off, free of sediment. For ring-bones, cut off the hair, and rub the ointment well into the lumps once in forty-eight hours. For spavins, once in twenty-four hours for three mornings. Wash well previous to each application with suds, rubbing over the place with a smooth stick, to squeeze out a thick, yellow matter. This has removed very large ring-bones.

Bone Spavins, French Paste — $300 Recipe. — Corrosive sublimate, quicksilver, and iodine, of each 1 oz. Rub the quicksilver and iodine together; then add the sublimate, and lastly the lard, rubbing them thoroughly. Shave off the hair the size of the bone enlargement; grease around it, but not where the hair is shaved off: this prevents the action of the medicine, except on the spavin. Then rub in as much of the paste as will lie on a three-cent piece, each morning, for three or four mornings. In from seven to eight days, the whole spavin will come out; then wash the wound with suds for an hour or so, to remove the poisonous effects of the paste; afterwards heal up the sore with any good healing salve, or Sloan's Horse Ointment, as per recipe above, keeping the sore covered while it is healing up.

Another very Valuable Recipe for Ring-Bone. — Pulverized cantharides, oils of spike, origanum, amber, cedar, Barbadoes tar, and British oil, of each 2 oz.; oil of wormwood, 1 oz.; spirits of turpentine, 4 oz.; common potash, ¼ oz.; nitric acid, 6 oz.; sulphuric acid, 4 oz.; lard, 3 lbs. Melt the lard, and slowly add the acids; stir well and add the other articles, stirring till cold; clip off the hair, and apply by rubbing and heating in. In about three

days, or when it is done running, wash off with soap-suds, and apply again. In old cases, it may take three or four weeks; but, in recent cases, two or three applications have cured.

Another.—Pulverized cantharides, oil of origanum and amber, and spirits turpentine, of each 1 oz.; olive oil, ½ oz.; sulphuric acid, 3 drachms; put all, except the acid, into alcohol; stir the mixture, add the acid slowly, and continue to stir till the mixture ceases to smoke; then bottle for use. Apply to ring-bone or spavin with a sponge tied on the end of a stick, as long as it is absorbed into the parts; twenty-four hours after, grease well with lard; and, in twenty-four hours more, wash off well with soap-suds. One application is generally sufficient for spavins, but may need two; ring-bones, always two or three applications, three or four days apart, which prevents loss of hair. This will stop all lameness, but does not remove the lump.

Splint and Spavin Liniment.—Oil of origanum, 6 oz.; gum camphor, 2 oz.; mercurial ointment, 2 oz.; iodine ointment, 1 oz.; melt by putting all into a wide-mouthed bottle, and setting it in a kettle of hot water. Apply it to bone spavins or splints, twice daily, for four or five days, and a cure is guaranteed.

Liniment for Sweeny.—Alcohol and spirits turpentine, of each, 8 oz.; camphor-gum, pulverized cantharides, and capsicum, of each, 1 oz.; oil of spike, 3 oz.: mix. Bathe this liniment in with a hot iron, and a certain cure is sure to follow.

For Looseness or Scouring in Horses or Cattle.—Tormentil root, powdered. Dose for a horse or cow, 1 to 1½ oz. It may be stirred into 1 pint of milk, and given; or it may be steeped in 1½ pints of milk, then given from three to six times daily, until cured.

Scours and Pin-Worms in Horses and Cattle.—White-ash bark burnt into ashes, and made into rather strong lye; then mix ½ pint of it with 1 pint warm water, and give all two or three times daily. This will certainly carry off the worms, which are the cause, in most instances, of scours and looseness.

English Stable Liniment, very strong.—Oil of spike, aqua-ammonia, and *oil* of turpentine, each 2 oz.; sweet oil, and oil of amber, each 1½ oz.; oil of origanum, 1 oz. Mix.

Colic Cure for Horses and Persons.—Spirits turpentine, 3 oz.; landanum, 1 oz.; mix; and for a horse give all for a dose, by putting it into a bottle with half a pint of warm water. If relief is not obtained in an hour, repeat the dose, adding half an ounce of the best powdered aloes, well dissolved. Cure, certain.

For Persons, a dose would be from 1 to 2 teaspoonfuls in warm tea; children or weak persons, less.

Liniment for Fifty Cents per Gallon.—Best vinegar, 2 quarts; pulverized saltpetre, ½ lb.; mix, and set in a cool place till dissolved. Invaluable for old swellings, sprains, bruises, &c.

Saddle and Harness Galls, &c.—White lead and linseed oil, mixed as for paint, is almost unrivaled for healing saddle, harness, or collar galls and bruises. Try it, applying it with a brush. It soon forms an air-tight coating, and soothes the pain, powerfully assisting nature.

Grease Heel.—Lye made from wood-ashes, and boil white-oak bark in it till it is quite strong, both in lye and bark-ooze; when it is cold, it is fit for use. Wash off the horse's legs with Castile soap; when dry, apply the above lye with a swab fastened on a long stick to keep out of his reach, as the smart caused by the application might make him let fly without much warning; but it is a sure cure, only it brings off the hair. To restore the hair after the cure is effected, make and apply a salve by stewing elder bark in old bacon; then form the salve by adding a little resin, according to the amount of oil when stewed, or ¼ lb. resin to each pound of oil.

Valuable Remedy for Heaves.—Calcined magnesia, balsam of fir, balsam copaiba, of each 1 oz.; spirits turpentine, 2 oz.; put them all into 1 pint best cider vinegar; give for a dose, 1 tablespoonful in his feed, once a day for a week; then every other day for two or three months. Wet his hay with brine, and also his other feed. He will cough more at first, but looser and looser till cured.

To Distinguish and cure Distemper.—Wet up bran with rather strong lye; if not too strong, the horse will eat it greedily. If they have the distemper, a free discharge from the nostrils, and a consequent cure, will be the result, if continued a few days; but, if only a cold, with swellings of the glands, no change will be discovered.

Remedy for Founder.—Draw about 1 gallon blood from the neck; then drench the horse with linseed oil, 1 quart; now rub the fore-legs long and well with water as hot as can be borne without scalding.

Physic-Ball for Horses.—Barbadoes aloes, from 4 to 5 or 6 drachms (according to size and strength of the horse); tartrate of potassa, 1 drachm; ginger and Castile soap, each 2 drachms; oil of anise, or peppermint, 20 drops; pulverize and make all into one ball, with thick gum solution. Feed by giving scalded bran, instead of oats, for two days before giving the physic, and during its operation.

Physic for Cattle.—Take *half* only of the dose above for a horse, and add to it glauber-salts, 8 oz.; dissolve all in gruel, 1 quart, and give as a drench.

Hoof-ail in Sheep.—Muriatic acid and butter of antimony, of each 2 oz.; white vitriol, pulverized, 1 oz; mix. Lift the foot, and drop a little of it on the bottom, only once or twice a week. It kills the old hoof, and a new one soon takes its place.

To Cultivate Tobacco.—To raise Tobacco, select a sheltered situation, where the young plants can receive the full force of the sun; burn over the surface of the ground early in spring (new land is best,) rake it well, and sow the seeds; have a dry, mellow, rich soil; and after a shower, when the plants have got leaves the size of a quarter-dollar, transplant as you would cabbage plants, three feet and a half apart, and weed out carefully afterwards. Break off the suckers from the foot stalks, as they appear; also the tops of the plants when they are well advanced,—say, about three feet high,—except those designed for seed, which should be the largest and best plants. The ripeness of tobacco is known by small dusky spots appearing on the leaves. The plants should then be cut near the roots, on the morning of a day of sunshine, and should lie singly to wither. When sufficiently withered, place the plants in close heaps, under cover, to sweat 48 hours or more; then hang them up under cover to dry.

To Renew Old Orchards.—Early in the spring, plough the entire orchard, and enrich the whole soil with a good dressing of compost of manure, swamp-muck, and lime; scrape off the old bark with a deck-scraper, or a sharp hoe; apply half a bushel of lime, and the same of ground charcoal round each tree. Then apply diluted soft soap, or strong soap-suds, on the trunks and limbs, as high as a man can reach. When the trees are in full bloom, throw over them a good proportion of fine slacked lime, and you will reap abundant fruits from your labors.

New England Apple Sauce or Butter.—Boil 2 barrels of new cider down to half a barrel. Pare, core, and slice up 3 bushels of apples (sweet apples are preferable), and put them into the cider thus reduced, and still kept boiling briskly. Stir the whole mass constantly, to prevent burning, till of the consistence of soft butter. A small quantity of pulverized allspice, added during the boiling, is an improvement. Boil in a brass kettle, and, when done, put it into a wooden firkin, or small cask, and it will keep for years.

Apple-Butter. (*Pennsylvania Method.*)—Boil new cider down to one-half. Pare, cut, and core equal quantities of sweet and sour apples. Put the sweet apples in a large kettle to soften a little first, as they are the hardest. Add enough boiled cider to cook them. After boiling half an hour, stirring often, put in the sour apples, and add more boiled cider, with molasses enough to sweeten moderately. Boil until tender, stirring to prevent burning. Pack in firkins or stone pots for winter use.

To Destroy the Moth or Miller.—Dr. Waterman says, "I took two white dishes (because white attracts their attention in the night), or deep plates, and placed them on the top of the hives, and filled them about half-full of sweetened vinegar. The next morning I had about 50 millers caught; the second night I caught 50 more; the third night, being cold, I did not get any; the fourth night, being very warm, I caught about 400; the fifth night I got about 200."

To keep Milk Sweet, and Sweeten Sour Milk.—Put into the milk a small quantity of carbonate of magnesia.

To Make Cheap and Good Vinegar.—To eight gallons of clear rain water, add three quarts of molasses; turn the mixture into a clean, tight cask, shake it well two or three times, and add three spoonfuls of good yeast, or two yeast cakes. Place the cask in a warm place, and in ten or fifteen days add a sheet of common wrapping-paper, smeared with molasses, and torn into narrow strips; and you will have good vinegar. The paper is necessary to form the "mother," or life of the liquor.

Mr. Culley's Red Salve, to cure the Rot in Sheep.—Mix four ounces of the best honey, two ounces of burnt alum reduced to powder, and half a pound of Armenian bole, with as much train or fish oil as will convert these ingredients into the consistence of a salve. The honey must be first gradually dissolved, when the Armenian bole must be stirred in; afterwards the alum and train-oil are to be added.

To Improve the Wool of Sheep, by Smearing.—Immediately after the sheep are shorn, soak the roots of the wool that remains all over with oil, or butter, and brimstone; and, three or four days afterwards, wash them with salt and water. The wool of next season will not only be much finer, but the quantity will be in greater abundance. It may be depended upon, that the sheep will not be troubled with the scab or vermin that year. Salt water is a safe and effectual remedy against maggots.

To Mark Sheep without injury to the Wool.—To 30 spoonfuls of linseed oil, add 2 oz. of litharge, and 1 oz. of lamp-black; boil all together, and mark the sheep therewith.

To Prevent the Fly in Turnips.—From experiments lately made, it has been ascertained that lime sown by hand, or distributed by a machine, is an infallible protection to turnips against the ravages of this destructive insect. It should be applied as soon as the turnips come up, and in the same daily rotation in which they were sown. The lime should be slacked immediately before it is used, if the air be not sufficiently moist to render that operation unnecessary.

Coloring for Cheese.—The coloring for cheese is, or at least should be, Spanish annotto; but, as soon as coloring became general in this country, a color of an adulterated kind was exposed for sale in almost every shop. The weight of a guinea and a half of real Spanish annotto is sufficient for a cheese of fifty pounds' weight. If a considerable part of the cream of the night's milk be taken for butter, more coloring will be requisite. The leaner the cheese is, the more coloring it requires. The manner of using annotto is, to tie up in a linen rag the quantity deemed sufficient, and put it into half a pint of warm water over night. This infusion is put into the tub of milk in the morning with the rennet infusion; dipping the rag into the milk, and rubbing it against the palm of the hand as long as any color runs out. The yolk of egg will color butter.

Composition for Driving out Rats, etc. — Keep on hand a quantity of chloride of lime. The whole secret consists in scattering it dry all around their haunts and into their holes, and they will leave at once, never failing; or garlic, or dog's tongue (synglossum), or the head of a garfish, thrown about their holes, will banish them.

How to form Springs. — The finest springs can be made by boring, which is performed by forcing an iron rod into the earth by its own weight, turning it round, and forcing it up and down by a spring-pole contrivance. The water will sometimes spout up several feet above the surface. Lead pipes are put down in the hole after the water is found. Depressed situations, having a southern exposure, with rising ground towards the north, are the best situations in the United States or the Canadas to find water.

To Burn Lime without a Kiln. — Make a pyramidal pile of large limestones, with an arched furnace next the ground for putting in the fuel, leaving a narrow vent or funnel at the top; now cover the whole pile with earth or turf, in the way that charcoal heaps are covered, and put in the fire. The heat will be more completely diffused through the pile, if the aperture in the top is partially closed. Produces a superior article of lime.

Eye Water for Horses and Cattle. — Alcohol, 1 table-spoonful; extract of lead, 1 teaspoonful; rainwater, ¼ pint.

To Destroy Moss on Trees. — Paint them with white-wash made of quick-lime and wood ashes.

To Protect Fruit-Trees from attack of Mice, etc. — Tar, 1 part; tallow, 3 parts; mix. Apply hot to the bark of the tree with a paint-brush.

Superior Bread from Buckwheat Meal. — To 2 qts. of sifted buckwheat meal, add hot water enough to wet the same; when sufficiently cooled, add 1 teaspoonful or more of salt, half a pint of yeast, and half a teaspoonful of molasses; then add wheat flour enough to make it into loaves (it should be kneaded well); and when risen light, bake or steam it three or more hours. If this should get sour while rising, add a teaspoonful of sugar and a little saleratus, dissolved in water. For bread from Indian meal, proceed in the same way, using it instead of buckwheat meal.

Mrs. Margaret Moore's Ne Plus Ultra Buckwheat Cake. — Make a batter of buckwheat flour as you would for pancakes; let it rise light. Then to each quart of the batter add 1 cup of molasses, 2 eggs, 1 teaspoonful of saleratus, a few caraway seeds, and 1 teacupful of wheat flour; stir well together, pour into a greased bread-pan, and bake in a moderate hot oven three-quarters of an hour.

Corn-Meal Bread No. 1. — Take 2 qts. of corn meal, with about a pint of (thin) bread sponge, and water enough to wet it; mix in about half a pint of wheat flour, and a tablespoonful of salt, let it rise, and then knead well the second time; bake 1¼ hours.

Corn-Meal Bread No. 2. — Mix 2 qts. of new corn meal with three pints of warm water; add 1 tablespoonful of salt; 2 tablespoonfuls of sugar, 1 large tablespoonful of hop yeast; let it stand in a warm place five hours to rise; then add 1½ teacupfuls of wheat flour, and half a pint of warm water. Let it rise again 1½ hours, then pour it into a pan well greased with sweet lard, and let it rise a few minutes. Then bake, in a moderately hot oven, 1 hour and 30 minutes.

Corn-Meal Bread No. 3. — Take 2 qts. of white corn meal, 1 tablespoonful of lard, 1 pint of hot water; mix the lard in water; stir it well that it may get heated thoroughly, and add one-half pint of cold water. When the mixture is cool enough, add two well-beaten eggs, and two tablespoonfuls of home-made yeast. Bake 1 hour in a moderately heated oven. If for breakfast, make over night.

London Baker's Bread. — To make a half-peck loaf, take ¾ lb. of well-boiled, mealy potatoes; mash them through a fine colander or coarse sieve; add ½ pt. of yeast, or ¾ oz. German dried yeast, and ¾ pt. lukewarm water (88° Fahr.), together with ¾ lb. of flour, to render the mixture the consistence of thin batter; this mixture is to be set aside to ferment; if set in a warm place, it will rise in less than two hours, when it resembles yeast except in color. The sponge so made is then to be mixed with 1 pt. of water nearly blood warm; viz., 92° Fahr., and poured into a half peck of flour, which has previously had 1¼ oz. salt mixed into it; the whole should then be kneaded into dough, and allowed to rise in a warm place for 2 hours, when it should be kneaded into loaves, and baked.

Buckwheat Short-Cake. — Take 3 or 4 cups nice sour milk, 1 teaspoonful of soda saleratus dissolved in the milk; if the milk is very sour, you must use saleratus in proportion with a little salt; mix up a dough with buckwheat flour thicker than you would mix the same for griddle cakes, say quite stiff; put into a buttered tin, and put directly into the stove oven, and bake about 30 minutes, or as you would a short-cake from common flour.

French Honey. — White sugar, 1 lb.; 6 eggs, leaving out the whites of 2; the juice of 3 or 4 lemons, and the grated rind of 2; and ¼ lb. of butter; stir over a slow fire until it is of the consistency of honey.

BAKER'S DEPARTMENT.

CAKE TABLE, FIFTEEN KINDS.

POUND — 1 lb. flour, 1 lb. butter, 1 lb. sugar, 8 eggs, rose-water three spoons, mace, &c.

GENUINE WHIG — 2 lbs. flour, 8 oz. butter, 8 oz sugar, 1 pt. milk, raise with yeast.

SHREWSBURY— 1 lb. flour, 1 lb. butter, ¾ lb. sugar, rose-water, &c.

TRAINING—3 lbs. flour, ¾ lb. butter, ¾ lb. sugar, cinnamon, nutmeg.

NUTCAKE—7 lbs. flour, ¾ lb. butter, 2 lbs. sugar, 7 eggs, cinnamon; wet with milk, raise with yeast, or wet and raise with sour milk and saleratus.

SHORT CAKE—5 lbs. flour, 8 oz. butter, ¾ lb. sugar, 8 eggs, rose-water and nutmeg.

CYMBALS—2 lbs. flour, 8 oz. butter, ½ lb. sugar, 6 eggs, rose-water and a little spice.

BURK CAKE—5 lbs. flour, 8 oz. butter, ¾ lb. sugar, 1 pint milk, 9 eggs, rose-water: raise with yeast.

JUMBLES—5 lbs. flour, 1 lb. butter, 2 lbs. sugar, 6 eggs; roll out in loaf sugar.

GINGER BREAD—1 lb. flour, ½ lb. butter, ½ lb. sugar, 3 eggs, yolks only, ginger to suit.

WONDERS—2 lbs. flour, ½ lb. butter, ½ oz. sugar, 10 eggs, cinnamon.

COOKIES—3 lbs. flour, ¾ lb. butter, ¾ lb. sugar, 3 eggs; or, without eggs, wet up, raise with saleratus and sour milk.

YORK BISCUIT—3 lbs. flour, ½ lb. butter, ¾ lb. sugar; wet up, and raise with sour milk and saleratus.

COMMON—12 lbs. flour, 3 lbs. butter, 3 lbs. sugar, 2 qts. milk, yeast, spice to taste.

LOAF—9 qts. flour, 3 lbs. butter, 4 lbs. sugar, 1 gal. milk, wine 1 pint, yeast 1 pint.

Cider Cake—Flour, 6 cups; sugar, 3 cups; butter, 1 cup; cider, 1 cup; saleratus, 1 teaspoon; 4 eggs; 1 grated nutmeg. Beat the eggs, sugar, and butter together, and stir in the flour and nutmeg; dissolve the saleratus in the cider, and stir into the mass, and bake immediately in a quick oven.

Molasses Cake.—Molasses, 1½ cups; saleratus, 1 teaspoon; sour milk, 2 cups; 2 eggs; butter, lard, or pork gravy, what you would take upon a spoon; if you use lard, add a little salt. Mix all by beating a minute or two with a spoon; dissolving the saleratus in the milk; then stir in flour to give it the consistency of soft cake, and put directly into a hot oven, being careful not to dry by overbaking.

Gold Cake.—Yolks of 1 doz. eggs; flour, 5 cups; white sugar, and butter, of each, one cup; cream, or sweet milk, 1 cup; cream of tartar, 1 teaspoon; soda, ½ teaspoon. Beat the eggs with the sugar; have the butter softened by the fire, then stir it in; put the soda and cream of tartar into the cream or milk, stirring up and mixing all together; then sift and stir in the flour.

Silver Cake.—Whites of 1 doz. eggs; flour, 5 cups; white sugar and butter, of each one cup; cream or sweet milk, 1 cup; cream of tartar, 1 teaspoon; soda, ½ teaspoon; beat and mix as the "Gold Cake." Bake in a deep pan.

Sugar Cake.—Take 7 eggs, and beat the whites and yolks

separately; then beat well together; now put into them sifted white sugar, 1 lb.; with melted butter, ½ lb.; and a small teaspoon of pulverized carbonate of ammonia. Stir in just sufficient sifted flour to allow of its being rolled out, and cut into cakes.

Ginger Cake.—Molasses, 2 cups; butter, or one-half lard if you choose, 1½ cups; sour milk, 2 cups; ground ginger, 1 teaspoon; saleratus, 1 heaping teaspoon.

Yankee Brown Bread.—For each good-sized loaf being made, take 1½ pts. corn meal, and pour boiling water upon it to scald it properly; let it stand until only blood warm, then put about 1 qt. of rye flour upon the meal, and pour in a good bowl of emptyings, with a little saleratus dissolved in a gill of water, kneading in more flour, to make of the consistence of common bread. If you raise it with yeast, put a little salt in the meal, but if you raise it with salt-risings, or emptyings, which I prefer, no more salt is needed. Form into loaves, and let them set an hour and a half, or until light; in a cool place in summer, and on the hearth or under the stove in winter; then bake about two hours. Make the dough fully as stiff as for wheat bread, or a little harder; for if made too soft it does not rise good.

Frosting, or Icing, for Cakes.—The whites of 8 eggs, beat to a perfect froth and stiff; pulverized white sugar, 2 lbs.; starch, one tablespoon; pulverized gum arabic, ½ oz.; juice of 1 lemon.

Lemon Pie, Extra Nice.—1 lemon; water, 1 cup; brown sugar, 1 cup; flour, 2 table-spoons; 5 eggs; white sugar, 2 table-spoons. Grate the rind from the lemon, squeeze out the juice, and chop up the balance very fine; put all together, and add the water, brown sugar, and flour, working the mass into a smooth paste; beat the eggs and mix with the paste, saving the whites of two of them; make two pies, baking with no top crust; while these are baking, beat the whites of the two eggs, saved for that purpose, to a stiff froth, and stir in the white sugar; when the pies are done, spread this frosting evenly over them, and set again in the oven, and brown slightly.

Bride Cake.—Take butter, 1¼ lbs.; sugar, 1¾ lbs., half of which is to be Orleans sugar; eggs well beaten, 2 lbs.; raisins, 4 lbs., having the seeds taken out, and chopped; English currants, having the grit picked out, and nicely washed, 5 lbs.; citron cut fine, 2 lbs.; sifted flour, 2 lbs.; nutmegs, 2 in number, and mace, as much in bulk; alcohol, 1 gill to ½ pt., in which a dozen or fifteen drops of oil of lemon have been put. When ready to make your cake, weigh your butter and cut it in pieces, and put it where it will soften, but not melt. Next, stir the butter to a cream, and then add the sugar, and work till white. Next beat the yolks of the eggs, and put them to the sugar and butter. Meanwhile another person should beat the whites to a stiff froth, and put them in. Then add the spices and flour, and, last of all, the fruit, except the citron, which is to be put in about three layers, the bottom

layer about one inch from the bottom, and the top one an inch from the top, and the other in the middle, smoothing the top of the cake by dipping a spoon or two of water upon it for that purpose. The pan in which it is baked should be about thirteen inches across the top, and five and a half or six inches deep, without scollops, and two three-quart pans also, which it will fill; and it will require to be slowly baked, about 3 or 4 hours; test by piercing it with a broom splinter, and if nothing adheres it is done.

French Bread.—Take nice rice, ¾ lb.; tie it up in a thick linen bag, giving enough room for it to swell; boil from three to four hours till it becomes a perfect paste; mix while warm with 7 lbs. flour; adding the usual quantities of yeast, salt and water. Allow the dough to work a proper time near the fire, then divide into loaves, dust them in, and knead vigorously. This quantity will make 13 lbs. 7 oz. of very nutritious bread.

Paris Baker's White Bread.—On 80 lbs. of the dough left from the previous day's baking, as much luke-warm water is poured as will make 320 lbs. flour into a rather thin dough. As soon as this has risen, 80 lbs. are taken out, and reserved in a warm place for next day's baking. One pound of *dry yeast* dissolved in *warm water* is then added to the remaining portion, and the whole lightly kneaded. As soon as it is sufficiently "risen," it is then made into loaves, and shortly afterwards baked, the loaves being placed in the oven without touching each other, so that they may be "crusted" all round.

No. 1 Crackers.—Butter, 1 cup; salt, 1 tea-spoon; flour two qts. Rub thoroughly together with the hand, and wet up with water; beat well, and beat in flour to make quite brittle and hard; then pinch off pieces, and roll out each cracker by itself.

Sugar Crackers.—Flour, 4 lbs.; loaf sugar and butter, of each ½ lb.; water, 1½ pts.; make as above.

Naples Biscuit.—White sugar, eggs and flour, of each 4 lbs.

DYEING DEPARTMENT.

Dyeing.—It may be necessary to remark, and I do it here, once for all, that every article to be dyed, as well as every thing used about dyeing, should be perfectly clean.

In the next place, the article to be dyed should be well scoured in soap, and then the soap rinsed out. It is also an advantage to dip the article you wish to dye into warm water, just before putting it into the alum or other preparation; for the neglect of this precaution it is nothing uncommon to have the goods or yarn spotted. *Soft* water should always be used if possible, and sufficient to cover the goods handsomely.

As soon as an article is dyed it should be aired a little, then well rinsed, and afterwards hung up to dry.

When dyeing or scouring silk or merino dresses, care should be taken not to wring them; for this has a tendency to wrinkle and break the silk.

In putting the dresses and shawls out to dry, that have been dyed, they should be hung up by the edge so as to dry evenly.

Chrome Black.—For Woollen Goods.—For 5 lbs. of goods, blue vitriol, 6 oz.; boil it a few minutes; then dip the goods ¾ of an hour, airing often; take out the goods, and make a dye with logwood, 3 lbs.; boil ½ hour; dip ¾ of an hour, and air the goods, and dip ¾ of an hour more. Wash in strong suds. This will not impart any of its color in fulling, nor fade by exposure to the sun.

Black on Wool.—For Mixtures.—For 10 lbs. of wool, bi-chromate of potash, 4 oz.; ground argal, 3 oz.; boil together, and put in the wool; stir well, and let it remain in the dye 4 hours. Then take out the wool, rinse it slightly in clear water; then make a new dye, into which put logwood, 3½ lbs. Boil 1 hour, and add chamberlye, 1 pt., and let the wool lie in all night. Wash in clear water.

Steel Mixed.—Dark.—Black wool, it may be natural or colored, 10 lbs.; white wool, 1½ lbs. Mix evenly together, and it will be beautiful.

Snuff Brown.—Dark, for Cloth or Wool.—For 5 lbs. goods, camwood, 1 lb.; boil it 15 minutes, then dip the goods for ¾ of an hour; take out the goods, and add to the dye, fustic, 2½ lbs.; boil 10 minutes, and dip the goods ¾ hour; then add blue vitriol, 1 oz.; copperas, 4 oz.; dip again ½ hour; if not dark enough, add more copperas. It is dark and permanent.

Wine Color.—For 5 lbs. goods, camwood, 2 lbs.; boil 15 minutes; then dip the goods for ½ hour; boil again, and dip ½ hour; then darken with blue vitriol, 1½ oz.; if not dark enough, add copperas, ½ oz.

Madder Red.—To each lb. of goods, alum, 5 oz.; red, or cream of tartar, 1 oz.; put in the goods, and bring your kettle to a boil for ½ an hour; then air them, and boil ½ hour longer; then empty your kettle, and fill with clean water; put in bran, 1 pk.; make it milk warm, and let it stand until the bran rises; then skim off the bran, and put in madder, ½ lb.; put in your goods, and heat slowly until it boils and is done. Wash in strong suds.

Green.—On Wool or Silk, with Oak Bark.—Make a strong yellow dye of yellow oak and hickory bark in equal quantities. Add the extract of indigo, or chemic (which see), 1 tablespoon at a time, until you get the shade of color desired. Or:

Green.—With Fustic.—For each lb. of goods, fustic, 1 lb.; with alum, 3½ oz. Steep until the strength is out, and soak the goods therein until a good yellow is obtained; then remove the chips, and add extract of indigo or chemic, 1 tablespoon at a time, until the color suits.

Blue.—Quick Process.—For 2 lbs of goods, alum, 5 oz.; cream of tartar, 3 oz.; boil the goods in this for one hour; then throw the goods into warm water, which has more or less of the extract of indigo in it, according to the depth of color desired, and boil again until it suits, adding more of the blue if needed. It is quick and permanent.

Stocking-Yarn, or Wool to Color—Between a Blue and Purple.—For 5 lbs. of wool, bi-chromate of potash, 1 oz.; alum, 2 oz.; dissolve them, and bring the water to a boil, putting in the wool, and boiling one hour; then throw away the dye, and make another dye with logwood chips, 1 lb.; or extract of logwood, 2½ oz.; and boil one hour. This also works very prettily on silk.

N. B.—Whenever you make a dye with logwood chips, either boil the chips ½ hour, and pour off the dye; or tie up the chips in a bag, and boil with the wool or other goods; or take 2½ oz. of the extract in place of 1 lb. of the chips is less trouble, and generally the better plan. In the above recipe, the more logwood that is used, the darker will be the shade.

Scarlet, with Cochineal—For Yarn or Cloth.—For 1 lb. of goods, cream of tartar, ½ oz.; cochineal well pulverized, ¼ oz.; muriate of tin, 2½ oz.; then boil up the dye, and enter the goods; work them briskly for 10 or 15 minutes, after which boil 1½ hours, stirring the goods slowly while boiling; wash in clear water, and dry in the shade.

Pink.—For 3 lbs. of goods, alum, 3 oz.; boil and dip the goods 1 hour; then add to the dye, cream of tartar, 4 oz.; cochineal, well pulverized, 1 oz.; boil well, and dip the goods while boiling, until the color suits.

Orange.—For 5 lbs. goods, muriate of tin, 6 tablespoons; argal, 4 oz.; boil and dip 1 hour; then add to the dye, fustic, 2½ lbs.; boil 10 minutes, and dip ½ hour; and add again to the dye, madder, 1 teacup; dip again ½ hour.

N. B.—Cochineal in place of madder makes a much brighter color, which should be added in small quantities until pleased. About 2 oz.

Lac Red.—For 5 lbs. goods, argal, 10 oz.; boil a few minutes; then mix fine ground lac, 1 lb., with muriate of tin, 1¼ lbs.; and let them stand 2 or 3 hours; then add half of the lac to the argal dye, and dip ½ hour; then add the balance of the lac, and dip again 1 hour; keep the dye at a boiling heat, until the last half hour, when the dye may be cooled off.

Purple.—For 5 lbs. goods, cream of tartar, 4 oz.; alum, 6 oz.; cochineal, well pulverized, 2 oz.; muriate of tin, half teacup. Boil the cream of tartar, alum, and tin, 15 minutes; then put in the cochineal, and boil 5 minutes; dip the goods two hours; then make a new dye with alum, 4 oz.; Brazil wood, 6 oz.; logwood, 14 oz.; muriate of tin, 1 teacup, with a little chemic; work again until pleased.

Silver Drab—Light.—For 5 lbs. goods, alum, 1 small teaspoon, and logwood about the same amount; boil well together, then dip the goods one hour; if not dark enough, add in equal quantities, alum and logwood, until suited.

Slate on Woolen or Cotton.—With Beech Bark.—Boil the bark in an iron kettle, skim out the chips after it has boiled

sufficiently, and then add copper as to set the dye. If you wish it very dark, add more copperas. This is excellent for stockings.

Extract of Indigo or Chemic.—To Make.—For good chemic or extract of indigo, take of vitriol, ½ lb., and stir it into indigo, finely ground, 2 oz., continuing the stirring at first for half hour; now cover over, and stir three or four times daily for two or three days; then put in a crumb of saleratus, and stir it up, and, if it foams, put in more and stir, and add as long as it foams; the saleratus neutralizes any excess of acid; then put into a glass vessel, and cork up tight. It improves by standing. Druggists keep this prepared.

Wool.—To Cleanse.—Make a liquid of water, three parts, and urine, one part; heat it as hot as you can bear the hand in it; then put in the wool, a little at a time, so as not to have it crowd; let remain in for fifteen minutes; take it out over a basket to drain; then rinse in running water, and spread it out to dry; thus proceed in the same liquor; when it gets reduced, fill it up in the same proportions, keeping it at hand heat all the time, not using any soap.

Dark Colors.—To Extract, and Insert Light.—This recipe is calculated for carpet rags. In the first place let the rags be washed clean, the black or brown rags can be colored red, or purple, at the opinion of the dyer; to do this, take, for every five lbs. black or brown rags, muriate of tin, ¾ lb.; and the lac, ½ lb., mixed with the same, as for the lac red; dip the goods in this dye 2 hours, boiling half of the time; if not red enough add more tin and lac. The goods can then be made a purple, by adding a little logwood; be careful and not get in but a small handful, as more can be added if not enough. White rags make a beautiful appearance in a carpet, by tying them in the skein, and coloring them red, green, or purple; gray rags will take a very good green; the coloring will be in proportion to the darkness of mix.

Black.—For five lbs. goods, sumach, wood and bark together, 3 lbs.; boil half hour, and let the goods steep 12 hours; then dip in lime water, half hour; then take out the goods, and let them drip an hour; now add to the sumach liquor, copperas, 8 oz., and dip another hour; then run them through the tub of lime-water again for 15 minutes; now make a new dye with logwood, 2½ lbs., by boiling 1 hour, and dip again 3 hours; now add bi-chromate of potash, 3 oz., to the logwood dye, and dip one hour. Wash in clear cold water, and dry in the shade. You may say this is doing too much. You cannot get a permanent black on cotton with less labor.

Sky Blue.—For 3 lbs. goods, blue vitriol, 4 oz.; boil a few minutes; then dip the goods 3 hours, after which pass them through strong lime-water. You can make this color a beautiful brown by putting the goods through a solution of prussiate of potash.

Lime-Water and Strong Lime-Water.—For Coloring.—

Lime-water is made by putting stone lime, 1 lb., and strong lime-water, 1½ lbs., into a pail of water, slacking, stirring, and letting it stand until it becomes clear, then turn into a tub of water, in which dip the goods.

Blue on Cotton or Linen.—With Logwood.—In all cases, if new, they should be boiled in a strong soap-suds or weak lye, and rinsed clean; then for cotton, 5 lbs., or linen, 3 lbs., take bi-chromate of potash, ¾ lb.; put in the goods, and dip 2 hours; then take out, rinse; make a dye with logwood, 4 lbs.; dip in this 1 hour, air, and let stand in the dye 3 or 4 hours, or till the dye is almost cold; wash out and dry.

Blue on Cotton.—Without Logwood.—For 5 lbs. of rags, copperas, 4 oz.; boil and dip 15 minutes; then dip in strong suds, and back to the dye 2 or 3 times; then make a dye with prussiate of potash, 1 oz.; oil of vitriol, 5 table-spoons; boil 30 minutes and rinse; then dry.

Green.—If the cotton is new, boil in weak lye or strong suds; then wash, and dry; give the cotton a dip in the home-made blue dye-tub until blue enough is obtained to make the green as dark as required; take out, dry, and rinse the goods a little; then make a dye with fustic, ¾ lb.; logwood, 3 oz., to each 1 lb. of goods, by boiling the dye 1 hour; when cooled so as to bear the hand, put in the cotton, move briskly a few minutes, and let lie in 1 hour; take out, and let it thoroughly drain; dissolve, and add to the dye, for each lb. of cotton, blue vitriol, ½ oz., and dip another hour; wring out, and let dry in the shade. By adding or diminishing the logwood and fustic, any shade of green may be obtained.

Yellow.—For 5 lbs. of goods, sugar of lead, 7 oz.; dip the goods 2 hours; make a new dye with bi-chromate of potash, 4 oz.; dip until the color suits, wring out, and dry; if not yellow enough, repeat the operation.

Orange.—For 5 lbs. of goods, sugar of lead, 4 oz.; boil a few minutes, and when a little cool put in the goods, dip 2 hours, wring out; make a new dye with bi-chromate of potash, 8 oz.; madder, 2 oz.; dip until it suits; if the color should be too red, take off a small sample, and dip it into lime-water, when the choice can be taken of the sample dipped in the lime or the original color.

Red.—Take muriate of tin, ½ of a tea-cup; add sufficient water to cover the goods well, bring it to a boiling heat, putting in the goods 1 hour, stirring often; take out the goods, and empty the kettle, and put in clean water, with nic-wood, 1 lb., steeping it for ½ hour, at hand heat; then put in the goods, and increase the heat for 1 hour, not bringing to a boil at all; stir the goods, and dip an hour as before; wash without soap.

Muriate of Tin.—Tin Liquor.—If druggists keep it, it is best to purchase of them already made; but if you prefer, proceed as follows: Get at a tinner's shop block tin; put it in a shovel, and melt it. After it is melted, pour it from the height of 4 or 5 feet

into a pail of clear water. The object of this is to have the tin in small particles, so that the acid can dissolve it. Take it out of the water and dry it; then put it into a strong glass bottle; pour over it muriatic acid, 12 oz.; then slowly add sulphuric acid, 8 oz. The acid should be added about a tablespoon at a time, at intervals of 5 or 8 minutes; for if you add it too rapidly you run the risk of breaking the bottle by heat. After you have all the acid in, let the bottle stand until the ebullition subsides; then stop it up with a beeswax or glass stopper, and set it away; and it will keep good for a year or more, or will be fit for use in 24 hours.

Green.—VERY HANDSOME, WITH OAK BARK.—For 1 lb. of silk. Yellow oak bark, 8 oz.; boil it ½ hour; turn off the liquor from the bark, and add alum, 6 oz.; let stand until cold; while this dye is being made, color the goods in the blue dye-tub, a light blue; dry, and wash; then dip in the alum and bark dye; if it does not take well, warm the dye a little.

Green or Yellow.—ON SILK OR WOOL, IN FIVE TO FIFTEEN MINUTES.—For 5 lbs. of goods. Black oak bark or peach leaves, ½ peck; boil well; then take out the bark or leaves, and add muriate of tin, ½ teacup, stirring well; then put in the goods and stir them round, and it will dye a deep yellow in from 5 to 15 minutes, according to the strength of the bark; take out the goods, rinse, and dry immediately.

N. B.—For a green, add to the above dye extract of indigo, or chemic, 1 tablespoon only at a time, and work the goods 5 minutes, and air; if not sufficiently dark, use the same amount of chemic as before, and work again until it suits.

Mulberry.—For 1 lb. of silk. Alum, 4 oz.; dip 1 hour; wash out, and make a dye with Brazil wood, 1 oz., and logwood, ¼ oz., by boiling together; dip in this, ½ hour, then add more Brazil wood and logwood, in equal proportions, until the color is dark enough.

Black.—Make a weak dye as you would for black on woollens, work the goods in bi-chromate of potash, at a little below boiling heat, then dip in the logwood in the same way; if colored in the blue vitriol dye, use about the same heat.

Spots.—TO REMOVE AND PREVENT WHEN COLORING BLACK ON SILK OR WOOLLEN.—N. B. In dyeing silk or woollen goods, if they should become rusty or spotted, all that is necessary is to make a weak lye, and have it scalding hot, and put your goods in for 15 minutes; or throw some ashes into your dye, and run your goods in it 5 minutes, and they will come out a jet black, and an even color.

Light Chemic Blue.—For cold water, 1 gal.; dissolve alum, ½ tablespoon, in hot water, 1 teacup, and add to it; then add chemic, 1 teaspoon at a time, to obtain the desired color; the more chemic that is used, the darker will be the color.

Purple.—For 1 lb. of silk. Having first obtained a light blue by dipping in the home-made blue dye-tub, and dried, dip in alum, 4 oz., to sufficient water to cover, when a little warm; if the color is not full enough, add a little chemic.

Yellow.—For 1 lb. of silk. Alum, 3 oz.; sugar of lead, ¾ oz.; immerse the goods in the solution over night; take out, drain, and make a new dye with fustic, 1 lb.; dip until the required color is obtained.

N. B.—The yellow or green, for wool, works equally well on silk.

Orange.—Take annotto and soda, and add in equal quantities, according to the amount of goods and darkness of the color wanted, say 1 oz. of each, to each pound of silk, and repeat as desired.

Crimson.—For 1 lb. of silk. Alum, 3 oz.; dip at hand-heat, 1 hour; take out and drain, while making a new dye, by boiling, 10 minutes, cochineal, 3 oz.; bruised nut galls, 2 oz.; and cream of tartar, ¼ oz., in one pail of water; when a little cool, begin to dip, raising the heat to a boil, continuing to dip 1 hour; wash, and dry.

Cinnamon or Brown on Cotton and Silk.—By a New Process.—Very Beautiful.—Give the goods as much color, from a solution of blue vitriol, 2 oz., to water, one gal., as it will take up in dippings 15 minutes; then run it through lime-water; this will make a beautiful sky-blue, of much durability; it has now to be run through a solution of prussiate of potash, 1 oz., to water, 1 gal.

To Color Straw Hats or Bonnets a Beautiful Slate.—First, soak the bonnet in rather strong warm suds for 15 minutes to remove sizing or stiffening; then rinse in warm water, to get out the soap; now scald cudbear, 1 oz., in sufficient water to cover the hat or bonnet; work the bonnet in this dye, at 180° of heat, until you get a light purple; now have a bucket of cold water, blued with the extract of indigo, ½ oz., and work or stir the bonnet in this, until the tint pleases; dry, then rinse out with cold water, and dry again, in the shade. If you get the purple too deep in shade the final slate will be too dark.

To Bleach Straw Bonnets.—Take a common plate, fill with water, set a small piece of sheet iron, with the ends bent down to raise the top above the water, place in the middle of the plate; on which tin plate you must place a small piece of brimstone, set it on fire, and cover it over tight with a large bell or large tumbler or bowl that will just shut down close within the rim of the plate; at first raise the cover a little to admit a current of air to cause the sulphur to burn, until you fill the whole with a white vapor; then shut down tight about ten minutes, and the water will absorb the sulphurous acid gas, with which straw hats or wooden articles are washed over to bleach in the most approved manner. It will also remove fruit and vegetable stains from dress.

Washing Fluid.—Take 1 lb. sal soda, ½ lb. good stone lime, and 5 qts. of water; boil a short time, let it settle, and pour off the clear fluid into a stone jug, and cork for use; soak your white clothes over night in simple water, wring out and soap wristbands, collars, and dirty or stained places; have your boiler half filled with water,

just beginning to boil, then put in one common teacupful of fluid, stir and put in your clothes, and boil for half an hour; then rub lightly through *one suds only*, and all is complete.

Chip or Straw Hats or Bonnets may be dyed black by boiling them three or four hours in a strong liquor of logwood, adding a little copperas occasionally. Let the bonnets remain in the liquor all night; then take out to dry in the air. If the black is not satisfactory, dye again after drying. Rub inside and out with a sponge moistened in fine oil; then block; *Red Dye.*—Boil ground Brazilwood in a lye of potash, and boil your straw hats, &c., in it. *Blue Dye.*—Take a sufficient quantity of potash lye, 1 lb. of litmus or lacmus, ground: make a decoction, and then put in the straw, and boil it.

Dyes for Hats.—The ordinary bath for dyeing hats, employed by the London manufacturers, consists, for twelve dozen, of 144 lbs. logwood, 12 lbs. of green sulphate of iron or copperas, 7½ lbs. verdigris. The logwood having been introduced into the copper, and digested for some time, the copperas and verdigris are added in successive quantities, and in the above proportions, along with every successive two or three dozens of hats suspended upon the dripping machine. Each set of hats, after being exposed to the bath with occasional airings during forty minutes, is taken off the pegs, and laid out upon the ground to be more completely blackened by the peroxydizement of the iron with the atmospheric oxygen. In three or four hours the dyeing is completed. When fully dyed, the hats are well washed in running water.

Waterproof Stiffening for Hats.—Mix 18 lbs. shellac with 1½ lbs. salt of tartar (carbonate of potash), and 5½ gals. water. These materials are to be put in a kettle, and made to boil gradually till the lac is dissolved; when the liquid will become as clear as water, without any scum upon the top, and, if left to cool, will have a thin crust upon the surface, of a whitish cast, mixed with the light impurities of the gum. When this skin is taken off, the hat body is to be dipped into the mixture in a cold state, so as to absorb as much as possible of it; or it may be applied with a brush or sponge. The hat body, being thus stiffened, may stand till it becomes dry, or nearly so; and, after it has been brushed, it must be immersed in very dilute sulphuric or acetic acid, in order to neutralize the polish, and cause the shellac to set. If the hats are not to be napped immediately, they may be thrown into a cistern of pure water, and taken out as wanted.

To Bleach Straw Hats, &c.—Straw hats and bonnets are bleached by putting them, previously washed in pure water, into a box with burning sulphur. The fumes which arise unite with the water on the bonnets, and the sulphurous acid thus formed bleaches them.

Method of Bleaching Straw.—Dip the straw in a solution of oxygenated muriatic acid, saturated with potash. (Oxygenated muriate of lime is much cheaper.) The straw is thus rendered very white, and its flexibility is increased.

To Bleach Linen. — Mix common bleaching-powder, in the proportion of one pound to a gallon of water; stir it occasionally for three days, let it settle, and pour it off clear. Then make a lye of one pound of soda to a gallon of boiling soft water, in which soak the linen for twelve hours, and boil it half an hour; next soak it in the bleaching liquor, made as above; and lastly wash it in the usual manner.

Discolored linen or muslin may be restored by putting a portion of bleaching liquor into the tub wherein the articles are soaking.

Black Varnish for Chip and Straw Hats.—Best alcohol, 4 oz.; pulverized black sealing-wax, 1 oz.; put them into a phial, and put the phial into a warm place, stirring or shaking occasionally until the wax is dissolved. Apply it when warm before the fire or in the sun. This makes a beautiful gloss, and resists wet.

DRUGGIST'S DEPARTMENT.

Remedy for Diphtheria.—The treatment consists in thoroughly swabbing the back of the mouth and throat with a wash made thus: Table salt, 2 drachms; black pepper, golden seal, nitrate of potash, alum, 1 drachm each; mix and pulverize; put into a teacup half full of water; stir well, and then fill up with good vinegar. Use every half hour, one, two, and four hours, as recovery progresses. The patient may swallow a little each time. Apply 1 oz. each of spirits turpentine, sweet oil, and aqua-ammonia, mixed, every hour to the whole of the throat, and to the breast bone every four hours, keeping flannel to the part.

Holloway's Ointment and Pills.—Butter, 22 oz.; beeswax, 3 oz.; yellow rosin, 3 oz.; melt; add vinegar of cantharides, 1 oz.; evaporate; and add Canada balsam, 1 oz.; oil of mace, ½ drachm; balsam of Peru, 15 drops. *Pills:* Aloes, 4 parts; myrrh, jalap, and ginger, of each 2 parts; mucilage to mix.

Abernethy's Pills.—Each pill contains 2 grains of blue pill and 3 grains compound extract of colocynth.

Worm Lozenges.—Powdered lump sugar, 10 oz.; starch, 5 oz.; mix with mucilage; and to every ounce add 12 grains calomel, divided in 20 grain lozenges. Dose, two to six.

Soothing Syrup.—Alcohol, oil of peppermint, castor oil, of each 1 oz.; mix; add oil of anise, ½ drachm; magnesia, 60 grains; pulverized ginger, 40 grains; water, 2 oz.; white sugar to form a syrup.

Soothing Syrup.—Take 1 lb. of honey; add 2 tablespoonfuls of paregoric, and the same of oil of anise seed; add enough water

to make a thick syrup, and bottle. For children teething, dose, teaspoonful occasionally.

Infants' Syrup.—The syrup is made thus: 1 lb. best box raisins; ½ ounce of anise seed; two sticks licorice; split the raisins, pound the anise seed, and cut the licorice fine; add to it 3 quarts of rain water, and boil down to 2 quarts. Feed three or four times a day, as much as the child will willingly drink. The raisins are to strengthen, the anise is to expel the wind, and the licorice as a physic.

Brandreth's Pills.—Take 2 lbs. of aloes, 1 lb. of gamboge, 4 oz. of extract of colocynth, ½ lb. of castile soap, 3 fluid drachms of oil of peppermint, and 1 fluid drachm of cinnamon. Mix, and form into pills.

Perry Davis's Pain Killer.—Myrrh, 1½ oz.; guaiacum resin, 1 oz.; camphor, ½ oz.; red pepper, oil anise, each, 1 drachm; dilute alcohol, 2 pints; mix. Stand seven days, and filter.

Fahnestock's Vermifuge.—Castor oil, oil of worm seed, each 1 oz.; oil anise, ½ oz.; tincture myrrh, ½ drachm; oil turpentine, 10 minims, castor oil, 2 drops; mix.

Swaim's Vermifuge.—Wormseed, 2 oz.; valerian, rhubarb, pink-root, white agaric, of each 1½ oz.; boil in sufficient water to yield 3 quarts of decoction; and add to it 30 drops of oil of tansy and 45 drops of oil of cloves, dissolved in a quart of rectified spirits. Dose, 1 tablespoonful at night.

Ayer's Cherry Pectoral.—Take 4 grains of acetate of morphia; 2 fluid drachms of tincture of bloodroot; 3 fluid drachms each of antimonial wine and wine of ipecacuanha, and 3 fluid oz. of syrup of wild cherry. Mix.

Brown's Bronchial Troches.—Take 1 lb. of pulverized extract of licorice; 1½ lbs of pulverized sugar; 4 oz. of pulverized cubebs; 4 oz. of pulverized gum arabic, and 1 oz. of pulverized extract of conium. Mix.

Russia Salve.—Take equal parts of yellow wax and sweet oil; melt slowly, carefully stirring; when cooling, stir in a small quantity of glycerine. Good for all kinds of wounds, &c.

Dentist's Composition for Filling Decayed Teeth.—Gold, 1 part; mercury, 8 parts; incorporated by heating together; when mixed pour them into cold water; or tinfoil and quicksilver; melt together in a convenient vessel, take a small quantity, knead it in the palm of the hand and apply quick: or mix a little finely powdered glass with some mineral succedaneum; apply as usual: or take some mineral succedaneum and add some steel dust; or mineral succedaneum mixed with levigated porcelain, or china: or gypsum, 1 part; levigated porcelain, 1 part; levigated iron filings, 1 part; make into a paste with equal parts of quick drying copal and mastic varnish: or quicksilver, 40 grains; steel filings, 20 grains: or silver, 72 parts; tin, 20 parts; zinc, 6 parts: better than either, pure gold, 1 part; silver, 3 parts; tin, 2 parts; melt the first two, add the tin, reduce all to a fine powder, use with an equal quantity of pure mercury.

Gutta-percha, softened by heat, is recommended. Dr. Rollfs advises melting a piece of caoutchouc at the end of a wire, and introducing it while warm.

Amalgams for the teeth are made with gold or silver, and quicksilver, the excess of the latter being squeezed out, and the stiff amalgam used warm. Inferior kinds are made with quicksilver and tin, or zinc. A popular nostrum of this kind consists of 40 grains of quicksilver and 20 of fine zinc filings, mixed at the time of using. The following is said to be the most lasting and least objectionable amalgam: Melt 2 parts of tin with one of cadmium, run it into an ingot, and reduce it to filings. Form these into a fluid amalgam with mercury, and squeeze out the excess of mercury through leather. Work up the solid residue in the hand, and press it into the tooth. Another cement consists of about 73 parts of silver, 21 of tin, and 6 of zinc, amalgamated with quicksilver.

Poudre Metallique.—The article sold under this name in Paris appears to be an amalgam of silver, mercury, and ammonium, with an excess of mercury, which is pressed out before using it.

To Extract Teeth with Little or no Pain.—Tincture of aconite, chloroform, and alcohol, of each, 1 oz.; mix; moisten two pledgets of cotton with the liquid, and apply to the gums on each side of the tooth to be extracted, holding them in their place with pliers or other instruments, for from five to ten minutes, rubbing the gum freely inside and out.

Tooth-Wash.—To Remove Blackness.—Pure muriatic acid, 1 oz.; water, 1 oz.; honey, 2 oz.; mix. Take a tooth-brush, and wet it freely with this preparation, and briskly rub the black teeth, and in a moment's time they will be perfectly white; then immediately wash out the mouth with water, that the acid may not act upon the *enamel* of the teeth.

Ague, Cure Without Quinine.—Take mandrake root, fresh dug, pound it, and squeeze out 1½ tablespoonfuls of the juice, add an equal quantity of molasses, divide into three doses of one tablespoonful each, to be given two hours apart, commencing so that all will be taken before the chill. Then steep dogwood bark (some call it boxwood,) make it strong, and continue to drink it freely for a week or two at least.

Compound Extract of Buchu.—Buchu leaves, 1 lb.; boiling distilled water, 3 gals.; boil the leaves in 2 gals. of the water down to 6 quarts; then boil it again in the remaining water till reduced to 2 quarts. Evaporate the mixed liquors down to 6 quarts, and add 1 quart strong sage tea, 2 drs. Bicarb. Potassa, 2 drs. tincture cannabis Indica, 5 oz. rectified spirit, 2 oz. balsam copaiba, and Harlem oil, bottle.

New Method of Embalming.—Mix together 5 pounds dry sulphate of alumine, 1 quart of warm water, and 100 grains of arsenious acid. Inject 3 or 4 quarts of this mixture into all the vessels of the human body. This applies as well to all animals,

birds, fishes, &c. This process supersedes the old and revolting mode, and has been introduced into the great anatomical schools of Paris.

Nitrate of Silver.—Pure silver, 1½ oz.; nitric acid, 1 oz. diluted with water, 2 oz.; heat by a sand-bath until ebullition ceases, and the water is expelled; then pour into moulds. This substance must be kept from the light.

Hair Dye, No. 1.—Take gallic acid, ½ oz.; alcohol, 8 oz.; soft water, 16 oz. Put the acid in the alcohol, then add the water.

No. 2—Crystallized nitrate of silver, 1 oz., strongest ammonia, 3 ounces, gum arabic, ½ oz., soft water, 6 oz. Put the silver in the ammonia; do not cork it till it is dissolved; dissolve the gum in the water, then mix, and it is ready for use.

Keep Nos. 1 and 2 in separate bottles, and apply each alternately to the hair. Be particular to cleanse the hair before applying the dye.

Another.—Nitrate of silver, 11 drachms; nitric acid, 1 drachm; distilled water, 1 pint; sap green, 3 drachms; gum arabic, 1 drachm. Mix.

Another.—Nitric acid, 1 drachm; nitrate of silver, 10 drachms; sap green, 9 drachms; mucilage, 5 drachms; distilled water, 37½ fluid ounces.

Hair Invigorator.—Bay rum, 2 pints; alcohol, 1 pint; castor oil, 1 oz.; carb. ammonia, ½ oz.; tincture of cantharides, 1 oz. Mix them well. This compound will promote the growth of the hair, and prevent it from falling out.

Razor-Strop Paste.—Wet the strop with a little sweet oil, and appl a little flower of emery evenly over the surface.

Oil of Roses.—Olive oil, 1 lb.; otto of roses, 50 drops; oil of rosemary, 35 drops; mix. Another, roses (hardly opened,) 12 oz.; olive oil, 10 oz.; beat them together in mortar; let them remain for a few days, then express the oil.

Balm of Beauty.—Pure soft water, 1 quart; pulverized castile soap, 4 oz.; emulsion of bitter almonds, 6 oz.; rose and orange flower water, of each, 8 oz.; tincture of benzoin, 2 drs.; borax, 1 dr.; add 5 grs. bi-chloride of mercury to every 8 oz. of the mixture. To use, apply on a cotton or linen cloth to the face, &c.

Oriental Cold Cream.—Oil of almonds, 4 oz.; white wax and spermaceti, of each, 2 drs.; melt, and add rose water, 4 oz.; orange flower water, 1 oz. Used to soften the skin; apply as the last.

Shaving Cream.—White wax, spermaceti, and almond oil, of each ¼ oz.; melt, and while warm beat in two squares of Windsor soap previously reduced to a paste with rose water.

Circassian Cream.—Take 2 ounces of perfectly fresh suet, either of mutton or venison; 3 ounces of olive oil; 1 ounce of gum benzoin in powder, and ¼ ounce of alkanet root. Put the whole into a jam jar, which, if without a lid, must be tied over with bladder, and place the jar in a sauce pan containing boiling water, at

the side of the fire. Digest for a whole day, then strain away all that is fluid through fine muslin, and stir till nearly cold. Add, say 1 drachm of essence of almonds, roses, bergamot or any other perfume desired.

Yankee Shaving Soap.—Take 3 lbs. white bar soap, 1 lb. Castile soap, 1 quart rain water, ½ pt. beef's gall, 1 gill spirits turpentine. Cut the soap into thin slices, and boil five minutes after the soap is dissolved, stir while boiling: scent with oil of rose or almonds. If wished to color it, use ½ oz. vermilion.

Freckle Cure.—Take 2 oz. lemon juice, or ½ drachm of powdered borax, and one drachm of sugar; mix together, and let them stand in a glass bottle for a few days, then rub on the face occasionally.

Bloom of Youth.—Boil 1 ounce of Brazil wood in 3 pints of water for 15 minutes; strain. Add ¾ oz. isinglass, ¼ oz. cochineal, 1 oz. alum, ½ oz. borax. Dissolve by heat, and strain.

Cologne Water.—Oils of rosemary and lemon, of each ¼ oz., oils of bergamot and lavender, each ⅛ oz., oil cinnamon, 8 drops, oils of cloves and rose, each 15 drops, best deodorized alcohol, 2 qts., shake 2 or 3 times per day for a week.

We propose to give the formula for the following preparations, and shall commence with what is said to be—

Bogle's Hyperion Fluid.—To 8 oz. of 90 or 95 per cent. alcohol, colored red with alkanet, add 1 oz. of castor oil: perfume with geranium and verbena.

Lyon's Kathairon.—To 8 oz. of 80 per cent. alcohol, colored yellow by a few drops extract of annotto, add 2 oz. castor-oil, and perfume with a little bergamot.

Phalon's Hair Restorative.—To 8 oz. of 90 per cent. alcohol, colored by a few drops tincture of alkanet-root, add 1 oz. of castor oil, and perfume with a compound of bergamot, neroli, verbena and orange.

Mrs. Allen's.—To 16 oz. of rose water, diluted with an equal part of soft water, add ¼ oz. of sulphur and ¼ oz. of sugar of lead; let the compound stand five days before using.

Bachelor's Hair-Dye.—No. 1. To 1 oz. of gallic acid, dissolved in 8 oz. alcohol, add ½ gal. of soft water. No. 2. To 1 oz. nitrate of silver, dissolved in 1 oz. of concentrated ammonia and 3 oz. of soft water, add 1 oz. gum-arabic and 4 oz. of soft water.

Christadoro's Hair-Dye.—No. 1. To ¼ oz. of gallic acid, dissolved in 8 oz. alcohol, add ½ gal. soft water. No. 2. To 1 oz. crystallized nitrate of silver, dissolved in 1 oz. concentrated aqua-ammonia and 2 oz. soft water, add 2 oz. gum-arabic and 5 oz. soft water.

Phalon's Instantaneous Hair-Dye.—No. 1. To 1½ oz. gallic acid, and ¼ oz. of tannia, dissolved in 8 oz. of alcohol, add ½ gallon of soft water. No. 2. To 1 oz. crystallized nitrate of silver, dissolved in 1 oz. concentrated aqua-ammonia, add 1½ oz. gum-arabic, and 8 oz. soft water.

Harrison's.—No. 1. To ½ oz. gallic acid, 1 oz. of tannia dissolved in 10 oz. alcohol, add 2 qts. soft water. No. 2. To 1 oz. crystallized nitrate of silver, dissolved in 2 oz. of concentrated aqua-ammonia, add 12 oz. soft water and 1½ oz. gum-arabic. No. 3. 1 oz. hydro-sulphate of potassa, dissolved in ½ gal. of soft water. This last ingredient is intended to produce a deep black color if the others should fail.

Roche's Inimitable.—No. 1. To 2 oz. gallic acid, dissolved in 12 oz. alcohol, add 3 qts. soft water. No. 2. To 1 oz. of crystallized nitrate of silver, dissolved in 2 oz. of concentrated aqua-ammonia, add 1 oz. gum-arabic and 8 oz. soft water.

Phalon's (One Preparation.)—To 1 oz. crystallized nitrate of silver, dissolved in 2 oz. of aqua-ammonia, add 16 oz. soft water. This is not an instantaneous dye; but, after exposure to the light and air, a dark color is produced upon the surface to which it is applied.

Twiggs' Hair-Coloring.—Take 1 dr. lac sulphur, ½ dr. sugar of lead, 4 oz. rose-water: mix carefully. Apply to the hair repeatedly till it assumes the desired shade.

Warren's Hair-Coloring.—Sifted lime, 16 oz.; white lead, 2 oz.; litharge in fine powder, 1 oz.; mix well together, and keep dry. To dye *black*, mix a little powder with water to the consistency of cream. To dye *brown*, use milk instead of water. Apply to the hair with a small sponge.

Professor Wood's.—To 8 oz. vinegar, diluted with an equal part of soft water, add 2 drs. sulphur, and 2 drs. sugar of lead.

Alpine Hair-Balm.—To 16 oz. of soft water add 8 oz. of alcohol and ½ oz. of spirits turpentine, ¼ oz. sulphur, and ¼ oz. sugar of lead.

Glycerine Preparation.—New rum, 1 qt.; concentrated spirits of ammonia, 15 drops; glycerine oil, 1 oz.; lac sulphur, 5½ drs.; sugar of lead, 5½ drs.; put the liquor into a bottle, add the ammonia, then the other components. Shake the compound occasionally for four or five days.

Crystalline Cream.—Oil of almond, 8 oz.; spermaceti, 1 oz.; melt together. When a little cooled, add ½ oz. or less of essence of bergamot or other perfume; put into wide-mouthed bottles, and let it stand till cold. *Camphorated* crystalline cream may be made by using camphorated oil (Lin. Champhoræ) instead of oil of almonds.

Macassar Oil.—Olive oil, 1 qt., alcohol, 2½ oz., rose oil, 1½ oz., then tie 1 oz. of chipped alkanet root in a muslin bag, and put it in the oil, let it alone for some days till it turns the color of a pretty red, then remove to other oils. Do not press it.

Ox Marrow.—Melt 4 oz. ox tallow, white wax, 1 oz., fresh lard, 6 oz., when cold add 1½ oz. oil of bergamot.

Bear's Oil.—Use good sweet lard oil, 1 qt., oil bergamot, 1½ ounce.

Hair Restorative.—Sugar of lead, borax, and lac-sulphur, of

each, 1 oz., aqua-ammonia, ½ oz., alcohol, 1 gill. These articles are to stand mixed for 14 hours; then add bay rum, 1 gill, fine table salt, 1 table spoon, soft water, 3 pints, essence of bergamot, 1 oz. This preparation gives a splendid glossy appearance to the hair, turns gray hair to a dark color, and restores the hair when common baldness sets in. When the hair is thin or bald, apply twice a day with a hard brush, working it into the roots of the hair. For gray hair once a day is sufficient.

Balm of a Thousand Flowers.—Deodorized alcohol, 1 pt., nice white bar soap, 4 oz., shave the soap when put in, stand in a warm place till dissolved; then add oil of citronella, 1 dr., and oils of neroli and rosemary, of each ½ dr.

New York Barber's Star Hair Oil.—Castor oil, 6½ pts., alcohol, 1½ pts., citronella and lavender oil, each ½ oz.

Barber's Shampoo Mixture.—Soft water, 1 pt., sal soda, 1 oz., cream tartar, ¼ oz. Apply thoroughly to the hair.

Frangipanni.—Spirits, 1 gal., oil bergamot, 1 oz., oil of lemon, 1 oz., macerate for 4 days, frequently shaking; then add water, 1 gal., orange-flower water, 1 pint, essence of vanilla, 2 oz. Mix.

Jockey Club.—Spirit of wine, 5 gals., orange-flower water, 1 gal., balsam of peru, 4 oz., essence of bergamot, 8 oz., essence of musk, 8 oz., essence of cloves, 4 oz., essence of neroli, 2 oz. Mix.

Ladies' Own.—Spirits of wine, 1 gal., otto of roses, 20 drops, essence of thyme, ½ oz., essence of neroli, ¼ oz., essence of vanilla, ½ oz., essence of bergamot, ¼ oz., orange-flower water, 6 oz.

Kiss Me Quick.—Spirits, 1 gal., essence of thyme, ¼ oz., essence of orange-flowers, 2 oz., essence neroli, ½ oz., otto of roses, 30 drops, essence of jasmine, 1 oz., essence of balm mint, ½ oz., petals of roses, 4 oz., oil lemon, 20 drops, calorus aromaticus, ½ oz., essence neroli, ¼ oz. Mix and strain.

Upper Ten.—Spirits of wine, 4 qts., essence of cedrat, 2 drs., essence of violets, ¼ oz., essence of neroli, ½ oz., otto of roses, 20 drops, orange-flower essence, 1 oz., oil of rosemary, 30 drops, oils bergamot and neroli, each ½ oz.

India Cholagogue.—Quinine, 20 grs.; Peruvian bark, pulverized, 1 oz., sulphuric acid, 15 drops, or 1 scruple of tartaric acid is best; brandy, 1 gill; water to make one pint; dose, 5 teaspoonfuls every 2 hours in the absence of fever, an excellent remedy.

Febrifuge Wine.—Quinine, 25 grs., water, 1 pint; sulphuric acid, 15 drops; epsom salts, 2 oz.; color with tincture of red sanders; dose, a wine glass 3 times per day. This is a world renowned medicine.

Barrel's Indian Liniment.—Alcohol, 1 qt., tincture of capsicum, 1 oz., oils of origanum, sassafras, pennyroyal, and hemlock, of each ½ oz., mix. More than $70,000 have been cleared by the sale of this medicine during the last twelve years, in the Western States.

Cod Liver Oil.—As usually prepared is nothing more or less than cod oil clarified, by which process it is in fact deprived in a great measure of its virtue. Cod oil can be purchased from any wholesale oil dealer for one thirtieth part of the price of cod liver oil as usually sold, as it is easy to clarify it. Dealers might turn this information to good account. To make it more palatable and digestible, put 1 oz. of fine table salt to each quart bottle.

Paregoric.—Best opium, ½ dr., dissolve it in about 2 tablespoons of boiling water; then add benzoic acid, ½ dr.; oil of anise, ½ a fluid dr.; clarified honey, 1 oz.; camphor gum, 1 scruple; alcohol, 76 per cent., 11 fluid oz.; distilled water, 4 fluid oz.; macerate (keep warm) for two weeks. DOSE—For children, 5 to 20 drops, adults, 1 to 2 teaspoons.

Cough Syrup.—Syrup of squills, 2 oz., tartarized antimony, 8 grs., sulphate of morphine, 5 grs., pulverized gum arabic, ½ oz., honey, 1 oz., water, 1 oz., mix; dose for an adult 1 small teaspoonful, repeat in half an hour if it does not relieve; child in proportion.

Vegetable Substitute for Calomel.—Jalap, 1 oz., senna, 2 oz., peppermint, 1 oz., (a little cinnamon if desired,) all pulverized and sifted through gauze: dose, 1 teaspoonful put in a cup with two or three spoonfuls of hot water, and a good lump of white sugar; when cool, drink all; to be taken fasting in the morning; drink freely, if it does not operate in 3 hours repeat ½ the quantity, use instead of calomel.

Camphor Ice.—Spermaceti, 1½ oz., gum camphor, ¾ oz., oil sweet almonds, 4 teaspoonfuls; set on the stove in an earthern dish till dissolved; heat just enough to dissolve it. While warm pour into small moulds, if desired to sell; then paper, and put into tinfoil; used for chaps on hands or lips.

Imperial Drops for Gravel and Kidney Complaints.—Oil of origanum, 1 oz., oil of hemlock, ¼ oz., oil of sassafras, ¼ oz., oil of anise, ½ oz., alcohol, 1 pint: mix. Dose, from ½ to 1 teaspoonful 3 times a day, in sweetened water, will soon give relief when constant weakness is felt across the small of the back, as well as gravelly affections causing pain about the kidneys.

Positive Cure for Gonorrhœa.—Liquor of potass, ½ oz., bitter apple, ½ oz., spirits of sweet nitre, ½ oz., balsam of copaiba, ½ oz., best gum, ¼ oz. To use, mix with peppermint water; take ½ teaspoonful 3 times per day: cure certain in 9 days.

Celebrated Pile Ointment.—Take carbonate of lead, ½ oz., sulphate of morphia, 15 grs., stramonium ointment, 1 oz., olive oil, 20 drops. Mix, and apply 3 times per day, or as the pain may require.

Fly Paper.—Coat paper with turpentine varnish, and oil it to keep the varnish from drying.

Sweating Drops.—Ipecac, saffron, boneset, and camphor gum

of each, 3 oz.; opium, 1 oz., alcohol, 2 qts. Let stand 2 weeks and filter. A teaspoonful in a cup of hot sage or catnip tea every hour until free perspiration is induced; excellent in colds, fevers, inflammations, &c. Bathe the feet in hot water at the same time.

Syrup for Consumptives.—Of tamarac bark, take from the tree without rossing, 1 peck; spikenard root, ½ lb., dandelion root, ¼ lb., hops, 2 oz. Boil these sufficient to get the strength in two or three galls. water; strain, and boil down to one gall., when blood warm, add 3 lbs. best honey, and 3 pints best brandy; bottle and keep in a cool place. Dose, drink freely of it 3 times per day before meals, at least a gill or more; cure very certain.

Common Castor Oil.—Pale vegetable oil, 1 gall, castor oil, 3 galls. Mix.

Pulmonic Wafers.—Lump sugar, licorice, and starch, of each 2 parts; gum, 10 parts; squills and ipecacuanha, of each 5 parts; lactucarium, 2 parts. Mix, and divide into 8-grain lozenges.

Sir James Clarke's Diarrhœa and Cholera Mixture.—Tinct. of opium, tinct. of camphor, and spirits of turpentine, of each 3 drachms; oil of peppermint 30 drops; mix. Dose 1 teaspoonful in brandy and water for diarrhœa; one tablespoonful for cholera.

Vegetable or Composition Powder.—Fine bayberry bark, 1 lb., ginger, 8 oz., common cayenne, 3 oz., mix. Dose, 1 teaspoonful in a cup of boiling water, sweeten and add milk. The best powder on record.

Tinctures.—Are made with one ounce of gum, root, or bark, &c., dried; to each pint of proof spirits, and let it stand one week, and filter.

Essences.—Are made with one ounce of any given oil, added to 1 pint alcohol. Peppermints are colored with tinct. turmeric, cinnamon with tinct. of red sanders, wintergreen with tinct. kino.

Substitute for Arrowroot.—Finest potato starch, 75 lbs., lump sugar, 8 lbs., finely ground rice, 21 lbs. Mix, and sift through lawn; yields 100 lbs. excellent arrowroot.

Certain Cures for Croup.—Goose oil and urine, equal parts. Dose 1 teaspoonful. A certain cure if taken in time.

Corns and Warts.—Take a small quantity of the potash paste recommended for Poll Evil and Fistula, and apply it to the corn or wart.

Druggist's Colors.—Yellow, take iron filings, hydrochloric acid to dissolve, dilute with cold water. Red, solution of sal ammoniac, cochineal to color. Blue, indigo 1 part, oil of vitriol, 7 parts, dissolve, then dilute with water. Green, verdigris, 1 part, acetic acid, 3 parts, dilute with water. Purple, cochineal, 25 grs., sugar of lead 1 oz., dissolve.

Smelling Salts.—Sub-carbonate of ammonia, 8 parts, put in coarse powder in a bottle, and pour on it oil of lavender, 1 part.

Tunbridge Wells Water.—Chloride of sodium, 5 grains, tinct. steel, 20 drops, distilled water, 1¼ pints.

Mineral Water.—Epsom salts, 1 oz., cream tartar, ½ oz., tartaric acid, ¼ oz., loaf sugar, 1 lb., oil of birch, 20 drops, put 1 qt. cold water on two tablespoonfuls yeast (winter green oil will do), let it work 2 hours and then bottle.

Genuine Seidlitz Powders.—Rochelle salts, 2 drs., bicarb. soda, 2 scruples, put these into a blue paper, and put 35 grains tartaric acid into a white paper. To use, put each into different tumblers, fill ½ with water, adding a little loaf sugar to the acid, then pour together and drink quick.

Bottled Seidlitz Water.—Fill soda-water bottles with clear water; add to each as below; cork and wire immediately: Rochelle salts, 3 drops; bi-carbonate of soda, 35 grs.; sulphuric acid, 11 drops.

Excellent Tooth Powder.—Suds of castile soap and spirits of camphor, of each an equal quantity; thicken with equal quantities of pulverized chalk and charcoal to a thick paste. Apply with the finger or brush.

Rat Exterminator.—Warm water, 1 qt., lard, 2 lbs., phosphorus, 1 oz., mix, and thicken with flour; to be spread on bread and covered with sugar.

Bug Poison.—Alcohol, ½ pint, turpentine, ½ pint, crude sal ammoniac, 1 oz.: mix all together, and let it digest in a warm place for a few days, and it is ready for use.

Medicated Cough Candy.—To 5 lbs. candy just ready to pour on the slab, add the following mixture, and form it into sticks to correspond with the price asked for them: Tinct. squills, 2 oz., camphorated tinct. of opium and tinct. of tolu of each ½ oz., wine of ipecac ½ oz., oils of gaultheria 4 drops, sassafras 3 drops, and of anise seed oil 2 drops, and use this freely in common coughs.

Atkinson's Infants' Preservation.—Carbonate of magnesia, 6 drs., sugar, 2 oz., oil of anise seed, 20 drops, sal volatile, 2½ drs., laudanum, 1 dr., syrup of saffron, 1 oz. Make up 1 pint with caraway water.

Ague Pill.—Quinine, 20 grs., Dover's powders, 10 grs., sub-carbonate of iron, 10 grs., mix with mucilage of gum arabic and form into 20 pills. Dose, 2 each hour, commencing 5 hours before the chill should set in. Then take 1 night and morning until all are taken.

Pills to promote Menstrual Secretion.—Take pills of aloes and myrrh, 4 drs.; compound iron pills, 280 grs.; mix and form into 100 pills. Dose 2, twice a day.

For Obstructed Menstruation.—Sulphate of iron, 60 grs.; potassa (sub. carb.), 60 grs.; myrrh, 2 drs.; make them into 3½ gr. pills; 2 to be taken 3 times a day, in the absence of fever. For Painful Menstruation, take pulv. rhei., 2 dr., pulv. jalap, 2 dr., pulv. opi., 2 dr., syrup of poppies to mix. Divide into 200 pills, and take night and morning. To check Immoderate Flow—Tinct. of ergot, 1 oz., liquor of ammonia, 3 drs., mix. Dose, teaspoonful in water 3 times a day.

Stimulant.—In Low Fevers, and After Uterine Hemorrhages.—Best brandy, and cinnamon water, of each, 4 fluid oz.; the yolks of 2 eggs, well beaten; loaf sugar, ½ oz.; oil of cinnamon, 2 drops; mix. Dose—From ½ to 1 (fluid) oz., as often as required. This makes both meat and drink. Of course any other flavoring oils can be used, if preferred, in place of the cinnamon.

For Female Complaints.—One of the best laxative pills for female complaints is marcrotin and rhubarb, each 10 grains; extract of hyoscyamus, 10 grains; castile soap, 40 grains; scrape the soap, and mix well together, forming into common sized pills with gum solution. Dose, 1 pill at bed time, or sufficiently often to keep the bowels in a laxative state.

Anodyne for Painful Menstruation —Extract of stramonium and sulphate of quinine, each 16 grains; macrotin, 8 grains; morphine, 1 grain; make into 8 pills. Dose, 1 pill, repeating once or twice only, 40 to 50 minutes apart, if the pain does not subside before this time. Pain *must* subside under the use of this pill, and costiveness is not increased.

Powder for Excessive Flooding.—Gums kino and catechu, each 1 dr.; sugar of lead and alum, each ½ dr.; pulverize all and thoroughly mix, then divide into 7 to 10 grain powders. Dose, one every two or three hours until checked, then less often merely to control the flow.

Injection for Leucorrhea.—When the glairy mucous discharge is present, prepare a tea of hemlock inner bark and witch hazel (often called spotted alder) leaves and bark, have a female syringe large enough to fill the vagina, and inject the tea, twice daily; and occasionally in bad cases, say twice a week, inject a syringe of the following composition:

For Chronic Female Complaints.—White vitriol and sugar of lead, each ½ oz.; common salt, pulverized alum, and loaf sugar, of each ½ dr.; soft water, 1 pint. Inject as above.

For Prolapsus Uteri, or Falling of the Womb—Not only the cheapest but the best support will be found to be a piece of fine firm sponge, cut to a proper size to admit, when damp, of being pressed up the vagina to hold the womb in its place. The sponge should have a stout piece of small cord sewed two or three times through its centre, up and down, and left sufficiently long to allow its being taken hold of to remove the sponge, once a day, or every other day at the farthest, for the purpose of washing, cleaning, and using the necessary injections; and this must be done while the patient is lying down, to prevent the womb from again falling or prolapsing. After having injected some of the above tea, wet the sponge in the same, and introduce it sufficiently high to hold the womb in its place. If pain is felt about the head, back, or loins for a few days before the menses appear, prepare and use the following:

Emmenagogue Tincture.—Alcohol, 1 pint; red oxide of iron, 1 oz.; oils of juniper and savin, each ¼ oz.; oil of tansy, 1 dr.;

tincture of ergot, 3 drs.; tincture Spanish flies, ½ oz.; mix all, and shake when taken. Dose, 1 teaspoon 3 times daily, to be taken in mucilage of slippery elm or gum arabic, and drink freely of the mucilage also through the day, or use the following:

Emmenagogue Pill.—Precipitated carbonate of iron and gum myrrh, of each 2 drs.; aloes and tincture of Spanish flies, of each 1 dr.; and oil of savin, 1 dr.; all to be pulverized, and make into 100 pills by using thick gum solution. Dose, 1 pill, from 1 to 3 times daily, but not to move the bowels too much.

Uterine Hemorrhages.—UNFAILING CURE.—Sugar of lead, 10 grs.; ergot, 10 grs.; opium, 3 grs.; ipecac, 1 gr.; all pulverized and well mixed. Dose, 10 to 12 grs., given in a little honey or syrup. In very bad cases after childbirth, it might be repeated in thirty minutes, or the dose increased to 15 or 18 grs.; but in cases of rather profuse masting, repeat it once at the end of 3 hours, or as the urgency of the case may require.

In every case of female debility make a liberal use of iron, as the want of iron in the system is often the cause of the trouble. Mix fine iron filings with as much ground ginger. Dose, half of a teaspoon 3 times daily in a little honey or molasses, increasing or lessening the dose to produce a blackness of the stools. Continue this course until well.

Nerve and Bone Liniment.—Beef's gall, 1 qt.; alcohol, 1 pt.; volatile liniment, 1 lb.; spirits of turpentine, 1 lb.; oil origanum, 4 oz.; aqua ammonia, 4 oz.; tincture of cayenne, ½ pt.; oil of amber, 3 oz.; tincture Spanish flies, 6 oz.; mix well.

Cephalic Snuff.—Take asarabacca leaves, marjoram, light Scotch snuff, equal parts; grind them and sift; use like common snuff.

Positive Cure for Ague Without Quinine.—Peruvian bark, 2 oz.; wild cherry-tree bark, 1 oz.; cinnamon, 1 dr.; capsicum, 1 teaspoonful; sulphur, 1 oz.; port wine, 2 quarts; let it stand 2 days. Buy your Peruvian bark and pulverize it yourself, as it is often adulterated otherwise. Dose, 1 wine-glass full every 2 or 3 hours after the fever is off, then 2 or 3 per day till all is used. A certain cure. Before taking the above, cleanse the bowels with a dose of epsom salts, or other purgative.

Liquid Opodeldoc.—Warm brandy, 1 quart; add to it gum camphor, 1 oz.; sal ammoniac, ¼ oz.; oils of origanum and rosemary, each ½ oz.; oil wormwood, ¼ oz.; when the oils are dissolved, add 6 oz. soft soap.

Green Mountain Salve.—For rheumatism, burns, pains in the back or side, &c. Take 2 lbs. rosin; burgundy pitch, ¼ lb.; beeswax, ¼ lb.; mutton tallow, ¼ lb.; melt slowly; when not too warm add oil hemlock, 1 oz.; balsam fir, 1 oz.; oil of origanum, 1 oz.; oil of red cedar, 1 oz.; Venice turpentine, 1 oz.; oil of wormwood, 1 oz.; verdigris, ½ oz. The verdigris must be finely pulverized and mixed with the oils; then add as above, and work in cold

water like wax till cold enough to roll; rolls five inches long, one inch diameter, sell for 25 cents. Superior to Peleg White's Salve.

English Remedy for Cancer.—Take chloride of zinc, blood-root pulverized, and flour, equal quantities of each, worked into a paste and applied. First spread a common sticking-plaster *much* larger than the cancer, cutting a circular piece from the centre of it a *little* larger than the cancer, applying it, which exposes a narrow rim of healthy skin; then apply the cancer plaster, and keep it on 24 hours. On removing it, the cancer will be found to be burned into, and appears the color of an old shoe-sole, and the rim outside will appear white and parboiled, as if burned by steam. Dress with slippery-elm poultice until suppuration takes place, then heal with any common salve.

Chronic Gout.—To CURE.—Take hot vinegar, and put into it all the table salt which it will dissolve, and bathe the parts affected with a soft piece of flannel. Rub in with the hand, and dry the foot, &c., by the fire. Repeat this operation four times in the 24 hours, 15 minutes each time, for four days; then twice a day for the same period; then once, and follow this rule whenever the symptoms show themselves at any future time.

Gout Tincture.—Veratrum viride (swamp hellebore,) ½ oz.; opium, ¼ oz.; wine, ½ pint; let them stand for several days. Dose, 15 to 30 drops, according to the robustness of the patient, at intervals of 2 to 4 hours.

Paralytic Liniment.—Sulphuric ether, 6 oz.; alcohol, 2 oz.; laudanum, 1 oz.; oil of lavender, 1 oz.; mix, and cork tightly. In a recent case of paralysis let the whole extent of the numb surface be thoroughly bathed and rubbed with this preparation, for several minutes, using the hand, at least three times daily; at the same time take internally 20 drops of the same, in a little sweetened water, to prevent translation upon some internal organ.

Charcoal, a Cure for Sick Headache.—It is stated that two teaspoons of finely powdered charcoal, drank in half a tumbler of water will, in less than fifteen minutes, give relief to the sick headache when caused, as in most cases it is, by superabundance of acid on the stomach. We have tried this remedy time and again, and its efficacy in every instance has been signally satisfactory.

Cathartic Syrup.—Best senna leaf, 1 oz.; butternut, the inner bark of the root, dried and bruised, 2 oz.; peppermint leaf, ½ oz.; fennel seed, ½ oz.; alcohol, ½ pint; water, 1½ pints; sugar, 2 lbs.; put all into the spirit and water, except the sugar, and let it stand two weeks; then strain, pressing out from the dregs, adding the sugar, and simmering a few minutes only, to form the syrup. If it should cause griping in any case, increase the fennel seed and peppermint leaf. Dose, one tablespoon, once a day, or less often if the bowels become too loose, up to the next period when the headache might have been expected, and it will not be forthcoming.

Chilblains—To Cure.—Published by Order of the Government of Wurtemberg.—Mutton tallow and lard, of each ¼ lb.; melt in an iron vessel and add hydrated oxyde of iron, 2 oz.; stirring continually with an iron spoon, until the mass is of a uniform black color; then let it cool, and add Venice turpentine, 2 oz.; Armenian bole, 1 oz.; oil of bergamot, 1 dr.; rub up the bole with a little olive oil before putting it in.

Felons.—If Recent, to Cure in Six Hours.—Venice turpentine, 1 oz.; and put into it half a teaspoon of water, and stir with a rough stick until the mass looks like candied honey; then spread a good coat on a cloth, and wrap around the finger. If the case is only recent it will remove the pain in six hours.

Felon Salve.—A salve made by burning one tablespoon of copperas, then pulverizing it and mixing with the yolk of an egg, is said to relieve the pain and cure the felon in 24 hours; then heal with cream two parts, and soft soap one part. Apply the healing salve daily after soaking the part in warm water.

Felon Ointment.—Take sweet oil, ½ pint, and stew a 3-cent plug of tobacco in it until the tobacco is crisped; then squeeze it out, and add red lead, 1 oz.; and boil until black; when a little cool, add pulverized camphor gum, 1 oz.

Warts and Corns.—To Cure in ten Minutes.—Take a small piece of potash, and let it stand in the open air until it slacks, then thicken it to a paste with pulverized gum arabic, which prevents it from spreading where it is not wanted.

German Rheumatic Fluid.—Oils of hemlock and cedar, of each ½ oz.; oils of origanum and sassafras, each 1 oz.; aqua ammonia, 1 oz.; capsicum, pulverized, 1 oz.; spirits of turpentine and gum camphor, each ½ oz.; put all into a quart bottle, and fill with 95 per cent. alcohol.

The Germans praise the above liniment very highly as a *sine qua non* for man or beast. Dose, for colic, for man, half a teaspoon; for a horse, ½ to 1 oz., in a little warm water, every 15 minutes, till relieved.

Liniment for Old Sores.—Alcohol, 1 quart; aqua ammonia, 4 oz.; oil of origanum, 2 oz.; camphor gum, 2 oz.; opium, 2 oz.; gum myrrh, 2 oz.; common salt, 2 tablespoons. Mix, and shake occasionally for a week.

Liniment.—Good Samaritan.—Take 98 per cent. alcohol, 2 quarts, and add to it the following articles: Oils of sassafras, hemlock, spirits of turpentine, tincture of cayenne, catechu, guaiac, (guac) and laudanum, of each 1 oz.; tincture of myrrh, 4 oz.; oil of origanum, 2 oz.; oil of winter green, ½ oz.; gum camphor, 2 oz.; and chloroform, 1½ oz. This is one of the best applications for internal pains known; it is superior to any other enumerated in this work.

Rheumatism.—Soak the root of polk berry bushes in hot lard, and apply it as hot as you can bear it to the parts affected, and leave it on, say all night. This has cured a case of two years standing.

Cook's Electro-Magnetic Liniment.—Best alcohol, 1 gallon;

oil of amber, 8 oz.; gum camphor, 8 oz.; castile soap shaved fine, 2 oz.; beef's gall, 4 oz.; ammonia, 3 F.'s strong, 12 oz.; mix, and shake occasionally for 12 hours, and it is fit for use. This will be found a strong and valuable liniment.

Great London Liniment.—Take chloroform, olive oil, and aqua ammonia, of each 1 oz.; acetate of morphia, 10 grs. Mix and use as other liniments. Very valuable.

Ointments.—FOR OLD SORES.—Red precipitate, ½ oz.; sugar of lead, ½ oz.; burnt alum, 1 oz.; white vitriol, ¼ oz., or a little less; all to be very finely pulverized; have mutton tallow made warm, ½ lb.; stir all in, and stir until cool.

Judkins Ointment.—Linseed oil, 1 pt.; sweet oil, 1 oz.; and boil them in a kettle on coals for nearly 4 hours, as warm as you can; then have pulverized and mixed borax, ½ oz.; red lead, 4 oz.; and sugar of lead, 1½ oz.; remove the kettle from the fire, and thicken in the powder; continue the stirring until cooled to blood heat, then stir in 1 oz. of spirits of turpentine; and now take out a little, letting it get cold, and if not then sufficiently thick to spread upon thin, soft linen, as a salve, you will boil again until this point is reached. It is good for all kinds of wounds, bruises, sores, burns, white swellings, rheumatisms, ulcers, sore breasts; and even where there are wounds on the inside, it has been used with advantage, by applying a plaster over the part.

Green Ointment.—Honey and beeswax, each ½ lb.; spirits of turpentine, 1 oz.; wintergreen oil and laudanum, each 2 oz.; verdigris, finely pulverized, ¼ oz.; lard, 1½ lbs.; mix by a stove fire, in a copper kettle, heating slowly.

Mead's Salt-Rheum Ointment.—Aquafortis, 1 oz.; quicksilver, 1 oz.; good hard soap dissolved so as to mix readily, 1 oz.; prepared chalk, 1 oz., mixed with 1 lb. of lard; incorporate the above by putting the aquafortis and quicksilver into an earthern vessel, and when done effervescing, mix with the other ingredients, putting the chalk in last; add a little spirits of turpentine, say ½ tablespoon.

Itch Ointment.—Unsalted butter, 1 lb.; burgundy pitch, 2 oz.; spirits of turpentine, 2 oz.; red precipitate, pulverized, 1¼ oz.; melt the pitch and add the butter, stirring well together; then remove from the fire, and when a little cool add the spirits of turpentine, and lastly the precipitate, and stir until cold.

Magnetic Ointment.—SAID TO BE TRASK'S.—Lard, raisins cut in pieces, and fine-cut tobacco, equal weights; simmer well together, then strain, and press out all from the dregs.

Jaundice.—DR. PEABODY'S CURE.—IN ITS WORST FORMS.—Red iodide of mercury, 7 grs.; iodide of potassium, 9 grs.; aqua dis. (distilled water) 1 oz.; mix. Commence by giving 6 drops 3 or 4 times a day, increasing 1 drop a day until 12 or 15 drops are given at a dose. Give in a little water immediately after meals. If it causes a griping sensation in the bowels, and fulness in the head, when you get up to 12 or 15 drops, go back to 6 drops, and up again as before.

Inflammatory Rheumatism.—WRIGHT'S CURE.—Sulphur and

saltpetre, of each 1 oz.; gum guaiac, ½ oz.; colchicum root, or seed, and nutmegs, of each ¼ oz., all to be pulverized and mixed with simple syrup, or molasses, 2 oz. Dose, one teaspoon every 2 hours until it moves the bowels rather freely; then 3 or 4 times daily until cured.

Dr. Kittredge's Remedy for Rheumatism and Stiff Joints.—Strong camphor spirits, 1 pt.; neats-foot, coon, bear, or skunk's oil, 1 pt.; spirits of turpentine, ½ pt. Shake the bottle when used, and apply 3 times daily, by pouring on a little at a time, and rubbing in all you can for 20 to 30 minutes.

Asthma Remedies.—Elecampane, angelica, comfrey, and spikenard roots with hoarhound tops, of each 1 oz.; bruise and steep in honey, 1 pt. Dose, a tablespoon, taken hot every few minutes, until relief is obtained, then several times daily until a cure is effected.

ANOTHER.—Oil of tar, 1 dr.; tincture of veratrum viride, 2 drs.; simple syrup, 2 drs.; mix. Dose, for adults, 15 drops 3 or 4 times daily. Iodide of potassium has cured a bad case of asthma by taking 5 gr. doses 3 times daily. Take ½ oz. and put it into a vial, and add 32 teaspoons of water; then 1 teaspoon of it will contain the 5 grs., which put into ½ gill more water, and drink before meals.

Composition Powder.—THOMPSON'S.—Bayberry bark, 2 lbs.; hemlock bark, 1 lb.; ginger root, 1 lb.; cayenne pepper, 2 oz.; cloves, 2 oz.; all finely pulverized and well mixed. Dose, ½ of a teaspoon of it, and a spoon of sugar; put them into a tea-cup, and pour it half full of boiling water; let it stand a few minutes, and fill the cup with milk, and drink freely. If no milk is to be obtained, fill up the cup with hot water.

French Remedy for Chronic Rheumatism.—Dr. Bonnet, of Graulbet, France, states in a letter to the "Abeille Medicale," that he has been long in the habit of prescribing "the essential oil of turpentine for frictions against rheumatism. And that he has used it himself with perfect success, having almost instantaneously got rid of rheumatic pains in both knees and in the left shoulder."

Diuretics.—PILL, DROPS, DECOCTION, &c.—Solidified copaiba, 2 parts; alcoholic extract of cubebs, 1 part; formed into pills with a little oil of juniper. Dose, 1 or 2 pills 3 or 4 times daily. This pill has been found very valuable in affections of the kidneys, bladder, and urethra, as inflammation from gravel, gonorrhœa, gleet, whites, leucorrhœa, common inflammations &c. For giving them a sugar coat, see that heading, if desired.

Diuretic Drops.—Oil of cubebs, ½ oz.; sweet spirits of nitre, ½ oz.; balsam of copaiba, 1 oz.; harlem oil, 1 bottle; oil of lavender, 20 drops; spirits of turpentine, 20 drops; mix. Dose: 10 to 25 drops, as the stomach will bear, three times daily.

It may be used in any of the above diseases with great satisfaction.

Diuretic Tincture.—Green or growing spearmint mashed, put into a bottle, and covered with gin, is an excellent diuretic.

Diuretic for Children.—Spirits of nitre—a few drops in a little spearmint tea—is all sufficient. For very young children, pumpkin-seed, or water-melon seed tea is perhaps the best.

Dropsy. — SYRUP AND PILLS. — Queen-of-the-meadow root, dwarf-elder flowers, berries, or inner bark, juniper berries, horse-radish root, pod milkweed, or silkweed, often called, root of each, 5 oz.; prickly-ash bark or berries, mandrake root, bittersweet bark, of the root of each, 2 oz.; white-mustard seed 1 oz.; holland gin, 1 pt.

Pour boiling water upon all except the gin, and keep hot for twelve hours; then boil and pour off twice, and boil down to three quarts, and strain, adding three pounds of sugar, and lastly the gin. Dose: take all the stomach will bear, say a wine glass a day, or more.

Dropsy Pills.—Jalap, 50 grs.; gamboge, 30 grs.; podophyllin 20 grs.; elaterium, 12 grs.; aloes, 30 grs.; cayenne, 35 grs.; castile soap, shaved and pulverized, 20 grs.; croton oil, 90 drops; powder all finely, and mix thoroughly; then form into pill mass, by using a thick mucilage made of equal parts of gum arabic and gum tragacanth, and divide in three-grain pills. Dose: 1 pill every 2 days for the first week; then every 3 or 4 days, until the water is evacuated by the combined aid of the pill with the alum syrup. This is a powerful medicine, and will thoroughly accomplish its work.

Eclectic Liver Pills.—Podophyllin, 10 grs.; leptandrin, 20 grs.; sanguinarin, 10 grs.; ext. of dandelion, 20 grs.; formed into 20 pills by being moistened a little with some essential oil, as cinnamon or peppermint, &c. Dose: in chronic diseases of the liver, take 1 pill at night for several days, or 2 may be taken at first to move the bowels; then 1 daily.

Liver Pill Improved.—Leptandrin, 40 grs.; podophyllin and cayenne, 30 grs. each; sanguinarin, irridin, and ipecac, 15 grs. each; see that all are pulverized and well mixed; then form into pill mass by using ¾ dr. of the soft extract of mandrake and a few drops of anise oil, then roll out into three-grain pills. Dose: 2 pills taken at bed-time will generally operate by morning; but there are those that will require 8.

Irritating Plaster.—EXTENSIVELY USED BY ECLECTICS.—Tar, 1 lb.; burgundy pitch, ½ oz.; white pine turpentine, 1 oz.; resin, 2 oz. Boil the tar, resin, and gum together a short time, remove from the fire, and stir in finely pulverized mandrake root, blood root, poke root, and Indian turnip, of each, 1 oz.

To Improve the Voice.—Beeswax, 2 drs.; copaiba balsam, 3 drs.; powder of liquorice root, 4 drs. Melt the copaiba balsam with the wax in a new earthen pipkin; when melted remove them from the fire, and mix in the powder; make the pills of 3 grains each. Two of these pills to be taken 3 or 4 times a day. Very best known.

Pills.—TO SUGAR COAT.—Pills to be sugar coated must be very dry, otherwise they will shrink away from the coating, and leave it a shell easily crushed off. When they are dry, you will take starch, gum arabic, and white sugar, equal parts, rubbing them very fine in a marble mortar, and if damp they must be dried before rubbing

together; then put the powder into a suitable pan, or box, for shaking; now put a few pills into a small tin box having a cover, and pour on to them just a little simple syrup, shaking well to moisten the surface only; then throw into the box of powder, and keep in motion until completely coated, dry, and smooth.

If you are not very careful, you will get too much syrup upon the pills; if you do, put in more, and be quick about it to prevent moistening the pill too much, getting them into the powder as soon as possible.

Positive Cure for Hydrophobia.—The dried root of elecampane, pulverize it, and measure out 9 heaping table-spoons, and mix it with 2 or 3 tea-spoons of pulverized gum arabic; then divide into 9 equal portions. When a person is bitten by a rabid animal, take one of these portions and steep it in 1 pt. of new milk, until nearly half the quantity of milk is evaporated; then strain, and drink it in the morning, fasting for 4 or 5 hours after. The same dose is to be repeated 3 mornings in succession, then skip 3, and so on until the 9 doses are taken.

The patient must avoid getting wet, or the heat of the sun, and abstain from high seasoned diet, or hard exercise, and, if costive, take a dose of salts. The above quantity is for an adult; children will take less according to age.

Eye Preparations.—Eye Water.—Table salt and white vitriol, of each, 1 table-spoon; heat them upon copper or earthern until dry; the heating drives off the acrid or biting water, called the water of crystallization, making them much milder in their action; now add them to soft water, ½ pint; putting in white sugar, 1 table-spoon; blue vitriol, a piece the size of a common pea. If it should prove too strong in any case, add a little more soft water to a phial of it. Apply it to the eyes 3 or 4 times daily.

India Prescription for Sore Eyes.—Sulphate of zinc, 3 grs.; tincture of opium (laudanum), 1 dr.; rose water, 2 oz.; mix. Put a drop or two in the eye, 2 or 3 times daily.

Another.—Sulphate of zinc, acetate of lead, and rock salt, of each, ½ oz.; loaf sugar, 1 oz.; soft water, 12 oz.; mix without heat, and use as other eye waters.

If sore eyes shed much water, put a little of the oxide of zinc into a phial of water, and use it rather freely. It will soon cure that difficulty.

Copperas and water has cured sore eyes of long standing; and used quite strong, it makes an excellent application in erysipelas.

Indian Eye Water.—Soft water, 1 pt.; gum arabic, 1 oz.; white vitriol, 1 oz.; fine salt, ½ teaspoon; put all into a bottle, and shake until dissolved. Put into the eye just as you retire to bed.

Cure for Drunkenness.—Take 5 grs. sulphate of iron; 10 grs. magnesia; 11 drs. peppermint water; 1 dr. spirit of nutmeg; mix all together, and take twice per day.

Black Oil.—Best alcohol, tincture of arnica, British oil, and oil tar, of each 2 oz.; and *slowly* add sulphuric acid, ½ oz.

These black oils are getting into extensive use as a liniment,

and are indeed valuable, except in cases attended with much inflammation.

Vermifuge—Santonin Lozenges.—Santonin, 60 grs.; pulverized sugar, 5 oz.; mucilage of gum tragacanth, sufficient to make into a thick paste, worked carefully together, that the santonin shall be evenly mixed throughout the whole mass; then, if not in too great a hurry, cover up the mortar in which you have rubbed them, and let stand from 12 to 24 hours to temper; at which time they will roll out better than if done immediately; divide into 120 lozenges. Dose, for a child one year old, 1 lozenge, night and morning; of 2 years, 2 lozenges; of 4 years, 3; of 8 years, 4; of 10 years or more, 5 to 7 lozenges; in all cases, to be taken twice daily, and continuing until the worms start on a voyage of discovery.

Harlem Oil, or Welsh Medicamentum.—Sublimed or flowers of sulphur and oil of amber, of each 2 oz.; linseed oil, 1 lb.; spirits of turpentine sufficient to reduce all to the consistence of thin molasses. Boil the sulphur in the linseed oil until it is dissolved, then add the oil of amber and turpentine. Dose: from 15 to 25 drops, morning and evening.

Amongst the Welsh and Germans it is extensively used for strengthening the stomach, kidneys, liver, and lungs, asthma, shortness of breath, cough, inward or outward sores, dropsy, worms, gravel, fevers, palpitation of the heart, giddiness, headache, &c., by taking it internally; and for ulcers, malignant sores, cankers, &c., anointing externally, and wetting linen with it, and applying to burns.

Egyptian Cure for Cholera.—Best Jamaica ginger root, bruised, 1 oz.; cayenne, 2 teaspoons; boil all in 1 qt. of water to ½ pt., and add loaf sugar to form a thick syrup. Dose: 1 tablespoon every 15 minutes, until vomiting and purging ceases; then follow up with a blackberry tea.

Indian Prescription for Cholera. — First, dissolve gum camphor, ¼ oz., in 1½ oz. of alcohol; second, give a teaspoon of spirits of hartshorn in a wine-glass of water, and follow it every 5 minutes with 15 drops of the camphor in a teaspoon of water, for 3 doses; then wait 15 minutes, and commence again as before; and continue the camphor for 30 minutes, unless there is returning heat. Should this be the case, give one more dose, and the cure is effected; let them perspire freely (which the medicine is designed to cause), as upon this the life depends, but add no additional clothing.

Isthmus Cholera Tincture. — Tincture of rhubarb, cayenne, opium, and spirits of camphor, with essence of peppermint, equal parts of each, and each as strong as can be made. Dose: from 5 to 30 drops, or even to 60, and repeat until relief is obtained, every 5 to 30 minutes.

Positive Cure for Diarrhœa.—Take 2 wine-glasses of vinegar and one table-spoonful of salt; mix the whole thoroughly to dissolve the salt; add 7 to 10 drops of laudanum according to the age or strenth of the patient, and give the whole at one dose.

King of Oils, for Neuralgia and Rheumatism.—Burning fluid, 1 pt.; oils of cedar, hemlock, sassafras, and origanum, of each 2 oz.; carbonate of ammonia, pulverized, 1 oz.; mix. DIRECTIONS.—Apply freely to the nerve and gums around the tooth; and to the face, in neuralgic pains, by wetting brown paper and laying on the parts, not too long, for fear of blistering,—to the nerves of teeth by lint.

Neuralgia.—Internal Remedy.—Sal-ammoniac, ½ drachm, dissolve in water, 1 oz. Dose: one tablespoon every 3 minutes, for 20 minutes, at the end of which time, if not before, the pain will have disappeared.

Artificial Skin.—For Burns, Bruises, Abrasions, &c.—Proof Against Water.—Take gun cotton and Venice turpentine, equal parts of each, and dissolve them in 20 times as much sulphuric ether, dissolving the cotton first, then adding the turpentine; keep it corked tightly. Water does not affect it, hence its value for cracked nipples, chapped hands, surface bruises, &c., &c.

Indian Balsam.—Clear, pale rosin, 3 lbs., and melt it, adding spirits of turpentine, 1 quart; balsam of tolu, 1 oz.; balsam of fir, 4 oz.; oil of hemlock, origanum, with Venice turpentine, of each, 1 ox.; strained honey 4 oz.; mix well, and bottle. Dose: 6 to 12 drops; for a child of six, 3 to 5 drops, on a little sugar. The dose can be varied according to the ability of the stomach to bear it, and the necessity of the case.

It is a valuable preparation for coughs, internal pains, or strains, and works benignly upon the kidneys.

Wens.—To Cure.—Dissolve copperas in water to make it very strong; now take a pin, needle, or sharp knife, and prick, or cut the wen in about a dozen places, just sufficient to cause it to bleed; then wet it thoroughly with the copperas water, once daily.

Bronchocele.—Enlarged Neck.—To Cure.—Iodide of potassium (often called hydriodate of potash), 2 drachms; iodine, 1 drachm; water, 2½ oz.; mix and shake a few minutes, and pour a little into a phial for internal use. Dose: 5 to 10 drops before each meal, to be taken in a little water.—EXTERNAL APPLICATION.—With a feather, wet the enlarged neck, from the other bottle, night and morning until well.

It will cause the scarf skin to peel off several times before the cure is perfect, leaving it tender, but do not omit the application more than one day at most, and you may rest assured of a cure, if a cure can be performed by any means whatever.

Dalby's Carminative.—Magnesia, 2 drachms; oil peppermint, 3 drops; oil nutmeg, 7 drops; oil anise, 9 drops; tinct. of castor, 1½ drachms; tinct. of assafœtida, 45 drops; tinct. of opium, 18 drops; essence penny-royal, 50 drops; tinct. of cardamoms, 95 drops; peppermint water, 7 oz.; mix.

Ague, Cure without Quinine.—Take mandrake root, fresh dug, pound it, and squeeze out 1½ tablespoonfuls of the juice, add an equal quantity of molasses, divide into 3 doses of 1 tablespoon-

ful each, to be given 2 hours apart, commencing so that all will be taken before the chill. Then steep dogwood-bark (some call it boxwood), make it strong, and continue to drink it freely for a week or two at least.

Ague Cure.—Cut 3 lemons into thin slices, and pound them with a mallet; then take enough coffee to make a quart; boil it down to a pint and pour it, while quite hot, over the lemons. Let it stand till cold, then strain through a cloth, and take the whole at one dose, immediately after the chill is over, and before the fever comes on.

Base for Artificial Teeth.—PROPORTIONS.—India rubber, 1 lb., sulphur, ½ lb., vermilion, 1 lb. 4 oz.

GROCER'S AND MANUFACTURER'S DEPARTMENT.

Vinegar for Family use in Three Weeks.—Molasses, 1 qt.; yeast, 1 pint; warm rain water, 3 gallons. Put all into a jug or keg, and tie a piece of gauze over the bung to keep out flies, and let in air; set it by the stove in cold weather and out in the sun in hot weather, and you will have good vinegar in three weeks; as it gets low add water, yeast and molasses, same proportions to keep up the stock.

For Grocer's Sales.—Take three barrels; let one of them be your vinegar barrel; fill this last up before it is quite empty with molasses, 1 gallon; soft water, 11 gallons; yeast, 1 pint; keeping these proportions in filling up the whole three barrels; sell the vinegar out of your old vinegar barrel as soon as it is ready, which will be in a short time; when nearly empty, fill it up with the fluid as before, and pass on to sell out of the next barrel; by the time it is disposed of go on to the last; then go back to the first, filling up your barrels in every case when nearly empty, and you will always keep a stock of good vinegar on hand unless your sales are very large; in which case, follow the next process. Have the bung-holes open in the barrels to admit air.

Vinegar in Three Days.—Get a quantity of maple, beech, or basswood chips or shavings, and soak these in good vinegar for two or three days. With these chips you will fill a barrel, which has been pierced with a large number of inch holes all around the sides for the free admission of air among the chips (the more holes in the barrel the better, for the more air the sooner the vinegar will be made); cut another barrel in two halves, place one half below the barrel with the chips and the other half above it. The top tub must have its bottom pierced with a number of gimlet holes, in which are placed several threads of twine, to conduct the vinegar evenly over the chips. The liquid drains down slowly through the chips and

out of a faucet near the bottom of the barrel into the lower tub. It should run through every few hours, and then be baled or pumped back. Directions to make vinegar from sugar: Use 1 lb. to each gallon of water; of the dregs of molasses barrels, use 1 lb. to each gallon of water; small beer, lager beer, ale, &c., which have become sour, make good vinegar by being reduced to water; small beer needs but little water, lager beer as much water as beer; to 2 gallons of cider add 1 of water; you can also make excellent vinegar out of the artificial cider mentioned below by diluting it with one-third water. Use, in every case, soft water to make vinegar, and use 1 quart yeast to every barrel. It makes much quicker if the fluid is slightly luke-warm. Leach either of these preparations through the shavings.

This process should be attended to during warm weather, or in a room where a pretty high temperature is kept up, as it will not work otherwise.

Excellent Vinegar, Cheap.—Acetic acid, 4 lbs.; molasses, 1 gallon; yeast, 1 quart; put them into a forty-gallon cask, and fill it up with rain water; stir it up, and let it stand one to three weeks, letting it have all the air possible, and you will have good vinegar. If wanted stronger, add more molasses. Should you at any time have weak vinegar on hand, put molasses into it to set it working. This will soon correct it.

White Wine Vinegar.—Mash up 20 lbs. raisins, and add 10 gallons water; let it stand in a warm place for one month, and you will have pure white wine vinegar. The raisins may be used a second time the same way.

To Preserve Eggs.—To each patent pailful of water, add 1 pint of fresh slacked lime, and 1 pint of common salt; mix well. Fill your barrel half full with this fluid, put your eggs down in it any time after June, and they will keep two years if desired.

Liquid Mucilage.—Fine clean glue, 1 lb.; gum arabic, 10 oz.; water, 1 quart; melt by heat in a glue kettle or water bath; when entirely melted, add slowly 10 oz. strong nitric acid, set off to cool. Then bottle, adding a couple of cloves to each bottle.

Artificial Lemon Syrup.—Pale sugar, 1½ lbs.; citric acid, 1 oz. or according to taste; oil lemon, 1 drachm. Put your oil of lemon on the sugar, then put sugar and acid in ½ gallon hot water, and frequently shake for one day.

Candied Lemon Peel.—Take lemon peels and boil them in syrup; then take them out, and dry.

Transparent Soap.—Slice 6 lbs. nice yellow bar-soap into shavings; put into a brass, tin, or copper kettle, with alcohol, ½ gallon, heating gradually over a slow fire, stirring till all is dissolved; then add 1 oz. sassafras essence, and stir until all is mixed; now pour into pans about 1½ inches deep, and when cold cut into square bars the length or width of the pan, as desired.

English Bar Soap.—Six gallons soft water; 6 lbs. good stone lime; 20 lbs. sal-soda; 4 oz. borax; 15 lbs. fat (tallow is best); 10 lbs. pulverized rosin, and 4 oz. bees-wax; put the water in a kettle on the

fire, and when nearly boiling add the lime and soda; when these are dissolved, add the borax; boil gently, and stir until all is dissolved; then add the fat, rosin, and bees-wax; boil all gently until it shows flaky on the stick, then pour into moulds.

Best Soft Soap.—Mix 10 lbs. potash in 10 gallons warm soft water over night; in the morning boil it, adding 6 lbs. grease; then put all in a barrel, adding 15 gallons soft water.

Soap without Lye or Grease.—In a clean pot put ¼ lb. home-made hard or mush soap, and ½ lb. sal-soda, and 5 pints of soft water. Boil the mixture 15 minutes, and you will have five pounds good soap for seven and a half cents.

Hard Soap.—Take 5 lbs. hard soap, or 7 lbs. soft soap, and 4 lbs. sal soda, and 2 oz. borax, and 1 oz. hartshorn; boil one quarter hour with 22 quarts water; add, to harden, ½ lb. rosin.

German Yellow Soap.—Tallow and sal-soda, of each 112 lbs.; rosin, 56 lbs.; stone lime, 28 lbs.; palm oil, 8 oz.; soft water, 28 gallons. Put soda, lime and water into a kettle, and boil, stirring well; then let it settle, and pour off the lye. In another kettle melt the tallow, rosin, and palm oil; having it hot, the lye being also boiling hot, mix all together, stirring well, and the work is done.

For Small Quantities.—Tallow and sal-soda, each 1 lb.; rosin 7 oz.; stone lime, 4 oz.; palm oil, 1 oz.; soft water, 1 quart.

Hard Soap with Lard.—Sal-soda and lard, each 6 lbs.; stone lime, 3 lbs.; soft water, 4 gallons; dissolve the lime and soda in the water by boiling, stirring, settling and pouring off; then return to the kettle (brass or copper), and add the lard, and boil it till it becomes soap; then pour into a dish or moulds; and, when cold, cut into bars and dry it.

White Hard Soap with Tallow.—Fresh slacked lime, sal-soda and tallow, of each 2 lbs.; dissolve the soda in 1 gallon boiling soft water; now mix in the lime, stirring occasionally for a few hours; after which, let it settle, pouring off the clear liquor, and boiling the tallow therein until it is all dissolved; cool it in a flat box or pan, cut into bars or cakes as desired. It may be perfumed with sassafras oil or any other perfume desired, stirring it in when cool.

One Hundred Pounds of Soap, very Cheap.—Potash, 6 lbs.; lard, 4 lbs.; rosin, ¼ lb. Beat up the rosin, mix all together, and set aside for five days; then put the whole into a 10 gallon cask of water, and stir twice a day for ten days, when it is ready for use.

Solid Candles from Lard.—Dissolve ¼ lb. alum and ¼ lb. saltpetre in ½ pint of water on a slow fire; then take 3 lbs. of lard cut into small pieces, and put into the pot with this solution, stirring it constantly over a very moderate fire until the lard is all dissolved; then let it simmer until all steam ceases to rise and remove it at once from the fire. If you leave it too long it will get discolored. These candles are harder and better than tallow.

Tallow.—To CLEANSE AND BLEACH.—Dissolve alum, 5 lbs., in water, 10 gallons, by boiling; and when it is all dissolved, add tallow, 20 lbs.; continue the boiling for an hour, constantly stirring and skimming; when sufficiently cool to allow it, strain through thick muslin; then set aside to harden; when taken from the water, lay it by for a short time to drip.

Imitation Wax Candles.—Purify melted tallow by throwing in powdered quick lime, then add two parts wax to one of tallow, and a most beautiful article of candle, resembling wax, will be the result. Dip the wicks in lime water and saltpetre on making. To a gallon of water add 2 oz. saltpetre and ½ lb. of lime: it improves the light, and prevents the tallow from running.

Adamantine Candles from Tallow.—Melt together 10 oz. mutton tallow; camphor, ¼ oz.; bees-wax, 4 oz.; alum, 2 oz. Very hard and durable, burning with a clear, steady light.

Teas.—The names of the different kinds of tea relate to the time of their being gathered, or to some peculiarity in their manufacture. It is a general rule, that all tea is fine in proportion to the tenderness and immaturity of the leaves. The quality and value of the different kinds diminish as they are gathered later in the season.

Black Teas.—As soon as the leaf-bud begins to expand, it is gathered to make *Pekoe*. A few days' later growth produces black-leaved Pekoe. The next picking is called *Souchong;* as the leaves grow larger and more mature, they form *Congou;* and the last picking is *Bohea*.

BOHEA is called by the Chinese, *Tu-cha* (large tea), on account of the maturity and size of the leaves; it contains a larger proportion of woody fibre than other teas, and its infusion is of a darker color and coarser flavor.

CONGOU, the next higher kind, is named from a corruption of the Chinese *Koong-foa* (great care, or assiduity.) This forms the bulk of the black tea imported, and is mostly valued for its strength.

SOUCHONG—*Seaou-choong* (small, scarce sort), is the finest of the strongest black tea, with a leaf that is generally entire and curly. It is much esteemed for its fragrance and fine flavor.

PEKOE is a corruption of the Canton name, *Pak-ho* (white down), being the first sprouts of the leaf-buds; they are covered with a white silky down. It is a delicate tea, rather deficient in strength, and is principally used for flavoring other teas.

Green Teas.—The following are the principal kinds: *Twankay, Hyson-Skin, Hyson, Gunpowder* and *Young Hyson.*

YOUNG HYSON is a delicate young leaf, called in the original language, *Yu-tsien* (before the rains), because gathered in the early spring.

HYSON, from the Chinese word *He-tchune*, which means flourishing spring. This fine tea is gathered early in the season, and prepared with great care and labor. Each leaf is picked separately, and nipped off above the footstalks; and every separate leaf is rolled in the hand. It is much esteemed for its flavor.

GUNPOWDER TEA is only Hyson rolled and rounded to give it the *granular* appearance whence it derives its name. The Chinese call it *Choo-cha* (pearl tea.)

HYSON-SKIN is so named from the Chinese term, in which connection *skin* means the refuse, or inferior portion. In preparing Hyson, all leaves that are of a coarse yellow, or imperfectly twisted appearance, are separated, and sold as *Skin-tea*, at an inferior price.

TWANKAY is the last picking of green tea, and the leaf is not rolled or twisted as much as the dearer descriptions. There is altogether less trouble bestowed on the preparation.

Coffees.—JAVA COFFEE.—Use of the imported article, 20 lbs.; dried dandelion root, 7 lbs.; chicory, 13 lbs. Roast, and grind well together.

FOR WEST INDIA, use rye, roasted with a little butter, and ground very fine.

FOR TURKEY COFFEE, use rice or wheat roasted with a little butter, 7 lbs.; chicory, 3 lbs.; grind.

ESSENCE OF COFFEE is made by boiling down molasses till hard; grind to a powder; add half lb. of good Java coffee to every four lbs. of the mixture. Put up for sale in round tin cans or air-tight paper packages.

COFFEE FOR POUND PACKAGES.—Best Java coffee, 1 lb.; rye 3 lbs.; carefully clean the rye from all bad grains, wash to remove dust, drain off the water, and put the grain into your roaster, carefully stirring to brown it evenly. Brown the rye and coffee separately; grind, and put up in tight packages to preserve the aroma.

Manufacturing and Flavoring Tobacco.—After the tobacco is properly cured and sweated, you will, preparatory to pressing, proceed to flavor it as follows: Take 1 oz. tonqua beans, 6 oz. liquorice, 1 lb. sugar; pulverize each completely; add the ingredients to 1 gallon water. Macerate and rummage up for a few days till the aromatic flavor is properly imparted to the liquid. Then spread out some tobacco leaves, and slightly sprinkle them with the above fluid till enough is absorbed to render them pliable. Then roll them up in round packages of such a size that ten will make 1 lb.; then reduce them into flat plugs in a powerful press. A large number of such plugs are subsequently pressed into blocks, when they are ready for the market at once. The strength of the above liquid may be increased or diluted as desired by the manufacturer, and extract of vanilla may be substituted for the tonqua bean.

Flavor for Cigar Makers.—Take 2 ounces tonqua beans and 1 oz. cinnamon; bruise and pulverize them to a powder, and put them into 1 pint of alcohol; let it stand for a few days to macerate; at the end of three days mix with 1 gallon water, adding 1½ oz. alum, and 2 oz. juice of the herb lovage; stir all together, and with this liquid sprinkle your common or inferior tobacco. Dry out of the sun, and the flavor will be unequaled.

To Improve Brown Sugar.—To every 10 lbs. of sugar add 2 lbs. flour; mix well, and you will have 12 lbs. of sugar worth fifteen per cent. more in quality.

To Cure Butter.—Take 2 parts of fine salt; 1 part loaf sugar; 1 part saltpetre; mix completely. Use 1 oz. of this mixture to each pound of butter; work well. Bury your butter firkins in the earth in your cellar bottom, tops nearly level with the ground, or store away in a very cool place, covering the butter with a clean cloth and a strong brine on the top, and it will keep two years if desired.

Unerring Tests for Good Flour.—Good flour is white, with a yellowish or straw-colored tint. Squeeze some of the flour in your hand; if good, it will retain the shape given by pressure. Knead a little between your fingers; if it works soft and sticky, it is poor. Throw a little against a dry perpendicular surface; if it fall like powder, it is bad.

To Correct Musty Flour.—Carbonate of magnesia, 3 lbs.; flour, 760 lbs.; mix. This improves bad flour, causing it to become more wholesome, producing lighter and better bread than when alum is used, and absorbs and dissipates the musty smell.

Baking Soda.—Carbonate of soda, 56 lbs.; tartaric acid, 28 lbs.; potato flour, 112 lbs.; turmeric, 12 oz. Mix.

Self-Raising Flour is made by adding 4 lbs. of the above powder to every 100 lbs. of common flour, and mixing completely. It must be kept perfectly dry. To use, bake quickly, and put it into the oven at once.

Patent Self-Raising Flour.—Kiln-dried flour, 1 cwt.; tartaric acid, 10½ oz.; mix thoroughly. After 2 or 3 days, add, of bicarb. soda, 12 oz.; lump sugar, ½ lb.; common salt, 1½ lbs. Mix, and pass through the "dressing-machine." Have all the articles perfectly dry, and separately reduced to fine powder before adding to the flour. Mix with cold water, and bake at once. It produces light and porous bread.

Tomato Catsup.—Boil 1 bushel of tomatoes till they are soft; squeeze them through a fine wire sieve; add 1½ pints salt; 2 oz. cayenne pepper, and 5 heads of onions, skinned and separated; mix together, and boil till reduced one half; then bottle.

Compound Tobacco from Herbs.—Thyme, marjoram, and hyssop, of each, 2 lbs.; coltsfoot, 3 lbs.; betony and eyebright, of each, 4 lbs.; rosemary and lavender, of each, 8 lbs.; mix, press together, and cut in imitation of common tobacco.

Tabac Parfumee aux Fleurs is made by putting orange flowers, jasmines, tube roses, musk roses, or common roses, to snuff in a close chest or jar, sifting them out after 24 hours, and repeating if necessary.

Maccaboy Snuff is imitated by moistening the tobacco with a mixture of treacle and water, and allowing it to ferment.

Spanish Snuff is made from unsifted Havana snuff, reduced by adding ground *Spanish nutshells*, sprinkling the mixture with

treacle water, and allowing it to sweat for some days before packing.

Yellow Snuff is prepared from ordinary *pale snuff*, moistened with a mixture of *yellow ochre* diffused in *water*, to which a few spoonfuls of thin mucilage have been added.

Perfumes for Snuff.—Tonqua beans, essence of ditto, ambergris, musk civet, leaves of orchis fusca and essence of orris root, essence or oils of bergamot, cedar, cloves, lavender, petit grains, neroli and roses, as well as several others, either alone or compounded.

Preserved or Solidified Milk.—1. Fresh-skimmed milk, 1 gal.; sesquicarbonate of soda (in powder), 1½ dr. Mix, evaporate to ¼ part by heat of a steam or a water-bath, with constant agitation; then add of powdered sugar 3½ lbs., and complete the evaporation at a reduced temperature. Reduce the dry mass to powder, add the *cream* well drained, which was taken from the milk. After thorough admixture, put the whole into well-stopped bottles or tins, and hermetically seal. 2. Carbonate of soda, ½ dr.; water, 1 fluid oz.; dissolve; add of fresh milk, 1 qt.; sugar, 1 lb.; reduce by heat to the consistence of a syrup, and finish the evaporation on plates by exposure, in an oven. *Observe*—About 1 oz. of the powder agitated with 1 pt. of water forms an agreeable substitute for milk.

Sealing Wax, Red.—Shellac (very pale), 4 oz.; cautiously melt in a bright copper pan over a clear charcoal fire; when fused, add Venice turpentine, 1¼ oz. Mix, and further add vermilion, 3 oz.; remove the pan from the fire, and pour into mould. For a *black* color, use ivory black, or lampblack, instead of the vermilion; for a *blue color*, use Prussian blue instead of the vermilion, same quantity. Each color must be well mixed with the composition; of the lampblack, use only sufficient to color.

Horticultural Ink.—Copper, 1 part; dissolve in nitric acid, 10 parts, and add water, 10 parts; used to write on zinc or tin labels.

Bottle Wax.—BLACK.—Black resin, 6¼ lbs.; beeswax, ½ lb.; finely powdered ivory black, 1½ lbs. Melt together. RED, as the last, but substitute Venetian red, or red lead, for the ivory black.

Gold-colored Sealing Wax.—Bleached shellac, 3 lbs.; Venice turpentine, 1 lb.; Dutch leaf ground fine, 1 lb., or less. The leaf should be ground or powdered sufficiently fine, without being reduced to dust. Mix with a gentle heat, and pour into moulds.

Fullam's Recipe for Indelible Stencil-plate Ink.—1 lb. precipitate carbonate of iron; 1 lb. sulphate of iron; 1¼ lbs. acetic acid. Stir over a fire until they combine; then add 3 lbs. printer's varnish and 2 lbs. fine book ink, and stir until well mixed. Add 1 lb. of Ethiops mineral.

Exchequer Ink.—Bruised galls, 40 lbs.; gum, 10 lbs.; green

sulphate of iron, 9 lbs.; soft water, 45 gals. Macerate for 3 weeks with frequent agitation and strain. This ink will endure for ages.

Asiatic Ink.—Bruised galls, 14 lbs.; gum, 5 lbs. Put them in a small cask, and add of boiling soft water, 15 gals. Allow the whole to macerate, with frequent agitation, for two weeks, then further add green copperas, 5 lbs., dissolved in 7 pts. water. Again mix well, and agitate the whole daily for two or three weeks.

Extra Good Black Ink.—Bruised galls, 2 lbs., logwood chips, green copperas and gum, of each 1 lb.; water, 7 gals. Boil 2 hours and strain. Product, 5 gals.

Brown Ink.—A strong decoction of catechu. The shade may be varied by the cautious addition of a little weak solution of bi-chromate of potash.

Indelible Ink.—Nitrate of Silver, ¼ oz.; water, ¾ oz. Dissolve, add as much of the strongest liquor of *ammonia* as will dissolve the precipitate formed on its first addition; then add of mucilage, 1½ dr., and a little sap green, syrup of buckthorn, or finely powdered indigo, to color. Turns black on being held near the fire, or touched with a hot iron.

Indelible for Glass or Metal.—Borax, 1 oz.; shellac, 2 oz.; water, 18 *fluid* oz., boil in a covered vessel, add of thick mucilage, 1 oz.; triturate it with levigated indigo and lampblack q. s. to give it a good color. After 2 hours' repose, decant from the dregs, and bottle for use. It may be bronzed after being applied. Resists moisture, chlorine, and acids.

Common Ink.—To 1 gallon boiling soft water, add ¾ oz. extract logwood; boil 2 minutes; remove from the fire, and stir in 48 grains bi-chromate of potash, and 8 grains prussiate of potash; for 10 gallons, use 6½ oz. logwood extract; 1 oz. bi-chromate of potash, and 80 grains prussiate of potash; strain.

Black Copying Ink, or Writing Fluid.—Take 2 gallons rain water, and put into it gum arabic, ¼ lb.; brown sugar, ¼ lb.; clean copperas, ¼ lb.; powdered nutgalls, ¾ lb.; mix, and shake occasionally for ten days and strain; if needed sooner, let it stand in an iron kettle until the strength is obtained. This ink will stand the action of the atmosphere for centuries, if required.

Red Ink.—In an ounce vhial put 1 teaspoonful of aqua-ammonia; gum arabic, size of two or three peas; and 6 grains of No. 40 carmine; fill up with soft water, and it is soon ready for use.

Liquid Blacking.—Ivory Black, 2 lbs.; molasses, 2 lbs.; sweet oil, 1 lb.; rub together till well mixed; then add oil vitriol, ¾ lb.; and coarse sugar, ½ lb.; and dilute with beer bottoms; this cannot be excelled.

Ticketing Ink, for Grocers, &c.—Dissolve 1 oz. of gum arabic in 6 oz. water, and strain; this is the mucilage; for a *black color*, use drop-black, powdered, and ground with the mucilage to extreme fineness; for *blue*, ultra-marine is used in the same manner; for *green*, emerald green; for *white*, flake white; for *red*, vermilion, lake, or carmine; for *yellow*, chrome yellow. When ground

too thick, they are thinned with a little water. Apply to the cords with a small brush. The cords may be sized with a thin glue, and afterwards varnished, if it is desired to preserve them.

Blueing for Clothes.—Take 1 oz. of soft Prussian blue, powder it, and put in a bottle with 1 quart of clear rain water, and add ½ oz. of pulverized oxalic acid. A tablespoonful is sufficient for a large washing.

Premium Method of Keeping Hams, &c.—To 4 gallons water, add 8 lbs. coarse salt; 1¼ oz. potash; 2 oz. saltpetre; 2 lbs. brown sugar. Boil together, skim when cold, put on the above quantity to 100 lbs. meat; hams to remain in eight weeks, beef, three weeks. Let the hams dry several days before smoking. Meat of all kinds, salmon and other fish, lobsters, &c., may be preserved for years by a light application of pyroligneous acid applied with a brush, sealing up in cans as usual. It imparts a splendid flavor to the meat, is very cheap, and an effectual preservative against loss.

To Preserve Meats, Salmon, Lobsters, &c., Hermetically Sealed.—The meat to be preserved is first parboiled or somewhat more, and freed from bones. It is then put into tin cases or canisters, which are quite filled up with a rich gravy. A tin cover, with a small aperture, is then carefully fixed on by solder; and, while the vessel is perfectly full, it is placed in boiling water, and undergoes the remainder of the cooking. The small hole in the cover is completely closed up by soldering while the whole is yet hot. The canister, with its ingredients, is now allowed to cool, in consequence of which these contract, and the sides of the vessel are slightly forced inwards by atmospheric pressure, and become a little concave. The vessel being thus hermetically sealed, and all access of air prevented, it may be sent into any climate without fear of putrefaction; and the most delicate food of one country may be used in another in all its original perfection months and years after its preparation. Lobsters should be boiled longer than meats, and the scales removed previous to putting into the canisters. Salmon put up by this process is most delicious. By the French process, the meat is boiled till it is three-quarters done, when two-thirds of it are taken out, the remaining one-third is boiled into a concentrated soup, and the meat previously taken out is put into the canisters, which are then filled up with the soup; the tin cover with the aperture is soldered on, and the canister with its contents submitted to a further boiling in hot water, when the aperture is closed, as above stated, and the canisters laid away in store.

To Preserve Fruits without Sugar.—Fill some stone wide-mouthed bottles with the fruit carefully picked, and set them in a copper or large kettle; then fill the kettle with cold water nearly up to the mouths of the bottles. Corks should be prepared to fit the bottles, and a cloth should be put under the bottoms of the bottles to prevent their cracking with the heat. Light the fire under the kettle, and heat the water to 160° or 170°. This heat should be continued for half an hour, when the fruit will be suffi-

ciently scalded; after that, fill up the bottles with boiling water to within an inch of the cork, and cork them tightly. Lay the bottles on their sides; change the position of the bottles once or twice a week during the first two months, turning them round to prevent any fermentation that might take place. Fruits could also be kept by the process mentioned above for meats, remembering that they are to be scalded only, not boiled, as is the case with meats.

Another Method.—After paring and coring, put amongst them sufficient sugar to make them palatable for present eating, about 3 or 4 lbs. only to each bushel; let them stand awhile to dissolve the sugar, not using any water; then heat to a boil, and continue the boiling with care for 10 or 30 minutes, or sufficiently long to heat them through, which expels the air. Have ready a kettle of hot water, into which dip the can or bottle long enough to heat it; then fill in the fruit while hot, corking it immediately, dipping the end of the cork into the bottle-wax preparation described elsewhere.

Worcestershire Sauce.—Port wine and mushroom catsup, of each, 1 qt.; old ale and strong vinegar, of each, ½ pt.; walnut pickle, 1 pt.; soy, ½ pt.; pounded anchovies, ½ lb., fresh lemon peel, minced shallots, and scraped horse-radish, of each, 2 oz.; allspice and black pepper (bruised), of each, 1 oz.; curry powder, ¾ oz. Digest 14 days; strain and bottle.

Gherkins.—Take small cucumbers (not young), steep for a week in *very strong* brine; it is then poured off, heated to the boiling point, and again poured on the fruit. The next day the gherkins are drained on a sieve, wiped dry, put into bottles or jars, with some spice, ginger, pepper, or cayenne, and at once covered with strong pickling vinegar.

Mixed Pickles from cauliflowers, white cabbage, French beans, onions, cucumbers; &c., are treated as *gherkins*, with raw ginger, capsicum, mustard-seed, and long pepper, added to each bottle. A little coarsely-bruised turmeric improves both the color and flavor.

Indian Pickles.—*Piccalilli.*—Take one hard white cabbage (sliced), 2 cauliflowers, pulled to pieces, 20 French beans, 1 stick of horseradish, sliced fine, 2 doz. small white onions, and 1 doz. gherkins. Cover these with boiling brine; next day, drain the whole on a sieve, put into a jar, add of curry powder, or turmeric, 2 oz.; garlic, ginger, and mustard-seed, of each, 1 oz.; capsicum, ½ oz. Fill up the vessel with hot pickling vinegar; bung it up close, and let it stand for a month, with occasional agitation every week.

To Preserve Fruit Juice without Heat.—Ingredients: 10 lbs. of fresh-gathered, picked, ripe red currants, or other fruit, 2 qts. cold water, 5 oz. tartaric acid, 6 lbs. of coarse-sifted sugar. Put the fruit into a large earthen pan, pour the water with the tartaric acid dissolved in it over the fruit, cover the pan with

some kind of lid, and allow the whole to steep for 24 hours in a *cold* place, and it would be all the better if the pan containing the fruit could be immersed in rough ice. Next, pour the steeped fruit into a suspended stout flannel bag, and when all the juice has run through tie up the open end of the bag, and place it on a large earthen dish, with another dish upon it; place a half hundredweight upon this, to press out all the remaining juice, and then mix it with the other juice. You now put the sifted sugar into the juice, and stir both together occasionally, until the sugar is dissolved, and then bottle up the syrup, cork, and tie down the bottles with wire, and keep them in the ice-well or in a cold cellar, in a reclining position.

To Restore Injured Meat.—When the brine sours and taints the meat, pour it off; boil it, skim it well, then pour it back again on the meat boiling hot; this will restore it, even when much injured. If tainted meat is injured, dip it in the solution of chloride of lime prescribed for rancid butter; it will restore it. Flyblown meat can be completely restored by immersing it for a few hours in a vessel containing a small quantity of beer; but it will taint and impart a putrid smell to the liquor. Fresh meat, hams, fish, etc., can be preserved for an indefinite length of time without salt, by a light application of pyroligneous acid applied with a brush; it imparts a fine smoky flavor to the meat, and is an effectual preservative. But pure acetic acid may be used instead.

Method of Curing bad Tub Butter.—A quantity of tub butter was brought to market in the West Indies, which, on opening, was found to be very bad, and almost stinking. A native of Pennsylvania undertook to cure it, which he did in the following manner:—

He started the tubs of butter in a large quantity of hot water, which soon melted the butter; he then skimmed it off as clean as possible, and worked it over again in a churn, and, with the addition of salt and fine sugar, the butter was sweet.

To Restore Rancid Butter.—Use 1 pint water to each lb. of butter, previously adding 20 grains chloride of lime to each pint of water; wash well the butter in this mixture, afterward re-wash in cold water and salt; or melt the butter in a water bath with animal charcoal, coarsely powdered and previously well sifted to free it from dust; skim, remove, and strain through flannel; then salt.

Fresh Meat.—To KEEP A WEEK OR TWO, IN SUMMER.—Farmers or others living at a distance from butchers can keep fresh meat very nicely for a week or two, by putting it into sour milk, or butter-milk, placing it in a cool cellar. The bone or fat need not be removed. Rinse well when used.

Milkman's Process.—To give a body to diluted milk use the following nutritive and healthy compound at the rate 8 oz. to every 5 gals., stirring it up in the milk till all is dissolved. Arrow-root, 6 oz.; magnesia, 6 oz.; starch, 1 lb.; flour, ½ lb.; white sugar in powder, 1 lb.; mix all intimately together, and keep in a dry place for use.

Custard Powders.—Sago meal and flour, 1 lb. each, color with turmeric to a cream color. Flavor with essential oil of almonds, 1 drachm; essence of lemon, 2 drachms. Use sweetened milk to form extemporaneous custards.

Curry Powder.—Turmeric and coriander seeds, of each, 4 oz.; black pepper, 2½ oz.; ginger, 14 drachms; cinnamon, mace, and cloves, each, ½ oz.; cardamom seeds, 1 oz.; cummin seeds, 2 drachms; cayenne pepper, 1 oz.; powder and mix.

Napoleon's Camp Sauce.—Old strong beer, 2 quarts, white wine, 1 quart, anchovies, 4 ounces; mix, boil for ten minutes; remove it from the fire, and add of peeled shallots 3 ounces; macerate for 14 days, and bottle.

Pickled Onions.—Choose small round onions, remove the skins, steep them in a strong brine for a week in a stone vessel, pour it off, and heat till it boils; then pour on the onions, boiling hot; after 24 hours, drain on a sieve, then put them in bottle, fill up over them with strong spiced vinegar, boiling hot, cork down immediately, and wax over the cork. In a similar manner are pickled mushrooms, cauliflowers, samphires, peas, beans, green gooseberries, walnuts, red cabbages (without salt, with cold vinegar.) Observe that the soft and more delicate articles do not require so long soaking in brine as the harder and coarser kinds, and may be often kept by simply pouring very strong pickled vinegar on them without the application of heat. *For peaches*, select ripe but not soft ones; rub with a dry cloth; put four cloves, free from their heads, in each large peach, and two in small ones; to 1 gallon vinegar, put 6 lbs. good brown sugar; put the peaches in a jar, and put the vinegar (diluted with water, if too strong) and sugar in a preserving kettle over the fire; boil and skim it; pour it boiling hot over the peaches, covering them closely; repeat the operation three times; then seal them tightly in cans or bottles.

French Patent Mustard.—Flour of Mustard, 8 lbs., wheaten flour, 8 lbs., bay salt, 2 lbs., cayenne pepper, 3 oz., vinegar to mix.

Common Mustard.—Flour of mustard, 28 lbs., wheat flour, 28 lbs., cayenne pepper, 8 oz., or as required; common salt, 10 lbs., rape oil, 3 lbs., turmeric to color; mix well, and pass through a fine sieve.

Starch Polish.—White wax, 1 oz., spermaceti, 2 oz.; melt them them together with a gentle heat. When you have prepared a sufficient amount of starch, in the usual way, for a dozen pieces, put into it a piece of the polish the size of a large pea; more or less, according to large or small washings. Or thick gum solution (made by pouring boiling water upon gum arabic) one table-spoon to a pint of starch, gives clothes a beautiful gloss.

Fire Kindlers.—To make very nice fire kindlers, take resin, any quantity, and melt it, putting in for each pound being used from 2 to 3 ounces of tallow, and when all is hot, stir in pine saw-dust to make very thick; and, while yet hot, spread it out about 1 inch thick, upon boards which have fine saw-dust sprinkled upon

them, to prevent it from sticking. When cold, break up into lumps about 1 inch square. But if for sale, take a thin board and press upon it, while yet warm, to lay it off into 1 inch squares; this makes it break regularly, if you press the crease sufficiently deep, greasing the marking-board to prevent it from sticking.

To keep Cider sweet, and sweeten sour Cider.—To keep cider perfect, take a keg and bore holes in the bottom of it; spread a piece of woolen cloth at the bottom; then fill with clean sand closely packed; draw your cider from a barrel just as fast as it will run through the sand; after this, put it in clean barrels which have had a piece of cotton or linen cloth 2 by 7 inches dipped in melted sulphur and burned inside of them, thereby absorbing the sulphur fumes (this process will also sweeten sour cider); then keep it in a cellar or room where there is no fire, and add ½ lb. white mustard seed to each barrel. If cider is long made, or souring when you get it, about 1 qt. of hickory ashes (or a little more of other hard wood ashes) stirred into each barrel will sweeten and clarify it nearly equal to rectifying it as above; but if it is not rectified, it must be racked off to get clear of the pomace, as with this in it it will sour. Oil or whisky barrels are best to put cider in, or ½ pint sweet oil to a barrel, or a gallon of whisky to a barrel, or both, may be added with decidedly good effects; isinglass, 4 oz. to each barrel, helps to clarify and settle cider that is not going to be rectified.

Ginger Wine.—Water 10 gals., lump sugar 20 lbs., bruised ginger 8 oz.; 3 or 4 eggs. Boil well and skim; then pour hot on six or seven lemons cut in slices, macerate for 2 hours; then rack and ferment; next add spirit 2 qts., and afterwards finings 1 pint; rummage well. To make the color, boil ½ oz. saleratus and ½ oz. alum in 1 pint of water till you get a bright red color.

Ice Cream.—Have rich, sweet cream, and a half pound of loaf sugar to each quart of cream or milk. If you cannot get cream, the best imitation is to boil a soft custard, 6 eggs to each quart of milk (eggs well beat.) Or another is made as follows: Boil 1 quart milk, and stir into it, while boiling, 1 tablespoonful of arrow-root wet with cold milk; when cool, stir into it the yolk of 1 egg to give it a rich color. Five minutes' boiling is enough for either plan. Put the sugar in after they cool; keep the same proportions for any amount desired. Or thus: To 6 quarts of milk add ½ lb. Oswego starch, first dissolved; put the starch in 1 quart of the milk, then mix altogether, and simmer a little (not boil); sweeten and flavor to your taste; excellent. The juice of strawberries or raspberries gives a beautiful color and flavor to ice creams, or about ½ ounce essence or extracts to 1 gallon, or to suit the taste. Have your ice well broken, 1 qt. salt to a bucket of ice. About one-half hour's constant stirring, with occasional scraping down and beating together, will freeze it.

Substitute for Cream.—Take two or three whole eggs, beat them well up in a basin; then pour boiling hot tea over them; pour gradually to prevent curdling. It is difficult for the taste to distinguish it from rich cream.

Chicago Ice Cream.—Irish moss soaked in warm water one hour, and rinsed well to cleanse it of sand and a certain foreign taste; then steep it in milk, keeping it just at the point of boiling or simmering for one hour, or until a rich yellow color is given to the milk; without cream or eggs, from 1 to 1½ ounce to a gallon only is necessary, and this will do to steep twice. Sweeten and flavor like other creams.

Ginger Beer.—Take 5½ gals. water, ¾ lb. ginger root bruised, tartaric acid ½ oz., white sugar 2½ lbs., whites of 3 eggs well beaten, 1 small teaspoonful of lemon oil, yeast 1 gill; boil the root for 30 minutes in 1 gal. of the water; strain off, and put the oil in while hot; mix, make over night; in the morning, skim and bottle, keeping out the sediments.

Philadelphia Beer.—Take 30 gals. water, brown sugar 20 lbs., ginger root bruised ¼ lb., cream tartar 1¼ lbs., carbonate of soda 3 oz., oil of lemon cut in a little alcohol 1 teaspoonful, the white of 10 eggs well beaten, hops 2 oz., yeast 1 quart. The ginger root and hops should be boiled for twenty or thirty minutes in enough of the water to make all milk-warm; then strained into the rest, and the yeast added and allowed to work itself clear; then bottle.

Cider without Apples.—Water 1 gallon; common sugar, 1 lb. tartaric acid, ½ oz.; yeast, one tablespoonful; shake well, make in the evening, and it will be fit to use next day.

For Bottling.—Put in a barrel, 5 gallons hot water; 30 lbs. common sugar; ¾ lb. tartaric acid; 25 gallons cold water; 3 pints of hop or brewers' yeast, worked into paste with 1 pint water and 1 lb. flour. Let it work in the barrel forty-eight hours, the yeast running out of the bunghole all the time, putting in a little sweetened water occasionally to keep it full; then bottle, putting in two or three broken raisins to each bottle; and it will nearly equal champagne.

Cheap Cider.—Put in a cask 5 gallons hot water; 15 lbs. brown sugar; 1 gallon molasses; ½ gallon hop or brewers' yeast; good vinegar, 6 quarts; stir well, add 25 gallons cold water, ferment as the last.

Another Cider.—Cold water 20 gals., brown sugar 15 lbs., tartaric acid ½ lb.; rummage well together, and add, if you have them, 2 or 3 lbs. of dried sour apples, or boil them and pour in the expressed juice. This cider will keep longer than the others.

Spruce and Ginger Beer.—Cold water, 10 gallons; boiling water 11 gallons; mix in a barrel; add molasses, 30 lbs., or brown sugar, 24 lbs.; oil of spruce or any oil of which you wish the flavor, 1 oz; add 1 pint yeast, ferment, bottle in two or three days. If you wish white spruce beer, use lump sugar; for ginger flavor, use 17 oz. ginger root bruised, and a few hops; boil for thirty minutes in three gallons of the water, strain and mix well; let it stand two hours and bottle, using yeast, of course, as before.

Hop Beer, VERY FINE.—Mix 14 lbs. molasses and 11 galls. water well together, and boil them for 2 hours with 6 oz. hops. When quite cool add a cupful of yeast, and stir it well by a gallon or two at a time. Let it ferment for 16 hours, in a tub covered with a sack, then put it into a 9 gallon cask, and keep it filled up; bung it down in 2 days, and in 7 days it will be fit to drink, and will be stronger beer than London Porter.

Edinburgh Ale.—Employ the best pale malt. 1st; mash 2 barrels pr. quarter, at 183°, mash three-quarters of an hour, let it stand 1 hour, and allow half an hour to run off the wort; 2d, mash 1 barrel per quarter, at 180°, mash three-fourths of an hour, let it stand three-fourths, and tap as before; 3d, mash 1 barrel per quarter, at 170°, mash half an hour, let it stand half an hour, and tap as before. The first and second wort may be mixed together, boiling them about an hour or an hour and a quarter, with a quantity of hops proportioned to the time the ale is required to be kept. The first two may be mixed at the heat of 60°, in the gyletun, and the second should be fermented separately for small beer. The best hops should be used in the proportion of about 4 lbs. for every quarter of malt employed.

Bottling Porter.—BROWN STOUT. Pale malt, 2 quarters; amber and brown malt, of each 1½ do.; mash at 3 times, with 12, 7, and 6 barrels of water; boil with hops, 50 lbs., set with yeast, 26 lbs. Product, 17 barrels, or 1½ times the malt.

Lemon Beer.—To make 20 galls., boil 6 oz. of ginger root bruised, ¼ lb. cream of tartar, for 20 or 30 minutes, in 2 or 3 galls. water; this will be strained into 13 lbs. coffee sugar, on which you have put 1 oz. oil of lemon, and six good lemons all squeezed up together, having warm water enough to make the whole 20 galls. just so hot that you can hold your hand in it without burning, or about 70 degrees of heat; put in 1½ pints of hop or brewer's yeast, worked into paste with 5 or 6 oz. flour. Let it work over night, then strain and bottle for use.

Table Beer.—Malt, 8 bushels; hops, 7 lbs.; molasses, 25 lbs.; brew for 10 barrels; smaller quantity in proportion.

Hop Beer.—Hops, 6 ounces; molasses, 5 quarts; boil the hops till the strength is out; strain them into a 30-gallon barrel; add the molasses and 1 teacupful of yeast, and fill up with water; shake it well, and leave the bung out till fermented, which will be in about 24 hours. Bung up, and it will be fit for use in about three days.

Molasses Beer.—Hops, 1 oz.; water, 1 gallon; boil for 10 minutes; strain; add molasses, 1 lb.; and when luke-warm, yeast, 1 spoonful. Ferment.

Root Beer.—For 10 gallons beer, take 3 lbs. common burdock root, or 1 oz. essence of sassafras; ½ lb. good hops; 1 pint corn, roasted brown. Boil the whole in 6 gallons pure water until the strength of the materials is obtained; strain while hot into a keg, adding enough cold water to make 10 gallons. When nearly cold, add clean molasses or syrup until palatable,—not sickishly sweet.

Add also as much fresh yeast as will raise a batch of eight loaves of bread. Place the keg in a cellar or other cool place, and in forty-eight hours you will have a keg of first-rate sparkling root beer.

Cheap Beer.—Water, 15 gallons; boil half the water with ¼ lb. hops; then add to the other half in the tun, and well mix with one gallon molasses and a little yeast.

To Restore Sour Beer.—Good hops, ¼ lb.; powdered chalk, 2 lbs.; put in the hole of the cask, and bung close for a few days. For frosted beer, add some finings, a few handfuls of flour, and some scalded hops. For ropy beer, use a handful or two of flour, the same of hops, with a little powdered alum to each barrel. Rummage well.

To Improve the Flavor of Beer.—Bruise ginger, 1 oz.; bruise cloves, ¼ oz.; a few scalded hops and a dozen broken coarse biscuits to every two barrels. Rummage well.

Lemonade.—White sugar, 1 lb.; tartaric acid, ¼ ounce; essence of lemon, 30 drops; water, 3 quarts. Mix.

Cream Soda.—Loaf sugar, 10 lbs.; water, 3 gallons; warm gradually so as not to burn; good rich cream, 2 quarts; extract vanilla, 1½ ounces; extract nutmeg, ½ ounce; tartaric acid, 4 ounces. Just bring to a boiling heat; for, if you cook it any length of time, it will crystallize; use 4 or 5 spoonfuls of this syrup instead of three, as in other syrups; put ¾ teaspoonful of soda to a glass, if used without a fountain. For charged fountains, no acid is used.

Freezing Preparation.—Common sal-ammoniac, well pulverized, 1 part, saltpetre, 2 parts; mix well together. Then take common soda, well pulverized. To use, take equal quantities of these preparations (which must be kept separate and well covered previous to using) and put them in the freezing pot; add of water a proper quantity, and put in the article to be frozen in a proper vessel; cover up, and your wants will soon be supplied. For freezing cream or wines, this can't be beat.

Portable Lemonade.—Tartaric acid, 1 ounce; white sugar, 2 lbs.; essence of lemon, ¼ ounce; powder and keep dry for use. One dessert spoonful will make a glass of lemonade.

Punch.—Water, 3 gallons; tartaric acid, 4 ounces or to taste; lump sugar to sweeten; brandy, 3 pints; rum, 3 pints. The peels of three lemons grated; essence of lemon to flavor; rub the essence with a little lump sugar in a mortar, adding a little of the spirit.

Milk Punch.—Yellow rinds of 2 dozen lemons; steep two days in two quarts of brandy; add spirits, 3 quarts; hot water, 2 quarts; lemon juice, 1 quart; loaf sugar, 4 lbs.; boiling milk, 2 quarts; 2 nutmegs grated; mix, and in two hours strain through wool.

Imperial Cream Nectar.—Part 1st, take 1 gallon water; loaf sugar, 6 lbs.; tartaric acid, 6 ounces; gum arabic, 1 ounce. Part 2d, flour, 4 teaspoonfuls; the whites of 5 eggs; beat finely together; then add ¼ pint water; when the first part is blood warm, put in the second; boil 3 minutes, and it is done. Directions: 3 table-

spoonfuls of syrup to two-thirds of a glass of water; add one-third teaspoonful of carbonate of soda, made fine; stir well, and drink at your leisure.

Peppermint Cordial.—Good whisky, 10 gals.; water, 10 gals.; white sugar, 10 lbs.; oil peppermint, 1 ounce, in 1 pint alcohol, 1 lb. flour well worked in the fluid; ½ lb. burned sugar to color. Mix, and let it stand one week before using. Other oil in place of peppermint, and you have any flavor desired.

Silver-top Drink.—Water, 3 qts.; white sugar, 4 lbs.; oil lemon, 1 teaspoonful; white of five eggs, beat with 1 tablespoonful of flour; boil to form a syrup; then divide into equal parts, and to one add 3 ounces tartaric acid, to the other 4 ounces of carbonate of soda. put in a teaspoonful of each of the syrups, more or less (according to the size of the glass), to two-thirds of a glass of water; drink quick.

Sangaree.—Wine, ale, or porter, or two-thirds water, hot or cold according to the season of the year, loaf sugar to taste with nutmeg.

Stoughton Bitters.—Gentian, 4 ounces; orange peel, 4 ounces; columbo, 4 ounces; camomile flowers, 4 ounces; quassia, 4 ounces; burned sugar, 1 lb.; whisky, 2½ gals. Mix and let it stand 1 week. Bottle the clear liquor.

Stomach Bitters.—Gentian root, 6 oz.; orange peel, 10 oz.; cinnamon, 1 oz.; anise seed, 2 oz.; coriander seed, 2 oz.; cardamom seed, ½ oz.; Peruvian bark unground, 2 oz.; bruise all the articles, and add 1 oz. gum kino; put in 2 qts. alcohol, and 2 qts. pure spirits, or good whisky may be used instead of pure spirit; shake occasionally for 10 days, and filter through three thicknesses of woollen; then ½ pint of this may be added to a gallon of whisky, more or less as desired.

Soda Syrups.—Loaf or crushed sugar, 8 lbs.; pure water, 1 gallon; gum arabic, 2 oz.; mix in a brass or copper kettle. Boil until the gum is dissolved, then skim and strain through white flannel, after which add tartaric acid, 5½ oz.; dissolve in hot water; to flavor, use extract of lemon, orange, vanilla, rose, sarsaparilla, strawberry, &c., &c., ½ oz., or to your taste. If you use juice of lemon, add 2½ lbs. of sugar to a pint, you do not need any tartaric acid with it; now use two tablespoonfuls of syrup to ¾ of a tumbler of water, and ½ teaspoonful of super-carbonate of soda, made fine; drink quick. For soda fountains, 1 oz. of super-carbonate of soda is used to 1 gallon of water. For charged fountains no acids are needed in the syrups.

Common Small Beer.—A handful of hops to a pail of water, a pint of bran and a half a pint of molasses, a cup of yeast and a spoonful of ginger.

Royal Pop.—Cream tartar, 1 lb.; ginger, 1½ oz.; white sugar, 7 lbs.; essence of lemon, 1 drachm; water, 6 gals.; yeast, ½ pint. Tie the corks down.

Raspberry Syrup without Raspberries.—First make a syrup

with 36 lbs. of white sugar, and 10 gallons of water, and put it into a clean mixing barrel. Then dissolve ¼ lb. tartaric acid in 1 qt. of *cold* water, and add to the syrup. Next take ½ lb. orris root, and pour over it half a gallon of *boiling* water; let it infuse until cold, then filter, and put it into the mixing barrel, stirring it well.

To Color.—Boil ½ oz. of cochineal; ¾ oz. cream tartar; ¼ oz. saleratus, and ½ oz. alum in 1 qt. of water till you get a bright red color, and add this to the syrup till the color suits. The above is a very valuable receipt, and will make 16 gals. syrup at a very low cost per gallon. If it is desirable to produce a richer syrup, add more sugar. Colors ought to be made in a brass or copper kettle.

Bottled Soda Water without a Machine.—In each gallon of water to be used, carefully dissolve ½ lb. of crushed sugar, and one ounce of super-carbonate of soda; then fill pint bottles with this water, have your corks ready; now drop into each bottle ½ drachm of citric acid in crystals, and immediately cork and tie down. Handle the bottles carefully, and keep cool until needed. More sugar may be added if needed.

Oyster Soup.—To each dozen or dish of oysters put ½ pint water; milk, 1 gill; butter, ½ oz., powdered crackers to thicken; bring the oysters and water to a boil, then add the other ingredients previously mixed together, and boil from three to five minutes only. Season with pepper and salt to taste.

Blackberry Wine.—Mash the berries, and pour 1 qt. of boiling water to each gallon. Let the mixture stand 24 hours, stirring occasionally; then strain and measure into a keg, adding 2 lbs. sugar, and good rye whisky 1 pint, or best alcohol ½ pint to each gallon. Cork tight, and put away for use. The best wine that can be made.

Lemon Syrup.—Havana sugar, 1 lb., boil in water down to a quart, drop in the white of 1 egg, and strain it. Add ¼ oz. tartaric acid: let it stand 2 days; shake often; 4 drops oil of lemon will much improve it.

Superior Raisin Wine.—Take 30 lbs. of chopped raisins free from stems and dust; put them in a large keg, and add to them 10 gals. soft water; let them stand two weeks unbunged, shaking occasionally (warm place in winter), then strain through woollen, or filter; color with burnt sugar; bottle and cork well for use. For bar-use, add 1 pt. good brandy to each gallon. The more raisins the better the wine, not exceeding 5 lbs. to each gallon.

Raisin Wine equal to Sherry.—Boil the proper quantity of water, and let it stand till cold. To each gallon of this water add 4 lbs. of chopped raisins, previously well washed, and freed from stalks; let the whole stand for one month, stirring frequently; then remove the raisins, and bung up closely for one month more; then rack into another vessel, leaving all sediment behind, which must be repeated till it becomes fine; then to every 10 gallons add 6 lbs. of fine sugar, and 1 dozen of good oranges, the

rinds being pared very thin, and infused in 2 qts. of brandy, which should be added to the liquor at its last racking. Let the whole stand three months in the cask, then bottle. It should remain bottled twelve months. To give it the flavor of Madeira, when it is in the cask, put in a couple of green citrons, and let them remain till the wine is bottled.

Port Wine.—Worked cider, 42 gals.; good port wine, 12 gals.; good brandy, 3 gals.; pure spirits, 6 gals.; mix. Elderberries and sloes, and the fruit of the black haws, make a fine purple color for wines, or use burnt sugar.

American Champagne.—Good cider (crab-apple cider is the best), 7 gals.; best fourth-proof brandy, 1 qt.; genuine champagne wine, 5 qts.; milk, 1 gal.; bitartrate of potassa, 2 oz. Mix, and let stand a short time; bottle while fermenting. An excellent imitation.

British Champagne.—Loaf sugar, 56 lbs.; brown sugar (pale,) 48 lbs.; water (warm,) 45 gals.; white tartar, 4 oz. Mix, and at a proper temperature add yeast, 1 qt.; afterwards sweet cider, 5 gals.; bruised wild cherries, 14 or 15 oz.; pale spirits, 1 gal.; orris-powder, ½ oz. Bottle while fermenting.

British Madeira.—Pale malt, 1 bushel; boiling water, 12 gals.; mash and strain; then add white sugar, 4 lbs.; yeast, 1 lb. Ferment, next add raisin or Cape wine, 3 qts.; brandy, 3 qts.; sherry, 2 qts.; port, 2 qts.; bung down. The malt may be mashed again for bottle beer.

Currant and other Fruit Wines.—To every gallon of expressed juice, add 2 gals. soft water, 6 lbs. brown sugar, cream tartar, 1½ oz.; and 1 qt. brandy to every 6 gals.; some prefer it without brandy. After fermentation take 4 oz. isinglass dissolved in 1 pt. of the wine, and put to each barrel, which will fine and clear it; when it must be drawn into clean casks, or bottled, which is preferable.

Blackberry and Strawberry Wines.—Are made by taking the above wine when made with port wine, and for every 10 gals. from 4 to 6 qts. of the fresh fruit, bruised and strained, are added, and let stand four days till the flavor is extracted; when bottling, add 3 or 4 broken raisins to each bottle.

Morello Wine.—To each qt. of the expressed juice of the morello, or tame cherries, add 3 qts. water, and 4 lbs. of coarse brown sugar; let them ferment, and skim till worked clear; then draw off, avoiding the sediment at the bottom. Bung up, or bottle, which is best for all wines, letting the bottles lie always on the side, either for wines or beers.

London Sherry.—Chopped raisins, 400 lbs.; soft water 100 gals.; sugar, 45 lbs.; white tartar, 1 lb.; cider, 16 gals. Let them stand together in a close vessel one month; stir frequently. Then add of spirits, 8 gals.; wild cherries bruised, 8 lbs. Let them stand one month longer, and fine with isinglass.

English Patent Wine from Rhubarb.—To each gal. of juice,

add 1 gal. soft water, in which 7 lbs of brown sugar have been dissolved; fill a keg or barrel with this proportion, leaving the bung out, and keep it filled with sweetened water as it works off, until clear. Any other vegetable extract may be used if this is not liked; then bung down or bottle as you please. The stalks will yield ¾ their weight in juice; fine and settle with isinglass as above. This wine will not lead to intemperance.

Various Wines.—To 28 gals. clarified cider add good brandy, 1 gal.; crude tartar (this is what is deposited by grape wines), 1 lb.; of any kind of wine you wish to imitate, 5 gals.; sweet milk to settle it, 1 pt.; draw off 36 hours after thoroughly mixing.

Ginger Wine.—Put 1 oz. of good ginger-root bruised in 1 qt. 95 per cent. alcohol; let it stand 9 days, and strain; add 4 qts. water, and 1 lb. white sugar dissolved in hot water, color with tincture of sanders to suit. For bar purposes add 1 pt. port wine.

Another.—To 1 qt. 65 per cent. alcohol add 1 oz. best ginger-root (bruised but not ground,) 5 grs. capsicum, and 1 dr. tartaric acid. Let it stand one week and filter; now add 1 gal. water, in which 1 lb. of crushed sugar has been boiled. Mix when cold. To make the color, boil ½ oz. cochineal, ¾ oz. cream tartar, ½ oz. saleratus, and ½ oz. alum, in 1 pt. of water till you get a bright red color.

To Restore Flat Wine.—Add 4 or 5 gals. of sugar, honey, or bruised raisins to every 100 gals., and bung close; a little spirit may be added, to roughen; take bruised sloes, or powdered catechu, and add to the wine in suitable proportions, or add a small quantity of bruised berries of the mountain ash. Let it stand 2 hours and bottle using yeast, of course, as before.

To Clear and Fine Liquors.—After all the articles used to prepare any kind of liquors are put in, and they do not become perfectly clear, you will draw into a barrel which has only one head or bottom in it, with a faucet near the bottom, and sift into each barrel from 1 to 3 oz. pulverized lime, which will cause every impurity to settle, when it can be drawn again, and returned to clean barrels or bottles as desired. *White wines* are generally fined by isinglass in the proportion of 1½ oz. (dissolved in 1½ pts. of water, and thinned with some of the wine) to the hogshead. *Red wines* are generally fined with the whites of eggs, in the proportion of 12 to 18 to each pipe; they must be well beaten to a froth with about 1 pt. of water, and afterwards mixed with a little of the wine, before adding them to the liquor. Rummage well.

Coloring for Liquor.—Take 1 lb. white sugar, put it into an iron kettle, moisten a little, let it boil and burn to a red, black and thick; remove from the fire, and put in a little hot water to keep it from hardening as it cools. Use this to color any liquors needing color, to your taste, or as near the color of the liquor you imitate as you can. Tincture kino is a good color; and 1 oz. gum to 1 pt. alcohol makes the tincture.

Champagne Cider.—Good pale cider, 1 hhd.; spirit, 3 gals.;

sugar, 20 lbs.; mix, and let it stand one fortnight; then fine with skimmed milk, ½ gal.; this will be very pale, and a similar article, when properly bottled and labelled, opens so brisk that even good judges have mistaken it for genuine champagne.

Berlin Caraway Cordial.—Take 8 gals. spirit, 50 per cent.; 1 oz. oil of caraway, which you dissolve in spirit 95 per cent.; 8 lbs. sugar, 8 lbs. water. Dissolve your sugar in the water; mix, stir, and filter.

Stomach Bitters, Equal to Hostetter's.—European gentian root, 1½ oz.; orange peel, 2½ oz.; cinnamon, ¼ oz.; anise seed, ½ oz.; coriander seed, ½ oz.; cardamom seed, ½ oz.; unground Peruvian bark, ½ oz.; gum kino, ¼ oz.; bruise all these articles, and put them into the best alcohol, 1 pt.; let it stand a week, and pour off the clear tincture; then boil the dregs a few minutes in 1 quart of water, strain, and press out all the strength; now dissolve loaf sugar, 1 pound, in the hot liquid, adding 3 quarts cold water, and mix with the spirit tincture first poured off, or you can add these, and let it stand on the dregs if preferred.

Boker's Bitters.—Rasped quassia, 1½ oz.; calamus, 1½ oz.; powdered catechu, 1½ oz.; cardamom, 1 oz.; dried orange peel, 2 oz.; macerate the above ten days in ½ gallon strong whisky, and then filter, and add 2 gals. water; color with mallow or malva flowers.

Curacoa Cordial, 40 Gals.—Essence of bitter oranges, 2 oz.; ess. of neroli, 2 oz.; ess. of cinnamon, ¼ oz.; 3 drachms mace, infused in alcohol. Dissolve the above essences in 1 gal. alcohol, 95 per cent.; then put in a clean barrel 13 gals. alcohol, 85 per cent.; 26 gals. sugar syrup, 30 degrees Baumé; and add 1 gal. perfumed spirit as above. Color with saffron or turmeric.

Curacoa d'Hollande, 20 Gals.—Curacoa orange-peel, 2 lbs.; ½ lb. Ceylon cinnamon. Let them soak in water; boil them for five minutes with the juice of 32 oranges and 14 gals. of white plain syrup; then add 6 gals. alcohol, 95 per cent.; strain, filter; color dark yellow with sugar coloring.

Anisette Cordial, 40 Gals.—Put in a barrel 13 gals. alcohol, 75 per cent. Dissolve 3½ oz. essence of green anise-seed in 1 gal. 95 per cent. alcohol, and add ½ gal. orange-flower water; 8 or ten drops infusion of mace, and 5 drops essence of cinnamon. Then put in the barral 26 gals. sugar syrup, 25 degrees Baumé. Stir fifteen minutes, and let it rest four or five days; then filter. Add 2 or 3 sheets of filtering paper.

Ratafia.—Ratafia may be made with the juice of any fruit. Take 3 gals. cherry juice, and 4 lbs. sugar, which you dissolve in the juice; steep in 2½ gals. brandy ten days; 2 drachms cinnamon; 24 cloves; 16 oz. peach leaves; 8 oz. bruised cherry kernels. Filter, mix both liquids, and filter again.

Arrack Punch Syrup.—53½ lbs. sugar; 3½ gals. water. Boil up well, then add 1⅔ gals. lemon-juice to the boiling sugar, and stir till the liquid is clear; pour it in a clean tub, and, when nearly cool, add 5 gals. Batavia arrack; then filter.

Simple Syrup.—To 8 lbs. best white sugar add 2 qts. water, and the whites of 2 eggs; stir until all the sugar is dissolved; simmer for two or three minutes; skim well, and strain through a fine flannel bag.

Sarsaparilla Syrup.—To simple syrup add 10 drops oil of anise; 20 drops oil of wintergreen, 20 drops oil of sassafras, and 6 oz. of caramel or coloring to the gallon. Before the oils are added to the syrup, they should be cut by grinding them in a mortar with as much sugar as they will moisten, or mix with a small quantity of alcohol.

Vanilla Syrup.—To simple syrup add ½ oz. of ext. of vanilla to the gallon.

Ginger Syrup.—Bruised Jamaica ginger, 2 oz.; boiling water, 1 pt.; macerate for four hours; add fine white sugar, 2 lbs.; and strain through a fine flannel bag. Ginger syrup may also be made by adding 2 oz. of the extract of ginger to 1 gallon of simple syrup.

Strawberry Syrup without Strawberries.—Add to 1 gal. simple syrup 2 teaspoons of essence of strawberry, and ¼ ounce tartaric acid. Color with coloring made as follows: Boil 1 oz. of cochineal with half a teaspoonful of cream tartar.

Strawberry Syrup.—Inclose fresh strawberries in a coarse bag, press out the juice, and to each quart add 1 pint water and 6 lbs. white sugar, dissolve by raising it to the boiling point, and strain; bottle and cork hot, and keep in a cool place.

Blackberry Syrup.—Is made as directed for strawberry, adding to each quart 1 oz. best French brandy.

Wild Cherry Syrup.—Steep 4 oz. wild cherry bark, well bruised, in 1 pt. of cold water, for thirty-six hours; press out the infusion; let it stand till clear, decant, and add 1½ lbs. fine white sugar; mix and strain.

Nectar Syrup.—Add to orgeat syrup 1 pt. of best port wine, and ½ oz. extract vanilla to the gal.; or flavor 1 gal. simple syrup with 1 teaspoonful extract of nectar.

Orgeat Syrup.—Take 3 oz. of sweet almonds, and ½ oz. bitter almonds; gum-arabic, in powder, ½ oz.; sugar in powder, 3 oz.; rub together in a mortar, adding water from time to time until the mixture measures 1 qt. Strain through a cloth, and mix with 1 gal. of simple syrup.

Orange-Flower Syrup.—Add to 1 gal. of simple syrup, ½ oz. ext. of orange-flowers.

Orange Syrup.—Grate off the outside yellow peel of fresh and ripe oranges; cut them and express the juice; to each quart add 1 pt. water and 6 lbs. sugar, previously well mixed with the grated peel. Dissolve by gentle heat, then strain.

Pine-Apple Syrup.—Pare and mash the fruit in a marble or porcelain mortar, with a small quantity of sugar; express the juice, and, for each quart, take 1½ pts. of water and 6 lbs. fine sugar; boil the sugar and water; then add the juice; remove from the

fire, skim and strain. Or make it with the essence directed for strawberries.

Pear Syrup.—Make as directed for pine-apple syrup; or use the essence of pear, by adding to each gallon of simple syrup 2 teaspoonfuls of essence of pear, and ¼ oz. tartaric acid.

Banana Syrup.—Make as directed for pine-apple syrup, or with the appropriate essence and acid as above.

Apple Syrup.—Make as directed for pine-apple syrup, or with the appropriate fruit and essences, as above.

Cream Syrup.—Fresh cream, 1 pt.; fresh milk, 1 pt.; fine powdered sugar, 3 lbs.; beat the sugar with the milk, and the whites of 2 eggs; then mix with the cream. Flavor with lemon, vanilla, or strawberry. Keep in a cool place, well bottled.

Butyric Ether is much used to impart a pine-apple flavor to rum. Dissolved in 8 or 10 parts of alcohol it forms the pine-apple essence. From 20 to 25 drops of this essence, added to 1 lb. sugar containing a little citric acid, imparts to the mixture a strong taste of pine-apple.

Amylo-Acetic Ether is a preparation of fruit-oil and other ingredients, and, when diluted with alcohol, it is sold as *essence of Jargonelle pear*, and is used for flavoring different liquors. Fifteen parts amylo-acetic ether, with half a part of acetic ether, dissolved in 100 parts of alcohol, form what may be called the *Bergamot pear essence*, which, when employed to flavor sugar, acidulated with a little citric acid, imparts the odor of the Bergamot pear, with a fruity, refreshing taste.

Pelargonate of Ethylic Ether—(*pelargonic ether*) has the agreeable odor of the quince, and, when dissolved in alcohol in due proportion forms the *quince essence.*

Acetate of Amylic Ether—(*same as amylo ether*) mixed with *butyric ether*, forms in alcoholic solution the *banana essence.*

Valerianate of Amylic Ether.—An alcoholic solution of this ether in the proportion of 1 part to 6 or 8 of alcohol forms a flavoring liquid under the name of *apple essence.*

Brandy.—To 40 gals. pure or neutral spirits, add 1 lb. crude tartar, dissolved in 1 gal. hot water; acetic ether, ¼ pt.; bruised raisins, 6 lbs.; tinct. kino, 2 oz.; sugar, 3 lbs.; color with sugar coloring. Stand 14 days, and draw off.

French Brandy.—Pure spirits, 1 gal.; best French brandy, or any kind you wish to imitate, 1 qt.; loaf sugar, 2 oz.; sweet spirits of nitre, ½ oz.; a few drops of tincture of catechu, or oak bark, to roughen the taste if desired, and color to suit.

Pale Brandy.—Is made the same as by the above receipt, using pale instead of the French, and using only 1 oz. tincture of kino for every 5 gallons.

Cognac Brandy.—To every 10 gals. of pure spirits add 2 qts. New England rum, or 1 qt. Jamaica rum, and from 30 to 40 drops of oil cognac cut in half a pint of alcohol, and color with burnt sugar to suit.

Cherry Brandy.—To every 10 gals. of brandy made by the receipt for French Brandy, add 3 qts. of wild black cherries, stones and all bruised; crushed sugar, 2 lbs.; let it stand for one week, then draw or rack it off as it is wanted for use. Do not use the bitter almond oil in any case, as it is the rankest poison.

Another.—Good whisky, 10 gals.; wild black cherries, 5 qts. well bruised with stones broken; common almonds, shelled, 1 lb.; white sugar, cinnamon, cloves, and nutmeg, well bruised, of each, ½ oz. Mix, and let them stand twelve days, and draw off. This, with the addition of 2 gals. brandy, makes most superior cherry brandy.

Blackberry Brandy.—Take 10 gals. of No. 2 brandy, and use 5 qts. nice rich blackberries mashed; macerate the berries in the liquor for ten days. Then strain off; add 3 oz. sugar to each gallon; if strawberries are used, work the same proportions with only half the quantity of sugar.

Brandy without Foreign Liquor.—To 100 gals. spirits, 5 to 10 over proof, add ½ or ¾ oz. oil of cognac, cut in alcohol; ½ lb. black tea; ¼ oz. oil of prune kernel cut in alcohol, 95°; ¼ gal. sugar syrup; 2 oz. acetic ether; color with sugar coloring. To vary your flavor, instead of the oil of prune kernels, add 1 to 2 oz. rum essence, or 40 drops oil of neroli, dissolved in 1 pt. of alcohol, 95°. Filter.

Imitation Otard Brandy.—To 40 gals. pure spirits, 5 over proof, add ¼ or ½ gal. Jamaica rum; 1 pt. sugar syrup; ¼ oz. tannin powder; 1 oz. acetic ether. To vary the flavor of this brandy, and give it a flavor imitating that of SEIGNETTE brandy, instead of Jamaica rum, use ¼ gal. Santa Cruz, or New England rum, and ¼ gal. apple brandy. To imitate ARMAGNAC brandy, instead of the liquors in combinations 1 and 2, use ½ gal. Muscat wine.

Holland Gin.—Pure spirits, 1 gal.; best Holland gin, or any kind you wish to imitate, 1 qt.; oil of juniper, 2 scruples; oil of anise, 1-40th of an ounce.

Another.—To 100 gals. of rectified spirits, add, after you have cut the oils well, 1½ oz. of the oil of English juniper; ½ oz. of angelica essence; ½ oz. of the oil of coriander; and ½ oz. oil caraway; put this into the rectified spirits, and rummage well. This is strong gin; to make this *up*, as it is called by the trade, add 45 lbs. of loaf sugar, dissolved; then rummage the whole well together with 4 oz. roche alum. For finings, add 4 oz. salts of tartar.

Another.—To 100 gals. pure proof spirit, add 1 to 1½ oz. oil of juniper berries; 1 gal. white sugar syrup; ½ oz. oil of sweet fennel; 1 lb. orange peel. Infuse the orange peel in sufficient pure spirit, 95°, to cover it for three or four days; then filter through filtering paper before using. The oils of juniper and fennel should be cut with pure spirit, say 1 qt. for each. All manufactured gin should be filtered.

Another.—To 40 gals. proof or neutral spirits, add spirits of

nitre, 3 oz.; loaf sugar, 4 lbs.; oil of juniper, 1 oz.; caraway, ⅛ oz. The two last to be cut in 1 qt. alcohol. Stand 24 hours.

London Cordial Gin.—To 90 gals. good gin, add 1 dr. oil of sweet almonds; 2 drs. oil cassia; 2 drs. oil nutmeg; 2 drs. oil of lemon; 3 drs. oil of juniper; 3 drs. oil of caraway; 3 drs. oil of coriander; 3 fluid oz. essence of orris root; 3 ditto of cardamom; 3 pts. orange-flower water; 56 to 60 lbs. lump sugar, dissolved in 4 gals. pure water. Dissolve the oils and essence in 2 qts. alcohol, 95°, and added gradually till the requisite flavor is produced. Then mix in the dissolved sugar, and a sufficient quantity of soft water (having previously dissolved 4 oz. of alum in it) to make up in all 100 gals. When the whole is perfectly mixed, add 2 oz. salt of tartar dissolved in 2 or 3 quarts of *hot water;* then stir up, and mix the liquor well once more, and allow it to repose. In a week or less it will become *brilliant,* and may be either racked or drawn from the same cask.

Aromatic Schiedam Schnapps, to Imitate.—To 25 gals. good common gin, 5 over proof, add 15 pts. strained honey; 2 gals. clear water; 5 pts. white-sugar syrup; 5 pts. spirit of nutmegs mixed with the nitric ether; 5 pts. orange-flower water; 7 qts. pure water; 1 oz. acetic ether; 8 drops oil of wintergreen, dissolved with the acetic ether; mix all the ingredients well; if necessary, fine with alum and salt of tartar.

To Reduce Holland Gin.—To 25 gals. pure Holland gin, add 25 gals. pure French spirit; ½ gal. of white sugar syrup; mix thoroughly.

Jamaica Rum.—To 45 gals. New England rum, add 5 gals. Jamaica rum; 2 oz. butyric ether; ½ oz. oil of caraway cut with alcohol, 95 per cent. Color with sugar coloring.

Another.—To 36 gals. pure spirit, add 1 gal. Jamaica rum; 3 oz. butyric ether; 3 oz. acetic ether; ½ gal. sugar syrup; mix the ethers and acid with the Jamaica rum, and stir it well in the spirit. Color with burnt sugar coloring.

Santa Cruz Rum.—To 50 gals. pure proof spirit, add 5 gals. Santa Cruz rum; 5 lbs. refined sugar, in ½ gal. water; 3 oz. butyric acid; 2 oz. acetic ether. Color if necessary.

Another.—To 45 gals. New England rum, add 5 gals. Santa Cruz rum, and 5 drs. vanilla essence.

Pine Apple Rum.—To 50 gals. rum made by the fruit method, add 25 pine-apples sliced, and 8 lbs. white sugar. Let it stand two weeks before drawing off.

Batavia Arrack.—To 12 gals. pale rum, add 2 oz. flowers of benzoin; ½ oz. balsam of Tolu; 1 oz. sliced pine-apple. Digest with occasional agitation for a month; then add ½ pt. raw milk agitated well for fifteen minutes, and rack in a week; a fine imitation.

Rum.—Pure spirits, 1 gal.; 1 pint of the kind of rum you wish to imitate; ⅛ oz. oil of caraway is enough for 6 gallons.

Rum Shrub.—Tartaric acid, 5 lbs.; pale sugar, 100 lbs.; oil lemon, 4 drs.; oil orange, 4 drs.; put them into a large cask (80 gals.) and add water, 10 gals. Rummage till the acid and sugar are dissolved, then add rum (proof,) 20 gals.; water to make up 55 gals. in all; coloring, 1 qt. or more. Fine with 12 eggs. The addition of 12 sliced oranges will improve the flavor.

Another.—Lemon juice, 1 pt.; white sugar, 2 lbs.; rum, 3 pts.; water, 4 pts.; mix and color. Ready for use.

Bourbon Whisky.—To 100 gals. pure proof spirit, add 4 oz. pear oil; 2 oz. pelargonic ether; 13 drs. oil of wintergreen, dissolved in the ether; 1 gallon wine vinegar. Color with burnt sugar.

Old Bourbon Whisky.—To 40 gals. spirits, add 5 gals. good Bourbon whisky; spirits nitre, 2 oz.; fusil oil from corn, 2 oz.; put in 1 qt. alcohol; stand four days.

Monongahela Whisky.—Common whisky, 36 gals.; dried peaches, 2 qts.; rye, burnt and ground as coffee, 1 qt.; cinnamon, cloves and allspice bruised, of each, 1 oz., loaf sugar, 5 lbs.; sweet spirits of nitre, 2 oz.; put these in 4 gals. pure spirits; shake every day for one week; then draw off, and add the whole to the 36 gallons of whisky.

Another.—To 20 gals. pure proof spirit, add 2 lbs. dried peaches; 2 lbs. white sugar; 1 pt. rye, burnt and ground like coffee; 2 oz. allspice (ground,) 4 oz. ground cinnamon; 1 oz. ground cloves. Infuse all the above ingredients in the spirit for five or ten days, and then draw off.

Old Rye.—Take dried peaches, ½ peck; bake, scorch, and roast them in a stove, but don't burn; bruise and put them in a woolen pointed bag, and leach good common whisky over them twice slowly; this for one barrel; add afterwards 12 drops aqua ammonia to each barrel; and with age you will have whisky equal to old Rye.

Another.—To 50 gals. pure proof spirit, add 2 oz. pelargonic ether; 1 oz. pear oil; 10 drops oil of wintergeen, dissolved in alcohol, 95°; 4 oz. acetic ether; 4 drops oil of cloves, dissolved in the acetic ether. Color if necessary with burnt sugar.

Scotch Whisky.—To 46 gals. alcohol, 95°, add 8 gals. best Scotch whisky; 18 gals. soft water; 3 lbs. clarified honey, dissolved in 1½ gals. soft water; 5 drops creosote, dissolved in 2 oz. strong acetic acid; 1 oz. pelargonic ether; 1 gal. old ale.

Another.—To 35 gals. pure spirit, 10 over proof, add 15 gals. best gennine Scotch whisky; 3 drops creosote, mixed in 1 oz. acetic acid; 1 oz. pelargonic ether.

Irish Whisky may be made by substituting Irish for Scotch whisky.

NOTE.—The peculiar flavor of Scotch whisky may be nicely imitated by adding a few drops of pure creosote dissolved in a little acetic acid to 2 or 3 gals. good London gin; and the imitation will be still more perfect if the liquor is kept some months before drinking it.

Irish Whisky.—To 30 gals. of pure spirit, 10 over proof, add 5 gals. genuine Irish whisky; ½ gal. old ale; 4 drops creosote mixed in 1 oz. acetic acid; 1 oz. pelargonic acid.

To Improve the Flavor of New Whisky.—Take 1 gallon of whisky, add tea, 4 oz.; allspice, 4 oz.; caraway seed, 4 oz.; cinnamon, 2 oz.; shake occasionally for 1 week, and use one pt. to a barrel. Let it stand in a jug.

Drogheda Usquebaugh.—To 1 gal. brandy, add stoned raisins, 1 lb.; cinnamon, cloves, nutmegs and cardamoms, each 1 oz. crushed in a mortar; saffron, ½ oz.; rind of one orange, and sugar candy. Shake these well; in 14 days afterwards, fine for use.

IMPORTANT.—Proof spirit, which is the standard by which all mixtures of alcohol and water are judged, contains 50 per cent. by volume and 42-52 per cent. by weight of alcohol. The specific gravity of proof spirit is 0.933; and when a spirit is "*above proof*," it denotes that it contains an excess of alcohol. Thus if 100 volumes of a spirit require 20 volumes of water to reduce it to "proof standard," it is said to be 20 over proof, while the term "under proof" has reference to a less strong spirit than the standard. Thus, if 100 volumes of a spirit require 20 volumes of spirit of a specific gravity of 0.825 to raise it to the "proof" standard, the sample is said to be "20 *under proof*." The strength is ascertained by the Hydrometer.

Alcohol, when thoroughly rectified and cleansed, is called pure neutral spirit, and is the basis of all the domestic manufactured imitations of foreign brandies, gins, cordials, &c. The high wines, or neutral spirit, distilled and rectified, and sold as French pure spirit, is free from all deleterious substances, and when sweetened, colored, and properly flavored, will compete favorably with imported brandy or gin. Good strong whisky may be used as a substitute for the above proof spirit, but it is inferior to the other. The whisky should be of proper strength, and treated as follows; this process destroys the fusil oil, and precipitates the verdigris to the bottom:—

To 40 gals. whisky, add 1½ lbs. unslacked lime; ¾ lb. powdered alum; and ½ pt. spirits of nitre; stir well, and let stand twenty-four hours. Then draw off to another cask, avoiding the sediment. It is then fit for use. All oils used must be cut in 90 per cent. alcohol, using 1 qt. alcohol to 2 oz. oil, and should stand twenty-four hours before using.

Bead for Liquor.—The best bead is the orange-flower water bead (oil of neroli), 1 drop to each gal. of brandy.

Another Method.—To every 40 drops of sulphuric acid, add 60 drops purest sweet oil in a glass vessel: use immediately. This quantity is generally sufficient for 10 gals. spirit.

Another.—Take 1 oz. of the purest oil sweet almonds; 1 oz. of sulphuric acid; put them in a stone mortar; add by *degrees*, 2 oz. white lump sugar, rubbing it well with the pestle till it becomes a paste; then add small quantities of spirits of wine till it comes into

a liquid. This quantity is sufficient for 100 gals. The first is strongly recommended as the best.

Wax Putty for Leaky Casks, Bungs, &c.—Spirits turpentine, 2 lbs.; tallow, 4 lbs.; yellow wax, 8 lbs.; solid turpentine, 12 lbs. Melt the wax and solid turpentine together over a slow fire; then add the tallow. When melted, remove far from the fire; then stir the spirits turpentine, and let it cool.

NOTE.—The writer has endeavored to give such receipts only as are worthy of every confidence on the ground of being perfectly free from all injurious or deleterious ingredients. He has paid dearly for receipts which are of an entirely opposite quality, and which no consideration whatever, either of money or to satisfy curiosity, could induce him to give to the public.

Punch.—To make punch in perfection, the essence of the lemon must be extracted by rubbing lumps of sugar on the rind, which breaks the delicate little vessels that contain the essence, and at the same time absorbs it. In making hot toddy or hot punch, you must put in the spirits before the water; in cold punch, grog, &c., the other way. The precise portions of spirit and water, or of acidity and sweetness, are hard to define in every case. In these, as well as in other matters, it will often be preferable to consult the taste.

Brandy Punch.—One table-spoonful of raspberry syrup, 2 ditto of white sugar, 1 wine glass of water, 1½ ditto of brandy, ½ small sized lemon, 2 slices of orange, 1 piece of pine-apple. Fill the tumbler with shaved ice, shake well, and dress the top with berries in season; sip through a straw.

Mississippi Punch.—One wine glass brandy, ½ ditto of Jamaica rum, ½ ditto Bourbon whisky, ½ ditto of water, 1½ table-spoonfuls of powdered white sugar, ¼ of a large lemon. Fill a tumbler with shaved ice, shake well, and sip through a glass tube or straw.

Hot Brandy and Rum Punch (*for a party of fifteen*).—One qt. of Jamaica rum, 1 ditto Cognac brandy, 1 lb. loaf sugar, 4 lemons, 3 qts. boiling water, 1 tea-spoonful of nutmeg. Rub the sugar over the lemons until it has absorbed all the yellow part of the skins, then put the sugar into a punch bowl; add the ingredients well together; add the rum, brandy and nutmeg; mix thoroughly and the punch will be ready to serve.

Irish Whisky Punch—Is generally ¼ pure whisky, ¼ boiling water, in which the sugar has been dissolved. If lemon punch, the rind is rubbed on the sugar, and a small proportion of juice added before the whisky is poured in.

Scotch Whisky Punch.—Steep the thin yellow shavings of lemon peel in the whisky, which should be the best Glenlivet or Islay; the sugar should be dissolved in boiling water. Proportions of boiling water and whisky, same as the above, or to suit the taste.

Whisky Punch.—One wine glass Irish or Scotch whisky, 2 ditto boiling water, sugar to taste. Dissolve the sugar well with 1 wine glass of water, then pour in the whisky, and add the balance of the water. Sweeten to taste, and put in a small piece of lemon rind, or a thin slice of lemon.

Gin Punch.—One tablespoonful of raspberry syrup, 2 ditto of white sugar, 1 wine glass of water, 1½ ditto of gin, ½ a small-sized lemon, 2 slices of orange, 1 piece of pine-apple. Fill the tumbler with snaved ice, shake well, and sip through a glass tube or straw.

Champagne Punch.—One quart bottle of wine, ¼ lb. sugar, 1 orange sliced. The juice of a lemon, 3 slices of pine-apple, 1 wine glass of raspberry or strawberry syrup. Ornament with fruits in season, and serve in champagne goblets.

Sherry Punch.—Two wine glasses of sherry, 1 tablespoonful of sugar, 2 or 3 slices of orange, 3 ditto of lemon. Fill tumbler with shaved ice; shake well, and sip through a straw.

Claret Punch.—One and a half tablespoonfuls of sugar, 1 slice lemon, 2 or 3 ditto of orange. Fill the tumbler with shaved ice, pour in your claret, shake well, and it is ready for use.

Port Wine Punch—Is made the same as claret punch, using port wine instead of claret.

Vanilla Punch.—One tablespoonful of sugar, 1 wine glass of brandy, and the juice of a lemon. Fill the tumbler with shaved ice, shake well, and flavor with a few drops of vanilla extract.

Orgeat Punch.—One and a half tablespoonfuls of Orgeat syrup, 1½ wine glasses of brandy, juice of ½ of a lemon, and fill the tumbler with shaved ice. Shake well, and dash port wine on the top.

Curacoa Punch.—One tablespoonful of sugar, 1 wine glass of brandy, ½ ditto of Jamaica rum, 1 ditto of water, ½ pony glass of Curacoa, the juice of ½ a lemon. Fill the tumbler with shaved ice, shake well, and sip the nectar through a straw.

Roman Punch.—One tablespoonful of sugar, 1 ditto of raspberry syrup, 1 teaspoonful of Curacoa, 1 wine glass of Jamaica rum, ½ ditto of brandy, juice of ½ a lemon. Fill with shaved ice, shake well, dash with port wine, and sip through a straw.

Milk Punch.—One tablespoonful of fine white sugar, 2 ditto of water, 1 wine glass of Cognac brandy, ½ ditto Santa Cruz rum, ½ tumblerfull of shaved ice; fill with milk. Shake the ingredients well together, and grate a little nutmeg on top. To make it HOT, use *hot* milk and no ice.

Glasgow Punch.—Melt lump sugar in cold water, with the juice of a couple of lemons, passed through a fine wire strainer; this is sherbet, and must be well mingled. Then add old Jamaica rum—one part of rum to five of sherbet. Cut a couple of lemons in two, and run each section rapidly around the edge of the jug or bowl, gently squeezing in some of the delicate acid, when all is ready.

Regent's Punch (*for a party of twenty.*)—Three bottles cham-

pagne, 1 ditto Hockheimer, 1 ditto Curacoa, 1 ditto Cognac, ½ ditto Jamaica rum, 2 bottles Madeira, 2 ditto Seltzer, or plain soda water, 4 lbs. bloom raisins. To which add oranges, lemons, rock candy, and, instead of water, green tea, to taste. Cool with ice.

Raspberry Punch.—One and a-half gills of raspberry juice or vinegar, ¾ lb. lump sugar, 3½ pints boiling water. Infuse half hour; strain; add ½ pint of porter, ¾ to 1 pint each of rum and brandy (or either 1½ to 2 pints,) and add more warm water or sugar, if desired weaker or sweeter.

National Guard Punch.—One tablespoonful of sugar, the juice of ¼ of a lemon, 1 wine glass of brandy, 1 ditto Catawba wine; flavor with raspberry syrup. Fill the glass with shaved ice, shake well, and dash with Jamaica rum. Sip through a straw.

St. Charles Punch.—One tablespoonful of sugar, 1 wine glass of port wine, pony glass of brandy, juice of ¼ of a lemon. Fill the tumbler with shaved ice; shake well, and serve with a straw.

Seventy-Ninth Regiment Punch.—Half a wine glass each of Scotch and Irish whisky, 1 teaspoonful of sugar, 1 piece of lemon, two wine glasses of hot water. Serve in an earthen mug.

Imperial Punch.—One bottle of claret, 1 ditto soda-water, 4 tablespoonfuls powdered white sugar, ¼ teaspoonful of grated nutmeg, 1 liqueur glass of Maraschino, ½ lb. of ice, 3 or 4 slices of cucumber rind. Put all the ingredients into a bowl, and mix well.

Victoria Punch.—Six lemons in slices, ½ gal. brandy, ½ ditto Jamaica rum, 1 lb. of white sugar, 1¾ quarts cold water, 1 pint of boiling milk. Steep the lemons for twenty-four hours in the brandy and rum; add the sugar, water, and milk, and when well mixed strain through a jelly bag. This punch may be bottled, and used afterward, hot or cold. The above quantity is for twenty persons.

Wellington Punch.—One wine glass brandy, 5 drops Curacoa, 1 ditto acetic acid, 2 teaspoonfuls of simple syrup, 1 teaspoonful of syrup of strawberries, ¼ of a pint of water, the peel of a lemon, sliced; mix. Serve with ice, in large goblets. An admirable punch to serve hot, in cold weather.

Non-Such Punch.—Six bottles of claret, 6 ditto soda-water, 1 ditto brandy, 1 ditto sherry, ½ pint green tea, juice of 3 lemons, ½ of a pineapple cut up in small pieces; sweeten with white sugar to taste; strain and bottle immediately; keep one month before using.

Canadian Punch.—Two quarts of rye whisky, 1 pint Jamaica rum, 6 lemons sliced, 1 pineapple ditto, 4 quarts of water; sweeten to taste, and ice.

Tip-Top Punch (*for a party of five.*)—One bottle champagne, 2 ditto soda-water, 1 liqueur glass Curacoa, 2 tablespoonfuls of pow-

dered sugar, 1 slice of pineapple cut up. Put all the ingredients together in a small punch-bowl, mix well, and serve in champagne goblets.

United Service Punch.—Dissolve in 2 pints of hot tea, ¾ lb. of loaf sugar, having previously rubbed off, with a portion of the sugar, the peel of 4 lemons; then add the juice of 8 lemons and a pint of arrack.

Royal Punch.—One pt. hot green tea, ½ ditto brandy, ½ ditto Jamaica rum, 1 wineglass Curacoa, 1 ditto arrack, juice of 2 limes, a thin slice of lemon, white sugar to taste, 1 gill calf 's foot jelly, or, in lieu thereof, the whites of a couple of eggs beaten to a froth may be substituted. Drink as hot as possible.

Century Club Punch.—Two parts old Santa Cruz rum, 1 part old Jamaica rum, 5 parts water, lemons and sugar *ad libitum*. An excellent punch.

Queen Punch.—Put 2 oz. cream tartar and the juice and parings of 2 lemons into a stone jar; pour on them 7 qts. of boiling water, stir, and cover close. When cold, sweeten with loaf sugar, and strain it. Bottle, and cork tight. Add in bottling ½ pint rum to the whole quantity.

Gothic Punch.—Four bottles still Catawba, 1 bottle claret, 3 oranges or 1 pineapple, 10 tablespoonfuls of sugar. Let this mixture stand in a very cold place or in ice for 1 hour or more, then add 1 bottle of champagne.

Tea Punch.—Infuse 1 oz. green tea in 1 qt. boiling water; put before the fire a silver or other metal bowl to become quite hot, and then put into it ½ pt. good brandy, ½ ditto rum, ¼ lb. of lump sugar, the juice of a large lemon. Set these alight, and pour in the tea gradually, mixing it from time to time with a ladle. It will remain burning for some time, and it is to be poured in that state into the glasses. In order to increase the flavor, a few lumps of the sugar should be rubbed over the lemon peel. This punch may be made in a china bowl, but in that case the flame goes off more rapidly.

West Indian Punch.—This punch is made the same as brandy punch, but to each glass add a clove or two of preserved ginger and a little of the syrup.

Barbadoe Punch.—To each glass of brandy punch add a tablespoonful guava jelly.

Apple Punch.—Lay in a china bowl slices of apples and lemons alternately, each layer being thickly strewed with powdered sugar. Pour over the fruit, when the bowl is half filled, a bottle of claret; cover, and let it stand for 6 hours. Then pour it through a muslin bag, and it is all ready.

Ale Punch.—A quart of mild ale, a glass of white wine, one of brandy, one of capillaire, the juice of a lemon, a roll of the peel pared thin, nutmeg grated on the top, and a bit of toasted bread.

Cider Punch.—On the thin rind of half a lemon pour ¼ pt. of

sherry; add ¼ lb. of sugar, the juice of a lemon, a little grated nutmeg, and a bottle of cider; mix it well, and, if possible, place it in ice. Add a glass of brandy and a few pieces of cucumber rind.

Orange Punch.—The juice of 3 or 4 oranges, the peel of 1 or 2 ditto, ¾ lb. lump sugar, 3½ pts. boiling water. Infuse ½ an hour, strain, add ½ pt. porter, ¾ to 1 pt. each of rum and brandy (or either alone 1½ to 2 pints), and add more warm water and sugar, if desired weaker or sweeter. A good lemon punch may be made by substituting lemons for oranges.

Egg Nog.—One tablespoonful of fine sugar dissolved with 1 tablespoonful of cold water, 1 egg, 1 wineglass of Cognac brandy, ¼ ditto of Santa Cruz rum, ½ tumblerful of milk. Fill the tumbler one-quarter full of strained ice, shake the ingredients until they *are thoroughly mixed together*, and grate a little nutmeg on top.

Hot Egg Nog is made in precisely the same manner as the cold egg nog above, except that you must use boiling hot water instead of ice.

Sherry Egg Nog.—One tablespoonful of white sugar, 1 egg, 2 wineglasses of sherry. Dissolve the sugar with a little water, break the yolk of the egg in a large glass, put in a quarter tumblerful of broken ice, fill with milk until the egg is thoroughly mixed with the other ingredients, then grate a little nutmeg on top.

Mint Julep.—One tablespoonful of white pulverized sugar, 2½ ditto water; mix well with a spoon. Take 3 or 4 sprigs of fresh mint, press them well in the sugar and water, add 1½ wineglasses of Cognac brandy, and fill the glass with shaved ice, then draw out the sprigs of mint, and insert them in the ice with the stems downwards, so that the leaves will be above in the shape of a bouquet, arrange berries and small pieces of sliced orange on top in a tasty manner, dash with Jamaica rum, and sprinkle sugar on top. Sip with a glass tube or straw.

Brandy Smash.—One half tablespoonful of white sugar, 1 ditto water, 1 wineglass of brandy. Fill glass two-thirds full of shaved ice, use 2 sprigs of mint the same as in the recipe for mint julep. Lay 2 small pieces of orange on the top, and ornament with berries in season.

Gin Smash.—One-half tablespoonful of white sugar, 1 ditto water, 1 wineglass of gin. Fill the glass two-thirds full of shaved ice, use two sprigs of mint as in receipt for mint julep. Lay two small pieces of orange on top, and ornament with berries in season. For a

Whisky Smash, use whisky instead of gin.

Champagne Cobbler.—One tablespoonful of sugar, 1 piece each of orange and lemon peel. Fill the tumbler one-third full of shaved ice, and fill balance with wine; ornament in a tasty manner with berries in season. Sip through a straw.

Whisky Cobbler.—Two wineglasses of whisky, 1 table-

spoonful of sugar. 2 or 3 slices of oranges. Fill the tumbler with ice, and shake well.

Sherry Cobbler.—Two wineglasses of sherry, 1 tablespoonful of sugar; 2 or 3 slices of orange. Fill the tumbler with shaved ice, shake well, and sip through a straw.

Brandy Cocktail.—Three or four dashes of gum syrup, 2 ditto Bogart's bitters, 1 wineglass of Brandy, 1 or 2 dashes of Curacoa; squeeze lemon peel, fill one-third full of ice, and stir with a spoon.

Whisky Cocktail.—Three or four dashes of gum syrup, 2 ditto Bogart's bitters, 1 wineglass of whisky, and a piece of lemon peel. Fill one-third full of ice, and strain in a fancy red wineglass.

Gin Cocktail.—Three or four dashes of gum syrup, 2 ditto bitters, 1 wineglass of gin, 1 or 2 dashes of Curacoa, 1 small piece of lemon peel. Fill one-third full of fine ice, shake well and strain in a glass.

Japanese Cocktail.—One tablespoonful of orgeat syrup, ½ teaspoonful of Bogart's bitters, 1 wineglass brandy, 1 or 2 pieces of lemon peel. Fill the tumbler one-third with ice, and stir well with a spoon.

Jersey Cocktail.—One teaspoonful of sugar, 2 dashes of bitters. Fill the tumbler with cider, and mix well, with lemon peel on top.

Soda Cocktail.—The same as Jersey cocktail, using soda water, instead of cider.

Apple Toddy.—One tablespoonful of fine white sugar, 1 wineglass of cider brandy, ½ of a baked apple. Fill the glass two-thirds full of boiling water, and grate a little nutmeg on top.

Brandy Toddy.—One teaspoonful of sugar, ½ a wineglass of water, 1 ditto of brandy, 1 small lump of ice. Stir with a spoon. For hot brandy toddy, omit the ice, and use boiling water.

Whisky Toddy.—One teaspoonful sugar, ½ wineglass of water, 1 ditto whisky, 1 small lump of ice. Stir with a spoon.

Gin Toddy.—One teaspoonful of sugar, ½ wineglass of water, 1 ditto gin, 1 small lump of ice. Stir with a spoon.

Brandy Sling is made same as the brandy toddy, except that you grate a little nutmeg on the top.

Hot Whisky Sling.—One glass of whisky; fill tumbler one-third full of boiling water, and grate nutmeg on top.

Gin Sling is made same as gin toddy, except you grate a little nutmeg on top.

Brandy Pix.—One tablespoonful of sugar, ¼ of a lemon, ½ a glass of water, 1 ditto brandy. Fill tumbler two-thirds full of shaved ice; stir with a spoon.

Gin Fix.—One tablespoonful of sugar, ¼ of a lemon, ½ of a wineglass of water, 1 ditto gin. Fill two-thirds full of shaved ice, and stir with a spoon.

Port Wine Negus.—One wineglass of port wine, 1 teaspoonful of sugar. Fill the tumbler one-third full of hot water.

Brandy Flip.—One teaspoonful of sugar, 1 wineglass brandy. Fill the tumbler one-third full of hot water, mix, and place a roasted cracker on top, and grate nutmeg over it.

Currant Shrub.—One lb. of sugar, 1 pint of strained currant juice. Boil it gently 8 or 10 minutes, skimming it well; take it off and when lukewarm add ½ a gill of brandy to every pint of shrub. Bottle tight.

Brandy Shrub.—To the thin rind of 2 lemons and the juice of 5, add 2 quts. brandy; cover it for 3 days; then add 1 qt. sherry and 2 lbs. of loaf sugar. Run it through a jelly bag and bottle it.

Rum Shrub.—Put 3 pts. of orange juice and 1 lb. loaf sugar to 1 gal. rum; put all into a cask, and leave it for six weeks, when it will be fit for use.

Spaniard's Delight.—One-third Cognac brandy, ⅓ maraschino, ⅓ Curacoa; mix well.

Brandy Champerelle.—One-third brandy, ⅓ Bogart's bitters, ⅓ Curacoa; mix well. This is a delicious French drink.

Tom and Jerry.—Five lbs. sugar, 12 eggs, ½ small glass of Jamaica rum, 1½ teaspoonsfuls of ground cinnamon, ½ ditto of cloves, ½ ditto allspice. Beat the eggs to a stiff froth, and the yolks until they are as thin as water, then mix together, and add the spice and rum; thicken with sugar until the mixture attains the consistency of a light batter. *To deal out*,—Take a small bar glass, and to 1 tablespoonful of the above mixture add 1 wineglass of brandy, and fill the glass with boiling water; grate a little nutmeg on top.

Knickerbocker.—Half a lime or lemon, squeeze out the juice, and put rind and juice in the glass, 2 teaspoonfuls of raspberry syrup, ½ teaspoonful of Curacoa. Cool with shaved ice, shake well, and, if not sweet enough, add more of the syrup.

Cider Nectar.—One qt. cider, 1 bottle soda water, 1 glass sherry, one small glass brandy, juice of half a lemon, peel of ¼ of a lemon, sugar and nutmeg to taste. Flavor it with extract of pine apple, strain, and ice it all well.

Half and Half.—In London, this drink is made by mixing half porter and half ale; in America, it is made by mixing half new and half old ale.

Molasses Candy.—West India molasses, 1 gallon; brown sugar, 2 lbs.; boil the molasses and sugar in a preserving kettle over a slow fire; when done enough, it will cease boiling; stir frequently, and, when nearly done, stir in the juice of four lemons, or two teaspoonfuls of essence of lemon; afterwards butter a pan, and pour out.

Confectioner's Colors.—*Red*, cochineal, 1 oz.; boil five minutes in half pint water; then add cream tartar, 1 oz.; pounded alum, ½ oz.; boil ten minutes longer, add sugar, 2 oz., and bottle for use. *Blue*, put a little warm water on a plate, and rub in indigo till the required color is got. *Yellow*, rub with some water

a little yellow gamboge on a plate, or infuse the heart of a yellow-lily flower with milk-warm water. *Green*, boil the leaves of spinach about one minute in a little water, and, when strained, bottle for use.

To Make Devices in Sugar.—Make powdered lump sugar into a paste with mucilage; and mould to suit.

To Candy Sugar.—Dissolve 2 parts of double refined sugar in 1 of water. Great care must be taken that the syrup does not boil over, and that the sugar is not burnt. The first degree is called the thread, which is subdivided into the little and great thread; if you dip your finger in the syrup, and apply it to the thumb, the tenacity of the syrup will, on separating the finger and thumb, afford a thread which shortly breaks, this is the little thread; if the thread admits of a greater extension of the finger and thumb, it is called the great thread; by longer boiling you obtain the pearl, which admits of being drawn without breaking by the utmost extension of finger and thumb; this makes candied sugar; by further boiling you obtain the *blow*, which is known by dipping a skimmer with holes in the syrup, and blowing through them; if bubbles are perceived, you have got the blow. The *feather* implies more numerous bubbles, and then the sugar will fly off like flakes while the skimmer is being tossed. By boiling longer, you obtain the *crack:* it will crack when broken, and does not stick to the tooth; dip a teaspoon into the sugar, and let it drop to the bottom of a pan of cold water. If the sugar remains hard; it has attained the degree termed *crack*.

Liquorice Lozenges.—Extract of liquorice, 1 pound; powdered white sugar, 2 pounds. Mix with mucilage made with rose water.

Fig Candy.—Take 1 pound sugar and one pint of water; set over a slow fire. When done, add a few drops of vinegar and a lump of butter, and pour into pans in which split figs are laid.

Raisin Candy.—Can be made in the same manner, substituting stoned raisins for the figs. Common molasses candy is very nice with all kinds of nuts added.

Scotch Butter Candy.—Take 1 pound of sugar, 1 pint of water; dissolve, and boil. When done, add one tablespoonful of butter, and enough lemon juice and oil of lemom to flavor.

Common Lemon Candy.—Take 3 pounds of coarse brown sugar; add to it three teacupfuls of water, and set it over a slow fire for half an hour; put to it a little gum arabic dissolved in hot water; this is to clear it. Continue to take off the scum as long as any rises. When perfectly clear, try it by dipping a pipe-stem first into it and then into cold water, or by taking a spoonful of it into a saucer; if it is done, it will snap like glass. Flavor with essence of lemon, and cut into sticks.

Peppermint, Rose, or Hoarhound Candy.—They may be made as lemon candy. Flavor with essence of rose or peppermint

or finely powdered hoarhound. Pour it out in a buttered paper, placed in a square tin pan.

Popped Corn.—Dipped in boiling molasses, and stuck together, forms an excellent candy.

Cocoa-Nut Candy.—Pare and cut cocoa-nut into slips, or grate on a coarse grater the white meat of cocoa-nuts until you have half a pound; dissolve ½ lb. of loaf sugar in 2 tablespoonfuls of water; put it over the fire, and, as soon as it boils, stir in the cocoa-nut. Continue to stir it until it is boiled to a flake, then pour it on a buttered pan or marble slab, and cut it into whatever form you wish, when it is nearly cold. Lemon or other flavors may be added.

Candy Drops.—Pound and sift double-refined sugar, first through a rather coarse, then through a fine sieve. Put the sugar into an earthen vessel, and dilute it with the flavoring extract, mixed with a little water. If too liquid, the syrup will be too thin, and the drops will run together; while, if too thick, the syrup will be too compact, and cannot be poured out easily. When the sugar is mixed into a rather stiff paste, put it into a small sauce-pan with a spout, and set it over the fire. As soon as it begins to bubble up the sides of the sauce-pan, stir it once in the middle, take it from the fire, and drop it in small lumps, of the size and shape required, upon sheets of tin, to stand for 2 hours, then put them in the stove to finish drying. As soon as they are perfectly hard and brilliant, take them from the fire, otherwise they will lose their aroma. Color the syrup just before taking it from the fire.

Orange, Jasmine and Clove Drops are made by mixing the paste with these respective extracts:

For Salad Drops.—Water distilled from lettuce is used.

Saffron Drops.—Make an infusion of saffron, strain it, let it cool, use it to mix the paste, and proceed as before.

Heliotrope Drops.—Proceed in the same manner, flavoring the paste with a few drops oil of neroli, or oil of orange, jasmine, and tube-rose, and color violet.

Pink Drops.—Flavor the paste with tincture of red pinks and color with carmine lake.

Ginger Candy.—Dissolve 1 lb. double-refined sugar in ½ pint of spring water; set it over a clear fire, and let it boil to a thin syrup. Have ready a teaspoonful of powdered ginger, mix it smoothly with 2 or 3 spoonfuls of the syrup, then stir it gradually into the whole. Boil the mixture into a *flake*, watching it carefully, that it may not exceed this point; then add the freshly grated rind of a large lemon, and stir the sugar constantly and rapidly until it falls in a mess from the spoon, without sinking when dropped upon a plate. If boiled for a moment beyond this point, it will fall into a powder. Should this happen by mistake, add a little water, and boil to the proper consistency. Dip the candy from the kettle, and drop it in small cakes upon buttered pans, then set it away to cool.

Cream Candy.—To 3 lbs. loaf sugar add ½ pt. water, and set it over a slow fire for half an hour; then add a teaspoonful of gum-arabic dissolved, and a tablespoonful of vinegar. Boil it till it is brittle, then take it off, and flavor with vanilla, rose, or orange. Rub the hands with sweet butter, and pull the candy till it is white; then twist or break it, or stretch it out into thin white strips, and cut it off.

Cinnamon Drops.—Mix 5 drs. powdered cinnamon and 8 oz. of sugar with mucilage enough to make it into a paste, and proceed as above.

Marshmallow and Licorice drops are made the same way.

Rose Drops.—Mix the paste with rose-water, and color with carmine lake. Proceed as above.

Violet Drops.—Flavor the paste with tincture of Florence iris, and color with blue and carmine lakes. A few drops of tartaric acid may be added to sustain the blue.

Lemon and Orange Drops.—Rasp off the yellow rind of an orange or lemon; mix the raspings with double-refined sugar; add 5 grs. of tartaric acid to every pound of sugar, color with yellow lake or saffron, and proceed as before. If too much tartaric acid is used, the candies will adhere to the sheets of tin.

Coffee Drops.—Substitute a strong, filtered infusion of coffee for water, in mixing the paste.

Chocolate Drops.—For every pound of sugar, take 5 pints good chocolate, pulverize it, and mix it into a paste, as already directed, taking care not to boil the paste too long, lest it granulate, and become unfit for use.

Vanilla Drops.—Mix the paste with extract of vanilla, or finely-ground vanilla bean; to which add 2 oz. 3 grs. of tartaric acid, dissolved in water, to sustain the blue, without which it would disappear.

Imitation Currant Drops.—Mix the paste with water, adding a little essence of raspberry and of violet, or Florence iris, with a little tartaric acid dissolved in water; color with carmine, and proceed as above.

Peppermint Drops.—Dissolve finely-powdered sugar with a little strong peppermint-water in a saucepan with a spout. As soon as it is thoroughly dissolved, add an equal quantity of coarse-grained sugar with a few drops more of peppermint, stir the whole for a few moments, then drop the mixture on paper, and dry it in the open air. In the same way are made lemon, rose, vanilla, and other drops. Citric and tartaric acid may be used to increase the acidity of lemon drops.

Extemporaneous Pastilles. Make the paste as usual, without flavoring the water, drop the pastilles upon paper, leave them for two hours, then take them off and put them into the stove to dry. When wanted for use, put the quantity required into a large-mouthed jar, and flavor as desired. For instance, to make 2 lbs. of peppermint drops, take 5 pts. of sulphuric ether in which are diluted a few drops of essence of peppermint, and pour it over the candies, then cover the jar, and shake it until they are thoroughly moistened; then place them on a sieve, and set them in the

stove for five minutes, to evaporate the ether. In this manner rose, orange, lemon, jonquil, tube-rose, mignonette, clove, cinnamon, or any other drops may be made, dissolving their essential oils in sulphuric ether.

Ginger Candy Tablets.—Take 1 lb. loaf sugar, a few drops of acetic acid or the juice of half a lemon, a desertspoonful of essence of Jamaica ginger. Boil the sugar with just water enough to dissolve it to the ball degree, then add the acid and the essence, and rub the sugar with the back part of the bowl of a silver spoon up against the sides of the sugar-boiler to whiten or grain it sufficiently to give to the whole an opalized appearance; then pour it into very small-sized moulds, measuring half an inch or an inch oblong square, or else a tin pan, the bottom part of which is marked out in small tablets, so that the candy may be easily broken into squares when dry. Smear the moulds slightly with oil of almonds. When the sugar is poured into the moulds, place in the screen for half an hour or more, to dry them hard.

Orange Flower Candy Tablets.—Ingredients: 1 lb. loaf sugar, a tablespoonful of orange-flower water, and a few drops of acetic acid. Proceed as directed in the preceding. No color.

Vanilla Candy Tablets.—Ingredients: 1 lb. of loaf sugar, a few drops of essence of Vanilla sugar, and a few drops of acetic acid. Proceed as for ornaments in grained sugar.

Peppermint Candy Tablets.—Ingredients: 1 lb. of loaf sugar, a few drops of essence of peppermint, and a few drops of acetic acid. Proceed as above. No color.

Liquor Candy Tablets.—Ingredients: 1 lb. of loaf sugar, and a gill of any kind of liqueur. Boil the sugar to the crack, then incorporate the liqueur, and finish as in the preceding. No color.

Cinnamon Candy Tablets.—Use 1 lb. loaf sugar, and a few drops essence of cinnamon. Proceed as in the last. This may be colored rose pink, the color to be added while the sugar is boiling.

Clove Candy Tablets are prepared in the same way as the foregoing, essence of cloves being used instead of cinnamon.

Rose Candy Tablets.—Use 1 lb. of loaf sugar, a few drops of essence of roses, a few drops of acetic acid, and a few drops of prepared cochineal. Proceed as in the preceding.

Fruit Candy Tablets.—Use 1 lb. of loaf sugar, ¼ pint of the juice of any kind of fruit, either currants, cherries, strawberries, raspberries, &c., extracted by pressing with a spoon through a clean hair-sieve. Boil the sugar to the crack, and then incorporate the fruit juice by rubbing it in with the sugar, as directed in the preceding, and finish the candies as therein indicated.

Acid Drops.—Pound and sift into a clean pan 8 oz. of double refined sugar, add slowly as much water as will render the sugar sufficiently moist not to stick to the stirring-spoon; place the pan on a small stove or slow fire, and stir till it nearly boils; remove from the fire and stir in ¼ oz. tartaric acid. Place it on the fire for half a minute, then drop out small quantities from the pan,

and let it fall in small drops on a clean tin plate. Remove the drops in 2 hours with a knife. Ready for sale in 24 hours.

To free Molasses from its sharp taste, and to render it fit to be used instead of Sugar.—Take 24 lbs. of molasses, 24 lbs. of water, and 6 lbs. of charcoal, coarsely pulverized; mix them in a kettle, and boil the whole over a slow wood fire. When the mixture has boiled half an hour, pour it into a flat vessel, in order that the charcoal may subside to the bottom; then pour off the liquid, and place it over the fire once more, that the superfluous water may evaporate, and the molasses be brought to its former consistence. Twenty-four pounds of molasses will produce twenty-four pounds of syrup.

To make Apple Molasses.—Take new sweet cider just from the press, made from sweet apples, and boil it down as thick as West India molasses. It should be boiled in brass, and not burned, as that would injure the flavor. It will keep in the cellar, and is said to be as good and for many purposes better than West India molasses.

Jellies.—LEMON JELLY.—Isinglass, 2 oz.; water, 1 quart; boil. add sugar, 1 lb.; clarify; and, when nearly cold, add the juice of 5 lemons, and the grated yellow rinds of 2 oranges and 2 lemons; mix well, strain off the peel, and put it into glasses or bottles.

HARTSHORN JELLY.—Hartshorn, 1 lb.; water, 1 gallon; peel of 2 lemons; boil over a gentle fire till sufficiently thick; strain, and add loaf sugar, ½ lb.; whites of 10 eggs beaten to a froth; juice of 6 lemons; mix well together, then bottle.

ISINGLASS JELLY.—Put 4 oz. isinglass and 2 oz. cloves into 1 gallon water; boil it down to half a gallon; strain it upon 4 lbs. of loaf sugar; add, while cooling, a little wine; then bottle.

APPLE JELLY FROM CIDER.—Take of apple juice, strained, 4 lbs.; sugar, 2 lbs.; boil to a jelly, and bottle.

GOOSEBERRY JELLY.—Sugar, 4 lbs.; water, 2 lbs.; boil together; it will be nearly solid when cold; to this syrup add an equal weight of gooseberry juice; give it a short boil, cool, then pot it.

CURRANT JELLY.—Take the juice of red currants, and loaf sugar, equal quantities; boil and stir gently for three hours; put it into glasses; and in three days it will concentrate into a firm jelly.

TAPIOCA JELLY.—Wash 8 oz. tapioca well; then soak it in 1 gallon fresh water, five or six hours; add the peels of 8 lemons, and set all on to heat; simmer till clear; add the juice of the 8 lemons with wine and sugar to taste; then bottle.

Ginger Lozenges.—Dissolve in ¼ pint of hot water ½ ounce of gum arabic; when cold, stir it up with 1½ pounds of loaf sugar and a spoonful of powdered ginger, or 12 drops of essence of ginger. Roll and beat the whole up into a paste; make it into a flat cake, and punch out the lozenges with a round stamp; dry them near the fire or in an oven.

Common Twist Candy.—Boil 3 pounds of common sugar and 1 pint of water over a slow fire for half an hour, without skimming. When boiled enough, take it off; rub the hands over with butter; take that which is a little cooled, and pull it as you would molasses

candy until it is white; then twist or braid it, and cut it up in strips.

Fine Peppermint Lozenges.—Best powdered white sugar, 7 pounds; pure starch, 1 pound; oil of peppermint to flavor. Mix with mucilage.

Everton Taffee.—To make this favorite and wholesome candy, take 1½ pounds of moist sugar, 3 ounces of butter, a teacup and a half of water, and one lemon. Boil the sugar, butter, water, and half the rind of the lemon together; and, when done,—which will be known by dropping into cold water, when it should be quite crisp,—let it stand aside till the boiling has ceased, and then stir in the juice of the lemon. Butter a dish, and pour it in about quarter of an inch in thickness. The fire must be quick, and the taffee stirred all the time.

Candy Fruit.—Take 1 pound of the best loaf sugar; dip each lump into a bowl of water, and put the sugar into your preserving kettle. Boil it down, and skim it until perfectly clear, and in a candying state. When sufficiently boiled, have ready the fruits you wish to preserve. Large white grapes, oranges, separated into small pieces, or preserved fruits, taken out of their syrup and dried, are very nice. Dip the fruits into the prepared sugar while it is hot; put them in a cold place; they will soon become hard.

Jellies without Fruit.—To 1 pint of water put ¼ oz. alum; boil a minute or two; then add 4 lbs. white sugar; continue the boiling a little; strain while hot; and, when cold, put in half a twenty-five cent bottle of extract of vanilla, strawberry, lemon, or any other flavor you desire for jelly.

Prize Honey.—Good common sugar, 5 lbs.; water, 2 lbs.; gradually bring to a boil, skimming when cool; add 1 lb. bees' honey and 4 drops essence of peppermint. If you desire a better article, use white sugar, and ½ lb. less water, and ½ lb. more honey.

Another.—Coffee sugar, 10 lbs.; water, 3 lbs.; cream tartar, 2 oz.; strong vinegar, 2 tablespoons; white of an egg well beaten; bees' honey, ½ lb.; Lubin's extract of honeysuckle, 10 drops. Put on the sugar and water in a suitable kettle on the fire; when luke-warm, stir in the cream tartar and vinegar; add the egg; when the sugar is nerrly melted put in the honey, and stir till it comes to a boil; take it off, let it stand a few minutes; strain, then add the extract of honeysuckle last; stand over night, and it is ready for use.

Another.—Common sugar, 4 lbs.; water, 1 pt.; let them come to a boil, and skim. Then add pulverized alum, ¼ oz.; remove from the fire, and stir in the cream of tartar, ½ oz., and water or extract of rose, 1 tablespoonful, and it is fit for use.

To Keep Fruits Fresh.—Rosin, 2 lbs.; tallow, 2 oz.; beeswax, 2 oz. Melt slowly over the fire in an iron pot, but don't boil. Take the fruit separately, and rub it over with pulverized chalk or whiting (to prevent the coating from adhering to the fruit), then

dip it into the solution once, and hold it up a moment to set the coating, then pack away carefully in barrels, boxes, or on shelves, in a cool place. Unequalled for preserving apples, pears, lemons, oranges, &c.

Acid Drops.—Tartaric acid, ¼ oz., white sugar, 8 oz., both in powder; oil of lemon, 10 drops; mix thoroughly; then beat them into a mass with mucilage, and form into lozenges.

RARE AND VALUABLE RECEIPTS AND TABLES FOR MECHANICAL PURPOSES.

Yellow Brass, for Turning.—(Common article.)—Copper, 20 lbs.; zinc, 10 lbs.; lead from 1 to 5 oz. Put in the lead last before pouring off.

Red Brass, for Turning.—Copper, 24 lbs.; zinc, 5 lbs., lead, 8 oz. Put in the lead last before pouring off.

Red Brass, free, for Turning.—Copper, 160 lbs.; zinc, 50 lbs.; lead, 10 lbs.; antimony, 44 oz.

Another Brass, for Turning.—Copper, 32 lbs.; zinc, 10 lbs; lead, 1 lb.

Best Red Brass, for Fine Castings.—Copper, 24 lbs.; zinc, 5 lbs.; bismuth, 1 oz. Put in the bismuth last before pouring off.

Bronze Metal.—Copper, 7 lbs.; zinc, 3 lbs.; tin, 2 lbs.

Bronze Metal.—Copper, 1 lb.; zinc, 12 lbs.; tin, 8 lbs.

Bell Metal, for Large Bells.—Copper, 100 lbs.; tin, from 20 to 25 lbs.

Bell Metal, for Small Bells.—Copper, 3 lbs.; tin, 1 lb.

Cock Metal.—Copper, 20 lbs.; lead, 8 lbs.; litharge, 1 oz.; antimony, 3 oz.

Hardening for Britannia.—(To be mixed separately from the other ingredients.)—Copper, 2 lbs.; tin, 1 lb.

Good Britannia Metal.—Tin, 150 lbs.; copper, 3 lbs.; antimony, 10 lbs.

Britannia Metal, second Quality.—Tin, 140 lbs.; copper, 3 lbs.; antimony, 9 lbs.

Britannia Metal, for Casting.—Tin, 210 lbs.; copper, 4 lbs.; antimony, 12 lbs.

Britannia Metal, for Spinning.—Tin, 100 lbs.; Britannia hardening, 4 lbs.; antimony, 4 lbs.

White Solder, for Raised Britannia Ware.—Tin, 100 lbs.; copper, 3 oz., to make it free; and lead, 3 oz.

Britannia Metal, for Registers.—Tin, 100 lbs.; hardening, 8 lbs.; antimony, 8 lbs.

Best Britannia, for Spouts.—Tin, 140 lbs.; copper 3 lbs.; antimony, 6 lbs.

Best Britannia, for Spoons.—Tin, 100 lbs.; hardening, 5 lbs.; antimony, 10 lbs.

Best Britannia, for Handles.—Tin, 140 lbs.; copper, 2 lbs.; antimony 5 lbs.

Best Britannia, for Lamps, Pillars and Spouts.—Tin, 300 lbs.; copper, 4 lbs.; antimony, 15 lbs.

Casting.—Tin, 100 lbs.; hardening, 5 lbs.; antimony, 5 lbs.

Lining Metal, for Boxes of Railroad Cars.—Mix tin, 24 lbs.; copper, 4 lbs.; antimony, 8 lbs. (for a hardening); then add tin, 72 lbs.

Fine Silver Colored Metal.—Tin, 100 lbs.; antimony, 8 lbs.; copper, 4 lbs.; bismuth, 1 lb.

German Silver, First Quality, for Casting.—Copper, 50 lbs.; zinc, 25 lbs.; nickel, 25 lbs.

German Silver, Second Quality, for Casting.—Copper, 50 lbs.; zinc, 20 lbs.; nickel (best pulverized), 10 lbs.

German Silver, for Rolling.—Copper, 60 lbs.; zinc, 20 lbs.; nickel, 25 lbs.

German Silver, for Bells and other Castings.—Copper, 60 lbs.; zinc, 20 lbs.; nickel, 20 lbs.; lead, 3 lbs.; iron (that of tin plate being best,) 2 lbs.

Imitation of Silver.—Tin, 3 oz.; copper, 4 lbs.

Pinchbeck.—Copper, 5 lbs.; zinc, 1 lb.

Tombac.—Copper, 16 lbs.; tin, 1 lb.; zinc, 1 lb.

Red Tombac.—Copper, 10 lbs.; zinc, 1 lb.

Hard White Metal.—Sheet brass, 32 oz.; lead, 2 oz.; tin, 2 oz.; zinc, 1 oz.

Metal for taking Impressions.—Lead, 3 lbs.; tin, 2 lbs.; bismuth, 5 lbs.

Spanish Tutania.—Iron or steel, 8 oz.; antimony, 16 oz.; nitre, 3 oz. Melt and harden 8 oz. tin with 1 oz. of the above compound.

Rivet Metal.—Copper, 32 oz.; tin, 2 oz.; zinc, 1 oz.

Rivet Metal, for Hose.—Tin, 64 lbs.; copper, 1 lb.

Fusible Alloy.—(Which melts in boiling water).—Bismuth, 8 oz.; tin, 3 oz.; lead, 5 oz.

Fusible Alloy, for Silvering Glass.—Tin, 6 oz., lead, 10 oz.; bismuth, 21 oz.; mercury, a small quantity.

Best Soft Solder for Cast Britannia Ware.—Tin, 8 lbs.; lead, 5 lbs.

Yellow Solder, for Brass or Copper.—Copper, 32 lbs.; zinc, 29 lbs.; tin, 1 lb.

Brass Solder.—1. Copper, 61.25 parts; zinc, 38.75 parts; 2. (Yellow and easily fusible) copper, 45 parts; zinc, 55 parts; 3. (White) copper, 57.41 parts, tin, 14.60 parts; zinc, 27.99 parts.

Solder, for Copper,—Copper, 10 lbs.; zinc, 9 lbs.

Black Solder.—Copper, 2 lbs.; zinc, 3 lbs.; tin, 2 oz.

Black Solder.—Sheet brass, 20 lbs.; tin, 6 lbs.; zinc, 1 lb.

Soft Solder.—Tin, 15 lbs.; lead, 15 lbs.

Pewterer's Soft Solders.—1. Bismuth, 2; lead, 4; tin, 3. 2. Bismuth, 1; lead, 1; tin, 2.

Plumber's Solder.—Lead, 3 parts; tin, 1 part.

Solder.—FOR LEAD, the solder is one part tin, 1 to 2 of lead; for TIN, 1 to 2 parts tin to 1 of lead; for ZINC, 1 part tin to 1 to 2 of lead; for PEWTER, 1 part tin to 1 of lead, and 1 to 2 parts of bismuth.

The surfaces to be joined are made perfectly clean and smooth, and then covered with sal ammoniac, or resin, or both; the solder is then applied, being melted in, and smoothed over by the soldering iron.

Coppersmith's Cement, &c.—Bullock's blood thickened with finely-powdered lime. Use as soon as mixed, as it rapidly gets hard. COPPERSMITH'S SOLDER.—Tin 2 parts, lead 1 part. When the copper is thick, heat it by a naked fire; if thin, use a tinned copper tool. Use muriate or chloride of zinc, or resin, as a flux. The same solder will do for IRON, CAST IRON, or STEEL; if thick, heat by a naked fire, or immerse in the solder.

Solder for Gold.—Gold, 6 dwts.; silver, 1 dwt.; copper, 2 dwts.

Soft Gold Solder.—Gold, 4 parts; silver, 1 part; copper, 1 part.

Solder for Silver.—(For the use of jewellers.)—Fine silver, 19 dwts.; copper, 1 dwt., sheet brass, 10 dwts.

White Solder, for Silver.—Silver, 1 oz.; tin, 1 oz.

Silver Solder, for Plated Metal.—Fine silver, 1 oz.; brass, 10 dwts.

Solders.—FOR STEEL JOINTS. Silver, 19 parts; copper, 1 part; brass, 2 parts; melt altogether.

HARD SOLDER.—Copper, 2 parts; zinc, 1 part; melt together.

FOR GOLD.—1. Silver, 7 parts; copper, 1 part, with borax. 2. Gold, 2 parts; silver, 1 part; copper, 1 part. 3. Gold, 3 parts; silver, 3 parts; copper, 1 part; zinc, ½ part.

FOR SILVER.—Silver, 2 parts; brass, 1 part, with borax; or, silver, 4 parts; brass, 3 parts; zinc, 1-16, with borax.

FOR BRASS.—Copper, 3 parts; zinc, 1 part, with borax.

FOR PLATINA.—Gold, with borax.

FOR IRON.—The best solder for iron is good tough brass, with a little borax.

FOR COPPER.—Brass, 6 parts; zinc, 1 part; tin, 1 part; melt all together, mix well, and pour out to cool.

Gold Solders.—1. Copper, 24.24 parts; silver, 27.57 parts; gold, 48.19 parts. 2. ENAMEL SOLDER—Copper, 25 parts; silver, 7.07 parts; gold, 67.93 parts. 3. Copper, 26.25 parts; zinc, 6.25 parts; silver, 31.25 parts; gold, 36.25 parts. 4. ENAMEL SOLDER—Silver, 19.57 parts; gold, 80.43 parts.

Solders.—FOR 22 CARAT GOLD—Gold of 22 carats, 1 dwt.; silver, 2 gr.; copper, 1 gr.

FOR 18 CARAT GOLD—Gold of 18 carats, 1 dwt.; silver, 2 gr.; copper, 1 gr.

FOR CHEAPER GOLD—Gold, 1 dwt.; silver, 10 gr.; copper, 8 gr.

CHEAPER STILL—Fine gold, 1 dwt.; silver, 1 dwt.; copper, 1 dwt.

Silver Solders.—1. (*hard.*) Copper, 30 parts; zinc, 12.85 parts; silver, 57.15 parts. 2. Copper, 23.33 parts; zinc, 10.00 parts; silver, 66.67 parts. 3. Copper, 26.66 parts; zinc, 10.00 parts; silver, 63.34 parts. 4. (*soft.*) Copper, 14.75 parts; zinc, 8.20 parts; silver, 77.05 parts. 5. Copper, 22.34 parts; zinc, 10.48 parts; silver, 67.18 parts. 6. Tin, 63.00 parts; lead, 37 parts.

Colored Gold.—1. FULL RED GOLD.—Gold, 5 dwt.; copper, 5 dwt. 2. RED GOLD.—Gold, 10 dwt.; silver, 1 dwt.; copper, 4 dwt. 3. GREEN GOLD.—Gold, 5 dwt.; silver, 21 gr. 4. GRAY GOLD.—Gold, 3 dwt. 15 gr.; silver, 1 dwt. 9 gr. 5. BLUE GOLD.—Gold, 5 dwt.; steel filings, 5 dwt. 6. ANTIQUE GOLD, GREENISH-YELLOW.—Gold, 18 dwt. 9 gr.; silver, 21 gr.; copper, 18 gr. These all require to be submitted to the process of wet-coloring. 7. FACTITIOUS GOLD, VERY BRIGHT.—Copper, 16 parts; platina, 7 parts; zinc, 1 part; fused together.

Alloys for Gold.—1. RED GOLD.—Copper, 66.67 parts; gold 33.33 parts. 2. YELLOW GOLD.—Copper, 12.50 parts; silver, 37.50 parts; gold, 50 parts. 3 GREEN GOLD.—Silver, 25 parts; gold, 75 parts. 4. YELLOW GOLD.—Silver, 66.67 parts; gold, 33.33, parts; 5. GRAY GOLD.—Silver, 5.89 parts; gold, 88.23 parts; iron, 5.89 parts. 6. DENTISTS' GOLD.—Silver, 8.34 parts; platinum, 66.67 parts; gold, 24.29 parts. 7. ENGLISH GOLD COIN.—Copper, 8.34 parts; gold, 91.66 parts. 8. AMERICAN GOLD COIN.—Copper, 10 parts; gold, 90 parts. French gold coin same as American.

Alloys for Silver Coin and Plate.—1. ENGLISH STANDARD.—Copper, 7.50 parts; silver, 92.50 parts. 2. AMERICAN STANDARD.—Copper, 10 parts; silver, 90 parts. French the same.

Gilding Metal for common jewelry is made by mixing 4 parts copper with one of calamine brass. Sometimes 1 lb. copper with 6 oz. of brass.

Jeweller's Gold Compositions, Common Gold.—Silver, 1 part; Spanish copper, 16 parts; gold, 2 parts; mix. RING GOLD.—Spanish copper, 6 parts; silver, 3 parts; gold, 5 parts; mix. MANHEIM GOLD.—Copper, 3 parts; zinc, 1 part; melt, and stir well. MOSAIC GOLD.—Copper and zinc, equal parts; melt at the lowest temperature that will fuse the former, then mix by stirring, and add 5 per cent. more zinc. PARKER'S MOSAIC GOLD.—Copper, 100 parts; zinc 54 parts; mix. FOR COMMON JEWELRY.—Copper, 3 parts; 1 of old brass, and 4 oz. of tin to every pound of copper.

Factitious Gold.—Copper, 16 parts; platinum, 7 parts; zinc, 1 part; fused together. This alloy resembles gold of 16 carats fine, or $\frac{2}{3}$, and will resist the action of nitric acid, unless very concentrated and boiling.

Harmstadt's True Imitation of Gold is stated not only to resemble gold in color, but also in specific gravity and ductility. Platinum, 16 parts; copper, 7 parts; zinc, 1 part; put in a crucible, cover with charcoal powder, and melt into a mass.

Do. of Silver.—Copper, ¼ oz.; brass, 2 oz.; pure silver, 3 oz.; bismuth, 2 oz.; saltpetre, 2 oz.; common salt, 1 oz.; arsenic, 1 oz.; potash, 1 oz.; melt in a crucible with powdered charcoal. This compound was used by a German chemist for unlawful purposes to the amount of thousands, and is so perfect that he was never discovered.

Artificial Gold.—This is a new metallic alloy which is now very extensively used in France as a substitute for gold. Pure copper, 100 parts; zinc, or, preferably, tin, 17 parts; magnesia, 6 parts; sal-ammoniac, 3-6 parts; quick-lime, ⅛ part; tartar of commerce, 9 parts; are mixed as follows: The copper is first melted, and the magnesia, sal-ammoniac, lime, and tartar are then added, separately, and by degrees, in the form of powder. The whole is now briskly stirred for about half an hour, so as to mix thoroughly; and then the zinc is added in small grains by throwing it on the surface, and stirring till it is entirely fused; the crucible is then covered, and the fusion maintained for about thirty-five minutes. The surface is then skimmed, and the alloy is ready for casting.

It has a fine grain, is malleable, and takes a splendid polish. It does not corrode readily, and, for many purposes, is an excellent substitute for gold. When tarnished, its brilliancy can be restored by a little acidulated water. If tin be employed instead of zinc, the alloy will be more brilliant. It is very much used in France, and must ultimately attain equal popularity here.

New French Patent Alloy for Silver.—Messieurs DeRuolz & Fontenay have invented the following alloy, which may be used for almost all purposes for which silver is usually employed: Silver, 20 parts; purified nickel, 28 parts; copper, 52 parts. Melt the copper and nickel in the granular state, then introduce the silver. The flux to be employed is charcoal and borax, both in the state of powder; and the ingots obtained are to be rendered malleable by annealing for a considerable time in powdered charcoal.

Alloys for Gold.—22 parts gold, 2 parts copper, is 22 carats fine; 20 parts gold, and 4 parts copper, is 20 carats fine; 18 parts gold, and 6 parts copper, is 18 carats fine.

English Standard for Silver.—Pure silver, 11 oz. 2 dwts.; copper, 22 dwts. Melt.

Silver Imitations.—Copper 1 lb.; tin, ¾ oz.; melt. This composition will roll and ring very near to silver. BRITANNIA METAL.—Copper, 1 lb.; tin, 1 lb.; regulus of antimony, 2 lbs.; melt together, with or without a little bismuth. GENUINE GERMAN SILVER.—Iron, 2½ parts; nickel, 31½ parts; zinc, 25½ parts; copper, 40½ parts; melt. FINE WHITE GERMAN SILVER.—Iron, 1 part; nickel, 10 parts; zinc, 10 parts; copper, 20 parts; melt. PINCH-

BECK.—Copper, 5 parts; zinc, 1 part; melt the copper, then add the zinc. JEWELLER'S METAL.—Copper, 30 parts; tin, 7 parts; brass, 10 parts. Mix.

French Gold Plate.—1. Gold, 92 parts; copper, 8 parts. 2. Gold, 84 parts; copper, 16 parts. 3. Gold, 75 parts; copper, 25 parts.

Bidery.—Copper, 48.48 parts; tin, 6.60 parts; zinc, 33.80 parts; lead, 12.12 parts.

Best Brass for Clocks.—Rose copper, 85 parts; zinc, 14 parts; lead, 1 part.

Alloy for Watch Pinion Sockets.—Gold, 31 parts; silver, 19 parts; copper, 39 parts; palladium, 1 part.

To Reduce Hair-Springs.—Immerse the springs about 2 or 3 seconds in nitric acid, 3 drops to one teaspoonful of water. By this means you can reduce them to any extent. It requires very careful manipulation, experience, and good judgment.

Albata Metal.—Nickel, 3 to 4 parts; copper, 20 parts; zinc, 16 parts. Used for plated goods.

British Plate.—Nickel, 5 to 6 parts; copper, 20 parts; zinc, 8 to 10 parts. Used for plated goods.

Chantry's Hard Alloy.—Copper, 1 lb.; zinc, 2½ oz.; tin, 2½ oz. Razors as hard as tempered steel have been made from this alloy.

Hard White Metal for Buttons.—Brass, 1 lb.; zinc, 2 oz.; tin, 1 oz.

Birmingham Platin.—Copper, 8 parts; zinc, 5 parts.

German Silver.—1. Copper, 40.62 parts; zinc, 43.76 parts; nickel, 15.62 parts. 2. Copper, 41.47 parts; zinc, 26.08 parts; nickel, 32.45 parts. 3. Copper, 55.55 parts; zinc, 5.55 parts; nickel, 38.90 parts. 4. Copper, 53.40 parts; zinc, 29.10 parts; nickel, 17.50 parts. 5. (*Alfenide* contains a trace of iron.) Copper, 59.60 parts; zinc, 30.30 parts; nickel, 10.10 parts.

Britannia Metal.—1. Copper, 0.30 parts; tin, 89.70 parts; zinc, 0.30 parts; antimony, 9.70 parts. 2. Copper, 1.85 parts; tin, 81.64 parts; antimony, 16.51 parts. 3. Copper, 0.91 parts; tin, 89.97 parts; antimony, 9.12 parts. 4. Tin, 90.00 parts; antimony, 10 parts. 5. Copper, 1.78 parts; tin; 89.30 parts; antimony, 7.14 parts; bismuth, 1.78 parts.

Gun Metal.—Copper, 90 parts; tin, 10 parts.

Melting Point of Metals.—Iron fuses at 2787° Fahr.; gold at 2016°; silver, 1873°; copper, 1996°; zinc, 773°; antimony, 809°; bismuth, 476° to 507°; nickel, 630°; tin, 442°; lead, 334°; mercury volatilizes at 670°.

Chinese Gong Metal.—Copper, 78.00 parts; tin, 22.00.

Alloy for Gun Mountings.—Copper, 80 parts; tin, 3; zinc, 17.

Bell Metal.—1. Copper, 60 parts; tin, 40 parts. 2. Copper, 80 parts; tin, 20 parts. 3. (*Thomson's*) Copper, 80 parts; tin, 10.10 parts; zinc, 5.60 parts; lead, 4.30 parts.

White Metal for Table Bells.—Copper 2.06 parts, tin 97.31 parts, bismuth 0.63 parts.

Clock Bell Metal.—Copper 75.19 parts, tin 48.81 parts.

Socket Metal for Locomotive Axle-trees.—1. Copper 86.03, tin 13. 97; 2. (*French*) Copper 82 parts, tin 10 parts, zinc 8 parts; 3. (*Stephenson's*) Copper 79 parts, tin 8 parts, zinc 5 parts, lead 8 parts; 4. (*Belgian*) Copper 89.02 parts, tin 2.44 parts, zinc 7.76 parts iron, 0.78 parts; 5. (*English*) Copper, 73.96 parts, tin, 9.49 parts, zinc, 9.03 parts, lead, 7.09 parts, iron, 0.43 parts.

Brass.—1. Copper 73 parts, zinc 27 parts; 2. Copper 65 parts, zinc 35 parts; 3. Copper 70 parts; zinc 30 parts.

Alloy for Mechanical Instruments.—Copper 1 lb., tin 1 oz.

Malleable Brass.—1. Copper 70.10 parts, zinc 29.90 parts· 2. (*Superior*) Copper 60 parts, zinc 40 parts.

Button Maker's Metal.—1. Copper 43 parts, zinc 67 parts; 2. Copper 62.22 parts, tin 2.78 parts, zinc 35.00 parts.

Metal for Sliding Levers of Locomotives.—1. Copper 85.25 parts, tin 12.75 parts, zinc 2.00 parts; 2. (*Fenton's*) Copper 5.50 parts, tin 14.50 parts, zinc 80 parts.

Alloy for Cylinders of Locomotives.—Copper 88,63 parts, tin 2.38 parts, zinc 6.99 parts.

Alloy for Stuffing Boxes of Locomotives.—Copper 90.06 parts, tin 3.56 parts, zinc 6.38 parts.

Amalgam for Mirrors.—1. Tin 70 parts, mercury 30 parts; 2, (*For curved mirrors*) tin 80 parts, mercury 20 parts; 3. Tin 8.33 parts, lead 8.34 parts, bismuth 8.33 parts, mercury 75 parts; 4. (*For spherical mirrors*) Bismuth 80 parts, mercury 26 parts.

Reflector Metal.—1. (*Duppler's*) Zinc 20 parts, silver 80 parts, 2. Copper 66.22 parts, tin 33.11 parts, arsenic 0.67 parts; 3. (*Cooper's*) Copper 57.86 parts, tin 27.28 parts, zinc 3.30 parts, arsenic 1.65 parts, platinum 9.91 parts; 4. Copper 64 parts, tin 32.00 parts, arsenic 4.00 parts; 5. Copper 82.18 parts, lead 9.22 parts, antimony 8.60 parts; 6. (*Little's*) Copper 69.01 parts, tin 30.82 parts, zinc 2.44 parts, arsenic 1.83 parts.

Metal for Gilt Wares.—1. Copper 78,47 parts, tin 2.87 parts, zinc 17.23 parts, lead 1.43 parts; 2. Copper 64.43 parts, tin 0.25 parts, zinc 32.44 parts, lead 2.86 parts; 3. Copper 72.43 parts, tin 1.87 parts, zinc 22.75 parts, lead 2.96 parts; 4. Copper 70.90 parts, tin 2.00 parts, zinc 24.05 parts, lead 3.05 parts.

Spurious Silver Leaf.—Tin 90.00 parts, zinc 9.91 parts.

Shot Metal.—1. Lead 97.07 parts, arsenic 2.93 parts; 2. Lead 99.60 parts, arsenic 0.40 parts.

Bismuth Solder.—Tin, 33.33 parts; lead, 33.33 parts, bismuth, 33.34 parts.

Alloy for Calico Printing Blocks.—Tin, 50.00 parts; lead, 33.34; bismuth, 16.66 parts.

Amalgam for Electrical Machines.—1. Tin, 25 parts; zinc, 25 parts; mercury, 50 parts; 2. Tin, 11.11 parts; zinc, 22.22 parts; mercury, 66.67 parts.

Type Metal.—1. (*For smallest and most brittle types*) Lead, 3; antimony, 1; 2. (*For small, hard, brittle types*) Lead, 4; antimony, 1; 3. (*For types of medium size*) Lead, 5; antimony, 1; 4. (*For large types*) Lead, 6; antimony, 1; 5. (*For largest and softest types*) Lead, 7; antimony, 1. In addition to lead and antimony, type metal also contains 4 to 8 per cent. of tin, and sometimes 1 to 2 per cent. of copper. Stereotype plates are made of lead, 20 parts; antimony, 4 parts; tin, 1 part.

Brass for Wire.—Copper, 34 parts; calamine, 56 parts; mix.

Britannia Metal.—1. Tin, 82 parts; lead, 18 parts; brass, 5 parts; antimony 5 parts; mix. 2. Brass, 1 part; antimony, 4 parts; tin, 20 parts; mix. 3. Plate-brass, tin, bismuth, and antimony, of each equal parts. Add this mixture to melted tin until it acquires the proper color and hardness.

Bronze.—1. Copper, 83 parts; zinc, 11 parts; tin, 4 parts; lead, 2 parts; mix. 2. Copper, 14 parts; melt, and add zinc, 6 parts; tin, 4 parts; mix.

Ancient Bronze.—Copper, 100 parts; lead and tin, each 7 parts; mix.

Alloy for Bronze Ornaments.—Copper, 82 parts; zinc, 18 parts; tin, 3 parts; mix.

Beautiful Red Bronze Powder.—Sulphate of copper, 100 parts; carbonate of soda, 60 parts; apply heat until they unite into a mass; then cool, and add copper-filings, 15 parts. Well mix, and keep them at a white heat for 20 minutes; then cool, powder, wash and dry.

Bronzing Fluid for Guns.—Nitric acid, sp. gr. 1.2; nitric ether, alcohol, murate of iron, each 1 part; mix, then add sulphate of copper, 2 parts, dissolved in water, 10 parts.

Cannon Metal.—Take tin, 10 parts; copper, 90 parts; melt.

Statuary Bronze.—1. Copper, 88 parts; tin, 9 parts; zinc, 2 parts; lead, 1 part. 2. Copper, 82½ parts; tin, 5 parts; zinc, 10½ parts; lead, 2 parts. 3. Copper, 90 parts; tin, 9 parts; lead, 1 part.

Bronze for Medals.—Copper, 89 parts; tin, 8 parts; zinc, 3 parts.

Bronze for Large Cannon.—Copper, 90; tin, 7.

Bronze for Small Cannon.—Copper, 93; tin, 7.

Alloy for Symbals.—Copper, 80; tin, 20.

Mirrors of Reflecting Telescopes.—Copper, 100; tin, 50.

White Argentine.—Copper, 8; nickel, 3; zinc, 35. This beautiful composition is in imitation of silver.

Chinese Silver.—Silver, 2.5; copper, 65.24; zinc, 19.52; cobalt of iron, 0.12; nickel, 13.

Tutenag.—Copper, 8; nickel, 3; zinc, 5.

Printing Characters.—Lead, 4; antimony, 1. For stereotype plates, lead, 25; antimony, 4; tin, 1.

Fine White German Silver.—1. *For Castings.* Lead, 3 parts; nickel, 20 parts; zinc 20 parts; copper, 60 parts; mix. 2. *For Rolling.* Nickel, 5 parts; zinc, 4 parts; copper, 12 parts; mix.

Imitation Platinum.—Melt together 8 parts brass and 5 of zinc. This alloy very closely resembles platinum.

Imitation Gold.—Platina, 8 parts; silver, 4 parts; copper, 12 parts; melt all together.

Imitation Silver.—Block-tin, 100 parts; antimony, 8 parts; bismuth, 1 part; copper, 4 parts; melt all together.

Tombac, or Red Brass.—Melt together, 8 parts of copper and 1 part of zinc.

Parisian Bell Metal.—Copper, 72 parts; tin, 26½ parts; iron, 1½ parts; used for the bells of small ornamental clocks.

Bell Metal.—1. Copper, 25 parts; tin, 5 parts; mix. 2. Copper, 79 parts; tin, 26 parts; mix. 3. Copper, 78 parts; tin, 22 parts; mix.

Prince's Metal.—1. Copper, 3 parts; zinc, 1 part. 2. Brass, 8 parts; zinc, 1 part. 3. Zinc and copper, equal parts : mix.

Queen's Metal.—1. Lead, 1 part; bismuth, 1 part; antimony, 1 part; tin, 9 parts; mix. 2. Tin, 9 parts; bismuth, 1 part; lead, 2 parts; antimony, 1 part, mix by melting.

Brass.—Copper, 3 parts; melt, then add zinc 1 part.

Button-Maker's Fine Brass.—Brass, 8 parts; zinc 5 parts.

Button-Maker's Common Brass.—Button-brass, 6 parts; tin, 1 part; lead, 1 part; mix.

Fine Brass.—Copper, 2 parts; zinc, 1 part; mix.

Organ Pipes consist of lead alloyed with about half its quantity of tin to harden it. The mottled or crystalline appearance so much admired shows an abundance of tin.

Baron Wetterstedt's Patent Sheathing for ships consists of lead, with from 2 to 8 per cent. of antimony; about 3 per cent. is the usual quantity. The alloy is rolled into sheets.

Lead Pipes are cast as hollow cylinders, and drawn out upon triblets; they are also cast of any length without drawing.

Lead Shot are cast by letting the metal run through a narrow slit into a species of colander at the top of a lofty tower; the metal escapes in drops, which, for the most part, assume the spherical form before they reach the tank of water into which they fall at the foot of the tower, and this prevents their being bruised. They are afterwards riddled or sifted for size, and afterwards churned in a barrel with black lead.

Metal for Anatomical Injections.—Tin, 16.41 parts; lead, 9.27 parts; bismuth, 27.81 parts; mercury, 46.41 parts.

Yellow Dipping Metal.—Copper, 32 lbs.; 6 to 7 oz. zinc to every lb. of copper.

Quick Bright Dipping Acid, for Brass which has been Ormolued.—Sulphuric acid, 1 gal.; nitric acid, 1 gal.

Dipping Acid.—Sulphuric acid, 12 lbs.; nitric acid, 1 pint; nitre, 4 lbs.; soot, 2 handfuls; brimstone, 2 oz. Pulverize the brimstone, and soak it in water an hour. Add the nitric acid last.

Good Dipping Acid for Cast Brass.—Sulphuric acid, 1 qt.; nitre, 1 qt.; water, 1 qt. A little muriatic acid may be added or omitted.

Dipping Acid.—Sulphuric acid, 4 gals.; nitric acid, 2 gals.; saturated solution of sulphate of iron (copperas,) 1 pint; solution of sulphate of copper, 1 qt.

Ormolu Dipping Acid, for Sheet Brass.—Sulphuric acid, 2 gals.; nitric acid, 1 pt.; muriatic acid, 1 pt.; water, 1 pint.; nitre, 12 lbs. Put in the muriatic acid last, a little at a time, and stir the mixture with a stick.

Ormolu Dipping Acid, for Sheet or Cast Brass.—Sulphuric acid, 1 gal.; sal ammoniac, 1 oz.; sulphur (in flour,) 1 oz.; blue vitriol, 1 oz.; saturated solution of zinc in nitric acid, mixed with an equal quantity of sulphuric acid, 1 gal.

To Prepare Brass Work for Ormolu Dipping.—If the work is oily, boil it in lye; and if it is finished work, filed or turned, dip it in old acid, and then it is ready to be ormolued; but if it is unfinished, and free from oil, pickle it in strong sulphuric acid, dip in pure nitric acid, and then in the old acid, after which it will be ready for ormoluing.

To Repair Old Nitric Acid Ormolu Dips.—If the work after dipping appears coarse and spotted, add vitriol till it answers the purpose. If the work after dipping appears too smooth, add muriatic acid and nitre till it gives the right appearance.

The other ormolu dips should be repaired according to the receipts, putting in the proper ingredients, to strengthen them. They should not be allowed to settle, but should be stirred often while using.

Tinning Acid, for Brass or Zinc.—Muriatic acid, 1 qt.; zinc, 6 oz. To a solution of this, add water, 1 qt; sal ammoniac, 2 oz.

Vinegar Bronze, for Brass.—Vinegar, 10 gals.; blue vitriol, 3 lbs.; muriatic acid, 3 lbs.; corrosive sublimate, 4 grs.; sal ammoniac, 2 lbs.; alum, 8 oz.

Directions for making Lacquer.—Mix the ingredients, and let the vessel containing them stand in the sun, or in a place slightly warmed, three or four days, shaking it frequently till the gum is dissolved, after which, let it settle from twenty-four to forty-eight hours, when the clear liquor may be poured off for use. Pulverized glass is sometimes used, in making lacquer, to carry down the impurities.

Lacquer, for Dipped Brass.—Alcohol, proof specific gravity not less than 95-100ths, 2 gals.; seed lac, 1 lb.; gum copal 1 oz.; English saffron, 1 oz.; annotto, 1 oz.

Lacquer for Bronzed Brass.—To one pint of the above lacquer, add gamboge, 1 oz.; and, after mixing it, add an equal quantity of the first lacquer.

Deep Gold-Colored Lacquer. — Best alcohol, 40 oz.; Spanish annotto, 8 grs.; turmeric, 2 drs.; shellac, ½ oz.; red sanders, 12 grs.; when dissolved, add spirits of turpentine, 30 drops.

Gold-Colored Lacquer, for Brass not Dipped.—Alcohol, 4 gals.; turmeric, 3 lbs.; gamboge, 3 oz.; gum sanderach, 7 lbs; shellac, 1½ lbs.; turpentine varnish, 1 pint.

Gold-Colored Lacquer, for Dipped Brass.—Alcohol, 36 oz.; seed lac, 6 oz.; amber, 2 oz.; gum gutta, 2 oz.; red sandal wood, 24 grs.; dragon's blood, 60 grs.; oriental saffron, 36 grs.; pulverized glass, 4 oz.

Gold Lacquer, for Brass. — Seed lac, 6 oz.; amber or copal, 2 oz.; best alcohol, 4 gals.; pulverized glass, 4 oz.; dragon's blood, 40 grs.; extract of red sandal wood obtained by water, 30 grains.

Lacquer for Dipped Brass.—Alcohol, 12 gals.; seed lac, 8 lbs.; turmeric, 1 lb. to a gallon of the above mixture; Spanish saffron, 4 oz. The saffron is to be added for bronze work.

Good Lacquer.—Alcohol, 8 oz.; gamboge, 1 oz.; shellac, 3 oz.; annotto, 1 oz.; solution of 3 oz. of seed lac in 1 pint of alcohol; when dissolved, add ½ oz. Venice turpentine, ¼ oz. dragon's blood, will make it dark; keep it in a warm place four or five days.

To Bronze Iron Castings. — Cleanse thoroughly, and afterwards immerse in a solution of sulphate of copper, when the castings will acquire a coat of the latter metal. They must be then washed in water.

Antique Bronze Paint.—Sal-ammoniac, 1 oz.; cream tartar, 3 oz.; common salt, 6 oz. Dissolve in 1 pint hot water, then add 2 oz. of nitrate of copper dissolved in ½ pint water, mix well, and apply it repeatedly to the article, in a damp situation, with a brush

To Fill Holes in Castings.—A mixture of putty and black lead is good, but a better method is a metal that expands in cooling: Lead, 9 parts; antimony, 2; and bismuth 1. To be melted and poured in.

Pale Lacquer for Tin Plate.—Best alcohol, 8 oz.; turmeric, 4 drs.; hay saffron, 2 scs.; dragon blood, 4 scs.; red sanders, 1 sc.; shellac, 1 oz.; gum sanderach, 2 drs.; gum mastic, 2 drs.; Canada balsam, 2 drs.; when dissolved, add spirits of turpentine, 80 drops.

Red Lacquer, for Brass. — Alcohol, 8 gallons; dragon's blood, 4 lbs.; Spanish annotto, 12 pounds; gum sanderach, 13 pounds; turpentine, 1 gallon.

Pale Lacquer, for Brass.—Alcohol, 2 gals.; Cape aloes, cut small, 3 oz.; pale shellac, 1 lb.; gamboge, 1 oz.

Bronze Dip.—Sal-ammoniac, 1 oz.; salt of sorrel (binoxolate of potash), ¼ oz. dissolved in vinegar.

Parisian Bronze Dip.—Sal-ammoniac, ½ oz.; common salt, ½ oz.; spirits of hartshorn, 1 oz. dissolved in an English quart of vinegar. A good result will be obtained by adding ½ oz. of sal-ammoniac, instead of the spirits of hartshorn. The piece of metal, being well cleaned; is to be rubbed with one of these solutions, then dried by friction with a flesh brush.

Best Lacquer for Brass.—Alcohol, 4 gals.; shellac, 2 lbs.; amber gum, 1 lb.; copal, 20 oz.; seed lac, 3 lbs.; saffron, to color; pulverized glass, 8 oz.

Color for Lacquer.—Alcohol, 1 qt.; annotto, 4 oz.

Lacquer for Philosophical Instruments.—Alcohol, 80 oz.; gum gutta, 3 oz.; gum sandarac, 8 oz.; gum elemi, 8 oz.; dragon's blood, 4 oz.; seed lac, 4 oz.; terra merita, 3 oz.; saffron, 8 grs.; pulverized glass, 12 oz.

Brown Bronze Dip.—Iron scales, 1 lb.; arsenic, 1 oz.; muriatic acid, 1 lb.; zinc (solid), 1 oz. Let the zinc be kept in only while it is in use.

Green Bronze Dip.—Wine vinegar, 2 qts.; verditer green, 2 oz.; sal ammoniac, 1 oz.; salt, 2 oz.; alum, ½ oz. French berries, 8 oz.; boil the ingredients together.

Aqua-fortis Bronze Dip.—Nitric acid, 8 oz.; muriatic acid, 1 qt.; sal-ammoniac, 2 oz.; alum, 1 oz.; salt, 2 oz.; water, 2 gals. Add the salt after boiling the other ingredients, and use it hot.

Olive Bronze Dip, for Brass.—Nitric acid, 3 oz.; muriatic acid, 2 oz.; add titanium or palladium; when the metal is dissolved, add 2 gals. pure soft water to each pint of the solution.

Brown Bronze Paint, for Copper Vessels.—Tincture of steel, 4 oz.; spirits of nitre, 4 oz.; essence of dendi, 4 oz.; blue vitriol, 1 oz.; water, ½ pint. Mix in a bottle; apply it with a fine brush, the vessel being full of boiling water; varnish after the application of the bronze.

Bronze for All Kinds of Metal.—Muriate of ammonia (sal-ammoniac), 4 drs.; oxalic acid, 1 dr.; vinegar, 1 pint. Dissolve the oxalic acid first; let the work be clean; put on the bronze with a brush, repeating the operation as many times as may be necessary.

Bronze Paint, for Iron or Brass.—Chrome green, 2 lbs.; ivory black, 1 oz.; chrome yellow, 1 oz.; good Japan, 1 gill: grind all together, and mix with linseed oil.

For Tinning Brass.—Water, 2 pails full; cream of tartar, ½ lb.; salt, ½ pint.

Shaved or Grained Tin.—Boil the work in the mixture, keeping it in motion during the time of boiling.

Silvering by Heat.—Dissolve 1 oz. of silver in nitric acid; add a small quantity of salt; then wash it, and add sal ammoniac, or 6 oz. of salt and white vitriol; also, ¼ oz. of corrosive sublimate;

rub them together till they form a paste; rub the piece which is to be silvered with the paste; heat it till the silver runs, after which dip it in a weak vitriol pickle to clean it.

Mixture for Silvering.—Dissolve 2 oz. of silver with 3 grs. of corrosive sublimate; add tartaric acid, 4 lbs.; salt, 8 qts.

Separate Silver from Copper.—Mix Sulphuric acid, 1 part; nitric acid, 1 part; water, 1 part; boil the metal in the mixture till it is dissolved, and throw in a little salt to cause the silver to subside.

Chinese White Copper.—Copper, 40.4; nickel, 31.6; zinc, 25.4; and iron, 2.6 parts.

Bath Metal.—Brass, 32; and zinc, 9 parts.

Speculum Metal.—Copper, 6; tin, 2; and arsenic, 1 part. Or copper, 7; zinc, 3; and tin, 4 parts.

Britannia Metal.—Brass, 4; tin, 4 parts; when fused, add bismuth, 4; and antimony, 4 parts. This composition is added at discretion to melted tin.

Jeweler's Soldering Fluid.—Take alcohol, and add to it all the chloride of zinc it will dissolve, and it is ready for use. A good *soft solder* for repairing,—equal quantities of tin, and lead from tea-boxes.

Tinman's Solder.—Lead, 1; tin, 1 part.

Pewterer's Solder.—Tin, 2; lead, 1 part.

Common Pewter.—Tin, 4; lead, 1 part.

Best Pewter.—Tin, 100; antimony, 17 parts.

Queen's Metal.—Tin, 9; antimony, 1; bismuth, 1; lead. 1 part.

Tinning Iron.—Cleanse the metal to be tinned; and rub with a coarse cloth, previously dipped in hydrochloric acid (muriatic acid,) and then rub on French putty with the same cloth. French putty is made by mixing tin filings with mercury.

Tinning.—1. Plates or vessels of brass or copper boiled with a solution of stannate of potassa, mixed with turnings of tin, become, in the course of a few minutes, covered with a firmly attached layer of pure tin. 2. A similar effect is produced by boiling the articles with tin-filings and caustic alkali, or cream of tartar. In the above way, chemical vessels made of copper or brass may be easily and perfectly tinned.

New Tinning Process.—The articles to be tinned are first covered with dilute sulphuric acid, and, when quite clean, are placed in warm water, then dipped in a solution of muriatic acid, copper, and zinc, and then plunged into a tin bath to which a small quantity of zinc has been added. When the tinning is finished, the articles are taken out and plunged into boiling water. The operation is completed by placing them in a very warm sand-bath. This last process softens the iron.

Kustitien's Metal for Tinning.—Malleable iron, 1 lb., heat to whiteness; add 5 oz. regulus of antimony, and Molucca tin, 24 pounds.

Watchmaker's Brass.—Copper, 1 part; zinc, 2 parts.

German Brass.—Copper, 1 part; zinc, 1 part.

Brass for Heavy Castings.—Copper, 6 to 7 parts; tin, 1 part; zinc, 1 part.

Yellow Brass.—(FOR CASTINGS).—1. Copper, 61.6 parts; zinc, 35.3 parts; lead, 2.9 parts; tin, 0.2 parts. 2. BRASS OF JEMAPPES.—Copper, 64.6 parts; zinc, 33.7 parts; lead, 1.4 parts; tin, 0.2 parts. 3. SHEET BRASS OF STOLBERG NEAR AIX-LA-CHAPELLE.—Copper, 64.8 parts; zinc, 32.8 parts; lead, 2.0 parts; tin, 0.4 parts. 4. D'ARCET'S BRASS FOR GILDING—Copper, 63.70 parts; zinc, 33.55 parts; lead, 0.25 parts; tin, 2.50 parts. 5. ANOTHER.—Copper, 64.45 parts; zinc, 32.44 parts; lead, 2.86 parts; tin, 0.25 parts. 6. SHEET BRASS OF ROMILLY.—Copper, 70.1 parts; zinc, 29.9 parts. 7. ENGLISH BRASS WIRE.—Copper, 70.29 parts; zinc, 29.26 parts; lead, 0.28 parts; tin, 0.17 parts. 8. AUGSBURG BRASS WIRE.—Copper, 71.89 parts; zinc, 27.63 parts; tin, 0.85 parts.

Red Brass for Gilt Articles.—1. Copper, 82.0 parts; zinc, 18.0 parts; lead, 1.5 parts; tin, 3.0 parts. 2. ANOTHER.—Copper, 82 parts; zinc, 18 parts; lead, 3 parts; tin, 1 part. 3. ANOTHER.—Copper, 82.3 parts; zinc, 17.5 parts; tin, 0.2 parts. 4. FRENCH TOMBAC FOR SWORD HANDLES.—Copper, 80 parts; zinc, 17 parts; tin, 3 parts. 5. FOR PARISIAN ORNAMENTS.—Copper, 85 parts; zinc, 15 parts; tin, a trace. 6. USED FOR GERMAN ORNAMENTS.—Copper, 85.3 parts; zinc, 14.7 parts. 7. CHRYSOCHALK.—Copper, 90.0 parts; zinc, 7.9 parts; lead, 1.6 parts. 8. RED TOMBAC FROM PARIS.—Copper, 92 parts; zinc, 8 parts.

Compositions.—1. FOR STRONG PUMPS, &C.—Copper, 1 lb.; zinc, ¼ oz.; tin, 1¼ oz. 2. FOR TOOTHED WHEELS.—Copper, 1 lb.; brass, 2 oz.; tin, 2 oz. 3. Copper, 1 lb.; brass, 2 oz.; tin, 1¾ oz. 4 FOR TURNING WORK.—Copper, 1 lb.; brass, 1¼ oz.; tin, 2 oz. 5. FOR NUTS OF COARSE THREADS AND BEARINGS.—Copper, 1 lb.; brass, 1¼ oz., tin, 2¼ oz. 6. FOR BEARINGS TO SUSTAIN GREAT WEIGHTS.—Copper, 1 lb.; zinc, ¼ oz.; tin, 2¼ oz. 7. PEWTERER'S TEMPER.—Tin, 2 lb.; copper, 1 lb. Used to add in small quantities to tin. 8. HARD BEARINGS FOR MACHINERY.—Copper, 1 lb.; tin, 2 oz. 9. VERY HARD DITTO.—Copper, 1 lb.; tin, 2½ oz.

Babbitt Metal.—Copper, 4 lbs.; regulus of antimony, 8 lbs.; Banca tin, 96 lbs.

Fenton's Anti-Friction Metal.—Grain zinc, 7½ lbs.; purified zince, 7½ lbs.; antimony, 1 lb.

Anti-Friction Alloy for Journal Boxes.—Zinc, 17 parts; copper, 1 part; antimony, 1¼ parts. This possesses unsurpassable anti-friction qualities, and does not require the protection of outer casings of a harder metal.

Babbitt Metal.—Block tin, 8 lbs.; antimony, 2 lbs.; copper, 1 lb. If the metal be too hard, it may be softened by adding some lead.

Alloy for Journal Boxes.—The best alloy for journal boxes is composed of copper, 24 lbs.; tin, 24 lbs.; and antimony, 8 lbs. Melt the copper first, then add the tin, and lastly the antimony. It should be first run into ingots, then melted, and cast in the form required for the boxes.

To Gild Steel.—Pour some of the ethereal solution of gold into a wine glass, and dip into it the blade of a new penknife, razor, lancet, &c.; withdraw the instrument, and allow the ether to evaporate. The blade will then be found covered with a beautiful coat of gold. The blade may be moistened with a clean rag, or a small piece of very dry sponge, dipped into the ether; and the same effects will be produced.

To Weld Cast Iron.—Take of good clear white sand, 3 parts; refined solton, 1 part; fosterine, 1 part; rock salt, 1 part: mix all together. Take 2 pieces of cast iron, heat them in a moderate charcoal fire, occasionally taking them out while heating, and dipping them into the composition, until they are of a proper heat to weld; then at once lay them on the anvil, and gently hammer them together, and, if done carefully by one who understands welding iron, you will have them nicely welded together. One man prefers heating the metal, then cooling it in the water of common beans, and heat it again for welding.

To Galvanize Iron.—Cleanse the surface of the iron perfectly by the joint action of dilute acid and friction, plunge it into a bath of melted zinc covered with sal-ammoniac, and stir it about till it be alloyed superficially with this metal. When the metal thus prepared is exposed to humidity, the zinc oxidizes slowly by a galvanic action, and protects the iron within from rust; whereby the outer surface remains for a long time perfectly white, in circumstances under which iron tinned in the usual way would be corroded with rust.

Muntz Metal for Ships.—Best selected copper, 60 parts; best zinc, 40 parts: melt together in the usual manner, and roll into sheets of suitable thickness. This composition resists oxidation from exposure to sea water, and prevents the adhesion of barnacles.

Tempering Saws, &c.—The usual method of tempering saws is to heat, and then dip them in oil. This process is slow, costly, and laborious. It is also disadvantageous, because the saws become warped, and require to be hammered up straight again by hand. A late improvement consists in tempering and straightening the saws at one operation. This is done by heating the saws to the proper degree, and then pressing them with a sudden and powerful stroke between two surfaces of cold iron. A drop press is employed for the purpose. The mechanism is quite simple and inexpensive. Its use effects an important economy in the manufacture of nearly all kinds of saws, and also improves their quality.

Silvering Shells.—Silver leaf and gum water a sufficient quantity; grind to a proper thickness, and cover the inside of the shells.

For a *gold color*, grind up gold-leaf with gum water, and apply to the inside of the shells.

Liquid Foil for Silvering Glass Globes, &c.—Lead, 1 part; tin, 1 part; bismuth, 1 part: melt, and, just before it sets, add mercury, 10 parts. Pour this into the globe, and turn it rapidly round.

To Soften Iron or Steel.—Either of the following methods will make iron or steel as soft as lead:—1. Anoint it all over with tallow, temper it in a gentle charcoal fire, and let it cool of itself. 2. Take a little clay, cover your iron with it, temper in a charcoal fire. 3. When the iron or steel is red hot, strew hellebore on it. 4. Quench the iron or steel in the juice or water of common beans.

Tempering.—The article, after being completed, is hardened by being heated gradually to a bright red, and then plunged into cold water: it is then tempered by being warmed gradually and equably, either over a fire, or on a piece of heated metal, till of the color corresponding to the purpose for which it is required, as per table below; when it is again plunged into water.

CORRESPONDING TEMPERATURE.

A very pale straw, -	430	Lancets.
Straw, - - - - - -	450	Razors.
Darker Straw - - -	470	Penknives. } All kinds of wood tools.
Yellow, - - - - -	490	Scissors. } Screw taps.
Brown yellow, - - -	500	Hatchets, chipping chisels,
Slightly tinged purple,	520	Saws.
Purple, - - - - -	530	All kinds of percussive tools.
Dark purple, - - -	550	Springs.
Blue, - - - - - -	570	
Dark blue, - - - -	600	Soft for saws.

Cast Iron Cement.—Clean borings or turnings of cast iron, 16; sal ammoniac, 2; flour of sulphur, 1 part; mix them well together in a mortar; and keep them dry. When required for use, take of the mixture, 1; clean borings, 20 parts; mix thoroughly, and add a sufficient quantity of water. A little grindstone dust added improves the cement.

Cement for Steam Pipe Joints, Etc., with Faced Flanges.—White lead, mixed, 2; red lead, dry, 1 part; grind, or otherwise mix them to a consistence of thin putty; apply interposed layers with one or two thicknesses of canvas, or gauze wire, as the necessity of the case may be.

Crucibles.—The best crucibles are made from a pure fire clay, mixed with finely ground *cement* of old crucibles, and a portion of black lead or graphite: some pounded coke may be mixed with the plumbago. The clay should be prepared in a similar way as for making pottery ware: the vessels, after being formed, must be slowly dried, and then properly baked in the kiln.

Black Lead Crucibles are made of 2 parts graphite, and 1 of fire-clay, mixed with water into a paste, pressed in moulds, and well dried, but not baked hard in the kiln. This compound forms excellent small or portable furnaces.

To Purify Gas.—The purifier is to be filled with milk of lime, made by mixing 1 part of slacked lime with 25 parts of water. A very great improvement in the purification of gas has been effected by Mr. Statter, of England, by the employment of hydrated clay along with the lime employed for this purpose. Hydrated clay unites with the ammonia of the gas as with a base, and, at the same time, with its sulphuret of carbon as an acid, and thus removes both of these noxious impurities from the gas exposed to its influence. It assists also, in conjunction with the lime, in removing tarry vapor and other impurities from the gas. The illuminating power of the gas is positively increased by the clay purification from 22 to 33⅓ per cent.

To Joint Lead Plates.—The joints of lead plates for some purposes are made as follows: The edges are brought together, hammered down into a sort of channel cut out of wood, and secured with a few tacks. The hollow is then scraped clean with a scraper, rubbed over with candle grease, and a stream of hot lead is poured into it, the surface being afterwards smoothed with a red hot plumber's iron.

To Joint Lead Pipes.—Widen out the end of one pipe with a taper wood drift, and scrape it clean inside; scrape the end of the other pipe outside a little tapered, and insert it in the former, then solder it with common lead solder as before described; or, if it requires to be strong, rub a little tallow over, and cover the joint with a ball of melted lead, holding a cloth (2 or 3 plies of greased bed-tick) on the under side; and smoothing over with it and the plumber's iron.

Composition used in Welding Cast Steel.—Borax, 10; sal ammoniac, 1 part; grind or pound them roughly together; then fuse them in a metal pot over a clear fire, taking care to continue the heat until all spume has disappeared from the surface. When the liquid appears clear, the composition is ready to be poured out to cool and concrete; afterwards being ground to a fine powder it is ready for use. To use this composition, the steel to be welded is raised to a heat which may be expressed by "bright yellow;" it is then dipped among the welding powder, and again placed in the fire until it attains the same degree of heat as before; it is then ready to be placed under the hammer.

To prevent Deposits of Lime in Boilers.—Throw into the tank or reservoir from which your boiler is fed, a quantity of rough bark, in the piece, such as tanners use, sufficient to turn the water of a brown color; if you have no tank, put into the boiler from a half to a bushel of ground bark when you blow off; repeat every month, using only half the quantity after the first time.

Scaling Cast Iron.—Vitriol, 1 part; water, 2 parts; mix and lay on the diluted vitriol with some old cloth in the form of a brush, enough to wet the surface well; after 8 or 10 hours, wash off with water, when the hard, scaly surface will be completely removed.

Varnish, for Smooth Moulding Patterns.—Alcohol, 1 gallon; shellac, 1 lb.; lamp or ivory black, sufficient to color it.

Cast Iron Ornaments are rendered susceptible of being finished with a scraper, where they cannot be reached with files, after having the above liquid applied to them.

Iron Lustre is obtained by dissolving a piece of zinc with muriatic acid, and mixing the solution with spirit of tar, and applying it to the surface of iron.

To Melt Steel as Easily as Lead.—This apparent impossibility is easily performed by heating the bar of iron or steel red hot, and then touching it with a roll of brimstone, when the metal will drop like water. Red hot iron can be easily cut with a saw.

Patent Lubricating Oil.—Water, 1 gal.; clean tallow, 3 lbs.; palm oil, 10 lbs.; common soda, ½ lb. Heat the mixture to about 210° F.; stir well till it cools down to 70° F., when it is fit for use.

Black Having a Polish for Iron·—Pulverized gum asphaltum, 2 lbs.; gum benzoin, ¼ lb.; spirits of turpentine, 1 gal.; to make quick, keep in a warm place, and shake often; shade to suit with finely ground ivory black. Apply with a brush. And it ought to be used on iron exposed to the weather as well as on inside work, desiring a nice appearance or polish. Or:

Varnish for Iron.—Asphaltum, 8 lbs.; melt in an iron kettle, slowly adding boiled linseed oil, 5 gals.; litharge, 1 lb., and sulphate of zinc, ½ lb.; continuing to boil for 3 hours; then add dark gum amber, 1½ lbs.; and continue to boil 2 hours longer. When cool, reduce to a proper consistence to apply with a brush, with spirits of turpentine.

To Restore Burnt Steel, and Improve Poor Steel.—Borax, 3 oz.; sal ammoniac, 8 oz.; prussiate of potash, 3 oz.; blue clay, 2 oz.; resin, 1½ lbs.; water, 1 gill; alcohol, 1 gill. Put all on the fire, and simmer till it dries to a powder. The steel is to be heated, and dipped into this powder, and afterwards hammered.

Composition to toughen Steel.—Resin, 2 lbs.; tallow, 2 lbs.; black pitch, 1 lb.; melt together, and dip in the steel when hot.

Burglar and Drill Proof Diamond Chill.—Take 1 gal. urine, and add to it 1 oz. borax and 1 oz. salt.

How to Re-cut Old Files and Rasps.—Dissolve 4 oz. of saleratus in 1 qt. of water, and boil the files in it for half an hour; then remove, wash and dry them. Now have ready, in a glass or stone-ware vessel, 1 qt. of rain water, into which you have slowly added 4 oz. of best sulphuric acid, and keep the proportions for any amount used. Immerse the files in this preparation for from six to twelve hours, according to fineness or coarseness of the file; then remove; wash them clean, dry quickly, and put a little sweet oil on them to cover the surface. If the files are coarse, they will need to remain in about twelve hours, but for fine files six to eight hours is sufficient. This plan is applicable to blacksmiths', gunsmiths', tin-

ners', coppersmiths', and machinists' files. Copper and tin workers will only require a short time to take the articles out of their files, as the soft metals with which they become filled are soon dissolved. Blacksmiths' and saw-mill files require full time. Files may be re-cut three times by this process. The liquid may be used at different times if required. Keep away from children, as it is poisonous.

Substitute for Borax.—Copperas, 2 oz.; saltpetre, 1 oz.; common salt, 6 oz.; black oxide of manganese, 1 oz.; prussiate of potash, 1 oz.; all pulverized and mixed with 3 lbs. nice welding sand, and use the same as you would sand. High-tempered steel can be welded with this at a lower heat than is required for borax.

Tempering Liquid.—To 6 qts. soft water put in corrosive sublimate, 1 oz.; common salt, 2 handfuls; when dissolved, it is ready for use. The first gives toughness to the steel, while the latter gives the hardness. Be careful with this preparation, as it is a dangerous poison.

Another.—Salt, ½ tea-cup; saltpetre, ½ oz., alum, pulverized, 1 teaspoon; soft water, 1 gallon; never heat over a cherry red, nor draw any temper.

Another.—Saltpetre, sal-ammoniac and alum, of each 2 oz.; salt, 1½ lbs.; water, 3 gallons, and draw no temper

Another.—Saltpetre and alum each, 2 oz.; sal-ammoniac, ½ oz.; salt, 1½ lbs.; soft water, 2 gallons. Heat to a cherry red, and plunge in, drawing no temper.

Another.—Water, 3 gallons; salt, 2 qts.; sal-ammoniac and saltpetre, of each 2 oz.; ashes from white-ash bark, 1 shovel, which causes the steel to scale white and smooth as silver. Do not hammer too cold, to avoid flaws; do not heat too high, which opens the pores of the steel; and do not heat more than one or two inches of the steel at a time while tempering, if you wish the hardness and toughness of the steel to be of the first quality.

To Improve Poor Iron.—Black oxide of manganese, 1 part; copperas and common salt, 4 parts each; dissolve in soft water, and boil till dry; when cool, pulverize and mix quite freely with nice welding sand. When you have poor iron which you cannot afford to throw away, heat it, and roll it in this mixture; working for a time, reheating, &c., will soon free it from all impurities, which is the cause of its rottenness. By this process you can make good horse-nails out of common iron.

Case Hardening for Iron.—Case iron may be case-hardened by heating to a red heat, and then rolling it in a composition composed of equal parts of prussiate of potash, sal-ammoniac, and saltpetre, all pulverized and thoroughly mixed. This must be got to every part of the surface; then plunged, while yet hot, into a bath containing 2 oz. prussiate of potash, and 4 oz. sal-ammoniac to each gallon of cold water.

For Malleable Iron.—Put the articles in an iron box, and stratify them among animal carbon, that is, pieces of horns, hoofs,

skins or leather, just sufficiently burned to be reduced to powder. Lute the box with equal parts of sand and clay; then place it in the fire, and keep at a light red heat for a length of time proportioned to the depth of steel required, when the contents of the box are emptied into water.

Another for Wrought Iron.—Take the prussiate of potash, finely pulverized, and roll the article in it, if its shape admits of it; if not, sprinkle the powder upon it freely while the iron is hot.

To Soften Cast Iron for Drilling.—Heat to a cherry red, having it lie level in the fire; then with a pair of cold tongs put on a piece of brimstone, a little less in size than the hole to be when drilled, and it softens entirely through the piece; let it lie in the fire until a little cool, when it is ready for drilling.

To Temper Springs.—For tempering cast-steel trap springs, all that is necessary is to heat them in the *dark*, just so that you can see that they are red; then cool them in luke-warm water. You can observe a much lower degree of heat in the dark than by day-light, and the low heat and warm water give the desired temper.

To Mend Broken Saws.—Pure silver, 19 parts; pure copper, 1 part; pure brass, 2 parts; all to be filed into powder, and thoroughly mixed; place the saw level on the anvil, broken edges in contact, and hold them so; now put a small line of the mixture along the seam, covering it with a larger bulk of powdered charcoal; now with a spirit lamp and a jeweller's blow-pipe, hold the coal dust in place, and blow sufficient to melt the solder mixture; then with a hammer set the joint smooth, and file away any superfluous solder, and you will be surprised at its strength; the heat will not injure the temper of the saw.

Writing Inscriptions on Metals.—Take ½ lb. nitric acid and 1 oz. muriatic acid. Mix, shake well together, and it is ready for use. Cover the place you wish to mark with melted bees-wax; when cold, write your inscription plainly in the wax clear to the metal with a sharp instrument; then apply the mixed acids with a feather, carefully filling each letter. Let it remain from one to ten minutes, according to appearance desired; then throw on water, which stops the process, and remove the wax.

Black Varnish for Iron Work.—Asphaltum, 1 lb.; lampblack, ¼ lb.; resin, ½ lb.; spirits turpentine, 1 qt.; linseed oil, just sufficient to rub up the lampblack with before mixing it with the others. Apply with a camel's hair brush.

To Petrify Wood.—Gem salt, rock alum, white vinegar, chalk and peebles powder, of each an equal quantity. Mix well together. If, after the ebullition is over, you throw into this liquid any wood or porous substance, it will petrify it.

The Finest Bronze.—Put in a clean crucible 7 lbs. copper, melt, then add 3 lbs. zinc, afterwards 2 lbs. tin. In order to gild polished steel or polished iron, dip the article into an ethereal solution of

gold, withdraw from the solution, and the ether flies off and leaves the gold deposited.

Soft Cement, for Steam Boilers, Steam Pipes, &c.—Red or white lead, in oil, 4; iron borings, 2 to 3 parts.

Hard Cement.—Iron borings and salt water, and a small quantity of sal ammoniac with fresh water.

Black Varnish, for Coal Buckets.—Asphaltum, 1 lb.; lampblack, ¼ lb.; resin, ½ lb.; spirits of turpentine, 1 qt. Dissolve the asphaltum and resin in the turpentine; then rub the lampblack with linseed oil, only sufficient to form a paste, and mix with the others. Apply with a brush.

Soldering Fluid.—Take 2 oz. muriatic acid; add zinc till bubbles cease to rise; add ½ teaspoonful of sal ammoniac and 2 oz. of water. Damp the part you wish to solder with this fluid; lay on a small piece of solder, and with a piece of hot iron or soldering iron solder the part.

Japan Flow for Tin.—ALL COLORS.—Gum sandarac, 1 lb.; balsam of fir, balsam of Tolu, and acetate of lead, of each, 2 oz.; linseed oil, ½ pint; spirits of turpentine, 2 qts. Put all into a suitable kettle, except the turpentine, over a slow fire, at first; then raise to a higher heat till all are melted; now take from the fire, and, when a little cool, stir in the spirits of turpentine, and strain through a fine cloth. This is transparent; but by the following modifications any or all the various colors are made from it.

2. BLACK.—Prussian blue, 1 oz.; asphaltum, 2 oz.; spirits of turpentine, ½ pint. Melt the asphaltum in the turpentine; rub up the blue with a little of it; mix well, and strain; then add the whole to 1 pint of the *first*, above.

3. BLUE.—Indigo, and Prussian blue, both finely pulverized, of each ½ oz.; spirits of turpentine, 1 pint. Mix well, and strain. Add of this to one pint of the *first* until the color suits.

4. RED.—Take spirits of turpentine, ½ pt.; add cochineal, ½ oz.; let stand 15 hours, and strain. Add of this to the *first* to suit the fancy. If carmine is used instead of cochineal, it will make a fine color for watch hands.

5. YELLOW.—Take 1 oz. of pulverized root of curcuma, and stir of it into 1 pt. of the *first* until the color pleases you; let stand a few hours, and strain.

6. GREEN.—Mix equal parts of the blue and yellow together, then mix with the *first* until it suits the fancy.

7. ORANGE.—Mix a little of the red with more of the yellow, and then with the *first* as heretofore, until pleased.

8. PINK.—Mix a little of the blue to more in quantity of the red, and then with the *first* until suited. Apply with a brush.

Transparent Blue for Iron or Steel.—Demar varnish, ½ gal.; fine ground Prussian blue, ½ oz.; mix thoroughly. Makes a splendid appearance. Excellent for blueing watch hands.

To Tin Copper Stew Dishes, etc.—Wash the surface of the article to be tinned with sulphuric acid, and rub the surface well, so as to have it smooth and free of blackness caused by the acid; then sprinkle calcined and finely pulverized sal-ammoniac upon the surface, holding it over a fire, when it will be sufficiently hot to melt a bar of solder which is to be rubbed over the surface: any copper dish or vessel may be tinned in this way.

To Copper the Surface of Iron, Steel, or Iron Wire.—Have the article perfectly clean, then wash with the following solution, and it presents at once a coppered surface. Rain water, 3 lbs.; sulphate of copper, 1 lb.

To Tin Iron for Soldering, &c.—Take any quantity of muriatic acid, and dissolve all the zinc in it that it will cut; dilute it with one-fourth as much soft water as of acid, and it is ready for use. Rub this liquid on iron; and no matter how rusty it may be, it will brighten it up so that solder will readily adhere to it; or the above copper solution may be applied, giving it a coat of copper.

Gold Lacquer for Tin.—TRANSPARENT, ALL COLORS.—Alcohol in a flask, ½ pt.; add gum shellac, 1 oz.; turmeric, ½ oz.; red sanders, ¼ oz. Set the flask in a warm place, shake frequently for 12 hours or more, then strain off the liquor, rinse the bottle, and return it, corking tightly for use.

When this varnish is used, it must be applied to the work freely and flowing; and the article must be hot when applied. One or more coats may be laid on, as the color is required more or less light or deep. If any of it should become thick from evaporation, at any time, thin it with alcohol. And by the following modifications, all the various colors are obtained.

2. ROSE COLOR.—Proceed as above, substituting ¼ oz. of finely ground best lake in place of the turmeric.

3. BLUE.—The blue is made by substituting pulverized Prussian blue, ½ oz., in place of the turmeric.

4. PURPLE.—Add a little of the blue to the *first*.

5. GREEN.—Add a little of the rose-color to the *first*.

Crystallized Tin Plate.—The figures are more or less beautiful and diversified, according to the degree of heat, and relative dilution of the acid. Place the tin-plate, slightly heated, over a tub of water, and rub its surface with a sponge dipped in a liquor composed of four parts of aquafortis, and two of distilled water, holding one part of common salt or sal ammoniac in solution. Whenever the crystalline spangles seem to be thoroughly brought out, the plate must be immersed in water, washed either with a feather or a little cotton (taking care not to rub off the film of tin that forms the feathering), forthwith dried with a low heat, and coated with a lacker varnish, otherwise it loses its lustre in the air. If the whole surface is not plunged at once in cold water, but if it be partially cooled by sprinkling water on it, the crystallization will be finely variegated with large and small figures. Similar

results will be obtained by blowing cold air through a pipe on the tinned surface, while it is just passing from the fused to the solid state.

To Crystallize Tin.—Sulphuric acid, 4 oz.; soft water, 2 to 3 oz., according to strength of the acid; salt, 1¼ oz; mix; heat the tin hot over a stove, then with a sponge apply the mixture, then wash off directly with clean water. Dry the tin, and varnish with demar varnish.

Improved Tinning Flux.—Muriatic acid, 1 lb.; put into it all the zinc it will dissolve and 1 oz. sal ammoniac, and it is ready for use.

To Clean and Polish Brass.—Oil of vitriol, 1 oz.; sweet oil, ½ gill; pulverized rotten stone, 1 gill; rain water, 1½ pints; mix all, and shake as used. Apply with a rag, and polish with buckskin or old woolen.

Silvering Powder.—Nitrate of silver and common salt, of each, 30 grs; cream of tartar, 3½ drs. Pulverize finely, mix thoroughly, and bottle for use. Unequalled for polishing copper and plated goods.

Tin Cans.—SIZE OF SHEET, FOR FROM 1 TO 100 GALLONS:

For 1	gallon,	7	by 20	inches.	For 25	gallons,	30	by 56	inches.
3½	"	10	by 28	"	40	"	36	by 63	"
5	"	12	by 40	"	50	"	40	by 70	"
6	"	14	by 40	"	75	"	40	by 84	"
10	"	20	by 42	"	100	"	40	by 98	"
15	"	30	by 42	"					

This includes all the laps, seams, &c., which will be found sufficiently correct for all practical purposes.

To Mend Tinware.—Take a vial two-thirds full of muriatic acid, put into it all the chippings of sheet zinc it will dissolve, then put in a crumb of sal ammoniac, and fill up with water. Wet the place to be mended with this liquid, put a piece of zinc over the hole, and apply a spirit lamp or candle below it, which melts the solder on the tin and causes the zinc to adhere.

Brunswick Black for Grates, &c.—Asphaltum, 5 lbs.; melt, and add boiled oil, 2 lbs.; spirits of turpentine, 1 gal. Mix.

Gas Fitter's Cement.—Mix together rosin, four and a half parts; wax, 1 part; and Venetian red, 3 parts.

Plumber's Cement.—Black resin, 1 part; brick dust, 2 parts; well incorporated by a melting heat. Boiled linseed oil and red lead mixed together into a putty are often used by coppersmiths and engineers to secure joints; the washers of leather or cloth are smeared with this mixture in a pasty state.

Browning for Gun Barrels.—Spirits of nitre, 1 lb.; alcohol, 1 lb.; corrosive sublimate, 1 oz.; mix in a bottle, and cork for use. Directions: Polish the barrel perfect; then rub it with quick-lime with a cloth, which removes grease and dirt; now apply the browning fluid with a clean white cloth; apply one coat, and set it in a warm dark place for from 10 to 20 hours until a red rust forms on

it; then cord it down with a gunmaker's cord, and rub off with a clean cloth. Repeat the process if you wish a dark shade.

Browning for Twist Barrels.—Spirits of nitre, ¾ oz.; tincture of steel, ¾ oz.; or use the unmedicated tincture of iron if the tincture of steel cannot be obtained; black brimstone, ¼ oz.; blue vitriol, ½ oz.; corrosive sublimate, ¼ oz.; nitric acid, 1 drachm; copperas, ¼ oz.; mix with 1½ pints rain water, and bottle for use. This is to be applied the same as the first. It causes the twist of the barrel to be visible after application, a quality which the other liquid does not possess.

Browning Compositions for Gun Barrels.—1. Blue vitriol, 4 oz.; tincture of muriate of iron, 2 oz.; water, 1 quart; dissolve, and add aquafortis and sweet spirits of nitre, of each, 1 oz. 2. Blue vitriol and sweet spirits of nitre, of each, 1 oz.; aquafortis, ½ oz.; water, 1 pint. To be used in the same manner as previously described in this work.

Varnish and Polish for Gun Stocks.—Gum shellac, 10 oz.; gum sandarac, 1 oz.; Venice turpentine, 1 drachm; 98 per cent. alcohol, 1 gallon; shake the jug occasionally for a day or two, and it is ready for use. Apply a few coats of this to your gunstocks, polish by rubbing smooth, and your work is complete.

Hardening and Filling for Fire-proof Safes.—Experience has shown that the fire and burglar proof diamond chill for iron or steel, described in another part of this work, has no superior as a hardening for security in the construction of safes; and, as a non-conductor of heat, we would recommend a filling of plaster of Paris or alum.

Tempering Razors, Cutlery, Saws, &c.—Razors and penknives are too frequently hardened without the removal of the scale arising from the forging. *This practice, which is never done with the best works, cannot be too much deprecated.* The blades are heated in a coke or charcoal fire, and dipped in the water obliquely. In tempering razors, they are laid on their backs upon a clean fire, about half a dozen together, and they are removed one at a time, when the edges, which are as yet thick, come down to a pale straw color. Should the backs accidentally get heated beyond the straw-color, the blades are cooled in water, but not otherwise. Penblades are tempered a dozen or two at a time, on a plate of iron or copper, about 12 inches long, 3 or 4 inches wide, and about ¼ of an inch thick. The blades are arranged close together on their backs, and lean at an angle against each other. As they come down to the temper, they are picked out with small pliers and thrown into water, if necessary; other blades are then thrust forward from the cooler parts of the plate to take their place. Axes, adzes, cold chisels, and other edge tools, in which the total bulk is considerable compared with the part to be hardened, are only partially dipped; they are afterwards let down by the heat of the remainder of the tool; and, when the color indicative of the temper is attained, they

are entirely quenched. With the view of removing the loose scales, or the oxidation acquired in the fire, some workmen rub the objects hastily in dry salt before plunging them in the water, in order to give them a cleaner and brighter face.

Oil, or resinous mixtures of oil, tallow, wax, and resin, are used for many thin and elastic objects, such as needles, fishhooks, steel-pens and springs, which require a milder degree of hardness than is given by water. Gunlock springs are sometimes *fried in oil* for a considerable time over a fire, in an iron tray; the thick parts are then sure to be sufficiently reduced, and the thin parts do not become the more softened from the continuance of the blazing heat.

Saws and springs are generally hardened in various compositions of oil, suet, wax, etc. The saws are heated in long furnaces, and then immersed horizontally and edgeways into a long trough containing the composition. Part of the composition is wiped off the saws with a piece of leather, when they are removed from the trough, and heated one by one, until the grease inflames. This is called "*blazing off.*" The composition used by a large saw manufacturer is 2 lbs. suet, and ¼ lb. of beeswax, to every gallon of whale oil; these are boiled together, and will serve for thin works and most kinds of steel. The addition of black resin, about 1 lb. to each gallon, makes it serve for thicker pieces, and for those it refused to harden before; but resin should be added with judgment, or the works will become too hard and brittle.

Silversmith's Stripping Liquid.—Sulphuric acid, 8 parts; nitre, 1 part. Use to re-cover silver on old plated ware.

To Silver Clock Faces, Etc.—Old silver lace, ½ oz.; nitric acid, 1 oz. Boil them over a gentle fire for about 5 minutes in an earthen pot. After the silver is dissolved, take the mixture off, and mix it in a pint of clean water, then pour it into another vessel, free from sediment; then add a tablespoonful of common salt, and the silver will be precipitated in the form of a white powder or curd; pour off the acid, and mix the curd with 2 oz. salt of tartar, and ½ oz. whiting, all together, and it is ready for use. To USE.—Clean your brass or copper plate with rotten stone and a piece of old hat; rub it with salt and water with your hand. Then take a little of the composition on your finger, and rub it over your plate, and it will firmly adhere and completly silver it. Wash it well with water. When dry, rub it with a clean rag, and varnish with this VARNISH FOR CLOCK-FACES: Spirits of wine, 1 pt.; divide into 3 parts, mix one part with gum mastic in a bottle by itself; 1 part spirits, and ½ oz. sandarac in another bottle; and 1 part spirits, and ½ oz. of whitest gum benjamin, in another bottle; mix and temper to your mind. If too thin, some mastic; if too soft, some sandarac or benjamin. When you use it, warm the silvered plate before the fire, and, with a flat camel's hair pencil, stroke it over till no white streaks appear, and this will preserve the silvering for many years.

Watchmaker's Drills.—Drills of the smallest kind are heated in the blue part of the flame of a candle; larger drills are heated with the blow-pipe flame, applied very obliquely, and a little below the point. When very thin, they may be whisked in the air to

cool them; but they are generally thrust into the tallow of a candle or the oil of a lamp. They are tempered either by their own heat, or by immersion in the flame below the point of the tool.

To Reduce Metallic Oxides.—This may be effected by the dry and the moist processes; but the deoxidizing agent of the greatest value to the metallurgist is coal in its several varieties, and the derivative materials yielded by its combustion. When coal is burned in a furnace, the first product of combustion may be considered to be carbonic acid gas; but inasmuch as the latter is readily decomposed by permeating ignited pieces of solid carbon (coke) losing a portion of its oxygen, and becoming carbonic acid gas, we may say that the products of the combustion of coal are, firstly, carbonic acid; secondly, carbonic oxide and carbonic acid; and lastly, carbonic oxide alone. The latter, in combination with heat, is a most powerful deoxidizing agent. Were it not for the production in furnaces of carbonic oxide gas—were it necessary that the solid carbon of the coke should be alone the deoxidizing body—then it follows that every particle of the ore to be reduced must be brought into intimate contact with the reducing body; a process involving more care and trouble than are compatible with large metallurgic operations. The reducing agent being a gas, there is no longer a necessity for that intimate mixture of fuel and ore which would otherwise be necessary. Provided that the gaseous results of combustion are placed under circumstances of readily permeating the ore, the necessities of practice are amply subserved. There is great difference as to the amount of heat at which the reduction of different metallic oxides can be effected. The oxides of lead, bismuth, antimony, nickel, cobalt, copper, and iron, require a strong red heat in the furnace, whilst the oxides of manganese, chromium, tin, and zinc, do not lose their oxygen until heated to whiteness.

On a large scale, the reduction of oxides is generally effected by mixing charcoal, together with the oxide to be reduced, in a refractory clay crucible, the charcoal furnishing the carbon necessary to the proper performance of the work. Some use a crucible thickly lined with charcoal, putting in the oxide on the top of the charcoal. It is necessary, however, when using the crucible and charcoal, to use a flux, say a little borax in powder, stewed on the mixture to accelerate the reduction of the oxide. The borax is generally the first to fuse, and, as the metal is eliminated, seems to purify and cleanse it, as it gathers into a button at the bottom of the crucible. It is all the better if you give the crucible a few sharp taps when you take it off the fire.

Copper Plates or Rods may be covered with a superficial coating of brass by exposing them to the *fumes* given off by melted zinc at a light temperature. The coated plates or rods can then be rolled into thin sheets; or drawn into wire.

Solution of Copper on Zinc.—Dissolve 8 oz. (troy) cyanide of potassium, and 3 oz. cyanide of copper or zinc, in 1 gallon of rainwater. To be used at about 160° F., with a compound battery of 3 to 12 cells.

Brass Solution.—Dissolve 1 lb. (troy) cyanide of potassium, 2 ozs. cyanide of copper, and 1 oz. cyanide of zinc, in 1 gal. of rain-water; then add 2 oz. of muriate ammonia. To be used at 160° F., for smooth work, with a compound battery of from 3 to 12 cells.

Brassing Iron.—Iron ornaments are covered with copper or brass, by properly preparing the surface so as to remove all organic matter which would prevent adhesion and then plunging them into melted brass. A thin coating is thus spread over the iron, and it admits of being polished or burnished.

To Enamel Cast Iron and Hollow Ware.—Calcined flints 6 parts; Cornish stone or *composition* two parts, litharge 9 parts, borax 6 parts, argillaceous earth 1 part, nitre 1 part, calx of tin 6 parts, purified potash 1 part. 2. Calcined flints 8 parts, red lead 8 parts, borax 6 parts, calx of tin 5 parts, nitre 1 part. 3. Potter's composition 12 parts, borax 8 parts, white lead 10 parts, nitre 2 parts, white marble calcined 1 part, purified potash 2 parts, calx of tin 5 parts. 4. Calcined flints 4 parts, potter's composition 1 part, nitre 2 parts, borax 8 parts, white marble calcined 1 part, argillaceous earth ½ part, calx of tin 2 parts. Whichever of the above compositions is taken must be finely powdered, mixed and fused. The vitreous mass is to be ground when cold, sifted, and levigated with water; it is then made into a pap with water, or gum-water. This pap is smeared or brushed over the interior of the vessel, dried, and fused with a proper heat in a muffle. Clean the vessels perfectly before applying.

Enameled Cast Iron.—Clean and brighten the iron before applying. The enamel consists of two coats—the body and the glaze. The body is made by fusing 100 lbs. ground flints, 75 of borax, and grinding 40 lbs. of this frit with 5 lbs. of potter's clay, in water, till it is brought to the consistence of a pap. A coat of this being applied and dried, but not hard, the glaze powder is sifted over it. This consists of 100 lbs. Cornish stone in fine powder, 117 of borax, 35 of soda ash, 35 of nitre, 35 of sifted slaked lime, 13 of white sand, and 50 of pounded white glass. These are all fused together; the frit obtained is pulverized. Of this powder, 45 lbs. are mixed with 1 lb. of soda ash, in hot water, and the mixture dried in a stove is the glaze-powder. After sifting this over the body-coat, the cast iron article is put into a stove, kept at a temperature of about 212°, to dry it hard, after which it is set in a muffle-kiln, to fuse it into a glaze. The inside of pipes is enamelled (after being cleaned) by pouring the above body-composition through them while the pipe is being turned around to insure an equal coating; after the body has become set, the glaze pap is poured in in like manner. The pipe is finally fired in the kiln.

To Enamel Copper and other Vessels.—Flint glass 6 parts, borax 3 parts, red lead 1 part, oxide of tin 1 part. Mix all to-

gether, frit, grind into powder, make into a thin paste with water, apply with a brush to the surface of the vessels (after scaling by heat and cleaning them), repeat with a second or even a third coat, afterwards dry, and lastly fuse on by heat of an enamelled kiln.

Emery Wheels for Polishing.—Coarse emery powder is mixed with about half its weight of pulverized Stourbridge loam, and a little water or other liquid to make a thick paste; this is pressed into a metallic mould by means of a screw-press, and, after being thoroughly dried, is baked or burned in a muffle at a temperature above a red, and below a white heat. This forms an artificial emery-stone, which cuts very greedily, with very little wear to itself. Unequalled for grinding and polishing glass, metals, enamels, stones, &c.

Refining Gold and Silver.—The art of assaying gold and silver is founded upon the feeble affinity which these have for oxygen in comparison with copper, tin, and other cheap metals, and on the tendency which the latter metals have to oxidize rapidly in contact with lead at a high temperature, and sink with it into any porous, earthy vessel in a thin, glassy, vitrified mass. The precious metal having previously been accurately weighed and prepared, the first process is CUPELLATION. The *muffle*, with cupel properly arranged on the "*muffle plate*," is placed in the furnace, and the charcoal added, and lighted at the top by means of a few ignited pieces thrown on last. After the cupels have been exposed to a strong white heat for about half an hour, and have become white hot, the lead is put into them by means of tongs. As soon as this becomes bright red and "*circulating*," as it is called, the specimen for assay, wrapped in a small piece of paper or lead-foil, is added; the fire is now kept up strongly until the metal enters the lead and "*circulates*" well, when the heat, slightly diminished, is so regulated that the assay appears convex and more glowing than the cupel itself, whilst the "*undulations*" circulate in all directions, and the middle of the metal appears smooth, with a margin of litharge, which is freely absorbed by the cupel. When the metal becomes bright and shining, or, in the technical language, begins to "*lighten*," and prismatic hues suddenly flash across the globules, and undulate and cross each other, followed by the metal becoming very brilliant and clear, and at length bright and solid (called *the brightening*), the separation is ended, and the process complete. The cupels are then drawn to the mouth of the "muffle," and allowed to cool slowly. When quite cold, the resulting "*button*," if of SILVER, is removed by the "pliers" or "tongs" from the cupels, and after being flattened on a small *anvil of polished steel*, with a polished steel hammer, to detach adhering oxide of lead, and cleaned with a small, hard brush, is very *accurately weighed*. The weight is that of *pure silver*, and the difference between the weight before cupellation and that of the pure metal represents the proportion of alloy in the sample examined. In the case of GOLD, the metal has next to undergo the operations of QUARTATION. The cupelled sample is fused with three times

its weight of pure silver (called the "*witness,*") and in this state may be easily removed by PARTING. The alloy, after quartation, is hammered or rolled out into a thin strip or leaf, curled into a spiral form, and boiled for a quarter of an hour with about 2½ to 3 ounces of nitric acid (specific gravity, 1.3); and the fluid being poured off, it is again boiled in a similar manner, with 1½ to 2 ounces more nitric acid (sp. gr., 1.2); after which the gold is carefully collected, washed in pure water, and dried. When the operation of parting is skilfully conducted, the acid not too strong, the metal preserves its spiral form; otherwise it falls into flakes or powder. The second boiling is termed the "*reprise.*" The loss of weight by parting corresponds to the quantity of SILVER originally in the specimen.

For Alloys containing Platinum, which usually consist of copper, silver, platinum, and gold, the method of assaying is as follows: The alloy is cupelled in the usual way, the loss of weight expresses the amount of *copper*, and the "button," made into a riband and treated with sulphuric acid, indicates by the portion dissolved that also of the *silver* present. By submitting the residuum to quartation, the *platinum* becomes soluble in nitric acid. The loss after digestion in this menstruum expresses the weight of that metal, and the weight of the portion now remaining is that of pure gold. Gold containing PALLADIUM may be assayed in the same manner.

Annealing.—This consists in putting the pure gold into a small, porous crucible, or cupel, and heating it to redness in the muffle. WEIGHING must be done with the utmost accuracy. The weight in grains troy, doubled or quadrupled as the case may be, gives the number of *carats fins* of the alloy examined, without calculation.

According to the OLD FRENCH METHOD of assaying gold, the following quantities were taken: For the *assay pound*, 12 gr.; fine silver, 30 grs.; lead, 108 grs. These having been cupelled together, the perfect button is rolled into a leaf (1¼ by 5 inches), twisted on a quill, and submitted to parting with 2½ oz. and 1¼ oz. of nitric acid, sp. gr., 1.16 (20° Baume). The remainder of the process is similar to that above described.

The usual weight of silver taken for the *assay pound*, when the fineness is reckoned in 1000ths, is 20 grs., every real grain of which represents 50-1000ths of fineness, and so on of smaller divisions.

Enamelling on Gold and Copper.—The basis of all enamels is a highly transparent and fusible glass, called FRIT, FLUX, or PASTE, which readily receives a color on the addition of the metallic oxides. PREPARATION.—Red lead, 16 parts; calcined borax, 3 parts; pounded flint glass, 12 parts; flints, 4 parts. Fuse in a Hessian crucible for 12 hours, then pour it out into water, and reduce it to powder in a biscuit-ware mortar. The following directions will serve to show how the coloring preparations are made: BLACK enamels are made with peroxide of manganese, or protoxide of iron, to which more depth of color is given with a little cobalt. VIOLET enamel of a very fine hue is made from peroxyde

of manganese in small quantity with saline or alkaline fluxes. RED enamel is made from protoxide of copper. Boil a solution of equal parts of sugar and acetate of copper in four parts of water. The sugar takes possession of a portion of the cupreous oxide, and reduces it to the protoxide; when it may be precipitated in the form of a granular powder of a brilliant red. After about two hours of moderate boiling, the liquid is set aside to settle, decanted off the precipitate, which is washed and dried. By this pure oxide any tint may be obtained from red to orange by adding a greater or smaller quantity of peroxide of iron. The oxide and purple of cassius are likewise employed to colored enamel. This composition resists a strong fire very well. GREEN enamel can be produced by a mixture of yellow and blue, but is generally obtained direct from the oxide of copper, or better still with the oxide of chrome, which last will resist a strong heat. YELLOW.—Take one part of white oxide of antimony, with from one to three parts of white lead, one of alum, and one of sal ammoniac. Each of these substances is to be pulverized, then all are to be exactly mixed, and exposed to a heat adequate to decompose the sal ammoniac. This operation is judged to be finished when the yellow color is well brought out. BLUE.—This color is obtained from the oxide of cobalt, or some of its combinations, and it produces it with such intensity that only a very little can be used lest the shade should pass into black. A WHITE enamel may be prepared with a *calcine* formed of 2 parts of tin and 1 of lead, calcined together: of this combined oxide, 1 part is melted with two parts of fine crystal and a very little manganese, all previously ground together. When the fusion is complete, the vitreous matter is to be poured into clear water, and the frit is then dried and melted anew. Repeat the pouring into water three or four times, to insure a perfect combination. Screen the crucible from smoke and flame. The smallest portions of oxide of iron or copper admitted into this enamel will destroy its value.

The artist prepares his enamel colors by pounding them in an agate mortar, with an agate pestle, and grinding them on an agate slab, with oil of lavender rendered viscid by exposure to the sun, in a shallow vessel, loosely covered with gauze or glass. He should have alongside of him a stove, in which a moderate fire is kept up, for drying his work whenever the fignres are finished. It is then passed through the muffle.

Silver Plating.—File the parts which are to receive the plate very smooth; then apply over the surface the muriate of zinc, which is made by dissolving zinc in muriatic acid; now hold this part over a dish containing hot soft solder, and with a swab apply the solder to the part to which it will adhere; brush off all superfluous solder, so as to leave the surface smooth; you will now take No. 2 fair silver plate, of the right size to cover the prepared surface, and lay the plate upon it, and rub down smooth with a cloth moistened with oil; then, with a turned soldering iron, pass slowly over all the surface of the plate, which melts the solder underneath it, causing the plate to adhere as firmly as the solder does to the iron; then polish the surface, and finish with buckskin.

Electro Gold Plating.—Take a $2.50 piece of gold, and put it into a mixture of 1 oz. nitric, and 4 oz. muriatic acid (glass vessels only are to be used in this work;) when it is all cut, dissolve ½ oz. of sulphate of potash in 1 pint of pure rain water, and mix with the gold solution, stirring well; then let it stand, and the gold will be thrown down; then pour off the acid fluid, and wash the gold in two or three waters, or until no acid is tasted by touching the tongue to the gold. Now dissolve 1 oz. of cyanuret of potassium in 1 pint of pure rain water, to which add the gold, and it is ready for use. Clean the article to be plated from all grease and dirt, with whiting and a good brush; if there are cracks, it may be necessary to put the article in a solution of caustic potash; at all events clean it perfectly; then suspend it in the cyanuret of gold solution with a small strip of zinc, cut about the width of a common knitting needle, hooking the top over a stick which will reach across the top of the vessel holding the solution. If the zinc is too large, the deposit will be made so fast it will scale off. The slower the plating goes on the better, and this is arranged by the size of the zinc used. When not in use keep it well corked and out of the way of children, for it is very poisonous.

Electro Silver Plating is done every way the same as gold (using coin,) except that rock-salt is used instead of the cyanuret of potassium, to hold the silver in solution for use, and when it is of the proper strength of salt, it has a thick curdy appearance, or you can add salt until the silver will deposit on the article to be plated, which is all that is required. This method entails no trouble with using a battery, and is the successful result of a long series of experiments in electro-plating.

Elkington's Patent Gilding.—Fine gold, 5 oz. (troy;) nitro-muriatic acid, 52 oz. (avoirdupois;) dissolve by heat, and continue the heat until red or yellow vapors cease to be evolved; decant the clear liquor into a suitable vessel; add *distilled* water, 4 gallons; pure bi-carbonate of potassa, 20 lbs.; and boil for 2 hours. N. B. The nitro-muriatic acid is made with *pure* nitric acid (sp. gr. 1.45,) 21 oz.; *pure* muriatic acid (sp. gr. 1.15,) 17 oz.; and *distilled* water, 14 oz.

The articles, after being perfectly cleaned from scale or grease, and receiving a proper *face*, are to be suspended on wires, dipped into the liquid *boiling hot*, and moved about therein, when, in from a few seconds to a minute, depending on the newness and strength of the liquid, the requisite coating of gold will be deposited on them. By a little practice the time to withdraw the articles is readily known; the duration of the immersion required to produce any given effect gradually increases as the liquid weakens by use. When properly gilded, the articles are withdrawn from the solution of gold, washed in clean water and dried; after which they undergo the usual operation of coloring, &c.

A "*dead gold*" *appearance* is produced by the application to the articles of a *weak* solution of *nitrate of mercury* previously to the immersion in the gilding liquor, or the *deadening* may be given by applying a solution of the nitrate to the *newly gilded* surface, and then expelling the mercury by heat.

Gold Silvering on Metals.—Mix 1 part of chloride of silver with 3 parts of pearlash, 1½ parts common salt, and 1 part whiting; and well rub the mixture on the surface of brass or copper, (previously well cleaned,) by means of a piece of soft leather, or a cork moistened with water, and dipped in the powder. When properly silvered, the metal should be well washed in hot water, slightly alkalized, then wiped dry.

To Heighten the Color of Yellow Gold.—Saltpetre, 6 oz.; green copperas, 2 oz.; white vitriol and alum, of each, 1 oz. If wanted redder, a small quantity of blue vitriol must be added.

For Green Gold.—Saltpetre, 1 oz. 10 dwts.; sal ammoniac, 1 oz. 4 dwts.; Roman vitriol, 1 oz. 4 dwts.; verdigris, 18 dwts.

For Red Gold.—To 4 oz. melted yellow wax, add, in fine powder, 1½ oz. of red ochre; 1½ oz. verdigris, calcined till it yields no fumes; and ½ oz. of calcined borax. Mix them well together. Dissolve either of above mixtures in water, as the color is wanted, and use as required.

Coloring of Gilding.—Defective colored gilding may also be improved by the help of the following mixture: Nitrate of potash, 3 oz.; alum, 1½ oz.; sulphate of zinc, 1½ oz.; common salt, 1½ oz. These ingredients are to be put into a small quantity of water to form a sort of paste, which is put upon the articles to be colored; they are then placed upon an iron plate over a clear fire, so that they will attain nearly to a black heat, when they are suddenly plunged into cold water; this gives them a beautiful high color. Different hues may be had by a variation in the mixture.

Gold is taken from the surface of silver by spreading over it a paste made of powdered sal-ammoniac, with aqua fortis, and heating it till the matter smokes, and it is nearly dry; when the gold may be separated by rubbing it with a scratch brush.

Moulds and Dies.—Copper, zinc, and silver in equal proportions, melt together under a coat of powdered charcoal, and mould into the form you desire. Bring them to nearly a white heat, and lay on the thing you would take the impression of, press with sufficient force, and you will get a perfect and beautiful impression.

Polishing Powder for Gold and Silver.—Rock alum (burnt and finely powdered,) 5 parts; levigated chalk, 1 part. Mix; apply with a dry brush.

Silver Plating Fluid.—Dissolve 1 ounce of nitrate of silver in crystal, in 12 ounces of soft water; then dissolve in the water 2 oz. cyanuret of potash; shake the whole together, and let it stand till

it becomes clear. Have ready some half-ounce vials, and fill half full of Paris white, or fine whiting; and then fill up the bottles with the liquor, and it is ready for use. The whiting does not increase the coating power; it only helps to clean the articles, and save the silver fluid, by half filling the bottles.

To Temper Gravers and Drills.—When the graver or drill is too hard, which may be known by the frequent breaking of the point, temper as follows: Heat a poker red hot, and hold the graver to it within an inch of the point, waving it to and fro till the steel changes to a light straw color; then put the point into oil to cool, or hold the graver close to the flame of a candle till it be of the same color, and cool in tallow; but be careful either way not to hold it too long, for then it will be too soft, in which case the point will be blue, and must be broken off, and whetted and tempered anew. For jewellers' drills, no better tempering liquid can be got than the first-named liquid under the blacksmiths' department, which see.

Jeweler's Armenian Cement.—Isinglass soaked in water and dissolved in spirit, 2 oz. (thick); dissolve in this 10 grains of very pale gum ammonia (in tears) by rubbing them together; then add 6 large tears of gum mastic, dissolved in the least possible quantity of rectified spirit. When carefully made, this cement resists moisture and dries colorless. Keep in a closely stopped vial.

Jeweler's Turkish Cement.—Put into a bottle 2 oz. of isinglass and 1 oz. of the best gum arabic; cover them with proof spirits, cork loosely, and place the bottle in a vessel of water, and boil it till a thorough solution is effected; then strain for use; best cement known.

Reviver of Old Jewelry.—Dissolve sal-ammoniac in urine, and put the jewelry in it for a short time; then take it out, and rub with chamois leather, and it will appear equal to new.

To Recover Gold From Gilt Metal.—Take a solution of borax water, apply to the gilt surface, and sprinkle over it some finely powdered sulphur; make the article red hot, and quench it in water; then scrape off the gold, and recover it by means of lead.

To Separate Gold and Silver from Lace, &c.—Cut in pieces the gold or silver lace, tie it tightly, and boil it in soap lye till the size appears diminished; take the cloth out of the liquid, and, after repeated rinsings in cold water, beat it with a mallet to draw out all the alkali. Open the linen, and the pure metal will be found in all its beauty.

Door Plates—TO MAKE.—Cut your glass the right size, and make it perfectly clean with alcohol or soap; then cut a strip of tinfoil sufficiently long and wide for the name, and with a piece of

ivory or other burnisher rub it lengthwise to make it smooth; now wet the glass with the tongue (as saliva is the best sticking substance,) or if the glass is very large, use a weak solution of gum arabic, or the white of an egg in half a pint of water, and lay on the foil, rubbing it down to the glass with a bit of cloth, then also with the burnisher; the more it is burnished the better will it look; now mark the width on the foil which is to be the height of the letter, and put on a straight edge, and hold it firmly to the foil, and with a sharp knife cut the foil, and take off the superfluous edges; then either lay out the letters on the back of the foil (so they shall read correctly on the front) by your own judgment or by means of pattern letters, which can be purchased for that purpose; cut with the knife, carefully holding down the pattern or straight edge, whichever you use; then rub down the edge of all the letters with the back of the knife, or edge of the burnisher, which prevents the black paint or japan which you next put over the back of the plate from getting under the foil; having put a line above and one below the name, or a border around the whole plate or not as you bargain for the job. The Japan is made by dissolving asphaltum in just enough turpentine to cut it (see "Asphaltum Varnish;") apply with a brush, as other paint, over the back of the letters, and over the glass forming a back ground. This is used on the iron plate of the frame, also putting it on when the plate is a little hot; and, as soon as it cools, it is dry. A little lamp-black may be rubbed into it if you desire it any blacker than it is without it.

Etching on Glass.—Druggist bottles, bar-tumblers, signs, and glassware of every description, can be lettered in a beautiful style of art, by simply giving the article to be engraved, or etched, a thin coat of the engraver's varnish (see next receipt), and the application of fluoric acid. Before doing so, the glass must be thoroughly cleaned and heated, so that it can hardly be held. The varnish is then to be applied lightly over, and made smooth by dabbing it with a small ball of silk, filled with cotton. When dry and even, the lines may be traced on it by a sharp steel, cutting clear through the varnish to the glass. The varnish must be removed clean from each letter, otherwise it will be an imperfect job. When all is ready, pour on or apply the fluoric acid with a feather, filling each letter. Let it remain until it etches to the required depth, then wash off with water, and remove the varnish.

Etching Varnish.—Take of virgin wax and asphaltum each 2 oz.; of black pitch and Burgundy pitch, each ½ oz.; melt the wax and pitch in a new earthenware glazed pot, and add to them, by degrees, the asphaltum, finely powdered. Let the whole boil, simmering gradually, till such time as that, taking a drop upon a plate, it will break when it is cold, on bending it double two or three times betwixt the fingers. The varnish, being then boiled enough, must be taken off the fire, and, after it cools a little, must be poured into warm water that it may work the more easily with the hands, so as to be formed into balls, which must be kneaded, and put into a piece of taffety for use.

Fluoric Acid, to Make for Etching Purposes.—You can make your own fluoric (sometimes called hydro-fluoric) acid, by getting the fluor or Derbyshire spar, pulverizing it, and putting all of it into sulphuric acid which the acid will cut or dissolve. Inasmuch as fluoric acid is destructive to glass, it cannot be kept in common bottles, but must be kept in lead or gutta percha bottles.

Glass-Grinding for Signs, Shades, Etc.—After you have etched a name or other design upon uncolored glass, and wish to have it show off to a better advantage by permitting the light to pass only through the letters, you can do so by taking a piece of flat brass sufficiently large not to dip into the letters, but pass over them when gliding upon the surface of the glass; then, with flour of emery, and keeping it wet, you can grind the whole surface, very quickly, to look like the ground glass globes often seen upon lamps, except the letter, which is eaten below the general surface.

Gold and Silver Ink.—The metal leaf is ground with honey until of a fine powder; it is then washed to remove the honey, and the powder is mixed with gum water for use.

Gold Lustre for Stoneware, China, Etc.—Gold, 6 parts; aquaregia, 36 parts. Dissolve, then add tin, 1 part; next add balsam of sulphur, 3 parts; oil of turpentine, 1 part. Mix gradually into a mortar, and rub it until the mixture becomes hard; then add oil of turpentine, 4 parts. It is then to be applied to a ground prepared for the purpose.

Gilding China and Glass.—Powdered gold is mixed with borax and gum water, and the solution applied with a camel-hair pencil. Heat is then applied by a stove until the borax fuses, when the gold is fixed and afterwards burnished.

Glass Staining.—The following colors, after having been prepared, and rubbed upon a plate of ground-glass, with the spirit of turpentine or lavender, thickened in the air, are applied with a hair-pencil. Before using them, however, it is necessary to try them on small pieces of glass, and expose them to the fire, to ascertain if the desired tone of color is produced. The artist must be guided by these proof-pieces in using his colors. The glass proper for receiving these pigments should be colorless, uniform and difficult of fusion. A design must be drawn on paper, and placed beneath the plate of glass. The upper side of the glass, being sponged over with gum-water, affords, when dry, a surface proper for receiving the colors without the risk of their running irregularly, as they would otherwise do on the slippery glass. The artist draws on the plate (usually in black), with a fine pencil, all the traces which mark the great outlines or shades of the figures. Afterwards, when it is dry, the vitrifying colors are laid on by means of larger hair-pencils; their selection being regulated by the burnt specimen-tints above mentioned. The following are all fast colors, which do not run, except the yellow, which must, therefore, be laid on the opposite side of the glass. The preparations being all laid on, the glass is ready for being fired in a muffle, in order to fix and bring out the proper colors. The muffle must be made of very refractory fire-

clay, flat at its bottom, and only five or six inches high, with a strong, arched roof, and close on all sides, to exclude smoke and flame. On the bottom, a smooth bed of sifted lime, freed from water, about half an inch thick, must be prepared for receiving the glass. Sometimes, several plates of glass are laid over each other, with a layer of lime-powder between each. The fire is now lighted, and very gradually raised, lest the glass should be broken; then keep it at a full heat for three or four hours, more or less, according to the indications of the trial slips; the yellow coloring being principally watched, it furnishing the best criterion of the state of the others. When all is right, let the fire die out, so as to anneal the glass.

Stained-Glass Pigments.—No. 1. *Flesh color.*—Red lead, 1 oz.; red enamel (Venetian glass enamel, from alum and copperas calcined together): grind them to a fine powder, and work this up with alcohol upon a hard stone. When slightly baked, this produces a fine flesh color.

No. 2. BLACK COLOR.—Take 14½ oz. of smithy scales of iron; mix them with 2 oz. of white glass; antimony 1 oz.; manganese, ½ oz.: pound and grind these ingredients together, with strong vinegar.

No. 3. BROWN COLOR.—White glass or enamel, 1 oz.; good manganese, ½ oz.: grind together.

No. 4. RED, ROSE AND BROWN COLORS are made from peroxide of iron, prepared by nitric acid. The flux consists of borax, sand and minium, in small quantities.

RED COLOR may likewise be obtained from 1 oz. of red chalk, pounded, mixed with 2 oz. of white, hard enamel, and a little peroxide of copper.

A RED may also be composed of rust of iron, glass of antimony, yellow glass of lead, such as is used by potters (or litharge,) each in equal quantities; to which a little sulphuret of silver is added. This composition, well ground, produces a very fine red color on glass.

No. 5. GREEN.—2 oz. of brass, calcined into an oxide; 2 oz.; of minium, and 8 oz. of white sand: reduce them to a fine powder, which is to be enclosed in a well-luted crucible, and heated strongly in an air-furnace for an hour. When the mixture is cold, grind it in a brass mortar. Green may, however, be advantageously produced, by a yellow on one side, and a blue on the other. Oxide of chrome has been also employed to stain glass green.

No. 6. A FINE YELLOW STAIN.—Take fine silver, laminated thin, dissolve in nitric acid, dilute with abundance of water, and precipitate with solution of sea-salt; mix this chloride of silver in a dry powder, with three times its weight of pipe-clay, well burnt and pounded. The back of the glass pane is to be painted with this powder; for; when painted on the face, it is apt to run into the other colors.

A PALE YELLOW can be made by mixing sulphuret of silver with glass of antimony and yellow ochre, previously calcined to a red-brown tint. Work all these powders together, and paint on the back of the glass. Or silver *laminæ*, melted with sulphur, and glass of antimony, thrown into cold water, and afterwards ground to powder, afford a yellow.

A PALE YELLOW may be made with the powder resulting from brass, sulphur and glass of antimony, calcined together in a crucible till they cease to smoke, and then mixed with a little burnt ochre.

THE FINE YELLOW of M. Meraud is prepared from chloride of silver, oxide of zinc, and rust of iron. This mixture, simply ground, is applied on the glass.

ORANGE COLOR.—Take 1 part of silver-powder, as precipitated from the nitrate of that metal, by plates of copper, and washed; mix with 1 part of red ochre, and 1 of yellow, by careful trituration; grind into a thin pap, with oil of turpentine or lavender; apply this with a brush, and burn in.

Silvering Looking-Glasses with Pure Silver.—Prepare a mixture of 3 grs. of ammonia, 60 grs. nitrate of silver, 90 minims of spirits of wine, 90 minims of water; when the nitrate of silver is dissolved, filter the liquid, and add a small quantity of sugar (15 grs.,) dissolved in 1½ oz. of water and 1½ oz. spirits of wine. Put the glass into this mixture, having one side covered with varnish, gum, or some substance to prevent the silver being attached to it. Let it remain for a few days, and you have a most elegant looking-glass; yet it is far more costly than the quicksilver.

Another Method.—A sheet of tin-foil corresponding to the size of the plate of glass is evenly spread on a perfectly smooth and solid marble table, and every wrinkle on its surface is carefully rubbed down with a brush; a portion of mercury is then poured on, and rubbed over the foil with a clean piece of soft woolen stuff, after which, two rules are applied to the edges, and mercury poured on to the depth of a crown piece; when any oxide on the surface is carefully removed, and the sheet of glass, perfectly clean and dry, is slid along over the surface of the liquid metal, so that no air, dirt, or oxide can possibly either remain or get between them. When the glass has arrived at its proper position, gentle pressure is applied, and the table sloped a little to carry off the waste mercury; after which it is covered with flannel, and loaded with heavy weights; in twenty-four hours, it is removed to another table, and further slanted, and this position is progressively increased during a month till it becomes perpendicular.

Porcelain Colors.—The following are some of the colors used in the celebrated porcelain manufactory of Sevres, and the proportions in which they are compounded. Though intended for porcelain painting, nearly all are applicable to painting on glass. Flux No. 1 minium or red lead, 3 parts; white sand, washed, 1 part. This mixture is melted, by which it is converted into a

greenish-colored glass. Flux No. 2. GRAY FLUX.—Of No. 1, 8 parts; fused borax in powder, 1 part; this mixture is melted. Flux No. 3. FOR CARMINES AND GREENS.—Melt together fused borax, 5 parts; calcined flint, 3 parts; pure minium, 1 part. No. 1. INDIGO BLUE. —Oxide of cobalt, 1 part; flux No. 3, 2 parts. DEEP AZURE BLUE. —Oxide of cobalt, 1 part; oxide of zinc, 2 parts; flux No. 3, 5 parts; No. 2. EMERALD GREEN.—Oxide of copper, 1 part; antimonic acid, 10 parts; flux No. 1, 30 parts; pulverize together, and melt. No. 3. GRASS GREEN.—Green oxide of chromium, 1 part; flux No. 3, 3 parts; triturate and melt. No. 4. YELLOW.—Antimonic acid, 1 part; subsulphate of the peroxyde of iron, 8 parts; oxide of zinc, 4 parts; flux No. 1, 36 parts; rub together, and melt; if this color is too deep, the salt of iron is diminished. No. 5. FIXED YELLOW FOR TOUCHES.—No. 4, 1 part; white enamel of commerce, 2 parts; melt and pour out; if not sufficiently fixed, a little sand may be added. No. 6. DEEP NANKIN YELLOW.—Subsulphate of iron, 1 part; oxide of zinc, 2 parts; flux No. 2, 8 parts; triturate without melting. No. 7. DEEP RED.—Subsulphate of iron, calcined in a muffle until it becomes of a beautiful capucine red, 1 part; flux No. 2, 3 parts; mix without melting. No. 8. LIVER BROWN.—Oxide of iron made of red brown, and mixed with 3 times its weight of flux. No. 2; a tenth of sienna earth is added to it, if it is not deep enough. No. 9. WHITE.—The white enamel of commerce, in cakes. No. 10. DEEP BLACK.—Oxide of cobalt, 2 parts; copper, 2 parts; oxide of manganese, 1 part; flux No. 1, 6 parts; fused borax, ½ part; melt, and add oxide of manganese, 1 part; oxide of copper, 2 parts; triturate without melting.

THE APPLICATION.—Follow the general directions given in another part of this work, in relation to staining glass.

Glass and Porcelain Gilding.—Dissolve in boiled linseed oil an equal weight either of copal or amber; add as much oil of turpentine as will enable you to apply the compound or size thus formed, as thin as possible, to the parts of the glass intended to be gilt. The glass is to be placed in a stove till it will almost burn the fingers when handled; at this temperature the size becomes adhesive, and a piece of gold-leaf, applied in the usual way, will immediately stick. Sweep off the superfluous portions of the leaf, and when quite cold it may be burnished; taking care to interpose a piece of India paper between the gold and the burnisher. See another process in a previous part of this work.

Soluble Glass.—1. Silica, 1 part; carbonate of soda, 2 parts; fuse together. 2. Carbonate of soda, (dry,) 54 parts; dry carbonate of potassa, 70 parts; silica, 192 parts; soluble in boiling water, yielding a fine transparent, semi-elastic varnish. 3. Carbonate of potassa, (dry,) 10 parts; powdered quartz (or sand, free from iron or alumina,) 15 parts; charcoal, 1 part; all fused together. Soluble in 5 or 6 times its weight of *boiling* water. The filtered solution evaporated to dryness yields a transparent glass, permanent in the air.

To Drill and Ornament Glass.—Glass can be easily drilled by a steel drill, hardened but not drawn, and driven at a high velocity. Holes of any size, from the 16th of an inch upwards, can be drilled, by using spirits of turpentine as a dip; and, easier still, by using camphor with the turpentine. Do not press the glass very hard against the drill. If you require to ornament glass by turning in a lathe, use a good mill file and the turpentine and camphor drip, and you will find it an easy matter to produce any shape you choose.

Gilding Glass Signs, &c.—Cut a piece of thin paper to the size of your glass, draw out your design correctly in black lead-pencil on the paper, then prick through the outline of the letters with a fine needle, tie up a little dry white lead in a piece of rag; this is a pounce-bag. Place your design upon the glass, right side up, dust it with the pounce-bag; and, after taking the paper off, the design will appear in white dots upon the glass; these will guide you in laying on the gold on the opposite side, which must be *well cleaned*, preparatory to laying on the gold. PREPARING THE SIZE.—Boil perfectly clean water in an enamelled saucepan, and while boiling, add 2 or 3 shreds of best selected isinglass, after a few minutes strain it through a clean linen rag; when cool it is ready for use. CLEAN THE GLASS PERFECTLY.—When this is done, use a flat camel's-hair brush for laying on the size; and let it drain off when you put the gold on. When the gold is laid on and perfectly dry, take a ball of the finest cotton wool and gently rub or polish the gold; you can then lay on another coat of gold if desirable; it is now ready for writing. In doing this, mix a little of the best vegetable black japan; thin with turpentine to a proper working consistency; apply this when thoroughly dry; wash off the superfluous gold, and shade as in sign-writing.

Gilder's Gold Size.—Drying or boiled linseed oil, thickened with yellow ochre, or calcined red ochre, and carefully reduced to the utmost smoothness by grinding. It is thinned with oil of turpentine.

To Gild Letters on Wood, &c.—When your sign is prepared as smooth as possible, go over it with a sizing made by the white of an egg dissolved in about four times its weight of cold wafer; adding a small quantity of fuller's earth; this is to prevent the gold sticking to any part but the letters. When dry, set out the letters and commence writing, laying on the size as thinly as possible, with a sable pencil. Let it stand until you can barely feel a slight stickiness, then go to work with your gold leaf knife and cushion, and gild the letters. Take a leaf up on the point of your knife, after giving it a slight puff into the back part of your cushion, and spread it on the front part of the cushion as straight as possible, giving it another slight puff with your mouth to flatten it out. Now cut it into the proper size, cutting with the heel of your knife forwards. Now rub the tip lightly on your hair; take up the gold

on the point, and place it neatly on the letters; when they are all covered get some very fine cotton wool, and gently rub the gold until it is smooth and bright. Then wash the sign with clean water to take off the egg size.

Compound Colors.—LIGHT GRAY is made by mixing white lead with lamp-black, using more or less of each material, as you wish to obtain a lighter or darker shade. BUFF is made from yellow ochre and white lead. SILVER OR PEARL GRAY.—Mix white lead, indigo, and a very slight portion of black, regulating the quantities you wish to obtain. FLAXEN GRAY is obtained by a mixture of white lead and Prussian blue, with a small quantity of lake. BRICK COLOR.—Yellow ochre and red lead, with a little white. OAK WOOD COLOR.—Three-fourths white lead and one-fourth part umber and yellow ochre, proportions of the last two ingredients being determined by the desired tints. WALNUT-TREE COLOR.—Two-thirds white lead, and one-third red ochre, yellow ochre, and umber mixed according to the shade sought. If veining is required, use different shades of the same mixture, and for the deepest places, black. JONQUIL.—Yellow, pink and white lead. This color is only proper for distemper. LEMON YELLOW.—Realgar and orpiment. The same color can be obtained by mixing yellow-pink with Naples yellow; but it is then only fit for distemper. ORANGE COLOR.—Red lead and yellow ochre. VIOLET COLOR.—Vermilion, or red lead, mixed with black or blue, and a small portion of white. Vermilion is far preferable to red lead in mixing this color. PURPLE.—Dark-red mixed with violet color. CARNATION.—Lake and white. GOLD COLOR.—Massicot, or Naples yellow, with a small quantity of realgar, and a very little Spanish white. OLIVE COLOR may be obtained by black and a little blue, mixed with yellow. Yellow-pink, with a little verdigris and lamp-black; also ochre and a small quantity of white will produce an olive color. For distemper, indigo and yellow-pink mixed with white lead or Spanish white must be used. If veined it must be done with umber. LEAD COLOR.—Indigo and white. CHESTNUT COLOR.—Red ochre and black, for a dark chestnut. To make it lighter, employ a mixture of yellow ochre. LIGHT TIMBER COLOR.—Spruce ochre, white, and a little umber. FLESH COLOR.—Lake, white lead, and a little vermilion. LIGHT WILLOW GREEN.—White mixed with verdigris. GRASS GREEN.—Yellow-pink mixed with verdigris. STONE COLOR.—White, with a little spruce ochre. DARK LEAD COLOR.—Black and white, with a little indigo. FAWN COLOR.—White lead, stone ochre, with a little vermilion. CHOCOLATE COLOR.—Lamp-black and Spanish brown. On account of the fatness of lamp-black, mix some litharge and red lead. PORTLAND STONE COLOR.—Umber, yellow ochre, and white lead.

Dyes for Veneers.—A FINE BLACK.—Put 6 lbs. of logwood chips into your copper, with as many veneers as it will hold without pressing too tight; fill it with water, let it boil slowly for about 3 hours, then add ½ lb. of *powdered verdigris*, ½ lb. copperas, bruised gall-nuts, 4 oz.; fill the copper up with vinegar, as the water evaporates; let it boil gently two hours each day till the wood is dyed through. A FINE BLUE.—Put oil of vitrol, 1 lb., and 4 oz. of

the best powdered indigo, in a glass bottle. Set it in a glazed earthen pan, as it will ferment. Now put your veneers into a copper or stone trough; fill it rather more than one-third with water, and add as much of the vitriol and indigo (stirring it about) as will make fine blue, testing it with a piece of white paper or wood. Let the veneers remain till the dye has struck through. Keep the solution of indigo a few weeks before using it; this improves the color. FINE YELLOW.—Reduce 4 lbs. of the root of barberry to dust by sawing, which put in a copper or brass trough; add turmeric, 4 oz.; water, 4 gals.; then put in as many white holly veneers as the liquor will cover. Boil them together for three hours, often turning them. When cool, add aquafortis, 2 oz., and the dye will strike through much sooner. BRIGHT GREEN.—Proceed as in the previous receipt to produce a yellow; but, instead of aquafortis, add as much of the vitriolated indigo (see above, under blue dye) as will produce the desired color. BRIGHT RED.—Brazil dust, 2 lbs.; add water, 4 gals. Put in as many veneers as the liquid will cover; boil them for 3 hours, then add alum, 2 oz.; aquafortis, 2 oz.; and keep it luke-warm until it has struck through. PURPLE.—To 2 lbs. of chip logwood and ½ lb. Brazil dust, add 4 gals. of water; and after putting in your veneers, boil for 3 hours; then add pearlash, 6 oz., and alum, 2 oz.; let them boil for 2 or 3 hours every day till the color has struck through. ORANGE.—Take the veneers out of the above yellow dye, and while still wet and saturated, transfer them to the bright red dye till the color penetrates throughout.

Gilders' Pickle.—Alum and common salt, each 1 oz.; nitre, 2 oz.; dissolved in water, ½ pt. Used to impart a rich yellow color to gold surfaces. It is best used largely diluted with water.

To Silver Ivory.—Pound a small piece of nitrate of silver in a mortar, add soft water to it, mix them well together, and keep in a phial for use. When you wish to silver any article, immerse it in this solution, let it remain till it turns of a deep yellow; then place it in clear water, and expose it to the rays of the sun. If you wish to depicture a figure, name, or cipher, on your ivory, dip a camel's hair pencil in the solution, and draw the subject on the ivory. After it has turned a deep yellow, wash it well with water, and place it in the sunshine, occasionally wetting it with pure water. In a short time it will turn of a deep black color, which, if well rubbed, will change to a brilliant silver.

To Improve the Color of Stains.—Nitric acid, 1 oz.; muriatic, ½ teaspoonful; grain tin, ¼ oz.; rain water, 2 oz. Mix it at least 2 days before using, and keep your bottle well corked.

Strong Glue for Inlaying or Veneering.—Select the best light brown glue, free from clouds and streaks. Dissolve this in water, and to every pint add ½ a gill of the best vinegar and ½ oz. of isinglass.

Compound Iron Paint.—Finely pulverized iron filings, 1 part; brick dust, 1 part; and ashes, 1 part. Pour over them glue-water or size, set the whole near the fire, and, when warm, stir them well together. With this paint cover all the wood-work which may be in danger; when dry, give a second coat, and the wood will be rendered incombustible.

Best Wash for Barns and Houses.—Water lime, 1 peck; freshly slacked lime, 1 peck; yellow ochre in powder, 4 lbs.; burnt umber, 4, lbs. To be dissolved in hot water, and applied with a brush.

Durable Outside Paint.—Take 2 parts (in bulk) of water lime, ground fine; 1 part (in bulk) of white lead, in oil. Mix them thoroughly, by adding *best* boiled linseed oil, enough to prepare it to pass through a paint mill; after which, temper with oil till it can be applied with a common paint brush. Make any color to suit. It will last 3 times as long as lead paint. IT IS SUPERIOR.

Farmers' Paint.—Farmers will find the following profitable for house or fence paint: skim milk, 2 quarts; fresh slacked lime, 8 oz.; linseed oil, 6 oz., white Burgundy pitch, 2 oz.; Spanish white, three pounds. The lime is to be slacked in water, exposed to the air, and then mixed with about one-fourth of the milk; the oil in which the pitch is dissolved to be added, a little at a time; then the rest of the milk, and afterwards the Spanish white. This is sufficient for 27 yards, 2 coats. This is for white paint. If desirable, any other color may be produced; thus, if a cream color is desired, in place of part of the Spanish white, use the ochre alone.

Painting in Milk.—Skimmed milk, ½ gallon; newly slacked lime, 6 oz.; and 4 oz. of poppy, linseed, or nut oil; and 5 lbs. Spanish white. Put the lime into an earthen vessel or clean bucket; and, having poured on it a sufficient quantity of milk to make it about the thickness of cream, add the oil in small quantities, a little at a time, stirring the mixture well. Then put in the rest of the milk, afterward the Spanish white finely powdered, or any other desired color. For out-door work add 2 oz. each more of oil and slacked lime, and 2 oz. of Burgundy pitch dissolved in the oil by a gentle heat.

Premium Paint, Without Oil or Lead.—Slack stone lime with boiling water in a tub or barrel to keep in the steam; then pass 6 quarts through a fine sieve. Now to this quantity add 1 quart of coarse salt, and 1 gallon of water; boil the mixture, and skim it clear. To every 5 gallons of this skimmed mixture, add 1 lb. alum; ½ lb. copperas; and by slow degrees ¾ lb. potash, and 4 quarts sifted ashes or fine sand; add any coloring desired. A more durable paint was never made.

Green Paint for Garden Stands, Blinds, Etc.—Take mineral

green, and white lead ground in turpentine; mix up the quantity you wish with a small quantity of turpentine varnish. This serves for the first coat. For the second, put as much varnish in your mixture as will produce a good gloss. If you desire a brighter green, add a little Prussian blue, which will improve the color.

Milk Paint for Barns.—ANY COLOR.—Mix water lime with skim-milk, to a proper consistence to apply with a brush, and it is ready to use. It will adhere well to wood, whether smooth or rough, to brick, mortar, or stone, where oil has not been used (in which case it cleaves to some extent,) and forms a very hard substance, as durable as the best oil paint. It is too cheap to estimate, and any one can put it on who can use a brush. Any color may be given to it, by using colors of the tinge desired. If a red is preferred, mix Venetian-red with milk, not using any lime. It looks well for fifteen years.

Paint.—TO MAKE WITHOUT LEAD OR OIL.—Whiting, 5 lbs.; skimmed milk, 2 qts.; fresh slacked lime, 2 oz. Put the lime into a stone-ware vessel, pour upon it a sufficient quantity of the milk to make a mixture resembling cream; the balance of the milk is then to be added; and lastly, the whiting is to be crumbled upon the surface of the fluid, in which it gradually sinks. At this period, it must be well stirred in, or ground as you would other paint, and it is fit for use.

Substitute for White Lead.——Hard cake stearine, 100 lbs.; bleached resin, 90 lbs.; fine potato starch, 25 lbs. Melt and mix well. Then add mucilage, 20 lbs.; stir well, till nearly cool; then put away for use.

Paints, Different Sorts.—BLUE.—Blue-black, 25 lbs.; whiting, 100 lbs.; road dust, sifted, 200 lbs.; lime-water, 12 gallons. Factitious linseed oil to grind.

WHITE PAINT.—Whiting, 500 lbs.; white-lead, 400 lbs.; lime-water, 20 gallons Factitious linseed-oil to grind.

BLACK PAINT.—Ivory or lamp-black, 100 lbs.; road-dust, sifted, 200 lbs.; lime-water, 18 gallons. Oil to grind.

BROWN PAINT.—Venetian red, or Spanish brown, 1 cwt.; road-dust, 3 cwt.; common soot, 28 lbs.; lime-water, 15 lbs. Factitious linseed oil to grind.

PARIS GREEN.—Take unslacked lime of the best quality, slack it with hot water; then take the finest part of the powder, and add alum-water as strong as it can be made, sufficient to form a thick paste; then color it with bi-chromate of potash and sulphate of copper until the color suits your fancy, and dry it for use. N. B.—The sulphate of copper gives a blue tinge; the bi-chromate of potash, a yellow. Observe this, and you will get it right.

Beautiful Green Paint for Walls.—Take 4 lbs. Roman vitriol, and pour on it a tea-kettle full of boiling water. When dissolved, add 2 lbs. pearlash, and stir the mixture well with a stick until the effervescence ceases; then add ¼ lb. pulverized yellow

arsenic, and stir the whole together. Lay it on with a paint-brush; and, if the wall has not been painted before, two, or even three coats will be requisite. If a pea green is required, put in less; if an apple green, more of the yellow arsenic. This paint does not cost the quarter of oil-paint, and looks better.

Blue Color for Ceilings, &c.—Boil slowly for 3 hours 1 lb. blue vitriol and ½ lb. of the best whiting in about 3 qts. water; stir it frequently while boiling, and also on taking it off the fire. When it has stood till quite cold, pour off the blue liquid, then mix the cake of color with good size, and use it with a plasterer's brush in the same manner as whitewash, either for walls or ceilings.

To Harden Whitewash.—With ½ a pail of common whitewash add ½ pint of flour. Pour on boiling water in a sufficient quantity to thicken it. Then add 6 gals. of the lime and water, and stir well.

Whitewash that will not rub off.—Mix up half a pailful of lime and water, ready to put on the wall; then take ¼ pt. of flour, mix it up with water, then pour on it the boiling water, a sufficient quantity to thicken it; then pour it while hot into the whitewash, stir all well together, and it is ready for use.

Whitewash.—The best method of making a whitewash for outside exposure is to slack half a bushel of lime in a barrel, add one pound of common salt, half a pound of the sulphate of zinc, and a gallon of sweet milk.

Substitute for Plaster of Paris.—Best whitening, 2 lbs.; glue, 1 lb.; linseed oil, 1 lb. Heat all together, and stir thoroughly. Let the compound cool, and then lay it on a stone covered with powdered whitening, and heat it well till it becomes of a tough and firm consistence; then put it by for use, covering with wet cloths to keep it fresh. When wanted for use, it must be cut in pieces adapted to the size of the mould, into which it is forced by a screw press. The ornament may be fixed to the wall, picture-frame, &c., with glue or white lead. It becomes in time as hard as stone itself.

Glue.—Powdered chalk added to common glue strengthens it. A glue which will resist the action of water is made by boiling 1 lb. of glue in 2 qts of skimmed milk.

Cheap Waterproof Glue.—Melt common glue with the smallest possible quantity of water; add, by degrees, linseed oil, rendered drying by boiling it with litharge. While the oil is added, the ingredients must be well stirred, to incorporate them thoroughly.

Fire and Waterproof Glue.—Mix a handful of quick-lime with 4 oz. of linseed oil; thoroughly lixiviate the mixture; boil it to a good thickness, and spread it on tin plates in the shade; it will become very hard, but can be dissolved over a fire, like common glue, and is then fit for use.

Prepared Liquid Glue.—Take of best white glue, 16 oz.;

white-lead, dry, 4 oz.; rain-water, 2 pts.; alcohol, 4 oz. With constant stirring, dissolve the glue and lead in the water, by means of a water-bath. Add the alcohol, and continue the heat for a few minutes. Lastly, pour into bottles, while it is still hot.

Prussian Blue.—Take nitric acid, any quantity, and as much iron shavings from the lathe as the acid will dissolve; heat the iron as hot as it can be handled with the hand; then add to it the acid in small quantities as long as the acid will dissolve it; then slowly add double the quantity of soft water that there was of acid, and put in iron again as long as the acid will dissolve it. 2. Take prussiate of potash, dissolve it in hot water to make a strong solution, and make sufficient of it with the first to give the depth of tint desired, and the blue is made. Or,—

Another Method.—A very passable Prussian blue is made by taking sulphate of iron (copperas) and prussiate of potash, equal parts of each; and dissolving each separately in water, then mixing the two waters.

Chrome Yellow.—1. Take sugar of lead and Paris white, of each 5 lbs.; dissolve them in hot water. 2. Take bi-chromate of potash, 6½ oz., and dissolve it in hot water also; each article to be dissolved separately; then mix all together, putting in the bi-chromate last. Let stand twenty-four hours.

Chrome Green.—Take Paris white, 6¼ lbs.; sugar of lead, and blue vitriol, of each, 3½ lbs.; alum, 10½ oz.; best soft Prussian blue and chrome yellow, of each, 3½ lbs. Mix thoroughly while in fine powder, and add water, 1 gallon, stirring well and let stand three or four hours.

Green, Durable and Cheap.—Take spruce yellow, and color it with a solution of chrome yellow and Prussian blue, until you give it the shade you wish.

Another Method.—Blue vitriol, 5 lbs.; sugar of lead 6¼ lbs.; arsenic, 2½ lbs.; bi-chromate of potash, 1½ oz.; mix them thoroughly in fine powder, and add water 3 parts, mixing well again, and let stand three or four hours.

Pea Brown.—1. Take sulphate of copper any quantity, and dissolve it in hot water. 2. Take prussiate of potash, dissolve it in hot water to make a strong solution; mix of the two solutions, as in the blue, and the color is made.

Rose Pink.—Brazil wood, 1 lb., and boil it for two hours, having 1 gallon of water at the end; then strain it, and boil alum, 1 lb., in the same water until dissolved, when sufficiently cool to admit the hand, add muriate of tin, ¾ oz. Now have Paris white, 12½ lbs.; moisten up to a salvy consistence, and when the first is cool stir them thoroughly together. Let stand twenty-four hours.

Patent Yellow.—Common salt, 100 lbs. and litharge, 400 lbs., are ground together with water, and kept for some time in a gentle heat, water being added to supply the loss by evaporation; the carbonate of soda is then washed out with more water, and the white residuum heated till it acquires a fine yellow color.

Naples Yellow.—No. 1. Metallic antimony, 12 lbs.; red lead, 8 lbs.; oxide of zinc, 4 lbs. Mix; calcine, triturate well together, and fuse in a crucible: the fused mass must be ground and elutriated to a fine powder.

Cheap Yellow Paint.—Whiting, 3 cwt.; ochre, 2 cwt.; ground white lead, 25 lbs. Factitious linseed oil to grind.

Stone Color Paint.—Road dust, 2 cwt.; ground white lead, ½ cwt.; whiting, 1 cwt.; ground umber, 14 lbs.; lime water, 6 gals. Factitious linseed oil to grind.

Glazier's Putty.—Whiting, 70 lbs.; boiled oil, 30 lbs.; water, 2 gals. Mix; if too thin, add more whiting; if too thick, add more oil.

Fish Oil Paints.—Dissolve white vitriol and litharge, of each 14 lbs., in vinegar, 32 gals.; add whale, seal, or cod oil, 1 tun, and boil to dryness, continually stirring during the ebullition. The next day, decant the clear portion; add linseed oil, 12 gals., oil of turpentine, 3 gals., mix well together. The sediment left is well agitated with half its quantity of lime water, used for some inferior paints under the name of "*prepared residue oil.*" This oil is used for various common purposes, as a substitute for linseed oil, of which the following paints are examples:—

1. Pale Green.—Lime water, 6 gals; whiting and road dust, of each, 1 cwt.; blue-black, 30 lbs.; yellow ochre, 28 lbs.; wet blue (previously ground in *prepared residue oil,*) 20 lbs.; grind well together. For use, thin with equal parts of *prepared residue oil* and linseed oil.

2. Bright Green.—Yellow ochre and wet blue, of each, 1 cwt.; road dust, 1¼ cwt.; blue-black, 10 lbs.; limewater, 6 gals.; prepared fish oil, 4 gals.; prepared residue and linseed oils, of each, 7½ gals.

3. Lead Color.—Whiting, 1 cwt.; blue-black, 7 lbs.; white lead, (ground in oil,) 28 lbs; road dust, 56 lbs.; lime water, 5 gals.; prepared residue oil, 2½ gals.

4. Reddish Brown.—Lime water, 8 gals.; Spanish brown, 1 cwt.; road dust, 2 cwt.; prepared fish, prepared residue and linseed oils, of each, 4 gals.

5. Yellow.—Substitute ochre for Spanish brown in the last receipt.

6. Black.—Substitute lamp or blue-black for Spanish brown in No. 4.

7. Stone Color.—Lime water, 4 gals.; whiting, 1 cwt.; white lead (ground in oil), 28 lbs.; road dust, 56 lbs.; prepared fish, linseed, and prepared residue oils, of each, 3 gals.

8. Chocolate.—Nos. 4 and 6 mixed together so as to form a chocolate color.

Remarks.—All the above paints require a little "driers." They are well fitted, by their cheapness, hardness, and durability, for common out-door work.

Porcelain Finish, very Hard and White for Parlors.—To prepare the wood for finish, if it be pine, give one or two coats of the "Varnish—Transparent for Wood," which prevents the pitch

from oozing out, causing the finish to turn yellow; next, give the room at least four coats of pure zinc, which may be ground in only sufficient oil to enable it to grind properly; then mix to a proper consistence with turpentine or naphtha. Give each coat time to dry. When it is dry and hard, sandpaper it to a perfectly smooth surface, when it is ready to receive the finish, which consists of two coats of French zinc ground in, and thinned with Demar varnish, until it works properly under the brush.

Japan Drier, BEST QUALITY.—Take linseed oil, 1 gallon; put into it gum shellac, ¾ lb.; litharge and burned Turkey umber, each ½ lb.; red lead, ½ lb.; sugar of lead, 6 oz. Boil in the oil till all are dissolved, which will require about four hours; remove from the fire, and stir in spirits turpentine 1 gallon, and it is done.

Another.—Linseed oil, 5 gallons; add red lead and litharge, each 3½ lbs.; raw umber, 1¼ lbs.; sugar of lead and sulphate of zinc, each ½ lb.; pulverize all the articles together, and boil in the oil till dissolved; when a little cool, thin with turpentine, 5 gallons.

Drying Oil Equal to Patent Driers at One Quarter their Price.—Linseed oil, 2 gallons; red lead and umber, each, 4 oz.; sulphate of zinc, 2 oz.; sugar of lead, 2 oz. Boil until it will scorch a feather, when it is ready for use.

Prepared Oil for Carriages, &c.—To 1 gallon linseed oil add 2 lbs. gum shellac; litharge, ½ lb.; red lead, ¼ lb.; umber, 1 oz. Boil slowly as usual until the gums are dissolved; grind your paints in this (any color,) and reduce with turpentine. Yellow ochre is used in floor painting.

Drying Oils. 1.—Nut or linseed oil, 1 gal.; litharge, 12 oz; sugar of lead and white vitriol, of each 1 oz.; simmer and skim until a pellicle forms; cool, and, when settled, decant the clear. 2. Oil, 1 gal.; litharge, 12 to 16 oz.; as last. 3. Old nut or linseed oil, 1 pint; litharge, 3 oz. Mix; agitate occasionally for 10 days; then decant the clear. 4. Nut oil and water, of each 2 lbs.; white vitriol, 2 oz.; boil to dryness. 5. Mix oil with powdered snow or ice, and keep it for 2 months without thawing.

To reduce Oil Paint with Water.—Take 8 lbs. of pure unslacked lime, add 12 qts. water, stir it and let it settle, turn it off gently and bottle it, keep it corked till used. This will mix with oil, and in proportion of half will render paint more durable.

Oil Paint.—TO REDUCE WITH WATER.—Gum shellac, 1 lb.; sal-soda, ½ lb.; water, 3 parts; boil all together in a kettle, stirring till dissolved. If it does not all dissolve, add a little more sal-soda; when cool, bottle for use; mix up 2 quarts of oil paint as usual, any color desired, using no turpentine; put 1 pint of the gum shellac mixture with the oil paint when it becomes thick; it can then be reduced with water to a proper thickness to lay on with a brush.

Another Method.—Soft water, 1 gallon; dissolve it in pearlash, 3 oz.; bring to a boil, and slowly add shellac, 1 lb.; when cold it is ready to be added to oil paint in equal proportions.

How to build Gravel Houses.—This is the best building material in the world. It is four times cheaper than wood, six times

cheaper than stone, and superior to either. Proportions for mixing: To eight barrows of slacked lime, well deluged with water, add 15 barrows of sand; mix these to a creamy consistency, then add 60 barrows of coarse gravel, which must be worked well and completely; you can then throw stones into this mixture, of any shape or size, up to ten inches in diameter. Form moulds for the walls of the house by fixing boards horizontally against upright standards which must be immovably braced so that they will not yield to the immense pressure outwards as the material settles; set the standards in pairs around the building where the walls are to stand, from six to eight feet apart, and so wide that the inner space shall form the thickness of the wall. Into the moulds thus formed throw in the concrete material as fast as you choose, and the more promiscuously the better. In a short time the gravel will get as hard as the solid rock.

Flexible Paint for Canvas.—Yellow soap, 2½ lbs., boiling water, 1½ gals., dissolve; grind the solution while hot with *good oil paint*, 1¼ cwt. Use for canvas.

Painter's Cream.—Pale nut oil, 6 oz., mastic, 1 oz., dissolve; add of sugar of lead, ¼ oz., previously ground in the least possible quantity of oil, then add of water *q. s.*, gradually, until it acquires the consistency of cream, working it well all the time. Used to cover the unfinished work of painters. It will wash off with water.

Mastic Cement for Covering the Fronts of Houses.—Fifty parts, by measure, of clean dry sand, fifty of limestone (not burned) reduced to grains like sand, or marble dust, and ten parts of red lead, mixed with as much boiled linseed oil as will make it slightly moist. The bricks to receive it should be covered with three coats of boiled oil, laid on with a brush, and suffered to dry before the mastic is put on. It is laid on with a trowel like plaster, but it is not so moist. It becomes hard as stone in a few months. Care must be exercised not to use too much oil.

Cement for Outside of Brick Walls.—Cement for the outside of brick walls, to imitate stone, is made of clean sand, 90 parts; litharge, 5 parts; plaster of Paris, 5 parts; moistened with boiled linseed oil. The bricks should receive two or three coats of oil before the cement is applied.

Cement for Tile Roofs.—Equal parts of whiting and dry sand, and 25 per cent. of litharge, made into the consistency of putty with linseed oil. It is not liable to crack when cold, nor melt, like coal-tar and asphalt, with the heat of the sun.

Excellent Cheap Roofing.—SHINGLES SUPERSEDED.—Have your roof stiff. rafters made of stuff 1½ by 8 inches, well supported and 6 feet apart, with ribs 1 inch by 2 inches, set edgeways, well nailed to the rafters, about 18 inches apart. The boards may be thin, but must be well seasoned, and nailed close together; this done, lay down and cover the roof with thin, soft, spongy straw paper used in making paper-boxes, which comes in rolls, and comes

very low. Lay in course up and down the roof, and lap over, nailing down with common No. 6 tacks, with leather under the heads like carpet-tacks. Then spread on several coatings of the following composition, previously boiled, stirred, and mixed together: good clean tar, 8 gals.; Roman cement, 2 gals. (or in its place very fine, clean sand may be used;) resin, 5 lbs.; tallow, 3 lbs.; apply hot; and let a hand follow, and shift on sharp grit sand, pressing it into the tar composition. If wished fire-proof, go over the above with the following preparation: Slake stone lime under cover with hot water till it falls into a fine powder; sift and mix 6 qts. of this with 1 qt. salt, add 2 gals. water, boil and skim. To 5 gals. of this add 1 lb. alum, and 1½ lbs. of copperas, and slowly, while boiling, 1½ lbs. potash, and 4 qts. of clean, sharp sand, and any coloring desired. Apply a thick coat with a brush, and you may have a roof which no fire can injure from the outside.

Water Lime at Fifty Cents per Barrel.—Fine, clean sand, 100 lbs.; quick lime in powder, 28 lbs.; bone-ashes, 14 lbs.; for use, beat up with water, and use as quick as possible.

To Render Wood Indestructible.—ROBBINS'S PROCESS.—This seems to be a process of inestimable value, and destined to produce very important results. The apparatus used consists of a retort or still, which can be made of any size or form, in which resin, coal tar, or other oleaginous substances, together with water, are placed in order to subject them to the action of heat. Fire being applied beneath the retort containing the coal tar, &c., oleaginous vapor commences to rise, and pass out through a connecting pipe into a large iron tank or chamber (which can also be built of any size), containing the timber, &c., to be operated upon. The heat acts at once on the wood, causing the sap to flow from every pore, which, rising in the form of steam, condenses on the body of the chamber, and discharges through an escape pipe in the lower part. In this process a temperature of 212° to 250° Fahr. is sufficient to remove the surface moisture from the wood; but after this the temperature should be raised to 300° or more, in order to completely saturate and permeate the body of the wood with the antiseptic vapors and heavier products of the distillation. The hot vapor coagulates the albumen of the wood, and opens the pores, so that a large portion of the oily product or creosote is admitted; the contraction resulting from the cooling process hermetically seals them, and decay seems to be almost impossible. There is a man hole in the retort, used to change or clean out the contents; and the wood chamber is furnished with doors made perfectly tight. The whole operation is completed in less than one hour, rendering the wood proof against rot, parasites, and the attacks of the *Teredo navilis* or naval worm.

Cement for Seams In Roofs.—Take equal quantities of white lead and white sand, and as much oil as will make it into the consistence of putty. It will in a few weeks become as hard as stone.

Roman Cement.—Drift sand, 84 parts; unslacked lime, 12 lbs.; and 4 lbs. of the poorest cheese grated; mix well; add hot (not boiling) water to reduce to a proper consistence for plastering. Work well and quick with a thin, smooth coat.

Smalt.—Roast cobalt ore to drive off the arsenic; make the residuum into a paste with oil of vitriol, and heat it to redness for an hour; powder, dissolve in water, and precipitate the oxide of iron by carbonate of potash, gradually added until a rose-colored powder begins to fall; then decant the clear, and precipitate by a solution of silicate of potash prepared by fusing together for 5 hours a mixture of 10 parts of potash, 15 parts of finely ground flints, and 1 part charcoal. The precipitate, when dry, may be fused and powdered very fine.

Fictitious Linseed Oil.—Fish or vegetable oil, 100 gallons; acetate of lead, 7 lbs.; litharge, 7 lbs.; dissolved in vinegar, 2 gallons. Well mixed with heat, then add boiled oil, 7 gallons; turpentine, 1 gallon. Again well mix.

Varnishes.—Common Oil Varnish.—Resin, 4 lbs.; beeswax, ½ lb.; boiled oil, 1 gallon; mix with heat; then add spirits turpentine, 2 quarts.

Mastic Varnish.—Mastic, 1 lb.; white wax, 1 oz.; spirits turpentine, 1 gallon; reduce the gums small; then digest it with heat in a close vessel till dissolved.

Turpentine Varnish.—Resin, 1 lb.; boiled oil, 1 lb.; melt; then add turpentine, 2 lbs. Mix well.

Pale Varnish.—Pale African copal, 1 part; fuse. Then add hot pale oil, 2 parts. Boil the mixture till it is stringy; then cool a little, and add spirits turpentine, 3 parts.

Lacquer Varnish.—A good lacquer is made by coloring lacquer varnish with turmeric and annotto. Add as much of these two coloring substances to the varnish as will give it the proper color; then squeeze the varnish through a cotton cloth, when it forms lacquer.

Deep Gold-Colored Lacquer.—Seed lac, three ounces; turmeric, one ounce; dragon's blood, one-fourth ounce; alcohol, one pint; digest for a week, frequently shaking; decant, and filter.

Lacquers are used upon polished metals and wood to impart the appearance of gold. If yellow is required, use turmeric, aloes, saffron, or gamboge; for red, use annotto, or dragon's blood, to color. Turmeric, gamboge, and dragon's blood generally afford a sufficient range of colors.

Gold Varnish.—Digest shellac, sixteen parts gum sandarach mastic, of each three parts; crocus, one part; gum gamboge, two parts; all bruised, with alcohol, one hundred and forty-four parts. Or, digest seedlac, sandarach, mastic, of each eight parts; gamboge, two parts; dragon's blood, one part; white turpentine, six parts; turmeric, four parts; bruised with alcohol, one hundred and twenty parts.

Gold Lacquer.—Put into a clean four-gallon tin 1 pound of ground turmeric, 1½ ozs. of gamboge, 3½ lbs. of powdered gum sandarach, ¾ of a lb. of shellac, and two gallons of spirits of wine. When shaken, dissolved, and strained, add 1 pint of turpentine varnish, well mixed.

Polish for Turner's Work.—Dissolve sandarach, 1 oz., in spirits of wine, ½ pt.; next shave beeswax, 1 oz.; and dissolve it in a sufficient quantity of spirits turpentine to make it into a paste; add the former mixture by degrees to it, then with a woolen cloth apply it to the work while it is in motion in the lathe, and with a soft linen rag polish it. It will appear as if highly varnished.

Varnish for Tools.—Take tallow, 2 oz.; resin, 1 oz., and melt together. Strain while hot to get rid of specks which are in the resin; apply a slight coat on your tools with a brush, and it will keep off rust for any length of time.

Gold Varnish.—Turmeric, 1 dram; gamboge, 1 dram; turpentine, 2 pints; shellac, 5 oz.; sandarach, 5 oz.; dragon's blood, 8 drams; thin mastic varnish, 8 oz.; digest with occasional agitation for 14 days; then set it aside to fine, and pour off the clear.

Book-Binder's Varnish.—Shellac, eight parts; gum benzoin, 3 parts; gum mastic, two parts; bruise, and digest in alcohol, 48 parts; oil of lavender, ½ part. Or, digest shellac, 4 parts; gum mastic, 2 parts; gum dammer and white turpentine, of each 1 part; with alcohol (95 per cent.), 28 parts.

Beautiful Pale Amber Varnish.—Amber, pale and transparent, 6 lbs.; fuse; add hot clarified linseed oil, 2 gals.; boil till it strings strongly, cool a little, and add oil of turpentine, 4 gals. This soon becomes very hard, and is the most durable of oil varnishes. When wanted to dry quicker, drying oil may be substituted for linseed, or "driers" may be added during the cooling.

Black Coach-Varnish.—Amber, 1 lb.; fuse; add hot *drying* oil, ½ pt.; powdered black resin and Naples asphaltum, of each 3 oz. When properly incorporated and considerably cooled, add oil of turpentine, 1 pt.

Body Varnish.—Finest African copal, 8 lbs.; fuse carefully; add clarified oil, 2 gals.; boil gently for 4½ hours, or until quite stringy; cool a little, and thin with oil of turpentine, 3½ gals. *Dries slowly.*

Carriage Varnish.—Sandarach, 10 oz.; pale shellac, 9½ oz.; very pale transparent resin, 12½ oz.; turpentine, 18 oz.; 85 per cent. alcohol, 5 pts.; dissolve. Used for the internal parts of carriages, &c. Dries in ten minutes.

Cabinet-Maker's Varnish.—Very pale shellac, 5 lbs.; mastic, 7 oz.; alcohol, 90 per cent, 5 or 6 pts.; dissolve in the cold with frequent stirring. Used for French polishing, &c.

Japanner's Copal Varnish.—Pale African copal, 7 lbs; fuse;

add clarified linseed oil, ½ gal.; boil five minutes, remove it into the open air; add boiling oil of turpentine, 3 gals.; mix well, strain it into the cistern, and cover it up immediately. Used to varnish furniture, and by japanners, coachmakers, &c.

Copal Varnish.—Pale, hard copal, 8 lbs.; add hot and pale drying oil, 2 gals.; boil till it strings strongly, cool a little, and thin with hot rectified oil of turpentine, 3 gals.; and strain immediately into the store can. Very fine.

Gold Varnish of Watin, for Gilded Articles.—Gumlac in grains, gamboge, dragon's blood, and annotto, of each 12½ oz.; saffron, 3½ oz. Each resin must be dissolved separately in 5 pts. of 90 per cent. alcohol, and two separate tinctures must be made with the dragon's blood and annotto in a like quantity of spirit; and a proper proportion of each mixed together to produce the required shade.

Varnish for Plaster Casts.—White soap and white wax, each ½ oz.; water, 2 pts.; boil together in a clean vessel for a short time. This varnish is to be applied when cold with a soft brush.

Transparent Varnish for Ploughs, &c.—Best alcohol, 1 gal.; gum sandarach, 2 lbs.; gum mastic, ½ lb.; place all in a tin can which admits of being corked; cork tight, shake it frequently, occasionally placing the can in hot water. When dissolved, it is ready for use.

Fine Black Varnish for Coaches.—Melt in an iron pot, amber, 32 oz.; resin, 6 oz.; asphaltum, 6 oz.; drying linseed oil, 1 pt.; when partly cooled, add oil of turpentine, warmed, 1 pint.

Mordant Varnish.—Dissolve 1 oz. mastic, 1 oz. sandarach, ½ oz. gum gamboge, and ¼ oz. turpentine in 6 oz. spirits turpentine. One of the simplest mordants is that procured by dissolving a little honey in thick glue. It has the effect of greatly heightening the color of the gold, and the leaf sticks extremely well.

Changing Varnish.—To imitate Gold or Silver, &c. Put 4 oz. best gum gamboge into 32 oz. spirits of turpentine; 4 oz. dragon's blood into 32 oz. spirits turpentine, and 1 oz. of annotto into 8 oz. spirits turpentine. Make the 3 three mixtures in different vessels. Keep them in a warm place, exposed to the sun as much as possible, for about 2 weeks, when they will be fit for use. Add together such quantities of each liquor as the nature of the color you are desirous of obtaining will point out.

Varnish, Transparent, for Wood.—Best alcohol, 1 gal.; nice gum shell, 2½ lbs. Place the jug or bottle in a situation to keep it just a little warm, and it will dissolve quicker than if hot, or left cold.

Patent Varnish for Wood or Canvas.—Take spirits of turpentine, 1 gal.; asphaltum, 2¼ lbs.; put them into an iron kettle which will fit upon a stove, and dissolve the gum by heat. When dissolved and a little cool, add copal varnish, 1 pt.; and boiled linseed oil, 1 pt.; when cold it is ready for use. Perhaps a little lampblack would make it a more perfect black.

Beautiful Varnish for Violins, &c. — Rectified spirits of wine, ½ gal.; add 6 oz. gum sandarach, 3 oz. gum mastic, and ½ pint turpentine varnish; put the above in a tin can by the stove, frequently shaking till well dissolved; strain, and keep for use. If you find it harder than you wish, thin with more turpentine-varnish.

Crimson Satin for Musical Instruments.—Ground Brazil wood, 1 lb.; water, 3 quarts; cochineal, ½ ounce; boil the Brazil with the water for an hour, strain, add the cochineal, boil gently for half an hour, when it will be fit for use. If you wish a *scarlet tint*, boil an ounce of saffron in a quart of water, and pass over the work before you stain it.

urple Satin.—Chipped logwood, 1 lb.; water, 3 quarts; pearl-ash, 4 ounces; powdered indigo, 2 ounces. Boil the logwood in the water half an hour, add the pearl-ash and indigo, and when dissolved you will have a beautiful purple.

Green Stain.—Strong vinegar, 3 pints; best verdigris, 4 oz. ground fine; sap green, ½ ounce; mixed together.

Black Stains for Wood.—1. Drop a little sulphuric acid into a small quantity of water; brush over the wood, and hold it to the fire; it will be a fine black, and receive a good polish. 2. For a beautiful black on wood, nothing can exceed the *black Japan* mentioned under Tinsmith's Department. Apply two coats; after which, varnish and polish it. 3. To 1 gallon vinegar, add a quarter of a pound of iron-rust; let it stand for a week; then add a pound of dry lamp-black, and three quarters of a pound of copperas; stir it up for a couple of days. Lay on five or six coats with a sponge, allowing it to dry between each; polish with linseed oil and a soft woolen rag, and it will look like ebony. Incomparable for iron work, ships' guns, shot, &c. 4. Vinegar, ½ gallon; dry lamp-black, ½ lb.; iron-rust sifted, 3 lbs.; mix, and let stand for a week. Lay three coats of this on hot, and then rub with linseed oil, and you will have a fine deep black. 5. Add to the above stain nut-galls, 1 oz.; logwood chips, ½ lb.; copperas, ¼ lb.; lay on three coats; oil well, and you will have a black stain that will stand any kind of weather, and is well adapted for ships' combings, &c. 6. Logwood chips, 1 lb.; Brazil wood, ¼ lb.; boil for 1½ hours in one gallon water. Brush the wood with this decoction while hot; make a decoction of nutgalls, by simmering gently, for three or four days, a quarter of a pound of the galls in 2 quarts water; give the wood three coats, and, while wet, lay on a solution of sulphate of iron (2 oz. to a quart,) and, when dry, oil or varnish. 7. Give three coats with a solution of copper-filings in aquafortis, and repeatedly brush over with the logwood decoction until the greenness of the copper is destroyed. 8. Boil ½ lb. logwood chips in 2 quarts water; add an ounce of pearl-ash, and apply hot with a brush. Then take 2 quarts of the logwood decoction, and ½ oz. of verdigris, and the same of copperas; strain, and throw in ½ lb. of iron-rust. Brush the work well with this, and oil.

Rose-wood Stain, Light Shade.—Equal parts of logwood and red-wood chips; boil well in water sufficient to make a strong stain; apply it to the furniture while hot, 2 or 3 coats, according to the depth of color desired.

Rose Pink Stain and Varnish.—Put 1 oz. of potash in 1 qt. water, with red sanders, 1½ oz.; extract the color from the wood, and strain; then add gum shellac, ½ lb.; dissolve it by a brisk fire. Used upon logwood stain for rosewood imitation.

Blue Stain for Wood.—1. Dissolve copper-filings in aqua-fortis, brush the wood with it, and then go over the work with a hot solution of pearlash (2 oz. to 1 pint water) till it assumes a perfectly blue color. 2. Boil 1 lb. of indigo, 2 lbs. wood, and 3 oz. alum, in 1 gallon water; brush well over until thoroughly stained.

Imitation of Botany Bay Wood.—Boil ½ lb. of French berries (the unripe berries of the *Rhamnus infectorius*) in 2 quarts water till of a deep yellow, and, while boiling hot, give two or three coats to the work. If a deeper color is desired, give a coat of logwood decoction over the yellow. When nearly dry, form the grain with No. 8 *black stain*, used hot; and, when dry, rust and varnish.

Mahogany Color.—DARK.—1. Boil ½ lb. of madder and 2 oz. logwood chips in a gallon of water, and brush well over while hot; when dry, go over the whole with pearlash solution, 2 drs. to the quart. 2. Put 2 oz. dragon's blood, bruised, into a quart of oil of turpentine; let the bottle stand in a warm place; shake frequently, and, when dissolved, steep the work in the mixture.

Box Wood Brown Stain.—Hold your work to the fire, that it may receive a gentle warmth; then take aquafortis, and, with a feather, pass it over the work till you find it change to a fine brown (always keeping it near the fire;) you may then varnish or polish it.

Light Brown Red.—Boil ½ lb. madder and ¼ lb. fustic in 1 gal. water; brush over the work, when boiling hot, until properly stained. 2. The surface of the work being quite smooth, brush over with a weak solution of aquafortis, ½ oz. to the pint; then finish with the following: Put 4½ oz. dragon's blood and 1 oz. soda, both well bruised, to 3 pints spirits of wine; let it stand in a warm place, shake frequently, strain, and lay on with a soft brush, repeating until of a proper color. Polish with linseed oil or varnish.

Purple.—Brush the work several times with the logwood decoction used for *No. 6 Black;* and, when dry, give a coat of pearlash solution, 1 drachm to a quart; lay it on evenly.

Red.—1. Boil 1 lb. Brazil wood and 1 oz. pearlash in 1 gallon water; and, while hot, brush over the work until of a proper color. Dissolve 2 oz. alum in 1 quart water, and brush the solution over the work before it dries. 2. Take a gallon of the above stain, add 2 oz. more pearlash; use hot, and brush over with the alum solution. 3. Use a cold solution of archil, and brush over with the pearlash solution used for No. 1 *dark mahogany.*

Ebony Stain.—Infuse gall-nuts in vinegar wherein you have soaked rusty nails; then rub your wood with this; let it dry, polish and burnish.

Bright Yellow Stain.—1. Brush over with the tincture of turmeric. 2. Warm the work, and brush it over with weak aquafortis; varnish or oil as usual. 3. A very small bit of aloes put into the varnish will give a rich yellow color to the wood.

Extra Black Stain for Wood.—Pour 2 qts. boiling water over 1 oz. of powdered extract of logwood, and, when the solution is effected, 1 dr. of yellow chromate of potash is added, and the whole well stirred. It is then ready for use as a wood-stain, or for writing ink. When rubbed on wood, it produces a pure black. Repeat with two, three, or four applications, till a deep black is produced, which acquires the highest beauty when polished or stained.

Imitation of Mahogany.—Let the first coat of painting be white lead; the second, orange; and the last, burnt umber or sienna; imitating the veins according to your taste and practice.

To Imitate Wainscot.—Let the first coat be white; the second, half white and half yellow; and the third, yellow ochre only; shadow with umber or sienna.

To Imitate Satin Wood.—Take white for your first coating, light blue for the second, and dark blue or dark green for the third.

Rosewood Satin, very Bright Shade.—USED COLD.—Take alcohol, 1 gal.; camwood, 2 oz.; set them in a warm place, 24 hours; then add extract of logwood, 3 oz.; aquafortis, 1 oz.; and when dissolved it is ready for use; it makes a very bright ground, like the most beautiful rosewood; one, two, or more coats as you desire, over the whole surface.

Varnish for Frames, Etc.—Lay the frames over with tin or silver foil by means of plaster of Paris, or cement of some kind, that the foil may be perfectly adherent to the wood; then apply your gold lacquer varnish, which is made as follows: ground turmeric, 1 lb.; powdered gamboge, 1¼ ounces; powdered sandarach, 3½ lbs.; powdered shellac, ¾ lb.; spirits of wine, 2 gals.; dissolve, and strain; then add turpentine varnish, 1 pt.; and it is ready for use.

Cherry Stain.—Rain water, 3 qts.; annotto, 4 oz.; boil in a copper kettle till the annotto is dissolved, then put in a piece of potash the size of a walnut, keep it on the fire about half an hour longer, and it is ready to bottle for use.

Black Walnut Stain.—Let the surface of the wood, after being thoroughly sand-papered, be washed with weak alum water, and then treated with linseed oil colored with burnt umber and red lead. The umber should be thoroughly burned, but the coloring matter not made too strong; it is better to have it rather light, and renew the application. When this has sufficiently dried, go over the surface with a strong sizing of glue (transparent), and then use two coats of good copal varnish.

Miscellaneous Stains.—YELLOW is produced by diluted nitric acid. RED is produced by a solution of dragon's blood in spirits of wine. BLACK is produced by a strong solution of nitric acid. GREEN is produced by a solution of verdigris in nitric acid. Then dipped in a hot solution of pearlash produces a BLUE stain. PURPLE is produced by a solution of sal-ammoniac in nitric acid.

Finishing with one Coat of Varnish.—VALUABLE PROCESS.—Give the furniture a coat of boiled linseed oil, then immediately sprinkle dry whiting upon it, and rub it in well with your hand, or a stiff brush, all over the surface; the whiting absorbs the oil, and fills the pores of the wood completely. For black walnut, add a little burned umber to the whiting; for cherry, a little Venetian red, &c., according to the color of the wood. Turned work can have it applied while in motion in the lathe. Furniture can afterwards be finished with only one coat of varnish.

Polishes.—CARVER'S POLISH.—White resin, 2 oz.; seed lac, 2 oz.; spirits of wine, 1 pt. Dissolve. It should be laid on warm. Avoid moisture and dampness when used.

2. FRENCH POLISH.—Gum shellac, 1 oz.; gum arabic, ¼ oz.; gum copal, ¼ oz. Powder, and sift through a piece of muslin; put them in a closely corked bottle with 1 pt. spirits of wine, in a very warm situation, shaking every *day* till the gums are dissolved; then strain through muslin, and cork for use.

3. POLISH FOR DARK-COLORED WOODS.—Seed lac, 1 oz.; gum guaiacum, 2 drs.; dragon's blood, 2 drs.; gum mastic, 2 drs.; put in a bottle with 1 pt. spirits of wine, cork close, expose to a moderate heat till the gums are dissolved; strain into a bottle for use, with ¼ gill of linseed oil; shake together.

4. WATER-PROOF POLISH.—Gum benjamin, 2 oz.; gum sandarach, ¼ oz.; gum anima, ¼ oz.; spirits of wine, 1 pt. Mix in a closely stopped bottle, and place either in a sand bath or in hot water till the gums are dissolved, then strain off the mixture, shake it up with a ¼ gill of the best clear poppy oil, and put it by for use.

5. FINISHING POLISH.—Gum shellac, 2 drs.; gum benjamin, 2 drs.; put into ½ pint of best rectified spirits of wine in a bottle closely corked, keep in a warm place, shaking frequently till the gums are dissolved. When cold, shake up with it two teaspoonfuls of the best clear poppy oil.

Polish for Removing Stains, Spots, and Mildew from Furniture.—Take of 98 per cent. alcohol, ½ pt.; pulverized resin and gum shellac, of each, ¼ oz. Let these cut in the alcohol; then add linseed oil, ½ pt.; shake well, and apply with a sponge, brush, or cotton flannel, or an old newspaper, rubbing it well after the application, which gives a nice polish.

Polish for Reviving Old Furniture, Equal to the "Brother Jonathan."—Take alcohol, 1½ oz.; spirits of salts (muriatic acid), ½ oz.; linseed oil, 8 oz.; best vinegar, ½ pt.; and butter of antimony, 1½ oz.; mix, putting in the vinegar last.

Jet or Polish fer Wood or Leather, Black, Red, or Blue.—Alcohol (98 per cent.), 1 pt.; sealing wax, the color desired, 3 sticks; dissolve by heat, and have it warm when applied. A sponge is the best to apply it with.

Furniture Pastes.—1. Beeswax, spirits of turpentine and linseed oil, equal parts; melt and cool. 2. Beeswax, four oz.; turpentine, 10 oz.; alkanet root, to color; melt and strain. 3. Beeswax, 1 lb.; linseed oil, 5 oz.; alkanet root, one-half ounce; melt, add 5 oz. of turpentine; strain and cool. 4. Beeswax, 4 oz; resin, 1 oz.; oil of turpentine, 2 oz.; Venetian red, to color.

Furniture Polish.—Beeswax, ½ lb.; and a ¼ oz. of alkanet root; melt together in a pipkin until the former is well colored. Then add linseed oil and spirits of turpentine, of each ½ a gill; strain through a piece of coarse muslin.

French Polishes.—1. Shellac, 3 lbs.; wood naphtha, 3 pts.; dissolve. 2. Shellac, 2 lbs.; powdered mastic and sandarach, of each, 1 oz.; copal varnish, ½ pt.; spirits of wine, 1 gal. Digest in the cold till dissolved.

Furniture Paste.—1. Turpentine, 1 pt.; alkanet root, ½ oz.; digest until sufficiently colored, then add beeswax, scraped small, 4 oz.; put the vessel into hot water, and stir till dissolved. If wanted *pale*, the alkanet root should be omitted. 2 (*White.*) White wax, 1 lb.; liquor of potassa, ½ gal.; boil to a proper consistence. 3. Beeswax, 1 lb.; soap, ¼ lb.; pearlash, 3 oz. (dissolved in water, ½ gal., and strained,) boil as last. 4. Yellow wax, 16 parts; resin, 1 part; alkanet root, 1 part; turpentine, 6 parts; linseed oil, 6 parts. First steep the alkanet in the oil with heat, and, when well colored, pour off the clear on the other ingredients, and again heat till all are dissolved.

Furniture Cream.—Beeswax, 1 lb.; soap, 4 oz.; pearlash, 2 oz.; soft water, 1 gal., boil together until mixed.

Furniture Oils.—1. Acetic acid, 2 dr.; oil of lavender, ½ dr.; rectified spirit, 1 dr.; linseed oil, 4 oz. 2. Linseed oil, 1 pt.; alkanet root, 2 oz.; heat, strain and add lac varnish, 1 oz. 3. Linseed oil, 1 pt.; rectified spirit, 2 oz.; butter of antimony, 4 oz.

Mosaic Gold Powder for Bronzing.—Melt 1 lb. tin in a crucible, and ½ lb. of purified quicksilver to it; when this is cold, it is reduced to powder, and ground, with ½ lb. sal-ammoniac and 7 oz. flour of sulphur, till the whole is thoroughly mixed. They are then calcined in a matrass; and the sublimation of the other ingredients leaves the tin converted into the mosaic gold powder which is found at the bottom of the glass. Remove any black or discolored particles. The sal-ammoniac used must be very white and clear, and the mercury of the utmost purity. When a deeper red is required, grind a very small quantity of red lead with the above materials.

True Gold Powder.—Put some gold-leaf, with a little honey, or thick gum-water made with gum arabic, into an earthen mortar, and pound the mixture till the gold is reduced to very small parti-

cles; then wash out the honey or gum repeatedly with warm water, and the gold in powder will be left behind. When dry, it is fit for use.

Dutch Gold Powder is made from Dutch gold-leaf, which is sold in books at a very low price. Treat in the manner described above for true gold powder. When this inferior powder is used, cover the gilding with a coat of clear varnish, otherwise it will soon lose its bright appearance.

Copper Powder is prepared by dissolving filing or slips of copper with nitrous acid in a receiver. When the acid is saturated, the slips are to be removed; or, if filings be employed, the solution is to be poured off from what remains undissolved. Small bars are then put in, which will precipitate the copper powder from the saturated acid: and, the liquid being poured from the powder, this is to be washed clean of the crystals by repeated waters.

General Directions for Bronzing.—The choice of the above powders is, of course, determined by the degree of brilliancy you wish to obtain. The powder is mixed with strong gum-water or isinglass, and laid on with a brush or pencil; and, when not so dry as to have still a certain clamminess, a piece of soft leather wrapped round the finger is dipped in the powder, and rubbed over the work. When the work has been all covered with the bronze, it must be left to dry, and any loose powder then cleared away by a hair-pencil.

The Bronzing of Plaster Casts is effected by giving them a coat of oil or size varnish, and when this is nearly dry applying with a dabber of cotton or a camel hair-pencil any of the metallic bronze powders; or the powder may be placed in a little bag of muslin, and dusted over the surface, and afterwards finished with a wad of linen. The surface must be afterwards varnished.

Bronzing Iron.—The subject should be heated to a greater degreee than the hand can bear, and German gold, mixed with a small quantity of spirit-of-wine varnish, spread over it with the pencil; should the iron be already polished, you must heat it well, and moisten it with a linen rag dipped in vinegar.

French Burnished Gilding.—*Encollage*, or glue coat.—To a decoction of wormwood and garlic in water, strained through a cloth, a little common salt and some vinegar are added. This is mixed with as much good glue, and the mixture spread in a hot state with a brush of boar's hair. When plaster or marble is gilded, leave out the salt. The first glue-coating is made thinner than the second. 2. *White preparation* consists in covering the above surface with 8, 10, or 12 coats of Spanish white, mixed up with strong size; each well worked on with the brush. 3. *Stop* up the pores with thick whiting and glue, and smooth the surface with dog-skin. 4. *Polish* the surface with pumice-stone and very cold water. 5. *Retouch* the whole in a skilful manner. 6. *Cleanse* with a damp linen rag, and then a soft sponge. 7. *Rub* with a horse's tail (*shave-grass*)

the parts to be yellowed, to make them softer. 8. *Yellow* with *yellow ochre* carefully ground in water, and mixed with transparent colorless size. Use the thinner part of the mixture with a fine brush. 9. Next rub the work with shave-grass to remove any granular appearance. 10. *Gold-water size* consists of Armenian bole, 1 lb.; bloodstone (hematite), 2 oz.; and as much galena, each separately ground in water. Then mix all together with a spoonful of olive oil. This is tempered with a white sheep-skin glue, clear and well strained. Heat and apply three coats with a fine long-haired brush. 11. *Rub* with a clean, dry linen cloth, except the parts to be burnished, which are to receive other two coats of the gold size, tempered with glue. 12. The surface damped with cold water (iced in summer), has then the *gold-leaf* applied to it. Gild the *hollow* ground before the more prominent parts; water being dexterously applied by a soft brush, immediately behind the gold-leaf, before laying it down; removing any excess of water with a dry brush. 13. *Burnish* with bloodstone. 14. Next pass a thin coat of glue, slightly warmed, over the parts that are not to be burnished. 15. Next moisten any broken points with a brush, and apply bits of gold-leaf to them. 16. Apply the *vermeil* coat very lightly over the gold-leaf with a soft brush. It gives lustre and fire to the gold, and is made as follows: annotto, 2 oz.; gamboge, 1 oz.; vermilion, 1 oz.; dragon's blood, ½ oz.; salt of tartar, 2 oz.; saffron, 18 grs.; boil in 2 English pints of water, over a slow fire, till it is reduced to a fourth; then pass the whole through silk or muslin sieve. 17. Next pass over the dead surfaces a second coat of deadening glue, hotter than the first. This finishes the work and gives it strength.

Bronzing or Gilding Wood.—Pipe clay, 2 oz.; Prussian blue, patent yellow, raw umber, lampblack, of each, 1 oz.: grind separately with water on a stone, and as much of them as will make a good color put into a small vessel three-fourths full of size. The wood, being previously cleaned and smoothed, and coated with a mixture of clean size and lampblack, receives a new coating twice successively, with the above compound, having allowed the first to dry. Afterwards the bronze powder is to be laid on with a pencil, and the whole burnished or cleaned anew, observing to repair the parts which may be injured by this operation; next the work must be coated over with a thin layer of Castile soap, which will take the glare off the burnishing; and afterwards be carefully rubbed with a woolen cloth. The superfluous powder may be rubbed off when dry.

Bronze Powder of a PALE GOLD color is produced from an alloy of 13¼ parts of copper, and 2¾ parts zinc, of a CRIMSON METALLIC LUSTRE from copper, of a *paler color*, copper, and a very little zinc; GREEN bronze with a proportion of verdigris, of a fine ORANGE color, by 14½ parts copper and 1¾ zince; another ORANGE color, 13¾ parts copper and 2¼ zinc. The alloy is laminated into very fine leaves with careful annealing, and these are levigated into impalpable powders, along with a film of fine oil, to prevent oxidizement, and to favor the levigation.

Reviver for Gilt Frames.—White of eggs, 2 oz.; chloride of potash or soda, 1 oz.; mix well, blow off the dust from the frames; then go over them with a soft brush dipped in the mixture, and they will appear equal to new.

Gilding on Wood.—To gild in oil, the wood after being properly smoothed, is covered with a coat of *gold size*, made of drying linseed oil mixed with yellow ochre; when this has become so dry as to adhere to the fingers without soiling them, the gold leaf is laid on with great care and dexterity, and pressed down with cotton wool; places that have been missed are covered with small pieces of gold leaf, and when the whole is dry, the ragged bits are rubbed off with the cotton. This is by far the easiest mode of gilding: any other metallic leaves may be applied in a similar manner. PALE LEAF GOLD has a greenish yellow color, and is an alloy of gold and silver. Dutch gold leaf is only copper leaf colored with the fumes of zinc; being much cheaper than true gold leaf, it is very useful when large quantities of gilding are required in places where it can be defended from the weather, as it changes color if exposed to moisture; and it should be covered with varnish. SILVER LEAF is prepared every way the same as gold leaf; but when applied should be kept well covered with varnish, otherwise it is liable to tarnish; a transparent yellow varnish will give it the appearance of gold. Whenever gold is fixed by means of linseed oil, it will bear washing off, which burnished gold will not.

Best Color for Boot, Shoe, and Harness Edge.—Alcohol, 1 pint; tincture of iron, 1½ oz.; extract logwood, 1 oz.; pulverized nutgalls, 1 oz.; soft water, ½ pint; sweet oil, ½ oz.; put this last into the alcohol before adding the water. Nothing can exceed the beautiful finish imparted to the leather by this preparation. The only objection is the cost.

Cheap Color for the Edge.—Soft water, 1 gallon; extract logwood, 1 oz.; boil till the extract is dissolved; remove from the fire, and add copperas, 2 oz.; bi-chromate of potash and gum arabic, of each, ½ oz.; all to be pulverized.

Superior Edge Blacking.—Soft water, 5 gallons; bring to a boil, and add 8 oz. logwood extract, pulverized; boil 3 minutes, remove from the fire, and stir in 2½ oz. gum arabic, 1 oz. bi-chromate of potash, and 80 grains prussiate of potash.

For a small quantity of this, use water, 2 quarts; extract of logwood, ¾ oz.; gum arabic, 96 grains; bi-chromate of potash, 48 grains; prussiate of potash, 8 grains. Boil the extract in the water 2 minutes; remove from the fire, and stir in the others; and it is ready for use.

For tanners' surface blacking, which is not required to take on a high polish, the gum arabic may be omitted.

Sizing for Boots and Shoes in Treeing Out.—Water, 1 quart; dissolve in it by heat, isingiass, 1 oz.; adding more water

to replace loss by evaporation; when dissolved, add starch, 6 oz.; extract of logwood, beeswax, and tallow, of each 2 oz. Rub the starch up first by pouring on sufficient boiling water for that purpose. It makes boots and shoes soft and pliable, and gives a splendid appearance to old stock on the shelves.

Black Varnish for the Edge.—Take 98 per cent. alcohol, 1 pint; shellac, 3 oz.; resin, 2 oz.; pine turpentine, 1 oz.; lamp-black, ¼ oz.; mix; and when the gums are all cut, it is ready for use. This preparation makes a most splendid appearance when applied to boot, shoe, or harness edge, and is equally applicable to cloth or wood, where a gloss is required after being painted.

Best Harness Varnish Extant.—Alcohol, 1 gallon; white turpentine, 1½ lbs.; gum shellac, 1½ lbs.; Venice turpentine, 1 gill. Let them stand by the stove till the gums are dissolved, then add sweet oil, 1 gill; and color if you wish it with lamp-black, 2 oz. This will not crack like the old varnish.

Another.—Isinglass, or gelatine, and indigo, of each, ¼ oz.; logwood, 4 oz.; soft soap, 2 oz ; glue, 4 oz.; vinegar, 1 pint; mix by heat, and strain.

Brilliant French Varnish for Leather.—Spirit of wine, ¾ pint; vinegar, 5 pints; gum senegal in powder, ½ lb.; loaf sugar, 6 oz.; powdered galls, 2 oz.; green copperas, 4 oz. Dissolve the gum and sugar in the water; strain, and put on a slow fire, but don't boil; now put in the galls, copperas, and the alcohol; stir well for five minutes; set off; and when nearly cool strain through flannel, and bottle for use. It is applied with a pencil brush. Most superior.

Liquid Japan for Leather.—Molasses, 8 lbs.; lamp-black, 1 lb.; sweet oil, 1 lb.; gum arabic, 1 lb.; isinglass, 1 lb. Mix well in 32 lbs. water; apply heat; when cool, add 1 quart alcohol; an ox's gall will improve it.

Waterproof Oil Blacking.—Camphene, 1 pint; add all the India rubber it will dissolve; currier's oil, 1 pint; tallow, 7 lbs.; lamp-black, 2 oz. Mix thoroughly by heat.

Shoemaker's Heel Ball.—Beeswax, 8 oz.; tallow, 1 oz.; melt, and add powdered gum arabic, 1 oz., and lamp-black to color.

Cement for Leather or Rubber Soles and Leather Belting.—Gutta percha, 1 lb.; India rubber, 4 oz.; pitch, 2 oz.; shellac, 1 oz.; oil, 2 oz.; melt and use hot.

Oil Paste Blacking.—Ivory black, 4 lbs.; molasses, 3 lbs.; sweet oil, 1 lb.; oil vitriol, 3 lbs.; mix, and put in tins.

To Dye Leather Blue, Red, or Purple.—For *red*, steep it in alum water, then pass it through a warm decoction of Brazil wood; *blue*, steep in an indigo vat; *purple*, steep the skins in alum water, then put it in a warm decoction of logwood.

Gold Varnish.—Turmeric, 1 drachm; gamboge, 1 drachm; turpentine, 2 pints; shellac, 5 oz.; sandarach, 5 oz.; dragon's blood, 8

drachms; thin mastic varnish, 8 oz.; digest with occasional agitation for fourteen days; then set aside to fine, and pour off the clear.

Grain Black for Harness Leather.—First stain in tallow; then take spirits turpentine, 1 pint; cream of tartar, 1 oz.; soda, 1 oz.; gum shellac, ½ oz.; thick paste reduced thin, 2 quarts. Mix well. This will finish 12 sides.

Stains for Wood and Leather.—RED.—Brazil wood, 11 parts; alum, 4 parts; water, 85 parts. Boil.

BLUE.—Logwood, 7 parts; blue vitriol, 1 part; water, 22 parts. Boil.

BLACK.—Logwood, 9 parts; sulphate of iron, 1 part; water, 25 parts. Boil.

GREEN.—Verdigris, 1 part; vinegar, 3 parts. Dissolve.

YELLOW.—French berries, 7 parts; water, 10 parts; alum, 1 part. Boil.

PURPLE.—Logwood, 11 parts; alum, 3 parts; water, 29 parts. Boil.

Deer Skins.—TANNING AND BUFFING FOR GLOVES.—For each skin take a bucket of water, and put into it 1 quart of lime; let the skin or skins lie in from 3 to 4 days; then rinse in clean water, hair, and grain; then soak them in cold water to get out the glue; now scour or pound in good soap-suds for half an hour; after which take white vitriol, alum, and salt, 1 tablespoon of each to a skin; these will be dissolved in sufficient water to cover the skin, and remain in it for 24 hours; wring out as dry as convenient, and spread on with a brush ½ pint of currier's oil, and hang in the sun about two days; after which you will scour out the oil with soap-suds, and hang out again until perfectly dry; then pull and work them until they are soft; and if a reasonable time does not make them soft, scour in suds again as before, until complete. The oil may be saved by pouring or taking it from the top of the suds, if left standing for a short time. The buff color is given by spreading yellow ochre evenly over the surface of the skin, when finished, rubbing it in well with a brush.

TANNING WITH ACID.—After having removed the hair, scouring, soaking, and pounding in the suds, &c., as in the last recipe, in place of the white vitriol, alum, and salt, as there mentioned, take oil of vitriol (sulphuric acid,) and water, equal parts of each, and thoroughly wet the flesh side of the skin with it, by means of a sponge or cloth upon a stick; then folding up the skin, letting it lie for 20 minutes only, having ready a solution of sal-soda and water, say 1 lb. to a bucket of water, and soak the skin or skins in that for two hours, when you will wash in clean water, and apply a little dry salt, letting lie in the salt over night, or that length of time; then remove the flesh with a blunt knife, or, if doing business on a large scale, by means of the regular beam and flesh-knife; when dry or nearly so, soften by pulling and rubbing with the hands, and also with a piece of pumice-stone. This, of course, is the quickest

way of tanning, and by only wetting the skins with the acid, and soaking them out in 20 minutes, they are not rotted.

Another Method.—Oil of vitriol, ½ oz.; salt, 1 teacup; milk sufficient to handsomely cover the skin, not exceeding 3 qts., warm the milk, then add the salt and vitriol; stir the skin in the liquid 40 minutes, keeping it warm; then dry, and work it as directed in No. 4.

Liquid Red.—Channellers will find that no better or richer color for their purposes can be got than the red ink described under the Grocer's Department, diluted to the required shade. For color for the bottoms of shoes use tincture of red sanders.

Bridle Stain.—Skimmed milk, 1 pint; spirits of salts, ½ oz.; spts. of red lavender, ½ oz.; gum arabic, 1 oz.; and the juice of 2 lemons; mix well together, and cork for use; apply with a a sponge; when dry, polish with a brush or a piece of flannel. If wished paler, put in less red lavender.

Process of Tanning Calf, Kip, and Harness Leather in from Six to Thirty Days.—For a 12 lb. calf skin, take 3 lbs. of terra japonica, common salt 2 lbs.; alum, 1 lb.; put them into a copper kettle with sufficient water to dissolve the whole by boiling. The skin will be limed, haired, and treated every way as for the old process, when it will be put it into a vessel with sufficient water to cover it, at which time you will put in 1 pint of the composition stirring it well, adding the same amount each night and morning for 3 days, when you will add the whole, handling 2 or 3 times daily all the time tanning; you can continue to use the tanning liquid by adding half the quantity each time, by keeping these proportions for any amount. If you desire to give a bark color to the leather, you will put in 1 lb. of Sicily sumac; kip skins will require about 20 days, light house hides for harness 30 days, calf skins from 6 to 10 days at most.

To Tan Raw Hide.—When taken from the animal, spread it flesh side up; then put 2 parts of saltpetre and alum combined, make it fine, sprinkle it evenly over the surface, roll it up, let it alone a few days till dissolved; then take off what flesh remains, and nail the skin to the side of a barn in the sun; stretch tight, to make it soft like harness leather, put neat's foot oil on it, fasten it up in the sun again; then rub out all the oil you can with a wedge-shaped stick, and it is tanned with the hair on.

French Finish for Leather.—Take a common wooden pail-ful of scraps (the legs and pates of calf skins are best), and put a handful each of salt and alum upon them, and let them stand 3 days; then boil them until they get a thick paste; in using, you will warm it, and in the first application put a little tallow with it, and for the second time a little soft soap, and use it in the regular way of finishing, and your leather will be soft and pliable, like French leather.

French Patent Leather.—Work into the skin with appropriate tools 3 or 4 successive coatings of drying varnish, made by

boiling linseed oil with white lead and litharge, in the proportion of 1 lb. of each of the latter to 1 gal. of the former, and adding a portion of chalk or ochre, each coating being thoroughly dried before the application of the rest. Ivory black is then substituted for the chalk or ochre, the varnish thinned with spirits of turpentine, and five additional applications made in the same manner as before, except that it is put on thin and not worked in. The leather is rubbed down with pumice stone, in powder, and then placed in a room at 90 degrees, out of the way of dust. The last varnish is prepared by boiling ½ lb. of asphaltum with 10 lbs. of the drying oil used in the first stage of the process, and then stirring in 5 lbs. copal varnish and 10 lbs. of turpentine. It must have 1 month's age before using.

Cheap Tanning without Bark or Mineral Astringents.—The astringent liquor is composed of water, 17 gals.; Aleppo galls, ½ lb.; Bengal catechu, 1½ oz. and 5 lbs. of tormentil, or septfoil root. Powder the ingredients, and boil in the water 1 hour; when cool, put in the skins (which must be prepared by being plunged into a preparation of bran and water for 2 days previously); handle them frequently during the first 3 days, let them alone the next 3 days, then handle 3 or 4 times in one day; let them lie undisturbed for 25 days more, when the process will be complete.

Canadian Process.—The Canadians make 4 liquors in using the japonica.

The FIRST liquor is made by dissolving, for 20 sides of upper, 15 lbs. of terra japonica in sufficient water to cover the upper being tanned. The SECOND liquor contains the same amount of japonica, and 8 lbs. of saltpetre also. The THIRD contains 20 lbs. of japonica, and 4½ lbs. of alum. The FOURTH liquor contains only 15 lbs. of japonica, and 1½ lbs. of sulphuric acid; and the leather remains 4 days in each liquor for upper; and for sole the quantities and time are both doubled. They count 50 calf skins in place of 20 sides of upper, but let them lie in each liquor only 3 days.

Fifty Dollar Recipe for Tanning Fur and Other Skins.—Remove the legs and useless parts, soak the skin soft, and then remove the fleshy substances, and soak it in warm water one hour. Now take for each skin borax, saltpetre, and Glauber-salt, of each ½ oz. and dissolve or wet with soft water sufficient to allow it to be spread on the flesh side of the skin. Put it on with a brush, thickest in centre or the thickest part of the skin, and double the skin together, flesh side in; keeping it in a cool place for 24 hours, not allowing it to freeze. Then wash the skin clean, and take sal-soda, 1 oz.; borax, ½ oz.; refined soap, 2 oz.; melt them slowly together, being careful not to allow them to boil, and apply the mixture to the flesh side as at first. Boil up again, and keep in a warm place for 24 hours; then wash the skin clean again, as above, and have saleratus, 2 oz.; dissolved in hot rain water sufficient to well

saturate the skin; then take alum, 4 oz.; salt, 8 oz.; and dissolve also in hot rain water; when sufficiently cool to allow the handling of it without scalding, put in the skin for 12 hours; then wring out the water, and hang up for 12 hours more to dry. Repeat this last soaking and drying two or three times, according to the desired softness of the skin when finished. Lastly, finish by pulling and working, and finally by rubbing with a piece of pumice stone and fine sand paper. This works like a charm on sheep skins, fur skins, dog, wolf, bear skins, &c.

French Polish or Dressing for Leather.—Mix 2 pints best vinegar with 1 pt. soft water; stir into it ¼ lb. glue, broken up, ½ lb. logwood chips, ¼ oz. of finely powdered indigo, ¼ oz. of the best soft soap, ¼ oz. of isinglass; put the mixture over the fire, and let it boil ten minutes or more; then strain, bottle and cork. When cold, it is fit for use. Apply with a sponge.

Currier's Size.—Take of sizing, 1 qt.; soft soap, 1 gill; stuffing, 1 gill; sweet milk, ½ pt.; boil the sizing in water to a proper consistence, strain, and add the other ingredients; and when thoroughly mixed, it is ready for use.

Currier's Paste.—First Coat.—Take of water, 2 qts.; flour, ½ pint; Castile soap, 1 oz.; make into paste. Second Coat.—Take of first paste, ½ pt.; gum tragacanth, 1 gill; water, 1 pt.; mix all together. This will finish eighteen sides of upper.

Currier's Skirting.—This is for finishing skirting and the flesh of harness leather, in imitation of oak tanning. Take of chrome yellow, ½ lb.; yellow ochre, 1 lb.; cream of tartar, 1 oz.; soda, ½ oz.; paste, 5 qts.; mix well. This will finish twelve sides.

Skirting.—For the grain to imitate oak tan. Take of chrome yellow, ½ lb.; yellow ochre, ½ lb.; cream of tartar, 1 oz.; soda, 1 oz.; paste, 2 qts.; spirits of turpentine, 1 pt.; mix well. This will finish twelve sides.

Dyes for Leather.—Blue.—For each skin, take 1 oz. of indigo, put it into boiling water, and let it stand one night; then warm it a little, and with a brush smear the skin twice over, and finish the same as the red.

Red.—After the skin has been properly prepared with sheep, pigs' dung, &c., then take strong alum water, and sponge over your skin; when dry, boil a strong gall liquor (it cannot be too strong); then boil a strong Brazil wood liquor (the stronger the better); take a sponge, dip it into your liquor, and sponge it over your skin; repeat this till it comes to a full red. To finish your skin, take the white of eggs, and a little gum dragon, mix the two together in half a gill of water, sponge over your skin, and, when dry, polish off.

Yellow.—1. Infuse quercitron bark in vinegar, in which put a little alum, and brush over your skins with the infusion; finish the same as the red. 2. Take 1 pt. of whisky, 4 oz. turmeric; mix them well together; when settled sponge your skins over, and finish as above.

Black.—Put your skin on a clean board, sponge it over with gall and sumach liquors, strong; then take a strong logwood liquor, sponge it over three or four times; then take a little copperas, mix

it in the logwood liquor; sponge it over your skin, and finish it the same as the red.

PURPLE.—First sponge with the alum liquor strong, then with logwood liquor strong; or mix them both, and boil them, and sponge with the liquor, finish the same as the red. The pleasing hues of yellow, brown, or tan color, are readily imparted to leather by the following simple process: Steep saffron in boiling water for a number of hours, wet a sponge or soft brush in the liquor, and with it smear the leather. The quantity of saffron, as well as of water, will, of course, depend on how much dye may be wanted, and their relative proportions to the depth of color required.

To Marble Books or Paper.—Marbling of books or paper is performed thus: Dissolve four ounces of gum arabic in two quarts of fair water; then provide several colors mixed with water in pots or shells, and with pencils peculiar to each color; sprinkle them by way of intermixture upon the gum water, which must be put into a trough, or some broad vessel; then, with a stick, curl them, or draw them out in streaks to as much variety as may be done. Having done this, hold your book or books close together, and only dip the edges in, on the top of the water and colors, very lightly; which done, take them off, and the plain impression of the colors, in mixture, will be upon the leaves; doing as well the ends as the front of the book in like manner, and afterwards glazing the colors.

ookbinder's Varnish.—Shellac, eight parts; gum benzoin, 3 parts; gum mastic, two parts; bruise, and digest in alcohol, forty-eight parts; oil of lavender, one-half part. Or digest shellac, four parts; gum mastic, two parts; gum dammer and white turpentine, of each, one part; with alcohol (95 per cent.,) twenty-eight parts.

Red Sprinkle for Bookbinder's Red.—Brazil wood (ground,) 4 parts; alum, 1 part; vinegar, 4 parts; water, 4 parts. Boil until reduced to 7 parts, then add a quantity of loaf sugar and gum; bottle for use.

BLUE.—Strong sulphuric acid, 8 oz.; Spanish indigo, powdered, 2 oz.; mix in a bottle that will hold a quart, and place it in a warm bath to promote solution. For use, dilute a little to the required color in a tea-cup.

BLACK.—No better black can be procured than that made by the receipt for surface blacking, in this work, which see.

ORANGE COLOR.—Ground Brazil wood, 16 parts; annotto, 4 parts; alum, sugar, and gum arabic, each 1 part; water, 70 parts; boil, strain, and bottle.

PURPLE.—Logwood chips, 4 parts; powdered alum, 1 part; soft water, 24 parts; boil until reduced to 16 parts, and bottle for use.

GREEN.—French berries, 1 part; soft water, 8 parts. Boil and add a little powdered alum; then bring it to the required shade of green by adding liquid blue.

BROWN.—Logwood chips, 1 part; annotto, 1 part; boil in water, 6 parts; if too light, add a piece of copperas the size of a pea.

Tree Marble.—A marble in the form of trees may be done by

bending the boards a little on the centre, using the same method as the common marble, having the covers previously prepared. The end of a candle may be rubbed on different parts of the board to form knots.

RICE-MARBLE.—Color the cover with spirits of wine and turmeric, then place on rice in a regular manner, throw on a very fine sprinkle of copperas water till the cover is nearly black, and let it remain till dry. The cover may be spotted with the red liquid or potash water, very freely, before the rice is thrown off the boards.

SPOTTED MARBLE FOR BOOKS, ETC.—After the fore-edge of the book is cut, let it remain in the press, and throw on linseeds in a regular manner, sprinkle the edge with any dark color till the paper is covered, then shake off the seeds. Various colors may be used; the edge may be colored with yellow or red before throwing on the seeds, and sprinkling with blue. The seeds will make a fine fancy edge when placed very thick on different parts, with a few slightly thrown on the spaces between.

JAPAN COLORING FOR LEATHER, BOOK-COVERS, ETC.—After the book is covered and dry, color the cover with potash water mixed with a little paste; give two good coats of Brazil wash, and glaze it; put the book between the hands, allowing the boards to slope a little; dash on copperas water, then with a sponge full of red liquid press out on the back and on different parts large drops, which will run down each board and make a fine shaded red; when the cover is dry, wash it over two or three times with Brazil wash to give it a brighter color. See the various dyes for leather under that head.

Dyes for Feathers.—GREEN DYE.—Take of verdigris and verditer, of each, 1 oz.; gum-water, 1 pt.; mix them well, and dip the bristles, fur, or feathers, they having been first soaked in hot water, into the said mixture.

BLUE.—Take of indigo and risse, each, 1 oz., and a piece of alum the size of a hazel nut; put them into gum-water; and dip the materials into it hot; hang them up to dry, and clap them well that they may open; and, by changing the colors, the aforesaid materials may be in this manner dyed of any color.

FOR PURPLE, use lake and indigo.

FOR CARNATION, vermilion and smalt.

RED.—Take an ounce sf Brazil wood in powder; half an ounce of alum; vermilion, ¼ oz.; and a pint of vinegar; boil them up to a moderate thickness, and dip the fur or feathers, they having been first soaked in hot water, into the said mixture.

FOR BLACK, use the same as for cloth. (See "Receipts for Dyeing.")

YELLOW.—Mordant with acetate of alumina, and dip in a bath of turmeric or weld.

CRIMSON.—Dip in acetate of alumina mordant, then in a boiling hot decoction of Brazil wood, and last of all pass through a bath of cudbear.

To make Paper into Parchment.—To produce this transformation, take unsized paper and plunge it into a solution of two parts of concentrated sulphuric acid combined with 1 part water; withdraw it immediately, and wash it in clean water, and the change is complete. It is now fit for writing; for the acid supplies the want of size, and it becomes so strong that a strip 2 or 3 inches wide will

bear from 60 to 80 lbs. weight, while a like strip of parchment will bear only about 25 lbs.

Best Cement for Aquaria.—It is the same as that used in constructing the tanks of the Zoological Gardens, London. One part, by measure, say a gill of litharge; 1 gill of plaster of Paris; 1 gill of dry, white sand; ¼ of a gill of finely powdered resin. Sift, and keep corked tight until required for use, when it is to be made into a putty by mixing in boiled oil (linseed) with a little patent drier added. Never use it after it has been mixed (that is, with the oil) over fifteen hours. This cement can be used for marine as well as fresh-water aquaria, as it resists the action of salt water. The tank can be used immediately, but it is best to give it three or four hours to dry.

Horn in Imitation of Tortoise Shell.—First steam and then press the horn into proper shapes, and afterwards lay the following mixture on with a small brush, in imitation of the mottle of tortoise-shell: Take equal parts of quick-lime and litharge, and mix with strong soap-lees; let this remain until it is thoroughly dry; brush off, and repeat two or three times if necessary. Such parts as are required to be of a reddish brown should be covered with a mixture of whiting and the stain.

Dyes for Ivory, Horn, and Bone.—BLACK.—1. Lay the articles for several hours in a strong solution of nitrate of silver, and expose to the light. 2. Boil the article for some time in a strained decoction of logwood, and then steep it in a solution of per-sulphate or acetate of iron. 3. Immerse frequently in ink until of sufficient depth of color.

BLUE.—1. Immerse for some time in a dilute solution of sulphate of indigo, partly saturated with potash, and it will be fully stained. 2. Steep in a strong solution of sulphate of copper.

GREEN.—1. Dip blue-stained articles for a short time in nitro-hydrochlorate of tin, and then in a hot decoction of fustic. 2. Boil in a solution of verdigris in vinegar until the desired color is obtained.

RED.—1. Dip the articles first in a tin mordant, used in dyeing, and then plunge into a hot decoction of Brazil wood—half a pound to a gallon of water—or cochineal. 2. Steep in red ink till sufficiently stained.

SCARLET.—Use lac-dye instead of the preceding.

VIOLET.—Dip in the tin mordant, and then immerse in a decoction of logwood.

YELLOW.—Boil the articles in a solution of alum, 1 lb. to ½ a gallon, then immerse for half an hour in the following mixture: Take a ½ lb. of turmeric, and a ¼ lb. of pearlash; boil in 1 gal. water: when taken from this, the bone must be again dipped in the alum solution.

Etching Fluid for Ivory.—Take dilute sulphuric acid, dilute muriatic acid, equal parts: mix. For etching varnish take white wax, 2 parts; tears of mastic, 2 parts: mix.

To Gild Ivory.—Immerse it in a solution of nitro-muriate of gold, and then expose it to hydrogen gas while damp. Wash it afterwards in clean water.

To Soften Ivory.—In 3 oz. spirits of nitre, and 15 oz. of spring water, mixed together, put your ivory to soak; and in three or four days it will obey your fingers.

To Whiten Ivory.——Slack some lime in water; put your ivory in that water, after being decanted from the grounds, and boil it till it looks quite white. To polish it afterwards, set it in the turner's wheel; and, after having worked, take rushes and pumice stones, subtile powder, with water, and rub it till it looks perfectly smooth. Next to that, heat it by turning it against a piece of linen or sheepskin leather; and, when hot, rub it over with a little whitening diluted in oil of olive; then, with a little dry whitening alone; finally with a piece of soft white rag. When all this is performed as directed, the ivory will look very white.

Another Way to Bleach Ivory.——Take 2 handfuls of lime, slake it by sprinkling it with water; then add 3 pints of water, and stir the whole together; let it settle ten minutes, and pour the water into a pan for your purpose. Then take your ivory and steep it in the lime-water for 24 hours, after which, boil it in a strong alum-water for 1 hour, and dry it in the air.

Additional Dyes for Feathers.—Black.—Immerse for 2 or 3 days in a bath, at first hot, of logwood, 8 parts, and copperas or acetate of iron, 1 part.

Blue.—With the indigo vat.

Brown.—By using any of the brown dyes for silk or woolen.

Crimson.—A mordant of alum, followed by a hot bath of Brazil wood, afterwards by a weak dye of cudbear.

Pink or Rose.—With safflower or lemon juice.

Plum.—With the red dye, followed by an alkaline bath.

Red.—A mordant of alum, followed by a bath of Brazil wood.

Yellow.—A mordant of alum, followed by a bath of turmeric or weld.

Colors for Artificial Flowers.——The French employ *velvet*, *fine cambric*, and *kid* for the *petals*, and *taffeta* for the leaves. Very recently thin plates of *bleached* whalebone have been used for some portions of the artificial flowers.

Colors and Stains—Blue.—Indigo dissolved in oil of vitriol, and the acid partly neutralized with salt of tartar or whiting.

Green.—A solution of distilled verdigris.

Lilac.—Liquid archil.

Red.—Carmine dissolved in a solution of salt of tartar, or in spirits of hartshorn.

Violet.—Liquid archil mixed with a little salt of tartar.

Yellow.—Tincture of turmeric. The colors are generally applied with the fingers.

To Cut and Polish Marble.—The marble saw is a thin plate of soft iron, continually supplied, during its sawing motion, with water and the sharpest sand. The sawing of moderate pieces is performed by hand; but that of large slabs is most economically done by a proper mill. The first substance used in the polishing process is the sharpest sand, which must be worked with till the surface becomes perfectly flat. Then a second, and even a third sand, of increasing fineness is to be applied. The next substance is emery, of progressive degrees of fineness; after which, tripoli is

employed; and the last polish is given with tin putty. The body with which the sand is rubbed upon the marble is usually a plate of iron; but, for the subsequent process, a plate of lead is used, with fine sand and emery. The polishing rubbers are coarse linen cloths, or bagging, wedged tight into an iron planing tool. In every step of the operation, a constant trickling supply of water is required.

Alabaster, Marble, or Stone may be stained of a yellow, red, green, blue, purple, black, or any of the compound colors, by the stains used for wood.

Powerful Cement for Broken Marble.—Take gum Arabic, 1 lb.; make into a thick mucilage; add to it powdered plaster of Paris, 1½ lbs.; sifted quick-lime, 5 oz.; mix well; heat the marble, and apply the mixture.

Seven Colors for Staining Marble.—It is necessary to heat the marble hot, but not so hot as to injure it, the proper heat being that at which the colors nearly boil. BLUE.—Alkaline indigo dye, or turnsole with alkali.

RED.—Dragon's blood in spirits of wine.

YELLOW.—Gamboge in spirits of wine.

GOLD COLOR.—Sal-ammoniac, sulphate of zinc, and verdigris, equal parts.

GREEN.—Sap green, in spirits of potash.

BROWN.—Tincture of logwood.

CRIMSON.—Alkanet root in turpentine. Marble may be veined according to taste. To stain marble *well* is a difficult operation.

Perpetual Ink for Tombstones, Etc.——Pitch, 11 lbs.; lamp-black, 1 lb.; turpentine sufficient; mix with heat.

To Clean Old Marble.—Take a bullock's gall, 1 gill of soap lees, half a gill of turpentine; make into a paste with pipe-clay, apply it to the marble; let it dry a day or two, then rub it off, and it will appear equal to new; if very dirty, repeat the application.

To Remove Grease.——Aqua ammonia, 2 oz.; soft water, 1 qt.; saltpetre, 1 teaspoonful; shaving soap in shavings, 1 oz.; mix all together; dissolve the soap well, and any grease or dirt that cannot be removed with this preparation nothing else need be tried for it.

To Clean Marble.—Take two parts of common soda, 1 part pumice stone, and 1 part of finely powdered chalk; sift it through a fine sieve, and mix it with water; then rub it well all over the marble, and the stains will be removed; then wash the marble over with soap and water, and it will be as clean as it was at first.

To make a Chemical Barometer.—Take a long, narrow bottle, and put into it 2½ drs. of camphor; spirits of wine, 11 drs. When the camphor is dissolved, add to it the following mixture: Water, 9 drs.; saltpetre, 38 grs.; sal-ammoniac, 38 grs. Dissolve these salts in the water prior to mixing with the camphorated spirit; then shake all well together, cork the bottle well, wax the top, but afterwards make a very small aperture in the cork with a red-hot needle. By observing the different appearances which the materials assume as the weather changes, it becomes an excellent prognosticator of a coming storm or of a sunny sky.

Waterproofing for Clothing.—Boiled oil, 15 lbs.; beeswax, 1 lb.; ground litharge, 13 lbs.; mix, and apply with a brush to the article, previously stretching against a wall or on a table, previously well washing and drying each article before applying the composition.

To Renew Old Silks.—Unravel and put them in a tub, cover them with cold water, let them remain one hour; dip them up and down, but do not wring; hang up to drain, and iron while very damp, and it will look beautiful.

Dyes for Furs.—For BLACK, use the hair dye described in these receipts. BROWN, use tincture of logwood. RED, ground Brazil wood, ½ lb.; water, 1½ quarts; cochineal, ¼ oz.; boil the Brazil wood in the water one hour; strain and add the cochineal; boil fifteen minutes. SCARLET COLOR, boil ½ oz. saffron in ½ pint of water, and pass over the work before applying the red. BLUE, logwood, 7 oz.; blue vitriol, 1 oz.; water, 22 oz.; boil. PURPLE, logwood, 11 oz.; alum, 3 oz.; water, 29 oz. GREEN, strong vinegar, 1½ pints; best verdigris, 2 oz.; ground fine, sap green, ¼ oz.; mix all together and boil.

Potter's Invisible Waterproofing for Clothing.—Imbue the cloth on the wrong side with a solution of isinglass, alum, and soap dissolved in water, forming an emulsion of a milky thickness; apply with a brush, rubbing in well. When dry, it is brushed on the wrong side against the grain, and then gone over with a brush dipped in water; afterwards brushed down smooth.

To raise a Nap on Cloth.—Clean the article, well; soak it in cold water for half an hour; put it on a board, and rub the threadbare parts with a half-worn hatter's card filled with flocks, or with a teazle or a prickly thistle until a nap is raised; then lay the nap the right way with a hatter's brush, and hang up to dry.

Black Reviver for Cloth.—Bruised galls, 1 lb.; logwood, 2 lbs.; green vitriol, ½ lb.; water, 5 quarts; boil two hours; strain, and it is ready for use.

Trapper's and Angler's Secret for Game and Fish.—A few drops of oil of anise, or oil rhodium, on any trapper's bait, will entice any wild animal into the snare trap. India cockle mixed with flour dough, and sprinkled on the surface of still water, will intoxicate fish, render them insensible; when coming up to the surface, they can be lifted into a tub of fresh water to revive them, when they may be used without fear.

Easy Method of Preventing Moths in Furs or Woolens.—Sprinkle the furs or woolen stuffs, as well as the drawers or boxes in which they are kept, with spirits of turpentine, the unpleasant scent of which will speedily evaporate on exposure of the stuffs to the air. Some persons place sheets of paper, moistened with spirits of turpentine, over, under, or between pieces of cloth, &c., and find it a very effectual method. Many woolen drapers put bits of camphor, the size of a nutmeg, in papers, on different parts of the shelves in their shops; and as they brush their cloths every two,

three, or four months, this keeps them free from moths; and this should be done in boxes where furs, &c., are put. A tallow candle is frequently put within each muff when laid by.

Clothing Renovator.—Soft water, 1 gal.; make a strong decoction of logwood by boiling the extract with the water. Strain; when cool, add 2 oz.; gum arabic in powder; bottle, cork well, and set aside for use; clean the coat well from grease and dirt, and apply the above liquid with a sponge evenly. Dilute to suit the color, and hang in the shade to dry; afterwards brush the nap smooth, and it will look like new.

Waterproofing for Porous Cloth.—Dissolve 2½ lbs. alum in 4 gals. water; dissolve also, in a separate vessel the same weight of acetate of lead in the same quantity of water. When both are well dissolved, mix the solutions together; and, when the sulphate of lead resulting from this mixture has been precipitated to the bottom of the vessel in the form of a powder, pour off the solution, and plunge into it the fabric to be rendered waterproof. Wash and rub it well during a few minutes, and hang it in the air to dry.

How to Write on Glass in the Sun.—Dissolve chalk in aqua fortis to the consistency of milk, and add to that a strong solution of silver. Keep this in a glass decanter well stopped. Then cut out from a paper the letters you would have appear, and paste the paper on the decanter or jar, which you are to place in the sun in such a manner that its rays may pass through the spaces cut out of the paper, and fall on the surface of the liquor. The part of the glass through which the rays pass will turn black, while that under the paper will remain white. Do not shake the bottle during the operation. Used for lettering jars.

To Transfer Prints, Etc., to Glass.—Take of gum sandarach, 4 oz.; mastic, 1 oz.; Venice turpentine, 1 oz.; alcohol, 15 oz. Digest in a bottle, frequently shaking, and it is ready for use. Directions: Use, if possible, good plate-glass of the size of the picture to be transferred, go over it with the above varnish, beginning at one side, press down the picture firmly and evenly as you proceed, so that no air can possibly lodge between; put aside, and let it dry perfectly, then moisten the paper cautiously with water, and remove it piece-meal by rubbing carefully with the fingers; if managed nicely, a complete transfer of the picture to the glass will be effected.

Paper for Photographing.—Wash the paper with a solution of nitrate of silver, 5 grs.; distilled water, ½ oz.; dry the paper, and wash it with iodide of potassium, 5 grs.; distilled water, ½ oz.; dry with a gentle heat; repeat the wash with the silver solution; and, when dry, the paper is ready for use. The sensitive surface is an iodide of silver, and is easily affected by light.

How to Photograph on Glass.—Take dry saltpetre, ½ oz.; strong oil vitriol, ¾ oz.; mix in a tumbler, add 20 grains of dry cotton wool, stir with a glass rod five minutes, remove the cotton, and

wash from all traces of the acid in four or five waters; then dry carefully under 120°. This is gun cotton. To make collodion, dissolve 20 grs. gun-cotton in 6 oz. sulphuric ether, to which add alcohol, ¾ oz.; let it stand a short time, and pour off the clear into bottle No. 1 for use. In bottle No. 2, put 1 oz. alcohol, and as much iodide of ammonium as it will dissolve; then add as much iodide of silver (made from nitrate of silver and iodide of potassium) as the solution will take up. Get another bottle, No. 3, with a wide mouth; into it put 1 oz. out of No. 1, to which add 15 or 20 drops out of No. 2. The collodion thus formed is call collodio-iodide of silver. Having well cleaned a plate of glass of the size of the frame in your camera, coat it completely and very evenly on one side, by pouring the collodion on the centre from the bottle; pour back any excess of liquid from one corner of the glass, and in this way you coat the plate in a uniform manner. To prepare the plate thus coated for the camera, plunge it carefully and quickly into a bath of the following proportions, then allow it to remain covered in the solution about two minutes: Distilled water, 1 oz.; nitrate of silver, 80 grs.; alcohol, 30 drops; dissolve and filter. Obtain a good focus, place the plate in the frame and the frame in the camera, pull up the slide in front, and expose a proper length of time; having closed your slide, remove the frame to your dark room, take out the plate, and develop the picture with the following solution, holding the plate perfectly level, the collodion side upward, and pouring enough of it on the plate to cover it; in a short time the picture will be developed: Water, 1 oz.; copperas, 14 grs.; saltpetre, 10 grs.; acetic acid, ½ drachm; nitric acid, 2 drops; then wash with water, and pour over it some of the solution of hyposulphite of soda made thus: Water, 1 pt.; hyposulphate of soda, 4 oz., allow it to remain for two minutes, then wash off thoroughly, and your picture is finished. By this process, a most beautiful picture is obtained in a space of time varying from a fraction of a second up to 15 seconds, with the most perfect detail of all the parts.

Bottle Glass.—No. 1. DARK GREEN.—Fused glauber-salts, 11 lbs.; soaper's salts, 12 lbs.; waste soap-ashes, ½ bushel; silicious sand, ½ cwt.; glass-skimmings, 22 lbs.; broken green glass, 1 cwt. to 1¼ cwt.; basalt, 25 lbs. to ¼ cwt.

No. 2. PALE GREEN.—Pale sand, 100 lbs.; kelp, 35 lbs.; lixiviated wood ashes, 1½ cwt.; fresh, do., 40 lbs.; pipe-clay, ¾ cwt.; cullet, or broken glass, 1½ cwt.

No. 3. Yellow or white sand, 120 parts; woodashes, 80 parts; pearlashes, 20 parts; common salt, 15 parts; white arsenic, 1 part; very pale.

Crystal Glass.—No. 1. Refined pot-ashes, 60 lbs.; sand, 120 lbs.; chalk, 24 lbs.; nitre and white arsenic, of each 2 lbs.; oxide of manganese, 1 to 2 oz. No. 2. Pure white sand, 120 parts; refined ashes, 70 parts; saltpetre; 10 parts; white arsenic, ½ part; oxide of manganese, ½ part. No. 3. Sand, 120 parts; red lead, 50 parts; purified pearlash, 40 parts; nitre, 20 parts; manganese, ½ part.

Flask Glass (*of St. Etienne.*)—Pure silicious sand, 61 parts; potash, 31½ parts; lime, 21 parts; heavy spar, 2 parts; oxide of manganese, q. s.

Best German Crystal Glass.—Take 120 lbs. of calcined flints or white sand; best pearl-ashes, 70 lbs.; saltpetre, 10 lbs.; arsenic, ½ lb.; and 5 oz. manganese. No. 2. (CHEAPER.) Sand or flint, 120 lbs.; pearlash, 46 lbs.; nitre, 7 lbs.; arsenic, 6 lbs.; magnesia, 5 oz. This will require a long continuance in the furnace, as do all others when much of the arsenic is used.

Plate Glass.—No. 1. Pure sand, 40 parts; dry carbonate of soda, 26½ parts; lime, 4 parts; nitre, 1½ parts; broken plate glass, 25 parts. No. 2. URE's.—Quartz-sand, 100 parts; calcined sulphate of soda, 24 parts; lime, 20 parts; cullet of soda-glass, 12 parts. No. 3. VIENNA.—Sand, 100 parts; calcined sulphate of soda, 50 parts; lime, 20 parts; charcoal, 2¾ parts. No. 4. FRENCH.—White quartz sand and cullet, of each 300 parts; dry carbonate of soda, 100 parts; slacked lime, 43 parts.

Crown Glass.—No. 1. Sand, 300 lbs.; soda-ash, 200 lbs.; lime, 30 to 35 lbs.; 200 to 300 lbs. of broken glass. No. 2. (BOHEMIAN.)—Pure silicious sand, 63 parts; potash, 22 parts; lime, 12 parts; oxide of manganese, 1 part. No. 3. (PROF. SCHWEIGER.) Pure sand, 100 lbs.; dry sulphate of soda, 50 parts; dry quicklime in powder, 17 to 20 parts; charcoal, 4 parts. PRODUCT—White and good.

Best Window Glass.—No. 1. Take of white sand, 60 lbs.; purified pearlashes, 30 lbs.; of saltpetre, 15 lbs.; of borax, 1 lb.; of arsenic, ½ lb. This will be very clear and colorless if the ingredients be good, and will not be very dear. No. 2. (CHEAPER.)—White sand, 60 lbs.; unpurified pearlashes, 25 lbs.; of common salt, 10 lbs.; nitre, 5 lbs.; arsenic, 2 lbs.; manganese, 1½ oz. No. 3. COMMON GREEN WINDOW-GLASS.—White sand, 60 lbs.; unpurified pearlashes, 30 lbs.; common salt, 10 lbs.; arsenic, 2 lbs.; manganese, 2 oz.

Looking Glass Plate.—No. 1. Cleansed white sand, 60 lbs.; pearlashes, purified, 25 lbs.; saltpetre, 15 lbs.; borax, 7 lbs. This composition should be continued long in the fire, which should be sometimes strong, and afterwards, more moderate, that the glass may be entirely free from bubbles before it be worked. No. 2. White sand, 60 lbs.; pearl-ashes, 20 lbs.; common salt, 10 lbs.; nitre, 7 lbs.; borax, 1 lb. This glass will run with as little heat as the former; but it will be more brittle, and refract the rays of light in a greater degree. No. 3. Washed white sand, 60 lbs.; purified pearl-ashes, 25 lbs.; nitre, 15 lbs.; borax, 7 lbs. If properly managed, this glass will be colorless.

Window Glass.—No. 1. Dried sulphate of soda, 11 lbs.; soaper-salt, 10 lbs.; lixiviated soap-waste, ½ bush.; sand, 50 to 60 lbs.; glass-pot skimmings, 22 lbs.; broken *pale* green glass, 1 cwt. No. 2. (PALER).—White sand, 60 lbs.; pearlashes, 30 lbs.; common salt, 10 lbs.; arsenic, 10 lbs.; oxide of manganese, 2 to 4 oz.

No. 3. (VERY PALE.)—White sand, 60 lbs.; good potashes, 25 lbs.; common salt, 10 lbs.; nitre, 5 lbs.; arsenic, 2 lbs.; manganese; 2 to 4 oz. as required; broken *pale* window-glass, 14 lbs.

Magic Paper. — Take lard oil, or sweet oil, mixed to the consistencey of cream, with either of the following paints, the color of which is desired: Prussian blue, lamp-black, Venetian red, or chrome green, either of which should be rubbed with a knife on a plate or stone until smooth. Use rather thin but firm paper; put on with a sponge, and wipe off as dry as convenient; then lay them between uncolored paper, or between newspapers, and press by laying books or some other flat substance upon them until the surplus oil is absorbed, when it is ready for use.

To Make Grindstones from Common Sand.—River sand, 30 lbs.; shellac, 10 parts; powdered glass, 2 parts; melt in an iron pot, and cast into moulds.

Printing Rollers are made of glue and molasses, with sometimes a little Spanish white. The proportions are 1 lb. glue to 1 pint molasses. Break the glue to pieces, soak for 24 hours is sufficient, then melt with the molasses, and cast in a mould previously oiled to prevent it from sticking. When it gets hard after long use remelt it, using a little more molasses.

Savage's Printing Ink.—Pure balsam of copaiba, 9 oz.; lamp-black, 3 oz.; indigo and Prussian blue, each 5 drachms; Indian red, ¾ oz.; yellow soap, 3 oz. Miz, and grind to the utmost smoothness.

Holes in Millstones are filled with melted alum, mixing burr sand with it. If the hole is large, put some pieces of burr-mill stones in it first, and pour in melted alum. These pieces of block should be cut exactly to fit. There should be small joints, and fastened with plaster of Paris. These holes should be cut at least 4 inches deep; there is then no danger of their getting loose.

Fitting a New Back in an Old Millstone.—Block your stone up with a block of wood, having its face down until it lies even, solid, and perfectly level; then pick and scrape off all the old plaster down to the face blocks, so that none remains but what is in the joints of the face blocks; then wash these blocks, and keep them soaked with water. Keep a number of pieces of burr blocks, at the same time, soaked with water. Take a pail half filled with clean water, and mixed with 2 tablespoonfuls of glue water, boiled and dissolved; mix in with your hand plaster of Paris until it be thick enough that it will not run; and, breaking all the lumps, pour this on the stone, rubbing it in with your hand; the stone being at the same time damped; and place small pieces of stone all over the joints of the face blocks; you then, with more plaster, mixed in the

same way, but more stiff, with this and pieces of burr stones, build walls round the eye and verge 4 or 5 inches high, leaving the surface uneven and the eye larger, as it will be brought to its proper size by the last operation. It is better to build up the wall of the running stone round the verge for 3 inches without any spalls, so that the holes may be cut in to balance it. If you wish to make your stone heavier, you will take small pieces of iron, perfectly clean and free from grease, and lay them evenly all around the stone in the hollow place between the two walls just built; and with plaster mixed a little thicker than milk, pour in under and through all the crevices in the iron until the surface is nearly level with the two walls. If the stones do not require additional weight added, instead of iron use pieces of stone the same way, leaving the surface rough and uneven. Again, as before, build walls round the verge of the stone, and round the eye of the stone, until they are within 2 inches of the thickness you want your stones to be, the wall round the eye being 2 inches higher than that round the verge, and filling the space between the walls with stones; and, pouring in plaster again, make it nearly level with the walls, but leaving the surface rough and jagged, to make the plaster adhere well to it. Let it stand until the back is dry and perfectly set, when you raise the stone upon its edge, and, with a trowel, plaster round the edge of the stone neatly, giving it a taper of ¼ inch from the face to the back of the stone. When cased round in this way, lay the stone down on the cock-head; it being in the balance ryne, but the driver off, then raise the spindle, and balance the stone as already directed before putting on the remainder of the back. Then have a tin made the size of the eye, and to reach from the balance ryne to the thickness you want the stone to be at the eye. This tin should be exactly fitted to its place, and made fast; then fit a hoop of wood or iron round the verge, having the upper edge of the thickness from the face you want the stone to be at the verge, and equal all round. This hoop should be greased; and all the cracks round it, and the tin in the eye, being stopped, you pour thin plaster (with more glue water then in previous operations, to prevent it from setting so quickly, and to give time to finish off the back correctly) until it be level with the hoop round the verge, and with a straight edge, one end resting on the hoop, and the other end resting on the tin at the eye; then, by moving it round, and working the plaster with a trowel, make the surface of the back even and smooth between these two points. The hoop is then taken off, and the back and edges planed smooth; then lower the spindle until your runner lies solid, and put your band or hoop on, it being first made nearly red hot, and taking care that it is of sufficient size not to require too much driving; if fitting too tightly, it may loosen the back in driving it to its proper place. It may be cooled gently by pouring water on it; and, when cold, it should fit tight.

Mill Dams.—When building a dam, you should select the most suitable place. If you can, place it across the stream near a rocky bluff, so that the ends of the dam may run into the bluff. This will prevent the water running by at the ends of the dam. Build your dam strong; if this is not done, they are breaking up often, causing ruinous expense in money and loss of time.

Rock Dams are incomparably the best in use, if there is plenty of material at hand for building, and a rock bottom to the stream; if there is not a rock bottom, you should dig a trench in the bottom, deep enough, so that the water cannot undermine it. This should be the same as if you were building the foundation of a large building. The wall to be built should be of a small, circular form, so that the back of the circle should be next to the body of water, which may by its pressure tighten it. To secure the water from leaking through at the ends of the dam, dig a ditch deeper than the bottom of the river; then fill this with small pieces of rock, and pour in cement. This cement is made of hydraulic cement, and is made of one part cement to five parts of pure sand. It will effectually stop all crevices. A rock dam, if well built, will be perfectly tight. Use as large rock as you conveniently can move; building this wall 4 to 6 feet thick, according to the length of the dam, with jam or buttresses every place where they are needed to strengthen it. Make true joints to these rocks, especially on the ends, so that they may join close together. When you have the outside walls laid in cement, for every layer fill the middle up with pieces of small rock, pouring in your grout, so that there may not be a crevice but what is filled. If there is any crevice or hole left open, the water will break through, wearing it larger and larger. If the stream is wide and large, it is necessary to build the dam in two sections, which should be divided by a waste way, necessary for the waste or surplus water to run over, to keep the head in its proper place or height. Let each section, next to where the water is to be run over, be abutments, built to strengthen the dam. The last layer of rock, on the top where the waste water runs over, should project 5 or 6 inches over the back of the dam, so that the water may not undermine it. This last layer should be of large rocks, and jointed true; then laid in hydraulic cement, in proportion of 1 of cement to 3 of sand. When the dam is built, the front should be filled up with coarse gravel or clay; this is best done with teams, as the more it is tramped the more durable it becomes.

Frame Dams.—In building a frame dam commence with a good foundation, laying the first sills in the bottom, of sufficient depth. They should be large square timbers that will last in the water without rotting. Where there is a soft foundation, the bottom should first be made level; then dig trenches for the mud sills, about 7 or 8 feet apart, lengthways of the stream, and 10 or 12 feet long. Into these first sills other sills must be framed, and put crosswise of the stream, 6 or 8 feet apart, to reach as far across the stream as necessary. Then two outside sills should be piled down with 2-inch plank driven down to a depth of 4 or 5 feet. If this can be done conveniently, they are to be jointed as closely as possible. It would be better to line with some stuff 1 inch thick; then with posts their proper length, about 12 or 14 inches square, which should be framed into the uppermost sills, in both sides, and all the way across the dam, from bank to bank, at a distance of 6 feet apart. Then, with braces to each post, to extend two-thirds of the length of the post, where they should be joined together with a lock, instead of a mortise and tenon, with an iron bolt of 1 or 1¼ inches in diameter, going through both, and tightened with a screw and

nut. When mortises and tenons are used, they often become rotten and useless in a few days. These braces should be set at an angle of 50 or 60° with the other end mortised into the mud sill. These braces require to be about 6 to 8 inches, and as long as you find necessary; being covered with dirt, it will not decay for a long time, as the air is excluded. These posts should be capped from one to the other, plate fashion. The posts should be lined with 2 or 2½ inch plank on the inside, pinned to the plank, and should, in the middle, be filled in with dirt.

If the stream is large and wide, the dam should be built in two sections, which should be divided by a waste-way for the surplus water, which should be in the centre of the dam, and sufficient for all the waste-water to run over. Let each section of the dam form an abutment next to the waste-way, placing cells or sills 4 feet apart the length of the waste-way; in each of these sills, posts should be framed with a brace for the sides. These rows of posts, standing across the dam, will form the sectional abutments; the middle one may be constructed by being lengthways of the stream, with shore braces, so that they will not be in the way of driftwood passing down the stream; it being necessary for strong pieces for a bridge. Then cover the sills with an apron of 2-inch plank joined perfectly straight, to extend 30 or 40 feet below the dam, to prevent the undermining of the dam. The planks which are used for the purpose of lining the posts which form the abutments of each section of the dam and the ends of the waste-way, should be truly pointed, so as to prevent any leakage. The dam being built, the dirt should be filled in with teams; as the more it is tramped the better. Clay or coarse gravel is the best. Then place your gates on the upper side of the waste-way, the size that is necessary to a level with low-water mark; which gates are not to be raised except in times of high water, as the proper height of the mill-pond should be regulated by boards placed over the gate for the desired head, as the water should be allowed to pass at all times freely over them. To strengthen the dam, if you think necessary, 2-inch plank may be used in lining the front side of the dam, long enough to reach from the bottom of the stream (on an inclined plane, and next to the body of water) to the top of the dam, and filled up nearly to the top of the dam with clay or gravel well tramped down.

Brush or Log Dams are very often used in small, muddy streams. When the bottom of the stream is of a soft nature; take a flat-boat where you want to fix your dam, and drive piles the whole length of the stream, about 3 or 4 feet apart, as deep as you can. Take young oak saplings, pointed at the end, for the purpose. If you can, construct a regular pile-driver, similar to those in use for making trestle-work on the railways. The weight may be pulled up by horses instead of an engine. When you have finished driving piles, make some boxes or troughs of 2 or 3 inch plank, about 3 feet wide and as long as the plank is. Sink these in the water, the length of the dam, close to the piles, by loading them with rock, until they are at the bottom of the stream, filling in the front part of the dam with dirt and brush, nearly to the height you want it. This kind of dam will last a long time.

Whenever there is a small break in the dam or race, cut up some willows and brush, put them in the break along with some straw and dirt, and ram them down with clay.

In regard to the flume, the greatest care must be taken to insure strength and durability, combined with lightness. Every step taken in its construction must be of such a nature as to unite these qualities in the highest possible degree, otherwise the whole is, in a manner, labor lost.

To Restore Burnt Steel, and Weld Cast Steel.—Borax, 48 oz.; sal ammonic, 16 oz.; prussiate potash, 8 oz.; rosin, 4 oz.; alcohol, ½ gill; soft water, ½ pint. Put into an iron pan, and hold over a slow fire till it comes to a slow boil, and until the liquid matter evaporates, not letting it boil hard, and being careful to stir it well from the bottom all the time.

Steel may be burned till it drops apart, and the particles gathered and welded together with this composition, making it as durable as ever.

Superior Bell Metal.—Copper, 100 lbs.; tin, 23 lbs.

Electrum.—Copper, 8 nickel, 4 zinc, 3½ parts. This compound is unsurpassed for ease of workmanship and beauty of appearance.

To Write in Silver.—Mix 1 oz. of the finest pewter or block tin, and 2 oz. of quicksilver together till both become fluid, then grind it with gum water, and write with it. The writing will then look as if done with silver.

Best Bronze for Brass.—Take 1 lb. muriatic acid, and ½ lb. white arsenic. Put them into an earthen vessel, and then proceed in the usual manner.

Another Bronze for Brass.—One ounce muriate of ammonia, ½ oz. alum, ¼ oz. arsenic, dissolved all together in 1 pint of strong vinegar.

Zincing.—Copper and brass vessels may be covered with a firmly adherent layer of pure zinc by boiling them in contact with a solution of chloride of zinc, pure zinc turnings being at the same time present in considerable excess.

Dentist's Emery Wheels.—Emery, 4 lbs.; shellac, ½ lb.; melt the shellac over a slow fire; stir in the emery, and pour it into a mould of plaster of Paris. When cold it is ready for use.

Incrustation of Boilers.—(DELFOSSE'S PATENT).—If the boiler be stationary, and fed with fresh water, the amount of anti-petrifying mixture per horse power for 336 hours' consumption may be

made by mixing together 12 oz. muriate of soda, 2 drs. of dry tannic or gallic acid, 2½ oz. of hydrate of soda, or 1 or ½ oz. of subcarbonate of potash. For locomotive boilers travelling an average of 140 miles per day, the quantity of the mixture per horse power is increased one-fifth. If the water be brackish, or a mixture of salt and fresh, the muriate of soda is omitted, and instead of 12 oz., are used for 2½ oz. of hydrate of soda, and 5 drs. instead of 2 of the dry tannic or gallic extract. The mixture is also prepared in this manner when sea water is used in the boiler. The patentee prefers introducing the mixture into stationary boilers in quantities for two, three, or more days, but locomotive and marine boilers are to be supplied daily with a portion of the mixture, corresponding with the amount of duty to be performed.

To Lessen Friction in Machinery.—Grind together black lead with 4 times its weight of lard or tallow. Camphor is sometimes added (7 lbs. to the hundred weight.)

Colored Glass.—(FINE BLUE).—To 10 lbs. flint glass, previously melted and cast into water, add zaffer, 6 drs., ½ oz. of calcined copper, prepared by putting sheet copper into a crucible, and exposing it to the action of a fire not strong enough to melt the copper, and you will have the copper in scales, which you pound.

BRIGHT PURPLE.—Use 10 lbs. flint glass as before; zaffer, 5 drs.; precipitate of calcium, 1 dr.

GOLD YELLOW.—Twenty-eight pounds flint glass, and a quarter pound of the tartar which is found in urine, purify by putting it in a crucible in the fire till it smoke no more; add 2 oz. of manganese.

To Take a Plaster of Paris Cast from a Person's Face.—The person must lie on his back, and his hair be tied behind, into each nostril put a conical piece of paper open at each end to allow of breathing. The face is to be lightly oiled over, and the plaster, being properly prepared, it is to be poured over the face, taking particular care that the eyes are shut, till it is a quarter of an inch thick. In a few minutes the plaster may be removed. In this a mold is to be formed, from which a second cast is to be taken, that will furnish casts exactly like the original.

To Harden and Temper Cast Steel.—For saws and springs in general, the following is an excellent liquid: Spermaceti oil, 20 gals.; beef suet *rendered*, 20 lbs.; neat's-foot oil, 1 gallon; pitch, 1 lb.; black resin, 3 lbs. The last two articles must be previously melted together, and then added to the other ingredients, when the whole must be heated in a proper iron vessel, with a close cover fitted to it, until all moisture is evaporated, and the composition will take fire on a flaming body being presented to its surface.

Furniture Oil.—Linseed oil, 1 gallon; alkanet root, 3 oz.; rose

pink, 1 oz. Boil them together ten minutes, and strain so that the oil be quite clear.

To Cast Figures in Imitation of Ivory.—Make isinglass and brandy into a paste, with powdered egg-shells very finely ground. You may give it what color you choose; but cast it warm into your mould which you previously oil over; leave the figure in the mould till dry, and you will find on taking it out that it bears a very strong resemblance to ivory.

To Print a Picture from the Print Itself.—The page or picture is soaked in a solution, first of potassa, and then of tartaric acid. This produces a perfect diffusion of crystals of bitartrate of potassa through the texture of the unprinted part of the paper. As this salt resists oil, the ink roller may now be passed over the surface, without transferring any part of its contents except to the printed part.

To Clean Old Oil-paintings.—Dissolve a small quantity of salt in stale urine; dip a woolen cloth in the mixture, and rub the paintings over with it till they are clean; then wash them with a sponge and clean water; dry them gradually, and rub them over with a clean cloth. Should the dirt be not easily removed by the above preparation, add a small quantity of soft soap. Be very careful not to rub the paintings too hard.

To Renew Old Oil-paintings.—The blackened lights of old pictures may be instantly restored to their original hue by touching them with deutoxide of hydrogen diluted with six or eight times its weight of water. The part must be afterwards washed with a clean sponge and water.

To Lengthen Levers of Anchor-escapement Watches without Hammering or Soldering.—Cut square across with a screw-head file, a little back from the point above the fork, and, when you have thus cut into it to a sufficient depth, bend forward the desired distance the piece thus partially detached. In the event of the piece snapping off while bending—which, however, rarely happens—file down the point level with the fork, and insert a pin, English lever style.

Chain Dip Solution, for Brass Chains, &c.—Sulphuric acid, 2¼ oz; nitric acid, 2 oz.; rain-water, 2 oz.; saltpetre, 1 dr.; mix together in a glass bottle, and let stand a few hours. Apply by dipping the article into the solution quickly, and then at once wash off thoroughly, and rinse in clean rain-water and dry in saw-dust. Removes instantaneously all stains or discolorations, and gives to the article a perfectly bright appearance.

Pickle for Frosting and Whitening Silver Goods.—Sulphuric acid, 1 dr.; water, 4 oz.; heat the pickle, and immerse the silver

in until frosted as desired; then wash off clean, and dry with a soft linen cloth, or in fine clean saw-dust. For whitening only, a smaller proportion of acid may be used.

Etruscan Gold Coloring.—Alum, 1 oz.; fine table-salt, 1 oz.; saltpetre (powdered,) 2 oz.; hot rain-water, sufficient to make the solution, when dissolved, about the consistency of thick ale; then add sufficient muriatic acid to produce the color desired. The degree of success must always depend, in a greater or less degree, upon the skill or judgment of the operator. The article to be colored should be from fourteen to eighteen carats fine, of pure gold and copper only, and be free from coatings of tin or silver solder. The solution is best used warm, and when freshly made the principle on which it acts is to eat out the copper alloy from the surface of the article, leaving thereon pure, frosted gold only. After coloring, wash off, first in rain-water, then in alcohol, and dry without rubbing, in fine, clean saw-dust. Fine Etruscan jewelry that has been defaced or tarnished by use may be perfectly renewed by the same process.

Tarnish on Electro-plated Ware may be removed by immersing the article from one to ten or fifteen minutes, or until the tarnish has been removed, but no longer, in the following solution: Rain-water, 2 gals.; cyanuret potassa, ½ lb.; dissolve, and put into a stone jug or jar and closely cork. After immersion, the articles must be taken out and thoroughly rinsed in two or three waters, then dried with a soft linen cloth, or, if frosted or chased work, with fine, clean saw-dust. Tarnished jewelry may be speedily restored by this process; but make sure work of removing the alkali, otherwise it will corrode the goods.

A Bright Gold Tinge may be given to silver by steeping it for a suitable length of time in a weak solution of sulphuric acid and water strongly impregnated with iron-rust.

To Make a Diamond Mill.—Make a brass chuck or wheel, suitable for use on a foot-lathe, with a flat, even surface or face of about 1½ or 2 inches in diameter; then place a number of the coarsest pieces of your diamond-dust on different parts of its face, and with a smooth-faced steel hammer drive the pieces of dust all evenly into the brass to nearly or quite level with the surface. Your mill, thus prepared, is now used for making pallet jewels or for grinding stone and glass of any kind. For polishing, use a bone or boxwood chuck or wheel, of similar form to your mill, and coat it lightly with the finest grade of your diamond-dust and oil; with this a beautiful polish may be given to the hardest stone.

To Temper Case and other Springs of Watches.—Draw the temper from the spring, and fit it properly in its place in the watch; then take it out and temper it hard in rain-water (the addition of a little table-salt to the water will be an improvement;) after which place it in a small sheet-iron ladle or cup and barely cover it with linseed

oil; then hold he ladle over a lighted lamp until the oil ignites; let it burn until the oil is nearly, not quite all, consumed; then re-cover with oil and burn down as before; and so a third time; at the end of which, plunge it again into water. Main and hair springs may, in like manner, be tempered by the same process: first draw the temper, and properly coil and clamp to keep in position, and then proceed the same as with case springs.

To Make Red Watch Hands.——1 oz. carmine, 1oz. muriate of silver, ½ oz. tinner's japan; mix together in an earthen vessel, and hold over a spirit-lamp until formed into a paste. Apply this to the watch hand, and then lay it on a copper plate, face side up, and heat the plate sufficiently to produce the color desired.

To Drill into Hard Steel.—Make your drill oval in form, instead of the usual pointed shape, and temper as hard as it will bear without breaking; then roughen the surface where you desire to drill with a little diluted muriatic acid, and, instead of oil, use turpentine or kerosene, in which a little gum camphor has been dissolved, with your drill. In operating, keep the pressure on your drill firm and steady; and if the bottom of the hole should chance to become burnished, so that the drill will not act, as sometimes happens, again roughen with diluted acid as before; then clean out the hole carefully, and proceed again.

To Case-harden Iron.—If you desire to harden to any considerable depth, put the article into a crucible with cyanide of potash, cover over and heat altogether, then plunge into water. This process will harden perfectly to the depth of two or three inches.

To Put Teeth in a Watch or Clock Wheels without Dovetailing or Soldering.—Drill a hole somewhat wider than the tooth square through the plate, a little below the base of the tooth; cut from the edge of the wheel square down to the hole already drilled; then flatten a piece of wire so as to fit snugly into the cut of the saw, and with a light hammer form a head on it like the head of a pin. When thus prepared, press the wire or pin into position in the wheel, the head filling the hole drilled through the plate, and the end projecting out so as to form the tooth; then with a sharp pointed graver cut a small groove each side of the pin from the edge of the wheel down to the hole, and with a blow of your hammer spread the face of the pin so as to fill the grooves just cut. Repeat the same operation on the other side of the wheel, and finish off in the usual way. The tooth will be found perfectly riveted in on every side, and as strong as the original one, while in appearance it will be equal to the best dovetailing.

To Tighten a Cannon Pinion on the Centre Arbor when too Loose.—Grasp the arbor lightly with a pair of cutting nippers, and, by a single turn of the nippers around the arbor, cut or raise a small thread thereon.

Jeweller's Alloys.—EIGHTEEN CARAT GOLD FOR RINGS.—Gold coin, 19½ grs.; pure copper, 3 grs.; pure silver, 1½ grs.

CHEAP GOLD, TWELVE CARAT.—Gold coin, 25 grs.; pure copper, 13½ grs.; pure silver, 7⅛ grs.

VERY CHEAP FOUR CARAT GOLD.—Copper, 18 parts; gold, 4 parts; silver, 2 parts.

IMITATIONS OF GOLD.—1. Platina, 4 dwt.; pure copper, 2¼ dwt.; sheet-zinc, 1 dwt.; block-tin, 1¾ dwt.; pure lead, 1½ dwt. If this should be found too hard or brittle for practical use, re-melting the composition with a little sal-ammoniac will generally render it malleable as desired. 2. Platina, 2 parts; silver, 1 part; copper, 3 parts. These compositions, when properly prepared, so nearly resemble pure gold that it is very difficult to distinguish them therefrom. A little powdered charcoal mixed with metals while melting will be found of service.

BEST OROIDE OF GOLD.—Pure copper, 4 oz.; sheet zinc, 1¾ oz.; magnesia, ¾ oz.; sal-ammoniac, ½ oz.; quicklime, 9-32 oz.; cream tartar, ¼ oz. First melt the copper at as low a temperature as it will melt; then add the zinc, and afterwards the other articles, in powder, in the order named. Use a charcoal fire to melt these metals.

Bushing Alloy for Pivot Holes, &c.—Gold coin, 3 dwt.; silver, 1 dwt., 20 grs.; copper, 3 dwt., 20 grs.; palladium, 1 dwt. The best composition known for the purpose named.

Gold Solder for Fourteen to Sixteen-Carat Work.—Gold coin, 1 dwt.; pure silver, 9 grs.; pure copper, 6 grs.; brass, 3 grs.

DARKER SOLDER.—Gold coin, 1 dwt.; pure copper, 8 grs.; pure silver, 5 grs.; brass, 2 grs.; melt together in charcoal fire.

The Northern-Light Burning Fluid.—COSTS ABOUT EIGHT CENTS PER GALLON.—Get good deodorized benzine, 60 to 65 gravity, and to each barrel of 42 gals. add 2 lbs. pulverized alum, 3½ oz. gum camphor, and 3½ oz. oil of sassafras, or 2 oz. oil bergamot; stir up and mix thoroughly together and it will soon be ready for use.

N. B.—As this fluid creates a much larger volume of light and flame than carbon oil, it is necessary to use either a high burner, such as the Sun burner, to elevate the flame away from the lamp, in order to keep it cool, or, instead thereof, to use a burner provided with a tube for the escape of the gas generated from the fluid, such, for instance, as the Meridian burner.

To Reduce Oxide of Zinc.—The oxide may be put in quantities of 500 or 600 lbs. weight into a large pot over the fire; pour a sufficient quantity of muriatic acid over the top, to act as a flux, and

the action of the fire will melt the dross, when the pure metal will be found at the bottom of the pot.

New Process to Restore Burnt Steel.—When your steel is burnt, immerse it immediately, for a very short time, in cold water; then hammer it on the anvil, turning, moving, and otherwise manipulating it while undergoing this treatment. A little dexterous practice will soon enable you to restore steel, by this beautiful and simple process, that would otherwise be hopelessly ruined.

To Remove Rust from Iron or Steel.—For cleaning purposes, &c., kerosene oil or benzine are probably the best things known. When articles have become pitted by rust, however, these can, of course, only be removed by mechanical means, such as scouring with fine powder, or flour of emery and oil, or with very fine emery paper. To prevent steel from rusting, rub it with a mixture of lime and oil, or with mercurial ointment, either of which will be found valuable.

To Restore Frozen Silver Solution.—If it is the whitening solution, add 10 pennyweights of cyanide of potassium to a pint of the solution. For the first, or hard coat solution, add about double the above quantity.

On Watch Cleaning.—It is hardly necessary to say that great caution must be observed in taking the watch down—that is, in separating its parts. If you are new at the business think before you act, and then act slowly. Take off the hands carefully so as not to bend the slender pivots upon which they work; this will be the first step. 2. Loosen and lift the movement from the case. 3. Remove the dial and dial wheels. 4. Let down the main-spring by placing your bench key upon the arbor, or "winding post," and turning as though you were going to wind the watch until the click rests lightly upon the ratchet; then with your screw-driver press the point of the click away from the teeth, and ease down the springs. 5. Draw the screws (or pins) and remove the bridges of the train, or the upper plate, as the case may be. 6. Take out the balance. Great care must be observed in this or you will injure the hair-spring. The stud or little square post into which the hair-spring is fastened may be removed from the bridge or plate of most modern watches, without unkeying the spring, by slipping a thin instrument, as the edge of a knife blade, under the corner of it and prying upward. This will save you a considerable amount of trouble, as you will not have the hair-spring to adjust when you reset the balance.

If the watch upon which you propose to work has an upper plate, as an American or an English lever, for instance, loosen the lever before you have entirely separated the plates, otherwise it will hang and most likely be broken.

Having the machine now down, brush the dust from its different parts and subject them to a careful examination with your eye-glass. Assure yourself that the teeth of the wheels and leaves of

the pinions are all perfect and smooth; that the pivots are all straight, round and highly polished, that the holes through which they are to work are not too large, and have not become oval in shape; that every jewel is smooth and perfectly sound; and that none of them are loose in their settings. See, also, that the escapement is not too deep or too shallow; that the lever or cylinder is perfect; that all the wheels have sufficient play to avoid friction, but not enough to derange their coming together properly; that none of them work against the pillar-plate; that the balance turns horizontally and does not rub; that the hair-spring is not bent or wrongly set so that the coils rub on each other, on the plate, or on the balance; in short, that everything about the whole movement is just as reason would teach you it should be. If you find it otherwise, proceed to repair in accordance with a carefully weighed judgment, and the processes given in the next chapter, after which clean—if not the watch only needs to be cleaned, and therefore you may go ahead with your work at once.

To Clean.—Many watchmakers wet the pillar-plates and bridges with saliva, and then dipping the brush into pulverized chalk or Spanish whiting, rub vigorously until they appear bright. This is not a good plan, as it tends to remove the plating and roughen the parts, and the chalk gets into the holes and damages them, or sticks around the edges of the wheel-beds. The best process is to simply blow your breath upon the plate or bridge to be cleaned, and then to use your brush with a little prepared chalk—(See recipe for preparing it.) The wheels and bridges should be held between the thumb and finger in a piece of soft paper while undergoing the process; otherwise the oil from the skin will prevent their becoming clean. The pinions may be cleaned by sinking them several times into a piece of pith, and the holes by turning a nicely shaped piece of pivot wood into them, first dry and afterwards oiled a very little with watch oil. When the holes pass through jewels you must work gently to avoid breaking them.

The oiling above named is all the watch will need. A great fault with many watchmakers lies in their use of too much oil.

The Chemical Process.—Some watchmakers employ what they call the "Chemical Process" to clean and remove discolorations from watch movements. It is as follows:

Remove the screws and other steel parts; then dampen with a solution of oxalic acid and water. Let it remain a few moments, after which immerse in a solution made of one-fourth pound cyanuret potassa to one gallon rain water. Let remain about five minutes, and then rinse well with clean water, after which you may dry in sawdust, or with a brush and prepared chalk, as suits your convenience. This gives the work an excellent appearance.

To Prepare Chalk for Cleaning.—Pulverize your chalk thoroughly, and then mix it with clear rain water in the proportion of two pounds to the gallon. Stir well and then let stand about two minutes. In this time the gritty matter will have settled to the bottom. Pour the water into another vessel, slowly so as not to stir up the settlings. Let stand until entirely settled, and then pour off

as before. The settlings in the second vessel will be your prepared chalk, ready for use as soon as dried.

Spanish whiting treated in the same way makes a very good cleaning or polishing powder. Some operatives add a little jeweler's rouge, and we think it an improvement; it gives the powder a nice color at least, and therefore adds to its importance in the eyes of the uninitiated. In cases where a sharper polishing powder is required, it may be prepared in the same way from rotten stone.

Pivot Wood.—Watchmakers usually buy this article of watch-material dealers. A small shrub known as Indian arrow-wood, to be met with in the Northern and Western States, makes an excellent pivot wood. It must be cut when the sap is down, and split into quarters so as to throw the pith outside of the rod.

Pith for Cleaning.—The stalk of the common mullen affords the best pith for cleaning pinions. Winter, when the stalk is dry, is the time to gather it. Some use cork instead of pith, but it is inferior.

To Pivot.—When you find a pivot broken, you will hardly be at a loss to understand that the easiest mode of repairing the damage is to drill into the end of the pinion or staff, as the case may be, and having inserted a new pivot, turn it down to the proper proportions. This is by no means a difficult thing when the piece to be drilled is not too hard, or when the temper may be slightly drawn without injury to the other parts of the article.

To Tell when the Lever is of Proper Length.—You may readily learn whether or not a lever is of proper length, by measuring from the guard point to the pallet staff, and then comparing with the roller or ruby-pin table; the diameter of the table should always be just half the length measured on the lever. The rule will work both ways, and may be useful in cases when a new ruby-pin table has to be supplied.

To Change Depth of Lever Escapement.—If you are operating on a fine watch the best plan is to put a new staff into the lever, cutting its pivots a little to one side—just as far as you desire to change the escapement. Common watches will not, of course, justify so much trouble. The usual process in their case is to knock out the staff, and with a small file cut the hole oblong in a direction opposite to that in which you desire to move your pallets; then replace the staff, wedge it to the required position, and secure by soft soldering.

In instances where the staff is put in with a screw you will have to proceed differently. Take out the staff, pry the pallets from the lever, file the pin holes to slant in the direction you would move the pallets, without changing their size on the other side of the lever. Connect the pieces as they were before, and

with the lever resting on some solid substance you may strike lightly with your hammer until the bending of the pins will allow the pallets to pass into position.

To Tell when the Lever Pallets are of Proper Size.—The clear space between the pallets should correspond with the outside measure, on the points, of three teeth of the scape wheel. The usual mode of measuring for new pallets is to set the wheel as close as possible to free itself when in motion. You can arrange it in your depthing tool, after which a measurement between the pivot holes of the two pieces, on the pillar plate, will show you exactly what is required.

To Put Watches in Beat.—If a cylinder escapement, or a detached lever, put the balance into a position; then turn the regulator so that it will point directly to the pivot-hole of the pallet staff, if a lever, or of the scape-wheel, if a cylinder. Then lift out the balance with its bridge or clock, turn it over and set the ruby-pin directly in the line with the regulator, or the square cut of the cylinder at right angles with it. Your watch will then be in perfect beat.

In case of an American or an English lever, when the regulator is placed upon the plate, you will have to proceed differently. Fix the balance into its place, cut off the connection of the train, if the mainspring is not entirely down, by slipping a fine broach into one of the wheels, look between the plates and ascertain how the lever stands. If the end furthest from the balance is equi-distant between the two brass pins it is all right—if not, change the hair-spring till it becomes so.

If dealing with a duplex watch, you must see that the roller notch, when the balance is at rest is exactly between the locking tooth and the line of centre—that is, a line drawn from the centre of the roller to the centre of the scape-wheel. The balance must start from its rest and move through an arc of about ten degrees before bringing the locking tooth into action.

To Prevent a Chain Running off the Fusee.—In the first place you must look after and ascertain the cause of the difficulty. If it results from the chain's being too large, the only difficulty is a new chain. If it is not too large, and yet runs off without any apparent cause, change it end for end—that will generally make it go all right. In cases where the channel in the fusee has been damaged and is rough, you will be under the necessity of dressing it over with a file the proper size and shape. Sometimes you find the chain naturally inclined to work away from the body of the fusee. The best way to remedy a difficulty of this kind is to file off a very little from the outer lower edge of the chain the entire length—this, as you can see, will incline it to work on instead of off. Some workmen, when they have a bad case, and a common watch, change the standing of the fusee so as to cause the winding end of its arbor to incline a little from the barrel. This, of course, cannot do otherwise than make the chain run to its place.

To Weaken the Hair-Spring.—This is often effected by grinding the spring down. You remove the spring from the collet, and place it upon a piece of pivot wood cut to fit the centre coil. A piece of soft steel wire, flattened so as to pass freely between the coils, and armed with a little pulverized oil stone and oil, will serve as your grinder, and with it you may soon reduce the strength of the spring. Your operations will, of course, be confined to the centre coil, for no other part of the spring will rest sufficiently against the wood to enable you to grind it, but this will generally suffice. The effect will be more rapid than one would suppose, therefore it will stand you in hand to be careful or you may get the spring too weak before you suspect it.

To Tighten a Ruby Pin.—Set the ruby pin in asphaltum varnish. It will become hard in a few minutes, and be much firmer and better than gum shellac, as generally used.

To Temper Brass or to Draw its Temper.—Brass is rendered hard by hammering or rolling, therefore when you make a thing of brass, necessary to be in temper, you must prepare the material before shaping the article. Temper may be drawn from brass by heating it to a cherry red, and then simply plunging it into water the same as though you were going to temper steel.

To Temper Drills.—Select none but the finest and best steel for your drills. In making them never heat higher than a cherry red, and always hammer till nearly cold. Do all your hammering in one way, for if, after you have flattened your piece out, you attempt to hammer it back to a square or a round you spoil it. When your drill is in proper shape heat it to a cherry red, and thrust it into a piece of resin, or into quicksilver.

Some use a solution of cyanuret potassa and rain water for tempering their drills, but for my part I have always found the resin or quicksilver to work best.

To Temper Gravers.—Gravers and other instruments larger than drills, may be tempered in quicksilver as above; or you may use lead instead of quicksilver. Cut down into the lead, say half an inch; then, having heated your instrument to a light cherry red, press it firmly into the cut. The lead will melt around it, and an excellent temper will be imparted.

Other Methods to Temper Case Springs.—Having fitted the spring into the case according to your liking, temper it hard by heating and plunging into water. Next polish the small end so that you may be able to see when the color changes; lay it on a piece of copper or brass plate, and hold the plate over your lamp, with the blaze directly under the largest part of the spring. Watch the polished part of the steel closely, and when you see it turn blue remove the plate from the lamp, letting all cool gradually together. When cool enough to handle polish the end of the spring again,

place it on the plate and hold it over the lamp as before. The third blueing of the polished end will leave the spring in proper temper. Any steel article to which you desire to give a spring temper may be treated in the same way.

Another process said to be good, is to temper the spring as in the first instance; then put it in a small iron ladle, cover it with linseed oil and hold over a lamp till the oil takes fire. Remove the ladle, but let the oil continue to burn until nearly all consumed, when blow out, re-cover with oil and hold over the lamp as before. The third burning out of the oil will leave the spring in the right temper.

To Temper Clicks, Ratchets, &c.—Clicks, Ratchets, or other steel articles requiring a similar degree of hardness should be tempered in mercurial ointment. The process consists in simply heating to a cherry red and plunging into the ointment. No other mode will combine toughness and hardness to such an extent.

To Draw the Temper from Delicate Steel Pieces without Springing them.—Place the article from which you desire to draw the temper into a common iron clock key. Fill around it with brass or iron filings, and then plug up the open end with a steel, iron or brass plug, made to fit closely. Take the handle of the key with your plyers and hold its pipe into the blaze of a lamp till near hot, then let it cool gradually. When sufficiently cold to handle, remove the plug, and you will find the article with its temper fully drawn, but in all other respects just as it was before.

You will understand the reason for having the article thus plugged up while passing it through the heating and cooling process, when we tell you that springing always results from the action of changeable currents of atmosphere. The temper may be drawn from cylinders, staffs, pinions, or any other delicate pieces by this mode with perfect safety.

To Temper Staffs, Cylinders or Pinions, without Springing them.—Prepare the articles as in the preceding process, using a steel plug. Having heated the key-pipe to a cherry red, plunge it into water; then polish the end of your steel plug, place the key upon a plate of brass or copper, and hold it over your lamp with the blaze immediately under the pipe till the polished part becomes blue. Let cool gradually, then polish again. Blue and cool a second time, and the work will be done.

To Draw the Temper from Part of a Small Steel Article.—Hold the part from which you wish to draw the temper, with a pair of tweezers, and with your blow-pipe direct the flame upon them—not the article—till sufficient heat is communicated to the article to produce the desired effect.

To Blue Screws Evenly.—Take an old watch barrel and drill as many holes into the head of it as you desire to blue screws at a time. Fill it about one-fourth full of brass or iron filings, put in the

head, and then fit a wire, long enough to bend over for a handle, into the arbor holes—head of the barrel upwards. Brighten the heads of your screws, set them, point downwards, into the holes already drilled, and expose the bottom of the barrel to your lamp till the screws assume the color you wish.

To Remove Blueing from Steel.—Immerse in a pickle composed of equal parts muriatic acid and elixir vitriol. Rinse in pure water and dry in tissue paper.

To Make Diamond Broaches.—Make your broaches of brass the size and shape you desire; then, having oiled them slightly, roll their points into fine diamond dust till entirely covered. Hold them then on the face of your anvil and tap with a light hammer till the grains disappear in the brass. Great caution will be necessary in this operation. Do not tap heavy enough to flatten the broach. Very light blows are all that will be required; the grains will be driven in much sooner than one would imagine.

Some roll the broach between two smooth pieces of steel to imbed the diamond dust. It is a very good way, but somewhat more wasteful of the dust.

Broaches made on this plan are used for dressing out jewels.

To Make Polishing Broaches.—These are usually made of ivory, and used with diamond dust, loose, instead of having been driven in. You oil the broach lightly, dip it into the finest diamond dust and proceed to work into the jewel the same as you do the brass broach. Unfortunately, too many watchmakers fail to attach sufficient importance to the polishing broach. The sluggish motion of watches now-a-days, is more often attributable to rough jewels than to any other cause.

To Make Diamond Files.—Shape your file of brass, and charge with diamond dust, as in the case of the mill. Grade the dust in accordance with the coarse or fine character of the file desired.

To Make Pivot Files.—Dress up a piece of wood file-fashion, about an inch brood, and glue a piece of fine emery paper upon it. Shape your file then, os you wish it, of the best cast steel, and before tempering pass your emery paper heavily across it several times, diagonally. Temper by heating to a cherry red, and, plunging into linseed oil. Old worn pivot files may be made over and made new by this process. At first thought one would be led to regard them too slightly cut to work well, but not so. They dress a pivot more rapidly than any other file.

To Make Burnishers.—Proceed the same as in making pivot files, with the exception that you are to use fine flour of emery on a slip of oiled brass or copper, instead of the emery paper. Burnishers which have become too smooth may be improved vastly with the flour of emery as above without drawing the temper.

To Prepare a Burnisher for Polishing.—Melt a little bees-wax on the face of your burnisher. Its effect then, on brass or other finer metals, will be equal to the best buff. A small burnisher prepared in this way is the very thing with which to polish up watch wheels. Rest them on a piece of pith while polishing.

To Clean a Clock.—Take the movement of the clock "to-pieces." Brush the wheels and pinions thoroughly with a stiff, coarse brush; also the plates into which the trains work. Clean the pivots well by turning in a piece of cotton cloth held tightly between your thumb and finger, The pivot holes in the plates are generally cleansed by turning a piece of wood in them, but I have always found a strip of cloth or a soft cord drawn lightly through them to act the best. If you use two cords, the first one slightly oiled, and the next dry to clean the oil out, all the better. Do not use salt or acid to clean your clock—it can do no good, but may do a great deal of harm. Boiling the movement in water, as some practice, is also foolishness.

To Bush.—The hole through which the great arbors or winding axles work, are the only ones that usually require bushing. When they have become too much worn the great wheel on the axle before-named strikes too deeply into the pinions above it, and stop the clock. To remedy this bushing is necessary, of course. The most common way of doing it is to drive a steel point or punch into the plate just above the axle hole, thus forcing the brass downward until the hole is reduced to its original size. Another mode is to solder a piece of brass upon the plate in such a position as to hold the axle down to its proper place. If you simply wish your clock to run, and have no ambition to produce a bush that will look workmanlike, about as good a way as any is to fit a piece of hard wood beetween the post which comes through the top of the plate and the axle. Make it long enough to hold the axle to its proper place, and so that the axle will run on the end of the grain. Cut notches where the pivots come through, and secure by wrapping around it and the plate a piece of small wire, or a thread. There is no post coming through above the axle on the striking side. but this will rarely require bushing. I have known clocks to run well on this kind of bushing, botchified as it may appear, for ten years.

To Remedy Worn Pinions.—Turn the leaves or rollers so the worn places upon them will be towards the arbor or shaft, and fasten them in that position. If they are "rolling pinions," and you cannot secure them otherwise, you had better do it with a little soft solder.

To Oil Properly.—Oil only, and very lightly, the pallets of the verge, the steel pin upon which the verge works, and the point where the loop of the verge wire works over the pendulum wire. Use none but the best watch oil. Though you might be working constantly at the clock repairing business, a bottle costing you but 25 cents, would last you two years at least. You can buy it at any watch-furnishing establishment.

To Make the Clock Strike Correctly.—If not very cautious in putting up your clock you will get some of the striking-train wheels in wrong, and thus produce a derangement in the striking. If this should happen, pry the plates apart on the striking side, slip the pivots of the upper wheels out, and having disconnected them from the train, turn them part around and put them back. If still not right, repeat the experiment. A few efforts at most will get them to working properly.

A Defect to Look After.—Always examine the pendulum-wire at the point where the loop of the verge wire works over it. You will generally find a small notch, or at least a rough place worn there. Dress it out perfectly smooth, or your clock will not be likely to work well. Small as this defect may seem, it stops a large number of clocks.

To Refine Gold.—If you desire to refine your gold from the baser metals, swedge or roll it out very thin, then cut into narrow strips and curl up so as to prevent its lying flatly. Drop the pieces thus prepared into a vessel containing good nitric acid, in the proportion of acid 2 oz., and pure rain water ½ oz. Suffer to remain until thoroughly dissolved, which will be the case in ½ hour to 1 hour. Then pour off the liquid carefully and you will find the gold in the form of a yellow powder lying at the bottom of the vessel. Wash this with pure water till it ceases to have an acid taste, after which you may melt and cast into any form you choose. Gold treated in this way may be relied on as perfectly pure.

In melting gold use none other than a charcoal fire, and during the process sprinkle saltpetre and potash into the crucible occasionally. Do not attempt to melt with stone coal, as it renders the metal brittle and otherwise imperfect.

To Refine Silver.—Dissolve in nitric acid as in the case of the gold. When the silver has entirely disappeared, add to the water. Sink, then, a sheet of clean copper into it—the silver will collect rapidly upon the copper, and you can scrape it off and melt into bulk at pleasure.

In the event you were refining gold in accordance with the foregoing formula, and the impurity was silver, the only steps necessary to save the latter would be to add the above-named proportion of water to the solution poured from the gold, and then to proceed with your copper plate as just directed.

To Refine Copper.—This process differs from the one employed to refine silver in no respects save the place to be immersed; you use an iron instead of a copper plate to collect the metal.

If the impurities of gold refined were both silver and copper, you might, after saving the silver as above directed, sink your iron plate into the solution yet remaining, and take out the copper. The parts of alloyed gold may be separated by these processes, and leave each in a perfectly pure state.

To Hard Solder Gold, Silver, Copper, Brass, Iron, Steel, or Platina.—The solders to be used for gold, silver, copper and brass are given in the preceding part. You commence operations by reducing your solder to small particles and mixing it with powdered sal-ammoniac and powdered borax in equal parts, moistened to make it hold together. Having fitted up the joint to be soldered, you secure the article upon a piece of soft charcoal, lay your soldering mixture immediately over the joint, and then with your blow pipe turn the flames of your lamp upon it until fusion takes place. The job is then done and ready to be cooled and dressed up.

Iron is usually soldered with copper or brass, in accordance with the above process. The best solder for steel is pure gold or pure silver, though gold or silver solders are often used successfully.

Platina can only be soldered well with gold; and the expense of it, therefore, contributes to the hindrance of a general use of platina vessels, even for chemical purposes, where they are of so much importance.

To Soft Solder Articles.—Moisten the parts to be united with soldering fluid; then, having joined them together, lay a small piece of solder upon the joint and hold over your lamp, or direct the blaze upon it with your blow pipe until fusion is apparent. Withdraw them from the blaze immediately, as too much heat will render the solder brittle and unsatisfactory. When the parts to be joined can be made to spring or press against each other, it is best to place a thin piece of solder between them before exposing to the lamp.

Where two smooth surfaces are to be soldered one upon the other, you may make an excellent job by moistening them with the fluid, and then, having placed a sheet of tin foil between them, holding them pressed firmly together over your lamp till the foil melts. If the surfaces fit nicely a joint may be made in this way so close as to be almost imperceptible. The brightest looking lead which comes as a lining to tin boxes works better in the same way than tin foil.

To Cleanse Gold Tarnished in Soldering.—The old English mode was to expose all parts of the article to a uniform heat, allow it to cool and then boil until bright in urine and sal-ammoniac. It is now usually cleansed with diluted sulphuric acid. The pickle is made in about the proportion of one-eighth of an oz. acid to 1 oz. rain water.

To Cleanse Silver Tarnished in Soldering.—Some expose to a uniform heat, as in the case of gold, and then boil in strong alum water. Others immerse for a considerable length of time in a liquid made of ½ an oz. of cyanuret potassa to 1 pt. rain water, and then brush off with prepared chalk.

To Make Gold Solution for Electro-Plating.—Dissolve five pennyweights gold coin, five grains pure copper and 4 grains pure silver in 3 oz. nitro muriatic acid; which is simply two parts muria-

tic acid and one part nitric acid. The silver will not be taken into solution as are the other two metals, but will gather at the bottom of the vessel. Add 1 oz. pulverized sulphate of iron, ½ oz. pulverized borax, 25 grs. pure table salt, and 1 qt. hot rain water. Upon this the gold and copper will be thrown to the bottom of the vessel with the silver. Let stand till fully settled, then pour off the liquid carefully, and refill with boiling rain water as before. Continue to repeat this operation until the precipitate is thoroughly washed; or, in other words, fill up, let settle, and pour off so long as the accumulation at the bottom of the vessel is acid to the taste.

You now have about an eighteen carat chloride of gold. Add to it an oz. and an eighth cyanuret potassa, and 1 qt. rain water—the latter heated to the boiling point. Shake up well, then let stand about twenty-four hours and it will be ready for use.

Some use platina as an alloy instead of silver, under the impression that plating done with it is harder. I have used both, but never could see much difference.

Solution for a darker colored plate to imitate Guinea gold may be made by adding to the above 1 oz. of dragon's blood and five grains of iodide of iron.

If you desire an alloyed plate, proceed as first directed, without the silver or copper, and with an oz. and a half of sulphuret potassa in place of the iron, borax and salt.

To Make Silver Solution for Electro-Plating.—Put together into a glass vessel, one oz. good silver, made thin and cut into strips; two oz. best nitric acid and ½ an oz. pure rain water. If solution does not begin at once, add a little more water—continue to add a very little at a time till it does. In the event it starts off well, but stops before the silver is fully dissolved, you may generally start it up again all right by adding a little more water.

When solution is entirely effected, add 1 qt. warm rain water and a large tablespoonful of table salt. Shake well and let settle, then proceed to pour off and wash through other waters as in the case of the gold preparation. When no longer acid to the taste, put in an oz. and an eighth cyanuret potassa and a qt. pure rain water; after standing about twenty-four hours it will be ready for use.

To Plate with a Battery.—If the plate is to be gold, use the gold solution for electroplating; if silver use the silver solution. Prepare the article to be plated by immersing it for several minutes in a strong lye made of potash and rain water, polishing off thoroughly at the end of the time with a soft brush and prepared chalk. Care should be taken not to let the fingers come in contact with the article while polishing, as that has a tendency to prevent the plate from adhering—it should be held in two or three thicknesses of tissue paper.

Attach the article, when thoroughly cleansed, to the positive pole of your battery, then affix a piece of gold or silver, as the case may be, to the negative pole, and immerse both into the solution in such a way as not to hang in contact with each other.

After the article has been exposed to the action of the battery about ten minutes, take it out and wash or polish over with a thick

mixture of water and prepared chalk or jeweller's rouge. If, in the operation, you find places where the plating seems inclined to peel off, or when it has not taken well, mix a little of the plating solution with prepared chalk or rouge, and rub the defective part thoroughly with it. This will be likely to set all right.

Govern your time of exposing the article to the battery by the desired thickness of the plate. During the time it should be taken out and polished up as just directed about every ten minutes, or as often at least as there is an indication of a growing darkness on any part of its surface. When done, finish with the burnisher on prepared chalk and chamois skin, as best suits your taste and convenience.

In case the article to be plated is iron, steel, lead, pewter, or block tin, you must, after first cleansing with the lye and chalk, prepare it by applying with a soft brush—a camel's hair pencil is best suited—a solution made of the following articles in the proportion named: Nitric acid, half an ounce; muriatic acid, one-third of an ounce; sulphuric acid, one-ninth of an ounce; muriate of potash, one-seventh of an ounce; sulphate of iron, one-fourth of an ounce; sulphuric ether, one-fifth of an ounce, and as much sheet zinc as it will dissolve. This prepares a foundation, without which the plate would fail to take well, if at all.

To Make Gold Amalgam.—Eight parts of gold and one of mercury are formed into an amalgam for plating, by rendering the gold into thin plates, making it red hot and then putting it into the mercury while the latter is also heated to ebullition. The gold immediately disappears in combination with the mercury, after which the mixture may be turned into water to cool. It is then ready for use.

To Plate With Gold Amalgam.—Gold amalgam is chiefly used as a plating for silver, copper, or brass. The article to be plated is washed over with diluted nitric acid or potash lye and prepared chalk, to remove any tarnish or rust that might prevent the amalgam from adhering. After having been polished perfectly bright, the amalgam is applied as evenly as possible, usually with a fine scratch brush. It is then set upon a grate over a charcoal fire, or placed into an oven and heated to that degree at which mercury exhales. The gold, when the mercury has evaporated, presents a dull yellow color. Cover it with a coating of pulverized nitre and alum in equal parts, mixed to a paste with water, and heat again till *it* is thoroughly melted, then plunge into water. Burnish up with a steel or bloodstone burnisher.

To Make and Apply Gold Plating Solution.—Dissolve half an ounce of gold amalgam in one ounce of nitro-muriatic acid. Add two ounces of alcohol, and then, having brightened the article in the usual way, apply the solution with a soft brush. Rinse and dry in saw-dust, or with tissue paper, and polish up with chamois skin.

To Make and Apply Gold Plating Powders.—Prepare a chloride of gold the same as for plating with a battery. Add to it, when thoroughly washed out, cyanuret potassa in the proportion of two ounces to five pennyweights of gold. Pour in a pint of clean rain water, shake up well and then let stand till the chloride is dissolved. Add then one pound of prepared Spanish whiting and let evaporate in the open air till dry, after which put away in a tight vessel for use. To apply it you prepare the article in the usual way, and having made the powder into a paste with water, rub it upon the surface with a piece of chamois skin or cotton flannel.

An old mode of making a gold plating powder was to dip clean linen rags into solution prepared as in the second article preceding this, and having dried, to fire and burn them into ashes. The ashes formed the powder, and were to be applied as above.

To Make and Apply Silver Plating Solution.—Put together in a glass vessel one ounce nitrate of silver, two ounces cyanuret potassa, four ounces prepared Spanish whiting, and ten ounces pure rain water. Cleanse the article to be plated as per preceding directions, and apply with a soft brush. Finish with the chamois skin or burnisher.

To Make and Apply Silver Plating Powder.—Dissolve silver in nitric acid by the aid of heat; put some pieces of copper into the solution to precipitate the silver; wash the acid out in the usual way; then with fifteen grains of it mix two drachms of tartar, two drachms of table salt, and half a drachm of pulverized alum. Brighten the article to be plated with lye and prepared chalk, and rub on the mixture. When it has assumed a white appearance, expose to heat as in the case of plating with gold amalgam, then polish up with the burnisher or soft leather.

To Frost Watch Movments.—Sink that part of the article to be frosted for a short time in a compound of nitric acid, muriatic acid and table salt—one ounce of each. On removing from the acid, place it in a shallow vessel containing enough sour beer to merely cover it; then with a fine scratch brush scour thoroughly, letting it remain under the beer during the operation. Next wash off, first in pure water and then in alcohol. Gild or silver in accordance with any recipe in the chapter on plating.

To Enamel Gold and Silver.—Take half a pennyweight of silver, two pennyweights and a half of copper, three pennyweights and a half of lead, and two pennyweights and a half of muriate of ammonia. Melt together and pour into a crucible with twice as much pulverized sulphur; the crucible is then to be immediately covered that the sulphur may not take fire, and the mixture is to be calcined over a smelting fire until the superfluous sulphur is burned away. The compound is then to be coarsely pounded, and

with a solution of muriate of ammonia to be formed into a paste which is to be placed upon the article it is designed to enamel. The article must then be held over a spirit lamp till the compound upon it melts and flows. After this it may be smoothed and polished up in safety. This makes the black enamel now so much used on jewelry.

To Destroy the Effects of Acid on Clothes.—Dampen as soon as possible after exposure to the acid with spirits ammonia. It will destroy the effect immediately.

To Wash Silver Ware.—Never use a particle of soap on your silverware, as it dulls the lustre, giving the article more the appearance of pewter than silver. When it wants cleaning rub it with a piece of soft leather and prepared chalk, the latter made into a kind of paste with pure water, for the reason that water not pure might contain gritty particles.

To Cleanse Brushes.—The best method of cleansing watchmakers' and jewelers' brushes is to wash them out in strong soda water. When the backs are wood you must favor that part as much as possible, for, being glued, the water might injure them.

To Cut Glass Round or Oval Without a Diamond.—Scratch the glass around the shape you desire with the corner of a file or graver; then, having bent a piece of wire in the same shape, heat it red hot and lay it upon the scratch, sink the glass into cold water just deep enough for the water to come almost upon a level with its upper surface. It will rarely ever fail to break perfectly true.

To Re-Black Clock Hands.—Use asphaltum varnish. One coat will make old rusty hands look as good as new, and it dries in a few minutes.

Improved Wood Filing Composition.—Whiting, 6 oz.; Japan, ½ pt.; boiled linseed oil, ½ pt.; turpentine, ½ pt.; corn starch, 1 oz. Mix *well* together and apply to the wood. On walnut wood add a little burned umber, on cherry a little Venetian red, to the above mixture.

Planing Metals.—The first operation about planing is to oil your planer and find out if the bed is smooth. If it is not file off the rough places; then change the dogs to see if they will work well, and find out the movements of the planer. After doing this, bolt your work on to the bed, and if it is a long, thin piece, plane off a chip, then turn it over and finish the other side, taking two chips, the last of which should be very light. Great care should be taken in bolting the bed not to spring it. After finishing this side turn it to the other side, and take off a light cut to finish it.

Planing Perpendicularly.—In planing perpendicularly, it is necessary to swivel the bottom of the small head around, so it will stand about three-fourths of an inch inside of square, towards the piece you are to plane. This prevents breaking the tool when the bed runs back.

Gear Cutting.—In cutting gears, they are reckoned on a certain

number of teeth to the inch, measuring across the diameter to a certain line which is marked on the face or sides of the gear with a tool. This line is one-half the depth of the teeth from the outer diameter. That is, if the teeth of the gear are two-tenths of an inch deep, this line would be one-tenth of an inch from the edge, and is called the pitch line.

Depth of Teeth.—Every gear cut with a different number of teeth to the inch, should be cut of a depth to the pitch line, to correspond with the number of teeth to the inch. This is called proportion. Therefore, if you cut a gear eight to the inch, the depth to the pitch line should be one-eighth of an inch, and the whole depth of the tooth would be two-eighths. Again, if you cut a gear twelve to the inch, the depth to pitch line should be one-twelfth of an inch, and the whole depth of tooth two-twelfths. And again, if you cut a gear twenty to the inch, the depth to pitch line should be one-twentieth of an inch, while the whole depth should be two-twentieths, and so on *ad infinitum*.

Measuring to find the Number of Teeth.—To find the size a certain gear should be, for a certain number of teeth, is an easy matter if you study carefully these rules. If you want a gear with thirty-two teeth and eight to the inch, it should be four inches, measuring across the diameter to the pitch line, and the two-eighths outside of the pitch line would make it four inches and two-eighths. Again, if you want a gear with forty teeth, and ten to the inch, it should measure across the diameter to pitch line four inches, and the two-tenths outside the pitch line would make the whole diameter four inches and two-tenths. And again, if you want a gear with eighty teeth, and twenty to the inch, it should measure to the pitch line, across the diameter, four inches, and the two-twentieths outside the pitch line would make it four inches and two-twentieths, and these examples will form a rule for the measurement of all except bevel gears.

Bevel Gears.—These are turned a certain bevel to correspond with each other, according to the angle upon which the shafts driven by them are set. For instance, if two shafts are set upon an angle of ninety degrees, the surfaces of the faces of these gears will stand at an angle of forty-five degrees. To get the surface of these gears in turning them, put a straight edge across the face, then set your level on an angle of forty-five degrees, and try the face of the teeth by placing the level on a straight edge. After turning the face of the teeth, square the outer diameter by the face of the teeth: and to get the size to which you wish to cut, measure from the centre of the face of the teeth. Thus if a bevel gear is six inches in diameter, and the face of the teeth is one inch, you will measure from the centre of the face, and find it is five inches. On this line you calculate the number of teeth to the inch, and if you want a gear with twenty teeth, and ten to the inch, it should measure two inches across the face to the centre of the surface of the teeth; and if the face of the teeth were one inch in length, the diameter of the gear would be three inches, and the inside of the teeth would measure only one inch. Again if you want to cut a

gear with forty teeth, and ten to the inch, it would measure four inches to the centre of the teeth on the surface. And if the surface of the teeth were one inch long, the diameter of the gear would be five inches, while it would only measure three inches inside the teeth. These examples will form a rule for all bevel gear.

Draw-Filing and Finishing.—To draw-file a piece of work smoothly and quickly, it is best to first draw-file it with a medium fine file, and finish with a superfine file. After doing this, polish the work with dry emery paper, and then with emery paper and oil.

Lining Boxes with Babbitt Metal.—To line boxes properly, so as to insure their filling every time, it is necessary to heat the box nearly red hot, or at least hot enough to melt the metal. Then smoke the shaft where the metal is to be poured upon it. This insures its coming out of the box easily, after it is cold. After smoking the shaft, put it into the box or boxes, and draw some putty around the ends of them, for the purpose of stopping them, taking care not to press upon it, for if you do it will go into the box, and fill a place that ought to be filled with metal; and in the meantime your metal ought to be heated, and after you have poured it, let the box stand till it is nearly cold; drive out your shaft, and it is done.

Making Lining Metal.—Melt in a crucible one and a half pounds of copper, and while the copper is melting, melt in a ladle twenty-five pounds of tin, and three of antimony, nearly red hot, pour the two together, and stir until nearly cool. This makes the finest kind of lining metal.

Putting Machines Together.—In putting machines together no part should be finished except where it is necessary to make a fit, as it is sometimes the case that machinery is miscalculated, and by finishing it would be spoiled, while if it were not it might be saved by slight alterations in design. And again, in finishing certain parts before you get a machine together, you are unknowingly finishing parts not necessary to be finished, and making them of a shape anything but desirable. This rule, however, is not intended to apply to machinery being made to detail drawings.

To Drill a Hole where you have no Reamer.—It is sometimes necessary to drill a hole of an exact size to fit a certain shaft, and at the same time have it smooth without reaming it. This may be done, by first drilling a hole, a one-hundredth of an inch smaller than the size desired, and then making a drill the exact size and running it through to finish with. This last drill should have the corners of its lips rounded, like a reamer, and the hole should be finished without holding the drill with a rest.

Boring a Hole with a Boring Tool.—In boring a hole with a boring tool, it is usually necessary to drill the hole first, and too much care cannot be taken in finishing. An iron gauge should be made first; is usually made of a piece of sheet iron or wire. The hole should then be drilled smaller than the size desired, and then bored to the required size, and it is impossible to bore a hole perfect

without taking two or three light chips, mere scrapings with which to finish. Holes, in this way, may be bored as nicely as they can be reamed.

Squaring or Facing up Cast Iron Surfaces.—A round end tool is best for this. A rough chip should first be taken off, over the entire surface to be faced. Then speed your lathe up and taking a light chip, merely enough to take out the first tool marks, run over the entire surface again. In turning up surfaces it is always best to begin at the centre and feed out, as the tool cuts freer and will wear twice as long.

Boring Holes with Boring Arbor.—A boring arbor is a shaft with a steel set in it, for the purpose of boring holes of great length, and is designed to be used in a lathe. In doing this properly, you must first see if your lathe is set straight. If not, adjust it; having done this, put the piece of work to be bored in the carriage of your lathe, pass your arbor through the hole to be bored, and put it on the centres of your lathe. Having done this, adjust your work true to the position desired by measuring from the point of the tool, continually turning round the arbor from side to side of the piece to be bored, while you are bolting it to the carriage, and measure until it is perfectly true. Having done this, bore the hole, and take for the last chip only a hundredth of an inch. This makes a true and smooth hole. It is impossible to make a hole true with any kind of a tool when you are cutting a large chip, for the tool springs so that no dependence can be placed upon it.

To make a Boring Arbor and Tool that will not Chatter.—Boring tools, when used in small arbors, are always liable to chatter and make a rough hole. To prevent this, the tool should be turned in a lathe, while in its position in the arbor, upon the circle of the size of the hole to be bored, and the bearing lengthwise of the arbor should be only as wide as the feed of the lathe; for if the bearing of the tool is on the face, the more it will chatter.

CEMENTS.

Rust Joint.—QUICK SETTING.—1 lb. sal ammoniac in powder, 2 lbs. of flour of sulphur, 80 lbs. iron borings. Made to a paste with water. SLOW SETTING.—2 lbs. sal ammoniac, 1 lb. of sulphur, 200 lbs. iron borings. This latter cement is best if the joint is not required for immediate use.

For Steam Boilers, Steam Pipes, Etc.—SOFT.—Red or white lead in oil, 4 parts; iron borings, 2 to 3 parts. HARD.—Iron borings and salt water, and a small quantity of sal ammoniac with fresh water.

Maltha, or Greek Mastic.—Lime and sand mixed in the manner of mortar, and made into a proper consistency with milk or size without water.

For China.—Curd of milk, dried and powdered, 10 oz.; quicklime, 1 oz.; camphor, 2 drachms. Mix, and keep in closely stopped bottles. When used, a portion is to be mixed with a little water into a paste.

For Earthen and Glassware.—Heat the article to be mended a little above 212°, then apply a thin coating of gum shellac upon both surfaces of the broken vessel. Or, dissolve gum shellac in alcohol, apply the solution, and bind the parts firmly together until the cement is dry.

Holes in Casting.—Sulphur in powder, 1 part; sal ammoniac, 2 parts; powdered iron turnings, 80 parts. Make into a thick paste. The ingredients composing this cement should be kept separate, and not mixed until required for use.

For Marble.—Plaster of Pasis, in a saturated solution of alum, baked in an oven, and reduced to powder. Mixed with water. It may be mixed with various colors.

For Marble Workers and Coppersmiths. — White of egg, mixed with finely sifted quicklime, will unite objects which are not submitted to moisture.

Transparent for Glass.—India rubber, 1 part in 64 of chloroform; add gum mastic in powder, 16 to 24 parts. Digest for two days with frequent shaking.

To Mend Iron Ware.—Sulphur, 2 parts; fine black lead, 1 part. Put the sulphur in an iron pan, over a fire, until it melts, then add the lead; stir well; then pour out. When cool, break into small pieces. A sufficient quantity of this compound being placed upon the crack of the ware to be mended, can be soldered by an iron.

For Cisterns and Water Casks.—Melted glue, 8 parts; linseed oil, 4 parts; boiled into a varnish with litharge. This cement hardens in about 48 hours, and renders the joints of wooden cisterns and casks air and water tight.

Hydraulic Cement Paint.—Hydraulic cement mixed with oil forms an incombustible and waterproof paint for roofs of buildings, out-houses, walls, etc.

Entomologists' Cement.—Thick mastic varnish and isinglass size, equal parts.

BROWNING.

Browning, or Bronzing Liquid.—Sulphate of copper, 1 oz.; sweet spirit of nitre, 1 oz.; water, 1 pint. Mix. In a few days it will be fit for use.

Browning for Gun Barrels.—Tinct. of mur. of iron, 1 oz.; nitric ether, 1 oz.; sulphate of copper, 4 scruples; rain water, 1 pint. If the process is to be hurried, add 2 or 3 grains of oxymuriate of mercury. When the barrel is finished, let it remain a short time in lime water, to neutralize any acid which may have penetrated; then rub it well with an iron wire scratch brush.

Bronzing Fluid for Guns, Etc.—Nitric acid, sp. gr. 1.2; Nitric ether, alcohol, and muriate of iron, each 1 part. Mix, then add sulphate of copper, 2 parts, dissolved in water, 10 parts.

LACKERS.

For Small Arms, or Waterproof Paper.—Beeswax, 13 lbs.; spirits of turpentine, 13 gallons; boiled linseed oil, 1 gallon. All the ingredients should be pure and of the best quality. Heat them together, in a copper or earthen vessel over a gentle fire, in a water-bath, until they are well mixed.

For Bright Iron Work.—Linseed oil, boiled, 80.5; litharge, 5.5; white lead, in oil, 11.25; resin, pulverized, 2.75. Add the litharge to the oil; let it simmer over a slow fire 3 hours; strain it, and add the resin and white lead; keep it gently warmed, and stir it until the resin is dissolved.

INKS.

Indelible, for Marking Linen, Etc.—1. Juice of sloes, 1 pint; gum, ½ an ounce. This requires no "preparation" or mordant, and is very durable. 2. Nitrate of silver, 1 part; water, 6 parts; gum, 1 part. Dissolve. MARKING.—Lunar caustic, 2 parts; sap green and gum arabic, each 1 part; dissolve with distilled water. THE "PREPARATION."—Soda, 1 ounce; water, 1 pint; sap green, ½ drachm. Dissolve, and wet the article to be marked, then dry and apply the ink.

PERPETUAL, FOR TOMB STONES, MARBLE, ETC.—Pitch, 11 parts; lampblack, 1 part; turpentine sufficient. Warm and stir.

COPYING INK.—Add 1 oz. of sugar to a pint of ordinary ink.

GLUES.

For Parchment.—Parchment shavings, 1 lb.; water, 6 quarts. Boil until dissolved, then strain and evaporate slowly to the proper consistence.

Rice Glue, or Japanese Cement.—Rice flour; water, sufficient quantity. Mix together cold, then boil, stirring it all the time.

Liquid.—Glue, water, and vinegar, each 2 parts. Dissolve in a water-bath, then add alcohol, 1 part. Or, cologne or strong glue, 2.2 lbs.; water, 1 quart; dissolved over a gentle heat; add nitric acid 36°, 7 oz., in small quantities. Remove from the fire and cool. Or, white glue, 16 oz.; white lead, dry, 4 oz.; rain water, 2 pints. Add alcohol, 4 oz., and continue the heaf for a few minutes.

Marine.—Dissolve India-rubber, 4 parts, in 34 parts of coal-tar naphtha; add powdered shellac, 64 parts. While the mixture is hot it is poured upon metal plates in sheets. When required for use, it is heated, and then applied with a brush. Or, 1 part India-rubber, 12 parts of coal-tar; heat gently, mix, and add 20 parts of powdered shellac. Pour out to cool. When used, heat to about 250°. Or, glue, 12 parts; water, sufficient to dissolve; and yellow resin, 3 parts; and, when melted, add turpentine, 4 parts. Mix thoroughly together.

Strong Glue.—Add powdered chalk to common glue.

Gum Mucilage.—A little oil of cloves poured into a bottle containing gum mucilage, prevents it from becoming sour.

Glue to Resist Moisture.—5 parts glue, 4 parts resin, 2 parts red ochre, mixed with the least practicable quantity of water. Or, 4 parts of glue, 1 part of boiled oil by weight, 1 part oxide of iron. Or, 1 lb. of glue melted in 2 quarts of skimmed milk.

VARNISHES.

Waterproof.—Flour of sulphur, 1 lb.; Linseed-oil, 1 gal.; boil them until they are thoroughly combined. This forms a good varnish for waterproof textile fabrics. Another is made of oxide of lead, 4 lbs.; lamp-black, 2 lbs.; sulphur, 5 oz.; and India-rubber dissolved in turpentine, 10 lbs. Boil together until they are thoroughly combined.

To Adhere Engravings or Lithographs upon Wood.—Sandarach, 250 parts; mastic in tears, 64; resin, 125; Venice turpentine, 250; and alcohol, 1000 parts by measure.

For Harness.—India-rubber, ¼ lb.; spirits of turpentine, 1 gal.; dissolve into a jelly; then take hot linseed oil, equal parts with the mass, and incorporate them well over a slow fire.

For Fastening Leather on Top Rollers.—Gum Arabic, 2¾ oz., dissolved in water, and a like volume of isinglass dissolved in water.

To Preserve Glass from the Rays of the Sun.—Reduce a quantity of gum tragacanth to fine powder, and let it dissolve for 24 hours in white of eggs well beat up.

For Water-Color Drawings.—Canada balsam, 1 part; oil of turpentine, 2 parts, mixed. Size the drawing before applying the varnish.

For Objects of Natural History, for Shells, Fish, &c.—Mucilage of gum tragacanth and mucilage of gum arabic, each 1 oz. Mix, and add spirit with corrosive sublimate, so as to precipitate the more stringy part of the gum.

For Articles of Iron and Steel.—Clear grains of mastic, 10 parts; camphor, 5 parts; sandarach, 15 parts; and elemi, 5 parts. Dissolve in a sufficient quantity of alcohol, and apply without heat. This varnish will retain its transparancy, and the metallic brilliancy of the article will not be obscured.

For Gun Barrels, after Browning.—Shellac, 1 oz.; Dragon's blood, ¼ oz.; rectified spirit, 1 quart. Dissolve and filter.

Black.—Heat to boiling, 10 parts of linseed oil varnish with burnt umber, 2 parts, and powdered asphaltum, 1 part. When cooled, dilute with spirits of turpentine as required.

Balloon.—Melt India-rubber in small pieces with its weight of boiled linseed oil. Thin with oil of turpentine.

Transfer.—Alcohol, 5 oz.; pure Venice turpentine, 4 oz.; mastic, 1 oz.

To Clean Varnish.—Mix a lye of potash, or soda, with a little powdered chalk.

Composition for Rendering Canvas Waterproof and Pliable.—Yellow soap, 1 lb., boiled in 6 pints of water, add, while hot, to 112 lbs. of paint.

STAINING.

Staining Wood and Ivory.—YELLOW.—Dilute Nitric acid will produce it on wood.

RED.—An infusion of Brazil wood in stale urine, in the proportion of 1 lb. to a gallon for wood, to be laid on when boiling hot, and should be laid over with alum water before it dries. Or, a solution of dragon's blood in spirits of wine.

BLACK.—Strong solution of nitric acid.

MAHOGANY.—Brazil, madder, and logwood, dissolved in water and put on hot.

BLUE.—For ivory—Soak it in a solution of verdigris in nitric acid, which will turn it *green;* then dip it into a solution of pearl-ash boiling hot.

PURPLE.—Soak ivory in a solution of sal-ammoniac into four times its weight of nitrous acid.

MISCELLANEOUS.

To Clean Marble.—Chalk, powdered, and pumice-stone, each 1 part; soda, 2 parts. Mix with water. Wash the spots, then clean and wash off with soap and water.

To Extract Grease from Stone or Marble.—Soft soap, 1 part; Fuller's earth, 2 parts; potash, 1 part. Mix with boiling water. Lay it upon the spots, and let it remain for a few hours.

Paint for Window Glass.—Chrome green, ¼ oz.; sugar of lead, 1 lb.; ground fine, in sufficient linseed oil to moisten it. Mix to the consistency of cream, and apply with a soft brush. The glass should be well cleaned before the paint is applied. The above quantity is sufficient for about 200 feet of glass.

Durable Paste.—Make common flour paste rather thick (by mixing some flour with a little *cold* water until it is of uniform consistency, and then stir it well while *boiling* water is being added to it;) add a little brown sugar and corrosive sublimate, which will prevent fermentation, and a few drops of oil of lavender, which will prevent it becoming mouldy. When this paste dries, it may be used again by dissolving it in water. It will keep for two or three years in a covered vessel.

Dubbing.—Resin, 2 lbs.; tallow, 1 lb.; train-oil, 1 gallon.

Blacking for Harness.—Bees' wax, ½ lb.; ivory black, 2 oz.; spirits of turpentine, 1 oz.; Prussian blue ground in oil, 1 oz.; copal varnish, ¼ oz. Melt the wax and stir it into the other ingredients before the mixture is quite cold; make it into balls. Rub a little upon a brush, and apply it upon the harness, then polish lightly with silk.

To Prevent Iron from Rusting.—Warm it; then rub with white wax; put it again to the fire until the wax has pervaded the entire surface. Or, immerse tools or bright work in boiled linseed oil and allow it to dry upon them.

Paper for Draughtsmen, &c.—Powdered tragacanth, 1 part; water, 10 parts; dissolve, and strain through clean gauze, then lay it smoothly upon the paper, previously stretched upon a board. This paper will take either oil or water-colors.

To Remove Old Ironmould.—Remoisten the part stained with ink, remove this by the use of muriatic acid diluted by 5 or 6 times its weight of water, when the old and new stain will be removed.

Pastiles for Fumigating.—Gum arabic, 2 oz.; charcoal powder, 5 oz.; cascarilla bark, powdered ¾ oz.; saltpetre, ¼ drachm. Mix together with water, and make into shape.

For Writing Upon Zinc Labels—Horticultural.—Dissolve 100 gr. of chloride of platinum in a pint of water; add a little mucilage and lamp-black. Or, sal-ammoniac, 1 dr; verdigris, 1 dr.; lamp-black, ½ dr.; water, 10 drs. Mix.

Booth's Grease for Railway Axles.—Water, 1 gall,; clean tallow, 3 lbs.; palm oil, 6 lbs.; common soda, ¼ lb.; or, tallow, 8 lbs.; palm oil, 10 lbs. To be heated to about 212°, and to be well stirred until it cools to 70°.

Anti-friction Grease.—100 lbs. tallow, 70 lbs. palm oil. Boiled together, and when cooled to 80°, strain through a sieve, and mix with 28 lbs. of Soda and 1½ gals. of water. For winter, take 25 lbs. more oil in place of the tallow. Or black lead, 1 part; lard, 4 parts.

Liard.—50 parts of finest rape oil and 1 part of caoutchouc, cut small. Apply heat until it is nearly all dissolved.

Stains.—To REMOVE—Stains of *Iodine* are removed by rectified spirit. *Ink* stains by oxalic or superoxalate of potash. *Ironmoulds* by the same; but if obstinate, moisten them with ink, then remove them in the usual way.

RED SPOTS upon black cloth from acids are removed by spirts of hartshorn, or other solutions of ammonia.

STAINS of MARKING-INK, OR NITRATE OF SILVER.—Wet the stain with fresh solution of cloride of lime, and after 10 or 15 minutes, if the marks have become white, dip the part in solution of ammonia or of hyposulphite of soda. In a few minutes wash with clean water. Or stretch the stained linen over a basin of hot water, and wet the mark with tincture of iodine.

Preservative Paste for Objects of Naturai History.—White arsenic, 1 lb.; powdered hellebore, 2 lbs.

Paste for Cleaning Metals.—Oxalic acid, 1 part; rottenstone, 6 parts. Mix with equal parts of train oil and spirits of turpentine.

Watchmaker's Oil, which never Corrodes or Thickens.—Place coils of thin sheet lead in a bottle with olive oil. Expose it to the sun for a few weeks, and pour off the clear oil.

Blacking, Without Polishing.—Molasses, 4 oz.; lamp-black, ½ oz.; yeast, a tablespoonful; eggs, 2; olive oil, a teaspoonful; turpentine, a teaspoonful. Mix well. To be applied with a sponge, without brushing.

To Preserve Sails.—Slacked lime, 2 bushels. Draw off the lime water, and mix it with 120 gallons water, and with blue vitriol, ¼ lb.

Whitewash.—For outside exposure, slack lime, ¼ a bushel, in a barrel; add common salt, 1 lb.; sulphate of zinc, ½ lb.; and sweet milk, 1 gal.

To Preserve Woodwork.—Boiled oil and finely powdered charcoal, each 1 part; mix to the consistence of paint. Lay on 2 or 3 coats with it. This composition is well adapted for casks, water-spouts, &c.

To Polish Wood.—Rub surface with pumice stone and water

until the rising of the grain is removed. Then, with powdered tripoli and boiled linseed oil, polish to a bright surface.

To Clean Brass Ornaments.—Brass ornaments that have not been gilt or lackered may be cleaned, and a very brilliant color given to them, by washing them in alum boiled in strong lye, in the proportion of an ounce to a pint, and afterward rubbing them with strong tripoli.

Adhesive Cement for Fractures of all Kinds.—White lead ground with linseed oil varnish, and kept out of contact with the air. It requires a few weeks to harden. When stone or iron are to be cemented together, use a compound of equal parts of sulphur and pitch.

ALLOYS AND COMPOSITIONS.

ALLOY is the proportion of a baser metal mixed with a finer or purer, as when copper is mixed with gold, &c.

AMALGAM is a compound of mercury and a metal—a soft alloy.

All compositions of copper contract in the admixture, and all amalgams expand.

In the manufacture of alloys and compositions, the more infusible metals should be melted first.

In compositions of brass, as the proportion of zinc is increased, so is the malleability decreased.

The tenacity of brass is impaired by the addition of lead or tin.

Steel alloyed with 1-500th part of platinum, or silver, is rendered harder, more malleable, and better adapted for cutting instruments.

ALLOYS AND COMPOSITIONS.

	Copper.	Zinc.	Tin.	Nickel.	Lead.	Antimony	Bismuth.	Silver	Cobalt of Iron.	Iron.	Arsenic.
Argentan	55.	24.	.....	21.	.....	.....	.....	.....	.....	.....	.....
Argentiferous	50.	2.5	2.5	40.	2.5	.....	.....	.....	.....	2.5	...z
Babbitt's metal*	3.7	.....	89.	.....	.....	7.3	.....	.....	.....	.....	.....
Brass, common	84.3	5.2	10.5	.....	.....	.....	.....	.....	.....	.....	.....
" "	75.	25.	.....	.....	.....	.....	.....	.....	.....	.....	.....
" " hard	79.3	6.4	14.3	.....	.....	.....	.....	.....	.....	.....	.....
" Mathematical instruments	92.2	.....	7.8	.....	.....	.....	.....	.....	.....	.....	.....
" pinchbeck	80.	20.	.....	.....	.....	.....	.....	.....	.....	.....	.....
" red tombac	88.8	11.2	.....	.....	.....	.....	.....	.....	.....	.....	.....
" rolled	74.3	22.3	3.4	.....	.....	.....	.....	.....	.....	.....	.....
" tutenag	50.	31.	.....	19.	.....	.....	.....	.....	.....	.....	.....
" very tenacious	88.9	2.8	8.3	.....	.....	.....	.....	.....	.....	.....	.....
" wheels, valves	90.	.....	10.	.....	.....	.....	.....	.....	.....	.....	.....
" white	10.	80.	10	.....	.....	.....	.....	.....	.....	.....	.....
" wire	67.	33.	.....	.....	.....	.....	.....	.....	.....	.....	.....
" yellow, fine	66.	34.	.....	.....	.....	.....	.....	.....	.....	.....	.....
Britannia metal	.....	.....	25.	.....	.....	25.	.....	.....	.....	.....	.....
When fused, add	.....	.....	.....	.....	.....	25.	25.	.....	.....	.....	.....
Bronze, red	87.	13.	.....	.....	.....	.....	.....	.....	.....	.....	.....
" red	86.	11 1	2.9	.....	.....	.....	.....	.....	.....	.....	.....
" yellow	67.2	31 2	1.6	.....	.....	.....	.....	.....	.....	.....	.....
" Cymbals	80.	.....	20.	.....	.....	.....	.....	.....	.....	.....	.....
" gun metal, large	90.	.....	10.	.....	.....	.....	.....	.....	.....	.....	.....
" " small	93.	.....	7.	.....	.....	.....	.....	.....	.....	.....	.....
" Medals	93.	.....	7.	.....	.....	.....	.....	.....	.....	.....	.....
" Statuary	91.4	5.5	1.4	.....	1.7	.....	.....	.....	.....	.....	.....
Chinese Silver	65.1	19 3	.....	13.	.....	.....	.....	2.48	.12	.....	.....
Chinese white copper	40.4	25.4	2.6	31.6	.....	.....	.....	.....	.....	.....	.....
Church bells	80.	5.6	10.1	.....	4.3	.....	.....	.....	.....	.....	.....
"	69.	.....	31.	.....	.....	.....	.....	.....	.....	.....	.....
Clock bells	72.	.....	26.5	.....	.....	.....	.....	.....	.....	1.5	.....
Cocks, Musical bells	87.5	.....	12.5	.....	.....	.....	.....	.....	.....	.....	.....
German silver	33.3	33.4	.....	33.3	.....	.....	.....	.....	.....	.....	.....
" "	40.4	25.4	.....	31.6	.....	.....	.....	.....	.....	2.6	.....
" " fine	49.5	24.	.....	24.	.....	.....	.....	.....	.....	2.5	.....
Gongs	81.6	.....	18.4	.....	.....	.....	.....	.....	.....	.....	.....
House bells	77.	.....	23.	.....	.....	.....	.....	.....	.....	.....	.....
Lathe bushes	80.	.....	20.	.....	.....	.....	.....	.....	.....	.....	.....
Machinery bearings	87.5	.....	12.5	.....	.....	.....	.....	.....	.....	.....	.....
" " hard	77.4	7.	15.6	.....	.....	.....	.....	.....	.....	.....	.....
Metal that expands in cooling	.....	.....	.....	.....	75.	16.7	8.3	.....	.....	.....	.....
Muntz metal	60.	40.	.....	.....	.....	.....	.....	.....	.....	.....	.....
Pewter, best	.....	.....	86.	.....	.....	14.	.....	.....	.....	.....	.....
"	.....	.....	80.	.....	20.	.....	.....	.....	.....	.....	.....
Printing characters	.....	.....	.....	.....	80.	20.	.....	.....	.....	.....	.....
Sheathing metal	55.	45.	.....	.....	.....	.....	.....	.....	.....	.....	.....
Speculum "	66.	.....	22.	.....	.....	.....	.....	.....	.....	.....	12.
" "	50.	21.	29.	.....	.....	.....	.....	.....	.....	.....	.....
Telescopic mirrors	66.6	.....	33.4	.....	.....	.....	.....	.....	.....	.....	.....
Tempert	33.4	.....	66.6	.....	.....	.....	.....	.....	.....	.....	.....
Type and stereotype plates	.....	.....	.....	.....	69.	15.5	15.5	.....	.....	.....	.....
White metal	7.4	7.4	28.4	.....	.....	56 8	.....	.....	.....	.....	.....
" " hard	69.8	25.8	4.4	.....	.....	.....	.....	.....	.....	.....	.....
Oreide	73.	12.3	{ Magnesia ..... 4.4 Cr'm of tartar 6.5 { Sal-ammoniac 2.5 Quick-lime 1.33								

*See page 194 for directions. †For adding small quantities of copper.

SOLDERS.

	Copper.	Tin.	Lead.	Zinc.	Silver.	Bismuth.	Gold.	Calcimine	Antimony
Tin	.....	25	75	.....	.....	.....	.....	.....	.....
"	.....	58	16	.....	.....	16	.....	.....	10
" coarse, melts at 500°	.....	33	67	.....	.....	.....	.....	.....	.....
" ordinary, melts at 360°	.....	67	33	.....	.....	.....	.....	.....	.....
Spelter, soft	50	.....	.....	50	.....	.....	.....	.....	.....
" hard	67	.....	.....	33	.....	.....	.....	.....	.....
Lead	.....	33	67	.....	.....	.....	.....	.....	.....
Steel	13	.....	.....	5	82	.....	.....	.....	.....
Brass or Copper	50	.....	.....	50	.....	.....	.....	.....	.....
Fine Brass	47	.....	.....	47	6	.....	.....	.....	.....
Pewterers' or Soft	.....	33	45	.....	.....	22	.....	...	.....
" "	.....	50	25	.....	.....	25	.....	.....	.....
Gold	4	.....	.....	.....	7	.....	89	.....	.....
" hard	66	.....	.....	34	.....	.....	.....	.....	.....
" soft	.....	66	34	.....	.....	.....	.....	.....	.....
Silver, hard	20	.....	.....	.....	80	.....	.....	.....	.....
" soft	12	.....	.....	.....	67	.....	.....	21	.....
Pewter	.....	40	20	.....	.....	40	.....	.....	.....
Iron	66	.....	.....	33	.....	.....	.....	.....	1
Copper	53	47	.....	.....	.....	.....	.....	.....	.....

A PLASTIC METALLIC ALLOY.—See Journal of Franklin Institute, vol. xxxix, page 55, for its composition and manufacture.

Composition for Welding Cast Steel.—Borax, 10 parts; sal-ammoniac, 1 part. Grind or pound them roughly together; fuse them in a metal pot over a clear fire, continuing the heat until all spume has disappeared from the surface. When the liquid is clear, pour the composition out to cool and concrete, and grind to a fine powder; then it is ready for use.

To use this composition, the steel to be welded should be raised to a bright yellow heat; then dip it in the welding powder, and again raise it to a like heat as before; it is then ready to be submitted to the hammer.

FUSIBLE COMPOUNDS.

Compounds.	Zinc.	Tin.	Lead.	Bismuth.	Cadmium.
Rose's fusing at 200°	.....	25	25	50	.....
Fusing at less than 200°	32.3	.....	33.3	33.4	.....
Newton's, fusing at less than 212°	.....	19	31	50	.....
Fusing at 150° to 160°	.....	12	25	50	13

Soldering Fluid for use with Soft Solder.—To 2 fluid oz. of muriatic acid add small pieces of zinc until bubbles cease to rise. Add ½ a teaspoonful of sal-ammoniac and 2 fluid oz. of water.

By the application of this to iron or steel, they may be soldered without their surfaces being previously tinned.

FLUXES FOR SOLDERING OR WELDING.

Iron	Borax.
Tinned Iron	Resin.
Copper and Brass	Sal-ammoniac.
Zinc	Chloride of zinc.
Lead	Tallow of resin.
Lead and tin pipes	Resin and sweet oil.

STEEL.—Sal-ammoniac, 1 part; borax, 10 parts. Pound together, and fuse until clear, and, when cool, reduce to powder.

Babbitt's Anti-attrition Metal.—Melt 4 lbs. copper; add, by degrees, 12 lbs. best Banca tin; 8 lbs. regulus of antimony, and 12 lbs. more of tin. After 4 or 5 lbs. tin have been added, reduce the heat to a dull red, then add the remainder of the metal as above.

This composition is termed *hardening;* for lining, take 1 lb. of this *hardening*, melt with it 2 lbs. Banca tin, which produces the lining metal for use. Hence, the proportions for lining metal are 4 lbs. of copper, 8 of regulus of antimony, and 96 of tin.

MISCELLANEOUS NOTES.

DIMENSIONS OF DRAWINGS FOR PATENTS.—United States, 8.5x12 inches.

PAINTING OF BRICK-WORK.—A square yard of new brick wall requires for the first coat of paint in oil, ¾ lb., and for the second, .3, and for the third, .4.

SERVICE TRAIN OF A QUARTERMASTER.—The Quartermaster's train of an army averages 1 wagon to every 24 men; and a well-equipped army in the field, with artillery, cavalry, and trains, requires 1 horse or mule, upon the average, to every 2 men.

A LUMINOUS POINT, to produce a *visual* circle, must have a velocity of 10 feet in a second, the diameter not exceeding 15 inches.

All solid bodies become *luminous* at 800 degrees of heat.

TIDES.—The difference in time between high water averages about 49 minutes each day.

In sandy soil, the greatest force of a pile-driver will not drive a pile over 15 feet.

A FALL of .1 of an inch in a mile will produce a *current* in rivers.

MELTED SNOW produces from ¼ to ⅛ of its bulk in water.

At the depth of 45 feet, the *temperature of the earth* is uniform throughout the year.

A SPERMACETI CANDLE .85 of an inch in diameter consumes an inch in length in 1 hour.

SILICA is the base of the mineral world, and *Carbon* of the organized.

SOUND passes in water at a velocity of 4,708 feet per second.

METALS have five degrees of lustre—*splendent, shining, glistening, glimmering* and *dull.*

A MARBLE-SAW requires half a horse's power.

WIRE AND HEMP ROPES.—A wire rope 3¼ ins. in circumference, and a hemp shroud 8 ins. in circumference, parted in the rope at 10½ tons—4,600 lbs. per square inch.

ENDLESS ROPES.—The friction or adhesion of ropes is from .1 to .07 of their weight.

Brief Rules for the Computation of the Weights of Cast Iron Pipes and Cast and Wrought Iron Bolts.—(Horatio Allen.)—CAST IRON PIPES.—To the inner diameter of the pipe add the thickness of the pipe in inches, and multiply the sum by 10 times the thickness, and the product will give the weight in pounds per foot.

WROUGHT IRON BOLTS.—Square the radius of the bolt and multiply it by 10, and the product will give the weight in pounds per foot.

For cast iron, subtract 2-27, or, .074 of the result.

MALLEABLE OR ALUMINUM BRONZE.—By weight: Copper, 90; Aluminum, 10. This composition may be forged either when heated or cooled, and becomes extremely dense. Its tensile strength is 100,000 lbs., and when drawn into wire 128,000 lbs., and its elasticity one half that of wrought iron. Specific gravity, 7700.

STRENGTH OF MATERIALS.

ELASTICITY AND STRENGTH.

The component parts of a rigid body adhere to each other with a force which is termed *cohesion.*

Elasticity is the resistance which a body opposes to a change of form.

Strength is the resistance which a body opposes to a permanent separation of its parts.

Elasticity and *strength*, according to the manner in which a force is exerted upon a body, are distinguished as *tensile strength*, or absolute resistance; *transverse strength*, or resistance to flexure; *crushing strength*, or resistance to compression; *torsional strength*, or resistance to torsion; and *detrusive strength*; or resistance to shearing.

The *limit of stiffness* is flexure, and the limit of strength or resistance is fracture.

Resilience, or toughness of bodies, is strength and flexibility combined; hence any material or body which bears the greatest load, and bends the most at the time of fracture, is the toughest.

The *specific gravity* of iron is ascertained to indicate very correctly the relative degree of its strength.

The *neutral axis*, or *line of equilibrium*, is the line at which extension terminates and compression begins.

The *resistance* of cast iron to crushing and tensile strains is, as a mean, as 4, 3 to 1.*

English cast iron has a higher resistance to compression, and a less tensile resistance, than American.

The *mean tensile strength* of American cast iron, as determined by Major Wade for the U. S. Ordnance Corps, is 31,829 lbs. per square inch of section; the mean of English, as determined by Mr. E. Hodgkinson for the Railway Commission, etc., in 1849, is 19,484 lbs.; and by Col. Wilmot at Woolwich, in 1858, for gun-metal, is 23,257 lbs.

The *ultimate extension* of cast iron is the 500th part of its length.

The *mean traverse strength* of American cast iron, also determined by Major Wade, is 681 lbs. per square inch, suspended from a bar fixed at one end and loaded at the other; and the mean of English, as determined by Fairbairn, Barlow, and others, is 500 lbs.

The *resistance of wrought iron* to crushing and tensile strains is, as a mean, as 1·5 to 1 for American; and for English, 1·2 to 1.

The *mean tensile strength* of American wrought iron, as determined by Prof. Johnson, is 55,900 lbs., and the mean of English, as determined by Capt. Brown, Barlow, Brunel, and Fairbairn, is 53,900 lbs.†

The *ultimate extension* of wrought iron is the 600th part of its length.

The *resistance to flexure*, acting evenly over the surface, is nearly ½ the tensile resistance.

Modulus of Elasticity.—The *modulus* or *coefficient of the elasticity* of any substance is the measure of its elastic reaction or force, and is the height of a column of the same substance, capable of producing a pressure on its base, which is to the weight causing a certain degree of compression, as the length of the substance is to the diminution of its length.

It is computed by this analogy: As the extension or diminution of the length of any given substance is to its length in inches, so is the force that produced that extension or diminution to the modulus of its elasticity.

Or, $x : P :: l : w = \frac{P}{\frac{}{x}}$, x representing the length a substance 1 in. square

*The experiments of Mr. Hodgkinson on iron of low tensile strength gives a mean of 6,595 to 1.

†The results, as given by Mr. Telford, included experiments upon Swedish iron; hence they are omitted in this summary.

and 1 foot in length would be extended or diminished by the force P, and w the weight of the modulus in lbs.

To Compute the Weight of the Modulus of Elasticity of a Substance.—RULE.—As the extension or compression of the length of any substance is to its length, so is the weight that produced that extension or compression to the modulus of elasticity in pounds avoirdupois.

EXAMPLE.—If a bar of cast-iron, 1 inch square and 10 feet in length, is extended .008 inch, with a weight of 1000 lbs., what is the weight of its modulus of elasticity?

$$.008 : 120\ (10\times12) :: 1000 : 15{,}000{,}000 \text{ lbs.}$$

NOTE.—When the weight of the modulus of elasticity of a substance is known, the height of it can be readily computed by dividing the weight by the weight of a bar of the substance 1 inch square and 1 foot in length.

EX. 2.—If a wrought-iron chain, 60 feet in length and .2 inch in diameter, is subjected to a strain of 150 lbs., what will it be extended?

The modulus of elasticity of iron wire is 26,808,000 lbs., and the area of chain $.2^2\times.7854=.31416$.

$$\frac{150}{.31416}=477{,}463 \text{ lbs. per square inch, and } 60\times12=720 \text{ ins.}$$

$$\text{Then } 477{,}463\times\frac{120}{26{,}808{,}000}=\frac{343{,}773\ 36}{26{,}808{,}000}=.0128 \text{ inch.}$$

To Compute the Weight when the Height is Given.—RULE.—Multiply the weight of 1 foot in length of the material by the height of the modulus in feet, and the product will give the weight.

To Compute the Height of the Modulus of Elasticity.—RULE.—Divide the weight of the modulus of elasticity of the material by weight of 1 foot of it and the quotient will give the height in feet.

From a series of elaborate experiments by Mr. E. Hodgkinson for the Railway Commission, he deduced the following formulæ for the extension and compression of cast and wrought iron:

CAST-IRON EXTENSION: $13{,}934{,}040\frac{e}{l}-2{,}907{,}432{,}000\frac{e^2}{l^2}=W.$

CAST-IRON COMPRESSION: $12{,}931{,}560\frac{c}{l}-522{,}979{,}200\frac{c^2}{l^2}=W$, e and c representing the extension and compression, and l the length in inches.

ILLUSTRATION.—What weight will extend a bar of cast-iron, 4 inches square and 10 feet in length, to the extent of .2 inch?

$$13{,}934{,}040\times\frac{.2}{120}-2{,}907{,}432{,}000\frac{.2^2}{120^2}=23223.4-8076.2=15147.2, \text{ which}\times4 \text{ ins.}$$
$$=60588.8 \text{ lbs.}$$

MODULUS OF ELASTICITY AND WEIGHT OF VARIOUS SUBSTANCES.

SUBSTANCES.	Height in feet.	Weight in lbs.	SUBSTANCES.	Height in feet.	Weight in lbs.
Ash	4,970,000	1,050,670	Lignum-vitæ	1,850,000	1,080,400
Brass, yellow	2,460,000	8,464,000	Limestone	2,400,000	3,300,000
" wire	4,112,000	14,632,720	Mahogany	6,570,000	2,071,000
Copper, cast	4,800,000	18,240,000	Marble, white	2,150,000	2,508,000
Elm	5,680,000	1,499,500	Oak	4,750,000	1,710,000
Fir, red	8,330,000	2,016,000	Pine, Pitch,	8,700,000	2,430,000
Glass	4,440,000	5,550,000	" White	8,970,000	1,830,000
Gun-metal	2,790,000	8,844,300	Steel, cast	8,530,000	26,650,000
Hempen fibres	5,000,000	170,000	" wire	9,000,000	28,689,000
Ice	6,000,000	2,370,000	Stone, Portland	1,672,000	1,718,800
Iron, cast	5,750,900	1,790,850	Tin, cast	1,053,000	3,510,000
" wrought	7,550,000	25,820,000	Willow	6,200,000	1,426,000
" wire	8,377,000	28,230,500	Yel. Pine, mean	10,500,000	2,100,000
Lead, cast	146,000	720,000	Zinc	4,480,000	13,440,000

The elasticity of Ivory, as compared to Glass, is as .95 to 1.

To Compute the Length of a Prism of a Material which would be severed by its own Weight when Suspended.—RULE.—Divide the tensile resistance of the material by the weight of a foot of it in length, and the quotient will give the length.

Modulus of Cohesion, or Length in Feet required to Tear assunder the following Substances.—Rawhide, 15,375 feet; hemp twine, 75,000 feet; Catgut, 25,000 feet.

Tensile Strength.—*Tensile strength* is the resistance of the fibres or particles of a body to separation. It is therefore proportional to their number, or to the area of its transverse section.

The *fibres of wood* are strongest near the centre of the trunk or limb of a tree.

CAST IRON.—Experiments on cast iron bars give a tensile strength of from 4,000 lbs. to 5,000 lbs. per square inch of its section, as just sufficient to balance the elasticity of the metal, and as a bar of it is extended the 5500th part of its length for every ton of direct strain per square inch of its section, it is deduced that its elasticity is fully excited when it is extended less than the 3000th part of its length, and the extension of it at its limit of elasticiy is estimated at the 1200th part of its length.

The *mean tensile strength*, then, of cast iron being from 16,000 to 20,000 lbs., the *value* of it, when subjected to a tensile strain, may be safely estimated at from ¼ to ⅓ of this, or of its breaking strain.

A bar of cast iron will *contract or expand* .000006173, or the 162000th of its length for each degree of heat; and assuming the extreme range of the temperature in this country 140° (— 20° + 120°), it will contract or expand with this change .0008642, or the 1157th part of its length. It shrinks in cooling from .0104 to .0118 of its length.

It follows, then, that as 2240 lbs. will extend a bar the 5500th

part of its length, the contraction or extension for the 1157th part will be equivalent to a force of 10,648 lbs. (4¾ tons) per square inch of section.

Cast iron (Greenwood) at three successive meltings gave tenacities of 21,300, 30,100, and 35,700 lbs.

Cast iron at 2.5 tons per square inch will extend the same as wrought iron at 5.6 tons.

The *mean tensile strength* of four kinds of English cast iron, as determined by the Commissioners on the Application of Iron to Railway Structures, was 15,711 lbs. per square inch (7.014 tons); and the mean ultimate extension was, for lengths of 10 feet, .1997 inch, being the 600th part of its length; and this weight would compress a bar the 775th part of its length.

Tensile strength of the strongest piece of cast iron ever tested—45,970 lbs. This was a mixture of grades 1, 2, and 3 of Greenwood iron, and at the 3d fusion.

Wrought Iron. — Experiments on wrought iron bars give a *tensile strength* of from 18,000 lbs. to 22,400 lbs. per square inch of its section, as just sufficient to balance the elasticity of the metal, and as a bar of it is extended the 10,000th part of its length for every ton of direct strain per square inch of its section, it is deduced that its elasticity is fully excited when it is extended the 1000th part of its length, and the extension of it at its limit of elasticity is estimated at the 1520th part of its length.

The *mean tensile strength* of wrought iron being from 55,000 to 65,000 lbs., the *value* of it, when subjected to a tensile strain, may be safely estimated at from ¼ to ⅓ of this, or of its breaking strain. A bar of wrought iron will *expand or contract* .000006614, or the 151,200th part of its length for each degree of heat; and assuming, as before stated for cast iron, that the extreme range of temperature in the air in this country is 140°, it will contract or expand with this change .000926, or the 1080th of its length, which is equivalent to a force of 20,740 lbs. (9¼ tons) per square inch of section.

Experiments upon wrought iron, to determine the results from repeated heating and laminating, furnished the following:—From 1 to 6 reheating and rollings, the *tensile strength* increased from 43,904 lbs. to 61,824 lbs., and from 6 to 12 it was reduced to 43,904 again.

The *tensile force* of metals varies with their temperature, generally decreasing as the temperature is increased. In silver the tenacity decreases more rapidly than the temperature; in copper, gold, and platinum it decreases less rapidly than the temperature.

In iron, the *tensile strength* at different temperature is as follows: 60°, 1; 114°, 1.14; 212°, 1.2; 250°, 1.32; 270°, 1.35; 325°, 1.41; 435°, 1.4.

Stirling's Mixed or Toughened Iron.—By the mixture of a portion of malleable iron with cast iron, carefully fused in a crucible, a tensile strain of 25,764 lbs. has been attained. This mixture, when judiciously managed and duly proportioned, increases the resistance of cast iron about one-third; the greatest effect being obtained with a proportion of about 30 per cent. of malleable iron.

Bronze (gun-metal) varies in *tenacity* from 23,000 to 54,500 lbs.

ELEMENTS CONNECTED WITH THE TENSILE RESISTANCE OF VARIOUS SUBSTANCES.

SUBSTANCES.	Tensile Strain per Sq. Inch for limit of Elasticity.	Ratio of Strain to that causing Rupture.	SUBSTANCES.	Tensile Strain per Sq. Inch for limit of Elasticity.	Ratio of Strain to that causing Rupture.
	Lbs.			Lbs.	
Beech	3,355	.3	Wrought-iron, Swe.	24,400	.34
Cast-iron, English	4,000	.22	" Eng.	18,850	.35
" American	5,000	.2		22,400	.35
Oak	2,856	.23	" Am.	21,000	.26
Steel plates, blue tempered	93,720	.62	Wrought wire, No. 9, unannealed	47,532	.49
Steel wire	35,700	.5	Wrought wire, No. 9, annealed	36,300	.45
Yellow Pine	3,332	.23			
Wrought-iron, or'dy	17,600	.3			

TENSILE STRENGTH OF MATERIALS.

WEIGHT OR POWER REQUIRED TO TEAR ASUNDER ONE SQUARE INCH.

METALS.

	Lbs.		Lbs.
Copper, wrought	34000	Iron plates, mean, English	51000
" rolled	36000	" " lengthwise	53800
" cast, American	24250	" " crosswise	48800
" wire	61200	" inferior, bar	30000
" bolt	36800	" wire, American	73600
Iron, cast, Low Moor, No. 2	14076	" " " 16 diam	80000
" Clyde, No. 1	16125	" scrap	53400
" " No. 3	23468	Lead, cast	1800
" Calder, No. 1	13735	" milled	3320
" Stirling, mean	25764	" wire	2580
" mean of American	31829	Platinum, wire	53000
" mean* of English	19484	Silver, cast	40000
" Greenwood, Amer'n.	45970	Steel, cast, maximum	142000
" gun-metal, mean	37.232	" " mean	88657
" wrought wire	103000	" blistered, soft	133000
" best Swedish bar	72000		101000
" Russian bar	59500	" shear	124000
" English bar	56000	" chrome, mean	170980
" rivets, American	53300	" puddled, extreme	173817
" bolts	52250	" American Tool Co.	179980
" hammered	53913	" plates, lengthwise	96300
" mean of English	53900	" " crosswise	93700
" rivets, English	45000	" razor	150000
" crank shaft	44750	Tin, cast, block	5000
" turnings	55800	" Banca	2122
" plates, boiler, American	48000	Zinc	3500
	62000	" sheet	16000

Lake Superior and Iron Mountain charcoal bloom iron has resisted 90000 lbs. per square inch.

* By Commissioners on Application of Iron to Railway Structures.

MISCELLANEOUS SUBSTANCES.

	Lbs.		Lbs.
Brick, well burned	750	Limestone	670 to 2800
" fire	65	Marble, Italian	5200
" inferior	290 to 100	" white	9000
Cement, blue stone	77	Mortar, 12 years old	60
" hydraulic	234	Plaster of Paris	72
" Harwich	30	Rope, Manilla	9000
" Portland, 6 mos.	414	" hemp, tarred	15000
" Sheppy	24	" wire	37000
" Portland 1, sand 3	380	Sandstone, fine grain	200
Chalk	118	Slate	12000
Glass, crown	2346	Stone, bath	352
Gutta-percha	3500	" Craigleth	400
Hydraulic lime	140	" Hailes	360
" " mortar	140	" Portland	857 to 1000
Ivory	16000	Whalebone	7600
Leather belts	330		

COMPOSITIONS.

	Lbs.		Lbs.
Gold 5, Copper 1	50000	Copper 10, Tin 1	32000
Brass	42000	" 8, Tin 1, gun-metal	30000
" yellow	18000	" 8, " 1, small bars	50000
Bronze, least	17698	Tin 10, Antimony 1	11000
" greatest	56788	Yellow metal	48700

WOODS.

	Lbs.		Lbs.
Ash	14000	Maple	10500
Beech	11500	Oak, American white	11500
Box	20000	" English	10000
Bay	15000	" seasoned	13600
Cedar	11400	" African	14500
Chestnut, sweet	10500	Pear	9800
Cypress	6000	Pine, pitch	12000
Deal, Christiana	12400	" larch	9500
Elm	13100	" American white	11800
Lance	23000	Poplar	7000
Lignum-vitæ	11800	Spruce, white	10200
Locust	20500	Sycamore	13000
Mahogany	21000	Teak	14000
" Spanish	12000	Walnut	7800
" "	8000	Willow	13000

RESULTS OF EXPERIMENTS ON THE TENSILE STRENGTH OF WROUGHT IRON TIE RODS.

Common English Iron, $1\frac{3}{16}$ Inches in Diameter.

Description of Connection.	Breaking Weight.
	Lbs.
Semicircular hook fitted to a circular and welded eye	14000
Two semicircular hooks hooked together	16220
Right-angled hook or goose-neck fitted into a cylindrical eye	29120
Two links or welded eyes connected together	48160
Straight rod without any connection articulation	56000

Iron bars when cold rolled are materially stronger than when only hot rolled, the difference being in some cases as great as 3 to 2.

WIRE ROPES.

RESULT OF EXPERIMENTS ON THE TENSILE STRENGTH OF IRON AND STEEL WIRE ROPES.

Charcoal Iron Wire Rope. Circum.	Weight per foot.	Breaking Weight	Steel Wire Rope. Circum.	Stretch in 6 feet.	Weight per foot.	Breaking Weight.
Ins.	Lbs.	Lbs.	Ins.	Ins.	Lbs.	Lbs.
$1\frac{7}{8}$	$\frac{1}{2}$	13440	$1\frac{15}{16}$	$1\frac{5}{8}$	$\frac{1}{2}$	33600
$3\frac{3}{8}$	$1\frac{1}{4}$	44800	$2\frac{3}{8}$	$\frac{3}{16}$	$\frac{1}{4}$	56000

EXTENSION OF CAST-IRON BARS WHEN SUSPENDED VERTICALLY.

1 Inch Square and 10 Feet in Length. Weight applied at one end.

Weight applied.	Extension.	Set.	Weight applied.	Extension.	Set.
Lbs.	Ins.	Ins.	Lbs.	Ins.	Ins.
529	.0044	.....	4234	.0397	.00265
1058	.0092	.000015	8468	.0871	.00855
2117	.0190	.000059	14820	.1829	.02555

Steel.—The tensile strength of steel increases by reheating and rolling up to the second operation, but decreases after that.

The relative resistance of wrought iron and copper to tension and compression is as 100 to 54.5.

Transverse Strength.—*The Transverse or Lateral Strength of any Bar, Beam, Rod, etc.*, is in proportion to the product of its

breadth and the square of its depth; in like-sided beams, bars, etc., it is as the cube of the diameter of the section.

When one end is fixed and the other projecting, the strength is inversely as the distance of the weight from the section acted upon; and the strain upon any section is directly as the distance of the weight from that section.

When both ends are supported only, the strength is 4 times greater for an equal length, when the weight is applied in the middle between the supports, than if one end only is fixed.

When both ends are fixed, the strength is 6 times greater for an equal length, when the weight is applied in the middle, than if one end only is fixed.

The strength of any beam, bar, etc., to support a weight in the centre of it, *when the end rests merely upon two supports*, compared to one *when the ends are fixed*, is as 2 to 3.

When the weight or strain is uniformly distributed, the weight or strain that can be supported, compared with that when the weight or strain is applied at one end or in the middle between the supports, is as 2 to 1.

In metals, the less the dimension of the side of a beam, etc., or the diameter of a cylinder, the greater its proportionate transverse strength. This is in consequence of their having a greater proportion of chilled or hammered surface compared to their elements of strength, resulting from dimensions alone.

The strength of a *cylinder*, compared to a *square* of like diameter or sides, is as 6.25 to 8. The strength of a *hollow cylinder* to that of a *solid cylinder*, of the same length and volume, is as the greater diameter of the former is to the diameter of the latter.

The strength of an *equilateral triangle, fixed at one end and loaded at the other*, having an *edge up*, compared to a *square* of the same area, is as 22 to 27; and the strength of an equilateral triangle, having an *edge down*, compared to one with an *edge up*, is as 10 to 7.

NOTE.—In these comparisons, the beam, bar, etc., is considered as one end being *fixed*, the weight suspended from the other. In Barlow and other authors the comparison is made when the beam, etc., rested upon *supports*. Hence the stress is contrariwise.

Detrusion is the resistance that the particles or fibres of materials oppose to their sliding upon each other. Punching and shearing are detrusive strains.

Deflection.—When a bar, beam etc., is deflected by a cross-strain, the side of the beam, etc., which is bounded by the concave surface, is *compressed*, and the opposite side is *extended*.

In *stones and cast metals*, the resistance to *compression* is greater than the resistance to extension.

In *woods*, the resistance to *extension* is greater than the resistance to compression.

The general law regarding *deflection* is, that it increases, *cæteris paribus*, directly as the cube of the length of the beam, bar, etc., and inversely as the breadth and cube of the depth.

The resistance of *flexure* of a body at its cross-section is very nearly 9-10 of its tensile resistance.

The *stiffest bar or beam* that can be cut out of a cylinder is that of which the depth is to the breadth as the square root of 3 to 1; the *strongest*, as the square root of 2 to 1; and the most *resilient*, that which has the breadth and depth equal.

RELATIVE STIFFNESS OF MATERIALS TO RESIST A TRANSVERSE STRAIN.

Ash	.089	White pine	.1
Beech	.073	Yellow pine	.087
Elm	.079	Wrought iron	1.3
Oak	.095	Cast iron	1.

The strength of a rectangular beam in an *inclined position*, to resist a vertical stress, is to its strength in a horizontal position as the square of radius to the square of the cosine of elevation; that is, as the square of the length of the beam to the square of the distance between its points of support, measured upon a horizontal plane.

Experiments upon bars of cast iron, 1, 2, and 3 inches square, give a result of transverse strength of 447, 348, and 338 lbs. respectively; being in the ratio of 1, .78, and .756.

The *strongest rectangular bar or beam* that can be cut out of a cylinder is one of which the squares of the breadth and depth of it, and the diameter of the cylinder, are as 1, 2, and 3 respectively.

The ratio of the *crushing* to the *transverse* strength is nearly the same in glass, stone, and marble, including the hardest and softest kinds.

Green sand iron castings are 6 per cent. stronger than dry, and 30 per cent. stronger than chilled; but when the castings are chilled and annealed, a gain of 115 per cent. is attained over those made in green sand.

Chilling the under side of cast iron very materially increases its strength.

WOODS.—*Beams of wood*, when laid with their annual or annular layers vertical, are stronger than when they are laid horizontal, in the proportion of 8 to 7.

Woods are *denser at the roots* and at the centre of their trunks. Their strength decreases with the decrease of their density.

TRANSVERSE STRENGTH OF MATERIALS, DEDUCED FROM EXPERIMENTS.

Reduced to the uniform Measure of One Inch Square, and one Foot in Length; Weight suspended from one End.

MATERIALS.	Breaking weight.	Value for general use.
METALS.	Lbs	
Cast iron, American { means of four divisions of grades	507	125 to 160
	622	155 " 210
	733	180 " 240
	772	192 " 230
" mean by Maj. Wade	681	170 " 225
" West Pt. Foundry, extreme	980	250 " 325
" English, Low Moof, cold blast	472	110 " 140
" Ponkey, cold	581	145 " 190
" hot blast, mean	500	125 " 165
" cold " "	516	130 " 170
" Ystalyfera cold bl't	770	195 " 255
" mean of 65 kinds	500	125 " 165
" mean of 15 kinds, direct from the Pig, cold blast	641	160 " 215
" planed bar	518	130 " 170
" rough bar	534	133 " 175
Steel, greatest	1918	350 " 450
Steel, puddled (permanent bend)	800	170 " 225
WOODS.		
Ash	168	55
Beech	130	32
Birch	160	40
Chestnut	160	53
Deal, Christiana	137	45
Elm	125	30
Hickory	250	55
Locust	295	80
Maple	202	65
Norway pine	123	40
Oak, African	208	50
" American white	230	50
" " live	245	55
" Canadian	146	36
" Dantzic	122	30
" English	140	35
" " superior	188	45
Pitch pine	133	45
" "	160	50
Riga fir	94	30
Teak	206	60
White pine	92	30
" American	130	45
Whitewood	116	38

MATERIALS.	Breaking weight.	Value for general use.
WROUGHT IRON.	Lbs	
American {	700	
	650	160 to 209
	600	
English	400	100 " 130
"	550	135 " 180
Swedish*	665	165 " 210
MIXTURE OF CAST AND WROUGHT IRON, etc.		
Cast iron, Blaenavon	...	145
" 10 per ct. of wr't	...	175
" 30 " "	...	230
" 50 " "	...	185
" and 2½ per ct. of nickel, mean	...	180
" Stirling, 2d qu.	...	154
" " 3d "	...	125
Copper	...	55
Brass	...	58
STONES (American).		
Flagging, blue	31.	10
Freestone, Conn	13.	4
" Dorchester	10.8	3¼
" N. Jersey	20 1	6½
	17.8	6
" N. York	24.	8
Granite, blue, coarse	18.	6
" Quincy, Mass.	26.	8½
STONES (English).		
Adelaide marble	4.6	1½
Arbroath	17.	5½
Bangor slate	90.	30
Bath	5.2	1¾
Caithness, paving, Sc.	68.	22
Cornish granite	22.	7
Craigleth sandstone	10.7	3½
Darley sandst., Vict'a	1.3	4
Kentish rag	35.8	12
Limestone	11.	3½
Llangollen slate	43.	14
Park Spring sandst'e	4.3	1 4
Portland oolite	21.2	7
Valentia, paving, Irel.	68 5	23
Welsh, "	137.	55
Yorkshire, blue	26.	8½
" landing	22.5	7½
" paving	10.4	3½

INCREASE IN STRENGTH OF SEVERAL WOODS BY SEASONING.

Ash.....44.7 per cent. | Elm.....12 3 per cent, | White pine....9 per cent.
Beech....91.9 " | Oak.....26.1 " |

* With 840 lbs. the deflection was 1 inch, and the elasticity of the metal destroyed.

CONCRETES, CEMENTS, ETC.

MATERIALS.	Breaking Weight.	MATERIALS.	Breaking Weight.
CONCRETES (English).		BRICKS (English).	
Fire-brick beam, Portl'd cem't	3.1	Best stock	11.8
" sand, 3 parts; lime, 1 part	.7	Fire-brick	14.
CEMENTS (English).		New brick	10.7
Blue clay and chalk	5.4	Old brick	9.1
Portland	37.5 / 10.2	Stock-brick, well burned	5.8
		" inferior, burned	2.5
Sheppy	5.		

TRANSVERSE STRENGTH OF CAST IRON BARS AND OAK BEAMS OF VARIOUS FIGURES.

Reduced to the uniform Measure of One Inch Square of Sectional Area, and One Foot in Length. Fixed at one end, Weight suspended from the other.

FORM OF BAR OR BEAM.	Breaking Weight.	FORM OF BAR OR BEAM.	Breaking Weight.
CAST IRON.	Lbs	Equilateral triangle, an edge up	Lbs 560
Square	673	Equilateral triangle, an edge down	958
Square, diagonal vertical	568	2 ins. deep × 2 ins. wide × .268 ins. depth	2068
Cylinder	573	2 ins. deep × 2 ins. wide × .268 ins. depth.	565
Hollow cylinder; greater diameter twice that of lesser	794	OAK.	
Rectangular prism, 2 ins. deep × ¼ in. depth	1456	Equilateral triangle, an edge up	114
" 3 ins. deep × ¼ in. depth	2392	Equilateral triangle, an edge down	130
" 4 " × ¼ "	2652		

TRANSVERSE STRENGTH OF SOLID AND HOLLOW CYLINDERS OF VARIOUS MATERIALS.

One foot in length. Fixed at one end; Weight suspended from the other.

MATERIALS.	Solid External Diameter.	Hollow Internal Diameter.	Breaking Weight.	Breaking Weight for 1 inch external Diameter and proportionate Internal Diameter.
WOODS.	Ins.	Ins.	Lbs.	Lbs.
Ash	2.	...	685	86
"	2.	1.	604	75
Fir*	2.	...	772	97
White pine	1.	...	75	75
"	2.	...	610	76
METALS.				
Cast iron, cold blast	3.	...	12000	444
STONE WARE.				
Rolled pipe of fine clay	2.87	1.923	190	8

Brick-work.—A brick arch, having a rise of 2 feet, and a span of 15 feet 9 inches, and 2 feet in width, with a depth at its crown of 4 inches, bore 358,400 lbs. laid along its centre.

To Compute the Transverse Strength of a Rectangular Beam or Bar.—When a Beam or Bar is Fixed at one End, and Loaded at the Other.—*Rule.*—Multiply the *value* of the material in the preceding tables, or as may be ascertained, by the breadth and square of the depth in inches, and divide the product by the length in feet.

Note—When the beam is loaded uniformly throughout its length, the result must be doubled.

Example.—What are the weights each that a cast and wrought iron bar, 2 inches square and projecting 30 inches in length, will bear without permanent injury?

The *values* for cast and wrought iron in this and the following calculations are assumed to be 225 and 180.

Hence $225\times2\times2^2=1800$, which, $\div2.5=720$ lbs.; and $180\times2\times2^2=1440$, which, $\div2.5=576$ lbs.

If the Dimensions of a Beam or Bar are Required to Support a Given Weight at its End.—*Rule.*—Divide the product of the weight and the length in feet by the *value* of the ma-

* An inch-square batten from the same plank as this specimen broke at 139 lbs.

terial, and the quotient will give the product of the breadth and the square of the depth.

EXAMPLE.—What is the depth of a wrought-iron beam, 2 inches broad, necessary to support 576 lbs. suspended at 30 inches from the fixed end?

$\frac{576\times2.5}{180}=8$, which,÷2 ins. for the breadth=4, and $\sqrt{4}=2$ ins., the breadth.

WHEN A BEAM OR BAR IS FIXED AT BOTH ENDS, AND LOADED IN THE MIDDLE.—*Rule.*—Multiply the *value* of the material by 6 times the breadth and the square of the depth in inches, and divide the product by the length in feet.

NOTE.—When the beam is loaded uniformly throughout its length, the result must be doubled.

EXAMPLE—What weight will a bar of cast iron, 2 inches square and 5 feet in length, support in the middle, without permanent injury?

$$225\times2\times6\times2^2=10800, \text{ which,}\div5=2160 \text{ lbs.}$$

OR, IF THE DIMENSIONS OF A BEAM OR BAR ARE REQUIRED TO SUPPORT A GIVEN WEIGHT IN THE MIDDLE, BETWEEN THE FIXED ENDS.—*Rule.*—Divide the product of the weight and the length in feet by 6 times the *value* of the material, and the quotient will give the product of the breadth and the square of the depth.

EXAMPLE.—What dimensions will a cast iron square bar 5 feet in length require to support without permanent injury a stress of 2160 lbs?

$\frac{2160\times5}{225\times6}=\frac{10800}{1350}=8$, which,÷2 ins. for the assumed breadth,=4, and $\sqrt{4}=2$ ins the depth.

WHEN THE BREADTH OR DEPTH IS REQUIRED.—*Rule.*—Divide the product obtained by the preceding rules by the square of the depth, and the quotient is the breadth; or by the breadth, and the square root of the quotient is the depth.

ILLUSTRATION.—If 128 is the product, and the depth is 8; then $128\div8^2=2$, the breadth. Also, $128\div2=64$, and $\sqrt{64}=8$, the depth.

WHEN THE WEIGHT IS NOT IN THE MIDDLE BETWEEN THE ENDS.—*Rule.*—Multiply the *value* of the material by 3 times the length in feet, and the breadth and square of the depth in inches, and divide the product by twice the product of the distances of the weight, or stress from either end.

EXAMPLE.—What is the weight a cast-iron bar, fixed at both ends, 2 ins. square and 5 feet in length, will bear without permanent injury, 2 feet from one end?

$$\frac{225\times3\times5\times2\times2^2}{2\times2\times3}=\frac{27000}{12}=2250 \text{ lbs.}$$

WHEN A BEAM OR BAR IS SUPPORTED AT BOTH ENDS, AND LOADED IN THE MIDDLE.—*Rule.*—Multiply the *value* of the material by 4 times the breadth and the square of the depth in inches, and divide the product by the length in feet.

NOTE.—When the beam is loaded uniformly throughout its length, the result must be doubled.

EXAMPLE.—What weight will a cast-iron bar, 5 feet between the supports, and 2 ins. square, bear in the middle, without permanent injury?

$$225\times2\times4\times2^2=7200, \text{ which,} \div 5=1440 \text{ lbs.}$$

OR, IF THE DIMENSIONS ARE REQUIRED TO SUPPORT A GIVEN WEIGHT.—*Rule.*—Divide the product of the weight and length in feet by 3 times the *value* of the material, and the quotient will give the product of the breadth, and the square of the depth.

WHEN THE WEIGHT IS IN THE MIDDLE BETWEEN THE SUPPORTS.—*Rule.*—Multiply the *value* of the material by the length in feet, and the breadth, and the square of the depth in inches, and divide the product by the product of the distances of the weight, or stress from either support.

EXAMPLE.—What weight will a cast-iron bar, 2 ins. square and 5 feet in length, support without permanent injury, at a distance of 2 feet from one end, or support?

$$\frac{225\times5\times2\times2^2}{2\times(5-2)}=\frac{9000}{6}=1500 \text{ lbs.}$$

To Compute the Pressure upon the Ends or upon the Supports.—*Rule.*—1. Divide the product of the weight and its distance from the nearest end or support by the whole length, and the quotient will give the pressure upon the end or support farthest from the weight.

2. Divide the product of the weight and its distance from the farthest end, or support, by the whole length, and the quotient will give the pressure upon the end or support nearest the weight.

EXAMPLE.—What is the pressure upon the supports in the case of the preceding example?

$\frac{1500\times2}{5}=600$ lbs. upon support farthest from the weight; $\frac{1500\times2}{5}=900$ lbs. upon support nearest to the weight.

WHEN A BEAM OR BAR, FIXED OR SUPPORTED AT BOTH ENDS, BEARS TWO WEIGHTS AT UNEQUAL DISTANCES FROM THE ENDS.—Let m and n represent distances of greatest and least weights from their nearest end, W and w greatest and least weights, L whole length, l distance from least weight to farthest end, and l' distance of greatest weight from farthest end.

Then $\frac{m\times W}{L}+\frac{l\times w}{L}=$ pressure at w end, and $\frac{n\times w}{L}+\frac{l'\times W}{L}=$ pressure at W end.

ILLUSTRATION.—A beam 10 feet in length, having both ends fixed in a wall, bears two weights, viz., one of 1000 lbs. at 4 feet from one of its ends, and the other of 2000 lbs. at 4 feet from the other end; what is the pressure upon each end?

$\frac{4\times2000}{10}+\frac{6\times1000}{10}=1400$ lbs. pressure upon w end, $\frac{4\times1000}{10}+\frac{6\times2000}{10}=1600$ lbs. pressure at W end.

WHEN THE PLANE OF THE BEAM OR BAR PROJECTS OBLIQUELY UPWARD OR DOWNWARD.—WHEN FIXED AT ONE END AND LOADED AT THE OTHER.—*Rule.*—Multiply the *value* of the material by the breadth and square of the depth in inches, and divide the product by the product of the length in feet and the cosine of the angle of elevation or depression.

NOTE.—When the weight is laid uniformly along its length, the result must be doubled.

EXAMPLE.—What is the weight an ash-beam, 5 feet in length, 3 ins. square, and projecting upward at an angle of 7° 15′, will bear without permanent injury?

$5\times3\times3^2=1485$, which, $\div5\times$ cos. 7° 15′, $=1485\div5\times.992=299.39$ lbs.

To Compute the Transverse Strength of Cylinders, Ellipses, etc.—WHEN A CYLINDER, RECTANGLE (THE DIAGONAL BEING VERTICAL,) HOLLOW CYLINDER, OR BEAMS HAVING SECTIONS OF AN ELLIPSE, ARE EITHER FIXED AT ONE END AND LOADED AT THE OTHER, OR SUPPORTED AT BOTH ENDS, THE LOAD APPLIED IN THE MIDDLE, OR BETWEEN THE SUPPORTS.—*Rule.*—Proceed in all cases as if for a rectangular beam, taking for the breadth and depth, and *value* of the material, as follows:

Cylinder, diameter^3 $\times.6$; Rectangle, * side^3 $\times.7$; Hollow Cylinder (diam.^{2}—diam.^{2}) $\times.6$; Ellipse, transverse diam. vertical conj. $\times$ transverse^2, $\times.6$; and Ellipse, conj. diam. vert. transverse $\times$ conj.^{2} $\times.6$ of *value*.

When an Equilaterial Triangle, or ⊤ *Beam.* RULE.—Proceed in all cases as if for a rectangular beam, taking the following proportions of the *value* of the material.

Fixed at one or both ends.	Equilateral triangle, edge up,	$b\times d^2$, $\times.2$	of *Value.*
	Equilateral triangle, edge down,	$b\times d^2$, $\times.34$	"
	⊤ beam or bar, edge down,	$b\times d^2$, $\times.42$	"
Supported at both ends.	Equilateral triangle, edge up,	$b\times d^2$, $\times.34$	"
	Equilateral triangle, edge down,	$b\times d^2$, $\times.2$	"
	⊤ beam or bar, edge up,	$b\times d^2$, $\times.42$	"

To Compute the Diameter of a Solid Cylinder to Support a Given Weight.—WHEN FIXED AT ONE END, AND LOADED AT THE OTHER.—*Rule.*—Multiply the weight to be supported in pounds by the length of the cylinder in feet; divide the product by .6 of the *value* of the material, and the cube root of the quotient will give the diameter.

NOTE.—When the cylinder is loaded uniformly throughout its length, the cube root of half the quotient will give the diameter.

EXAMPLE.—What should be the diameter of a cast-iron cylindrical beam, 8 ins. in length, to support 15000 lbs. without permanent injury?

$$3\text{ ins.}=.66\text{ feet};\ \frac{15000\times.66}{.6\times225}=74.07;\text{ and }\sqrt[3]{74.07}=4.2.$$

WHEN FIXED AT BOTH ENDS, AND LOADED IN THE MIDDLE.—*Rule.*—Multiply the weight to be supported in pounds by the length

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The strength of a Rectangle, the diagonal being vertical, compared to that of its circumscribing rectangle, when the direction of the strain is parallel to the side of it, is as 2.45 to 1.

of the cylinder between the supports in feet; divide the product by .6 of the *value* of the material, and the cube root of ¼ of the quotient will give the diameter.

NOTE.—When the cylinder is loaded uniformly along its length, the cube root of half the quotient will give the diameter.

EXAMPLE.—What should be the diameter of a cast-iron cylinder, 2 feet between the supports, that will support 19305 lbs. without permanent injury?

$$\frac{19305\times2}{.6\times225}=286, \text{ and } \sqrt[3]{\frac{286}{6}}=3.61 \text{ ins.}$$

WHEN SUPPORTED AT BOTH ENDS, AND LOADED IN THE MIDDLE.—*Rule.*—Multiply the weight to be supported in pounds by the length of the cylinder between the supports in feet; divide the product by .6 of the *value* of material, and the cube root of ¼ of the quotient will give the diameter.

NOTE.—When the cylinder is loaded uniformly along its length, the cube root of half quotient will give the diameter.

EXAMPLE.—What should be the diameter of a cast-iron cylinder, 2 feet between the supports, that will support 54000 lbs. without permanent injury?

$$\frac{54000\times2}{.\times225}=800, \text{ and } \sqrt[3]{\frac{800}{4}}=5.85 \text{ ins.}$$

And what its diameter if loaded uniformly along its length?

$$\frac{800\div2}{4}=100, \text{ and } \sqrt[3]{100}=4.64 \text{ ins.}$$

To Compute the Relative Value of Materials to resist a Transverse Strain.—Let V represent this value in a Beam, Bar, or Cylinder, one foot in length, and one inch square, side, or in diameter; W the weight; l the length in feet; b the breadth, and d the depth in inches; m the distance of the weight from one end; and n the distance of it from the other in feet.

NOTE.—In cylinders, for $b\,d^2$ put d^3.

1. Fixed at one End, weight suspended from the other, $\frac{l\,W}{b\,d^2}=V$.

2. Fixed at both Ends, weight suspended from the middle, $\frac{l\,W}{6\,b\,d^2}=V$.

3. Supported at both Ends, weight suspended from the middle $\frac{l\,W}{4\,b\,d^2}=V$.

4. Supported at both Ends, weight suspended at any other point than the middle, $\frac{m\,n\,W}{l\,b\,d^2}=V$.

5. Fixed at both Ends, weight suspended at any other point than the middle, $\frac{2\,m\,n\,W}{3\,l\,b\,d^2}=V$.

From which formulæ, the weight that may be borne, or any of the dimensions, may be computed by the following:

1. $\frac{V d b^2}{l} = W$; $\frac{V b d^2}{W} = l$; $\frac{l W}{V d^2} = b$: $\sqrt{\frac{l W}{b V}} = d$. In rectangular beams, etc., b and $d = \sqrt[3]{\frac{l W}{V}}$.

2. $\frac{6 b d^2 V}{l} = W$; $\frac{6 b d^2 V}{W} = l$; $\frac{l W}{6 d^2 V} = b$; $\sqrt{\frac{l W}{6 b V}} = d$. In rectangular beams, etc., b and $d = \sqrt[3]{\frac{l W}{6 V}}$.

3. $\frac{4 b d^2 V}{l} = W$; $\frac{4 b d^2 V}{W} = l$; $\frac{l W}{4 d^2 V} = b$: $\sqrt{\frac{l W}{4 b V}} = d$. In rectangular beams, etc., b and $d = \sqrt[3]{\frac{l W}{4 V}}$.

4. $\frac{l b d^2 V}{m n} = W$; $\frac{m n W}{b d^2 V} = l$; $\frac{m n W}{l d^2 V} = b$; $\sqrt{\frac{m n W}{l b V}} = d$. In rectangular beams, etc., b and $d = \sqrt[3]{\frac{m n W}{l V}}$.

5. $\frac{3 l b d^2 V}{2 m n} = W$; $\frac{2 m n W}{3 b d^2 V} = l$; $\frac{2 m n W}{3 l d^2 V} = b$; $\sqrt{\frac{2 m n W}{3 l b V}} = d$. In rectangular beams, etc., b and $d = \sqrt[3]{\frac{2 m n W}{3 l V}}$.

When the weight is uniformly distributed, the same formulæ will apply, W representing only half the required or given weight.

Girders, Beams, Lintels, etc.—*The Transverse or Lateral Strength of any Girder, Beam Brest-summer, Lintel*, etc., is in proportion to the product of its breadth and the square of its depth, and also to the area of its cross-section.

The *best form of section* for cast-iron girders or beams, etc., is deduced from the experiments of Mr. E. Hodgkinson, and such as have this form of section ⌶ are known as Hodgkinson's.

The rule deduced from his experiments directs that the area of the bottom flange should be 6 times that of the top flange—flanges connected by a thin vertical web, sufficiently rigid, however, to give the requisite lateral stiffness, and tapering both upward and downward from the neutral axis; and in order to set aside the risk of an imperfect casting, by any great disproportion between the web and the flanges, it should be tapered so as to connect with them, with a thickness corresponding to that of the flange.

As both cast and wrought iron resist crushing or compression with a greater force than extension, it follows that the flange of a girder or beam of either of these metals, which is subjected to a crushing strain, according as the girder or beam is *supported at both*

ends, or fixed at one end, should be of less area than the other flange, which is subjected to extension or a tensile strain.

When *girders are subjected to impulses*, and are used to sustain vibrating loads, as in bridges, etc., the best proportion between the top and bottom flange is as 1 to 4: as a general rule, they should be as narrow and deep as practicable, and should never be deflected to more than one five-hundredth of their length.

In *Public Halls, Churches and Buildings* where the weight of people alone is to be provided for, an estimate of 175 lbs. per square foot of floor surface is sufficient to provide for the weight of flooring and the load upon it.

In churches, buildings, etc., the weight to be provided for should be estimated at that which may at any time be placed thereon, or which at any time may bear upon any portion of their floors; the usual allowance, however, is for a weight of 280 lbs. per square foot of floor surface for stores and factories, and 175 lbs. per square foot when the weight of people alone is to be provided for.

In all uses, such as in buildings and bridges, where the structure is exposed to sudden impulses, the load or stress to be sustained should not exceed from 1-5 to 1-6 of the breaking weight of the material employed; but when the load is uniform or the stress quiescent, it may be increased to ⅓ and ¼ of the breaking weight.

An *open-web girder or beam*, etc., is to be estimated in its resistance on the same principle as if it had a solid web. In cast metals, allowance is to be made for the loss of strength due to the unequal contraction in cooling of the web and flanges.

In *cast-iron*, the mean resistance to *crushing or extension* is as 4.3 to 1, and in wrought iron as 1.35 to 1; hence the mass of metal below the neutral axis will be greatest in these proportions when the stress is intermediate between the ends or supports of the girders, etc.

Wooden girders or beams, when sawed in two or more pieces, and have slips set between them, and the whole bolted together, are made stiffer by the operation, and are rendered less liable to decay.

Girders cast with a face up are stronger than when cast on a side, in the proportion to 1 to .96, and they are strongest also when cast with the bottom flange up.

The following results of the resistances of metals will show how the material should be distributed in order to obtain the *maximum* of strength with the *minimum* of material:

	To Tension	To Crushing.
Cast-iron	{ 21,000 { 32,000	90,300 140,000
Copper	24,250	117,000
Wrought-iron	{ 45,000 { 72,000	40,000 83,000

The best iron has the greatest tensile strength, and the least compressive or crushing.

The *most economical construction of a girder or beam*, with reference to attaining the greatest strength with the least material, is as follows: The outline of the top, bottom and sides should be a curve of various forms, according as the breadth or depth throughout is equal, and as the girder or beam is loaded only at one end, or in the middle, or uniformly throughout.

To Compute the Dimensions and Form of a Girder or Beam.—When a Girder or Beam is Fixed at one End, and Loaded at the other.—1. *When the depth is uniform throughout the entire length.*—The section at every point must be in proportion to the product of the length, breadth and square of the depth, and as the square of the depth is in every point the same, the breadth must vary directly as the length; consequently, each side of the beam must be a vertical plane, tapering gradually to the end.

2. *When the breadth is uniform throughout the entire length.*—The depth must vary as the square root of the length; hence the upper or lower sides, or both, must be determined by a parabolic curve.

3. *When the section at every point is similar—that is, a Circle, an Ellipse, a Square, or a Rectangle, the sides of which bear a fixed proportion to each other.*—The section at every point being a regular figure, for a circle, the diameter at every point must be as the cube root of the length; and for an ellipse, or a rectangle, the breadth and depth must vary as the cube root of the length.

When a Girder or Beam is Fixed at one End and Loaded uniformly throughout its Length.—1. *When the depth is uniform throughout its entire length.*—The breadth must increase as the square of the length.

2. *When the breadth is uniform throughout its entire length.*—The depth will vary directly as the length.

3. *When the section at every point is similar, as a Circle, Ellipse, Square, and Rectangle.*—The section at every point being a regular figure, the cube of the depth must be in the ratio of the square of the length.

When a Girder or Beam is supported at both Ends.—1. *When loaded in the middle.*—The *constant* of the beam, or the product of the breadth and the square of the depth, must be in proportion to the distance from the nearest support; consequently, whether the lines forming the beam are straight or curved, they meet in the centre, and of course the two halves are alike: the beam, therefore, may be considered as one half the length, the supported end corresponding with the free end in the case of beams, one end being fixed, and the middle of the beams similarly corresponding with the fixed end.

2. *When the depth is uniform throughout.*—The breadth must be in the ratio of the length.

3. *When the breadth is uniform throughout.*—The depth will vary as the square root of the length.

4. *When the section at every point is similar, as a Circle, Ellipse,*

Square, and Rectangle.—The section at every point being a regular figure, the cube of the depth will be as the square of the distance from the supported end.

When a Girder or Beam is Supported at both Ends, and Loaded uniformly throughout its Length. 1. *When the depth is uniform.*—The breadth will be as the product of the length of the beam and the length of it on one side of the given point, less the square of the length on one side of the given point.

2. *When the breadth is uniform.*—The depth will be as the square root of the product of the length of the beam and the length of it on one side of the given point, less the square of the length on one side of the given point.

3. *When the section at every point is similar, as a Circle, Ellipse, Square, and Rectangle.*—The section at every point being a regular figure, the cube of the depth will be as the product of the length of the beam and the length of it on one side of the given point, less the square of the length on one side of the given point.

General Deductions from the Experiments of Stephenson, Fairbairn, Cubitt, Hughes, etc. Fairbairn shows in his experiments that with a stress of about 12,320 lbs. per square inch on cast iron, and 28,000 lbs. on wrought iron, the sets and elongations are nearly equal to each other.

A cast-iron beam will be bent to one-third of its breaking weight if the load is laid on gradually; and one-sixth of it, if laid on at once, will produce the same effect, if the weight of the beam is small compared with the weight laid on. Hence beams of cast iron should be made capable of bearing more than 6 times the greatest weight which will be laid upon them.

In wrought-iron beams, if fixed at both ends, the upper flange should be larger than the lower, in the ratio of 1.35 to 1.

The breaking weights in similar beams are to each other as the squares of their like linear dimensions; that is, the breaking weights of beams are computed by multiplying together the area of their section, their depth, and a *constant*, determined from experiments on beams of the particular form under investigation, and dividing the product by the distance between the supports.

Cast and wrought iron beams, having similar resistances, have weights nearly as 2.44 to 1.

The range of the comparative strength of girders of the same depth, having a top and bottom flange, and those having bottom flange alone, is from having but a little area of bottom flange to a large proportion of it, from ½ to ¼ greater strength.

A box beam or girder, constructed of plates of wrought iron, compared to a single rib and flanged beam **I**, of equal weights, has a resistance as 100 to 93.

The resistance of beams or girders, where the depth is greater than their breadth, when supported at top, is much increased. In some cases the difference is fully one third

When a beam is of equal thickness throughout its depth, the

curve should be an *ellipse* to enable it to support a uniform load with equal resistance in every part; and if the beam is an open one, the curve of equilibrium, for a uniform load, should be that of a *parabola*. Hence, when the middle portion is not wholly removed, the curve should be a compound of an ellipse and a parabola, approaching nearer to the latter as the middle part is decreased.

Girders of cast iron, up to a span of 40 feet, involve a less cost than of wrought iron.

Cast iron beams and girders should not be loaded to exceed one-fifth of their breaking weight; and when the strain is attended with concussion and vibration, this proportion must be increased.

Simple cast iron girders may be made 50 feet in length, and the best form is that of Hodgkinson: when subjected to a fixed load, the flange should be as 1 to 6, and when to a concussion, etc., as 1 to 4.

The forms of girders for spaces exceeding the limit of those of simple cast iron are various; the principal ones adopted are those of the straight or arched cast iron girders in separate pieces, and bolted together—the Trussed, the Bow-string, and the wrought iron Box and Tubular.

A *Straight* or *Arched Girder* is formed of separate castings, and is entirely dependent upon the bolts of connection for its strength.

A *Trussed* or *Bow-string Girder* is made of one or more castings to a single piece, and its strength depends, other than upon the depth or area of it, upon the proper adjustment of the tension, or the initial strain, upon the wrought iron truss.

A *Box* or *Tubular Girder* is made of wrought iron, and is best constructed with cast iron tops, in order to resist compression: this form of girder is best adapted to afford lateral stiffness.

Floor Beams, Girders, etc.—The condition of the stress borne by a floor beam is that of a beam supported at both ends and uniformly loaded; but from the irregularity in its loading and unloading, and from the necessity of its possessing great rigidity, it is impracticable to estimate its capacity other than as a beam having the weight borne upon the middle of its length.

To Compute the Depth of a Floor Beam.—When the Length and Breadth are given, and the Distance between the Centres of the Beam is One Foot.—*Rule.*—Divide the product of the square of the length in feet and the weight to be borne in pounds per square foot of floor, by the product of 4 times the breadth and the *value* of the material from the Table (page 208,) and the square root of the quotient will give the depth of the beam in inches.

Example.—A white pine beam is 2 ins. wide, and 12 feet in length between the supports; what should be the depth of it to support a weight of 175 lbs. per square foot?

$$\frac{12^2 \times 175}{2 \times 1 \times 50} = 105, \text{ and } \sqrt{105} = 10.25 \text{ ins.}$$

When the Distance between the Centres of the Beam is greater or less than One Foot.—*Rule.*—Divide the product

of the square of the depth for a beam, *when the distance between the centres is one foot*, by the distance given in inches by 12, and the square root of the quotient will give the depth of the beam in inches.

EXAMPLE.—Assume the beam in the preceding case to be set 15 ins. from the centres of its adjoining beams; what should be its depth?

$$\frac{10.25^2 \times 15}{12} = 131.25, \text{ and } \sqrt{131.25} = 11.45 \text{ ins.}$$

Header and Trimmer Beams.—The conditions of the stress borne or to be provided for by them are as follows:

Header or *Trimmer* beams support ½ of the weight of and upon the tail beams inserted into or attached to them.

Trimmer Beams support, in addition to that borne by them directly as a floor beam, each ½ the weight on the headers.

The stress, therefore, upon a header is due directly to its length, or the number of tail beams it supports; and the stress upon the trimmer beams is that of their own stress as a floor beam, and ½ of the weight upon the header supported by them.

NOTE.—The distance between the support of the trimmer-beams and the point of connection with the header does not in anywise affect the stress upon the trimmer-beams; for in just proportion as this distance is increased, and the stress upon them consequently increased, by the suspension of the header from them nearer to the middle of their length, so is the area of their surface supported by the header reduced, and, consequently, the load to be borne by it.

Girder.—The condition of the stress borne by a Girder* is that of a beam fixed or supported at both ends, as the case may be, supporting the weight borne by all of the beams resting thereon, at the points at which they rest; and its dimensions must be proportionate to the stress upon it, and the distance between its points of insertion or support.

ILLUSTRATION.—It is required to determine the dimensions of a pitch-pine girder, 15 feet between its several points of supports, to support the ends of two lengths of beams each 20 feet in length, having a superincumbent weight, including that of the beams, of 200 lbs. per square foot.

The condition of the stress upon such a girder would be that of a number of beams, 40 feet in length (20×2), supported at both ends, and loaded uniformly along their length, with 200 lbs. upon every superficial foot of their area.

Hence the amount of the weight to be borne is determined by $20 \times 2 \times 15 \times 200 = 120{,}000$ lbs.= the product of twice the length of a beam, the distance between the supports of the girder and the weight borne per square foot of area; and the resistance to be provided for is that to be borne by a beam, 15 feet in length, fixed at both ends, and supporting 120,000 lbs. uniformly laid along its length, equal to 60,000 lbs. supported at its centre.

Consequently, $\frac{15 \times 60{,}000}{6 \times 50} = 3000$ = quotient of the product of the length and weight ÷ the product of 6 times the value of the material; and assuming the girder to be 12 inches wide, then $\sqrt{\frac{3000}{12}} = 15.8$ ins.

* When a girder has four or more supports, its condition as regards a stress upon its middle is that of a beam fixed at both ends.

FORMULÆ TO COMPUTE THE VALUES AND THE DIMENSIONS OF BEAMS, BARS, ETC., OF VARIOUS SECTIONS.—(TREDGOLD.)

For a Square, Rectangle, Rectangle the diagonal being vertical, and Cylinder, they are alike to those already given, substituting in the Rectangles for $b\ d^2$. 8^3.

For a Grooved or Double-flanged, Open, and Single-flanged Beam they are as follows:

	Grooved. 	Open. 
1. *Fixed at one End*, Weight suspended from the other,	$\frac{l\,W}{b\ d^2\ (1-q\ y^3)} = V.$	$\frac{l\,W}{b\ d^2\ (1-y^3)} = V.$
2. *Fixed at both Ends*, Weight suspended from the middle,	$\frac{l\,W}{b\ d^2\ (1-q\ y^3)} = V.$	$\frac{l\,W}{b\ d^2\ (1-y^3)} = V.$
3. *Supported at both Ends*, Weigh suspended from the middle,	$\frac{l\,W}{b\ d^2\ (1-q\ y^3)} = V.$	$\frac{l\,W}{b\ d^2\ (1-y^3)} = V.$
4. *Supported at both Ends*, Weight suspended at any other point than the middle,	$\frac{m\ n\ W}{b\ d^2\ \overline{m+n}\ (1-q\ y^3)} = V.$	$\frac{m\ n\ W}{b\ d^2\ \overline{m+n}\ (1-y^3)} = V.$
5. *Fixed at both Ends*, Weight suspended from any other p't than the middle,	$\frac{m\ n\ W}{b\ d^2\ \overline{m+n}\ (1-q\ y^3)} = V.$	$\frac{m\ n\ W}{b\ d^2\ \overline{m+n}\ (1-y^3)} = V.$

Single-flanged 1. $\frac{l\,W}{b\ d^2\ (1-q\ y^3)\ (1-q)} = V.$ $\frac{}{(\sqrt{1-q\ y^3}\ +\ \sqrt{1-q\ y^2}}$ 2. 3. 4. 5. For the other conditions of a Beam, Bar, etc., use the same formula as the above, multiplying the *Value* obtained above by 6, 4, 1 and 1.5 respectively, y and q representing $\frac{\text{depth of groove}}{\text{whole depth of beam}} = y$, and $\frac{\text{whole breadth of beam}}{\text{width of web}} = q$.

TRANSVERSE RESISTANCE FROM END PRESSURE APPLIED HORIZONTALLY.

L WROUGHT IRON.—7¼ feet in length; flanges, 6×3½ ins. × ⅝ depth; area, 5½ square ins.; 50,000 lbs. produced no set; 58,240 lbs. produced a set of 1¾ ins.

WHITE OAK.—Rectangle 10 feet in length, 11×4½ ins.; 33,600 lbs. gave a deflection of .⅝ in.; 50,400 lbs. gave a deflection of .5 in.; 67,200 lbs. gave a deflection of .⅞ and with 78,400 it broke.

TRANSVERSE STRENGTH OF CAST-IRON GIRDERS AND BEAMS, DEDUCED FROM EXPERIMENTS IN ENGLAND AND AMERICA.

Reduced to a Uniform Measure of One Inch in Depth, One Foot in Length, Supported at both Ends; the Stress or Weight applied in the Middle.

SECTION OF GIRDER OR BEAM.	Flanges. Top.	Flanges. Bottom.	Width of Vertical Web.	Depth of Girder.	Breadth of Girder.	Area of Section in Centre.	Breaking Weight at Length of one foot.	Strength per Sq. Inch of Section.	Values for Breaking Weight $= \frac{A\,d}{l}\,W = V.I$
	Sq. Ins	Sq. Ins.	In.	In.	In.	Sq I.	Lbs.	Lbs.	Lbs.
Eq. area of flange at top & bottom,	1.75×.42 =.735	1.77×.39 =.69	.29	5.125	1.77	2.82	30150	10768	2100
do.	2.02×.515 =1.045	2.02×.515 =1.045	.51*	2.02	2.02	2.59	10276	3952	1900
Area of sec. of top & bot. 1 to 6,	2.23×.31 =.72	6.67×.66 = 4.4	.266	5.125	6.67	6.23	117450	18852	3650
	.....	5 ×.3 = 1.5	.365	1.56	5.	1.96	7280	3714	2350
	5 ×.3 =1.5	.....	.365	1.56	5.	1.96	2366	1213	760
	.....	23.9×3.12 = 74.56	3.3	36.1	23.9	183.5	8066240	43958	1200
	5 ×.5 =.25	1.5×.5 = .75	.5	4.†	1.5	1.	19980	19980	5000
	1.5×.5 =.75	.5×.5 = .25	.5	4.†	1.5	1.	7252	7252	1800
	4 ×.2 = 8	.....	2.	4.	4.	12.	33600	2800	700
	5.1 ×2.33 = 11.88	12.1×2.07 = 25.04	2.08	30.5	11.1	90.8	4793800	52795	1700
Rectangular Prism,	.....	.....	.994	2.012	2.994	2.025	9440	4662	2350
Open Beam.	1.005×.98	1.005×.99	1.005	2.51	1.005	1.98	12340	6232	2450
	.995×1.01	.995×1	.995	3.01	.995	2.	15420	7710	2550
	1.005×.98	1.005×.99	1.005	.4	1.005	1.98	21765	10992	2700
	.771×1.51	.771×1.5	.771	4.04	.771	2.322	25705	11070	2750
	1.507×.74	1.507×.74	1.507	4.04	1.507	2.23	25735	11540	2850
	1.525×.78	1.525×.78	1.525	4.07	1.525	2.35	30000	12689	3100
Square Prism, Stress at Side,	.....	.....	1.02	1.01	1.02	1.032	2635	2552	2500
Cylinder,	.....	.....	1.122	1.122	1.122	.989	2370	2396	2150
Square Prism, angle up.	.....	.....	.4431	1.443	1.443	1.041	2269	2182	1500

* Horizontal web. † Depth of opening 3 inches.

‡ A representing area of section, d the depth in inches, l the length in feet, and W the breaking weight in pounds.

CRUSHING STRENGTH OF VARIOUS MATERIALS, DEDUCED FROM EXPERIMENTS IN ENGLAND AND AMERICA.

Reduced to a uniform Measure of One Square Inch.

FIGURES AND MATERIAL.	Crushing Weight.
Prisms.	Lbs.
CAST IRON.	
American, gun-metal	174803
" mean	129000
English, Low Moor, No. 1	62450
" " No. 2	92330
" Clyde, No. 3	106039
" Stirling, mean of all	122395
" " extreme	134400
WROUGHT IRON.	
American	127720
" mean	83500
English	65200 to 40000
VARIOUS METALS.	
Fine brass	101860
Cast copper	117000
Cast steel	285000
Cast tin	15500
Lead	7730
WOODS.	
Ash	6663
Beech	6963
Birch	7969
Box	10513
Cedar, red	5968
Chestnut	5350
Elm	6831
Hickory, white	8925
Locust	9113
Mahogany, Spanish	8198
Maple	8150
Oak, American white	6100
" Canadian white	5982
" " live	6850
" English	9500 to 6484
Pine, pitch	8947
" white	5775
" yellow	8200
Spruce, white	5950
Sycamore	7082
Teak	12100
Walnut	6645
STONES, CEMENTS, ETC.	
Brick, hard	2000 to 4368
" common	4000 to 800
Clay, fine, baked	175
" " rolled and baked	400
Common brick masonry	800 to 500
Crown glass	31000
Craigleith Limestone, Eng'h	7300 to 2185
Aberdeen granite, "	8400 to 10363
Arbroath "	7884
Caithness "	6493
Limestone "	3065
Portland "	15583 to 4570
Portland cement "	15000
" mean "	8200
Portland oolite "	3850
Fire-brick, Stourbridge	1717
Freestone, Bellville	3522
" Caen	1088
" Connecticut	3319
" Dorchester	3069
" Little Falls	2991
Gneiss	10600
Granite, Patapsco	5340
" Quincy	15300
Marble, Baltimore, large	8057
" " small	18061
" East Chester*	23917
" Hastings, N. Y	18941
" Italian	12624
" Lee, Mass	22702
" Montgomery co., Pa	8950
" Stockbridge†	10382
" Symington, large	11156
" " fine crystal	18248
" " strata horizontal	10124
" " strata vertical	9324
Mortar, good	240
" common	120
Normandy Caen	1543
Portland cement, 1; sand, 1	1280
Roman "	342
Sandstone, Adelaide	2800
" Acquia Creek‡	5340
" Seneca§	10762
Stock brick	2177
Sydney "	2928

* Same as that of the General Post Office, Washington.
† Same as that of the City Hall, New York.
‡ Same as that of the Capitol, Treasury Department, and Patent Office, Washington, D. C.
§ Same as that of the Smithsonian Institute.
‖ Same as that of the National Washington Monument.

CRUSHING STRENGTH.

The *crushing strength* of any body is in proportion to the area of its section, and inversely as its height. In tapered columns, the strength is determined by the least diameter.

When the height of a *prism or column* is not 5 times its side or diameter, the crushing strength is at its maximum.

Experiments upon *cast-iron bars* give a *crushing stress* of 5,000 lbs. per square inch of section as just sufficient to overcome the elasticity of the metal; and when the height exceeds 3 times the diameter, the iron yields by bending.

When it is 10 times, it is reduced as 1 to 1.75; when it is 15 times, it is reduced as 1 to 2; when it is 20 times, it is reduced as 1 to 3; when it is 30 times, it is reduced as 1 to 4; and when it is 40 times, it is reduced as 1 to 6.

The experiment of Mr. Hodgkinson have determined that an increase of strength of about $\frac{1}{6}$ of the breaking weight is obtained by *enlarging the diameter of the column in its middle.*

In cast iron columns of the same thickness, the strength is inversely proportional to the 1.7 power of the length nearly. Thus in solid columns, the ends being flat, the strength is as $\frac{d^{3.6}}{l^{1.7}}$, l representing the length, and d the diameter.

Hollow columns, having a greater diameter at one end than the other, have not any additional strength over that of uniform cylindrical columns.

Experiment upon *wrought iron* give a *mean crushing stress* of 74,250 lbs. per square inch. Cast iron is decreased in length nearly double what wrought iron is by the same weight; but wrought iron will sink to any degree with little more than 26680 lbs. per square inch, while cast iron will bear 97500 lbs. to produce the same effect.

A *wrought bar* will bear a *compression* of 1-863 of its length, without its utility being destroyed.

With *cast iron*, a pressure beyond 26680 lbs. per square inch is of little, if any, use in practice.

For equal decrements of length, wrought iron will sustain double the pressure of cast iron.

Glass and *the hardest stones* have a *crushing strength* from 7 to 9 times greater than tensile; hence an approximate value of their crushing strength may be obtained from their tensile, and contrariwise.

Various experiments show that the power of *stones*, &c., to resist the effects of *freezing* is a fair exponent of that to resist compression.

WROUGHT IRON PLATES, CYLINDRICAL TUBES.

LENGTH.	Width.	Thickness.	Area.	Crushing Weight.
PLATES.	Ins.	Ins.	Ins.	Lbs.
10 feet	2.98	.497	1.48	815
10 "	3.01	.766	2.3	3379
HOLLOW CYLINDERS.	External.	Internal.		
10 feet	1.495	1.292	.444	14661
10 "	2.49	2.275	.804	29779
10 "	6.366	6.106	2.547	35886
RECTANGULAR TUBES.				
10 lap-riveted	4.1	4.1	.504	10980
10 lap-riveted	4.1	4.1	1.02	19261
10 lap-riveted	4.25	4.25	2.395	21585
10 lap-riveted	8.4	4.25	6.89	29981
10 lap-riveted	8.1	8.1	2.07	132760
10 lap-riveted, and two internal diaphragm plates	8.1	8.1	3.551	19800

EXPANSION OR DILATATION OF SOLIDS.—(FARADAY.)

Lineal.

At 212°, the length of the bar at 32°=1.

Bismuth	1.0013908	Gold	1.001495	Silver	1.00201
Brass	1.0019062	Granite	1.0007894	Slate	1.0011436
Cast iron	1.0011112	Lead	1.0028426	Stock brick	1.0005502
Cement	1.001435	Marble	1.0011041	Steel	1.0011899
Copper	1.001435	Pavements	1.0008985	Tin	1.002
Fire-brick	1.0004928	Platinum	1.0009542	Wrought iron	1.0012575
Glass	1.0008545	Sandstone	1.001743	Zinc	1.002042

DAMS AND TUNNELS.

DAMS (EARTHWORK.)

Width at top in high dams from 7 to 20 ft. | Breast slopes..... = 3 to 1
Width at top in low dams..... = height. | Back slopes..... = 2 to 1

Height above surface of water not less than 3.5 feet.

PROPORTION OF LABORERS IN BANK, FILLERS, AND WHEELERS IN DIFFERENT SOILS, WHEELERS BEING ESTIMATED FOR A DISTANCE OF FIFTY YARDS.

	Getters.	Fillers.	Wheelers.		Getters.	Fillers.	Wheelers.
In loose earth, sand, etc	1	1	1	In hard clay	1	1¼	1¼
In compact earth	1	2	2	In compact gravel	1	1	1
In marl	1	2	2	In rock	3	1	1

MASONRY.

Width at bottom = .7 height; at middle = .5 height; and at top = .3 height.

TUNNELS.—(From Actual Practice in Brickwork.)

PURPOSE.	Formation of Strata.	Extreme Height.		Extreme Width.		Depth at Crown.	
		Feet.	Ins.	Feet.	Ins.	Feet.	Ins.
Canal	Various	16	2	17		1	3
Canal	Clay	21	6	20		1	6
Thames Tunnel	Clay	22	3	37	6	2	6
Railway	Chalk	26	6	27		1	6
"	Various	27	6	27		1	$10\frac{1}{4}$
"	Shale	30		30		1	$10\frac{1}{2}$
"	Green sand	30	6	30		2	3
"	Freestone	36		36		2	3
Canal	Chalk and earth	39		35	6	1	2

WIND-MILLS.—(Molesworth.)

To Compute the Angles of the Sails.

$23° - \frac{18\,d^2}{r^2}$ = angle of the sail with the plane of motion at any part of the sail; r representing radius of sail in feet, and d distance of any part of the sail from the axis.

Axis of Shaft of Wind-mill with Horizon.

8° upon level ground.
Breadth of whip at axis, $\frac{1}{3.0}$ length of whip.
Depth " " $\frac{1}{4.0}$ "
Breadth of whip at end, $\frac{1}{6.0}$ "
Depth " " $\frac{1}{8.0}$ "
Width of sail " $\frac{1}{3}$ "

Divided by the whip in the proportion of 5 to 3, the narrowest portion being nearest to the wind.

Width of sail at axis, $\frac{1}{5}$ length of whip; distance of sail from axis, $\frac{1}{7}$ length of whip.

Cross-bars from 16 to 18 inches apart.

STRENGTH OF ICE.

Thickness, 2 ins. will bear infantry.
" 4 " cavalry or light guns.
" 6 " heavy field guns.
" 8 " upon sledges, a weight not exceeding 1000 lbs. per square foot.

STIFFNESS OF BEAMS.

Stiffness of Beams.—(TREDGOLD.)

$\sqrt[3]{\frac{l^2 W C}{b}} = d$; $\frac{l^2 W C}{d^3} = b$; b representing breadth, and d depth in inches, l length in feet, and W load in lbs. upon the middle.

C = Pine, .01; Ash, .01; Beech, .013; Elm, .015; Oak, .13; Teak, .008.

When the beam is uniformly loaded, put .625 W instead of W.

Resistance to Detrusion.—When one beam is let in, at an inclination to the depth of another, so as to bear in the direction of the fibres of the beam that is cut, the depth of the cut *at right angles to the fibres* should not be more than one-fifth of the length of the piece, the fibres of which, by their cohesion, resist the pressure.

To Compute the Length necessary to resist a given Horizontal Thrust, as in the Case of a Rafter let into a Tie-Beam.

$\frac{4T}{bc} = l$; b representing the breadth of the beam in inches, T the horizontal thrust in lbs., c the cohesive resistance of the material in lbs. per square inch, and l the length in inches.

REVOLVING DISC.

To Compute the Power.—RULE. Multiply one-half the weight of the disc by the height due to the velocity of its circumference in feet per second.

EXAMPLE.—A grind-stone $3\frac{3}{4}$ feet in diameter, weighing 2000 lbs., is required to make $362\frac{1}{4}$ revolutions per minute; what power must be communicated to it?

Circum. of $3\frac{3}{4} = 10.6$ feet, which $\times$ 362.25 and $\div$ 60 = 64 feet per second. Then $2000 \div 2 \times 64 = 64000$ lbs. raised 1 foot.

NOTE.—If the revolving disc is not an entire or solid wheel, being a ring or annulus, it must first be computed as if an entire disc, and then the portion wanting must be computed and deducted.

Power Concentrated in Moving Bodies.—Simple power is *force multiplied by its velocity*. Power concentrated in a moving body is the *weight of the body multiplied by the square of its velocity; and the product divided by the acceleratrix*, or the power concentrated in a moving body is equal to the power expended in generating the motion.

SHRINKAGE OF CASTINGS.

	In.
Iron, small cylinders	$= \frac{1}{16}$ per foot.
" Pipes	$= \frac{1}{8}$ "
" Girders, beams, etc	$= \frac{1}{8}$ in 15 ins.
" Large cylinders, the contraction of diameter at top	$= \frac{1}{16}$ per foot.
" Ditto at bottom	$= \frac{1}{12}$ per foot.
" Ditto in length	$= \frac{1}{8}$ in 16 ins.

Brass, thin..... = $\frac{1}{8}$ in 9 ins.
Brass, thick..... = $\frac{1}{8}$ in 10 ins.
Zinc..... = $\frac{5}{16}$ in a foot.
Lead..... = $\frac{5}{16}$ in a foot.
Copper..... = $\frac{3}{16}$ in a foot.
Bismuth..... = $\frac{5}{32}$ in a foot.

VERNIER SCALE.

The *Vernier* Scale is 11-10ths, divided into 10 equal parts; so that it divides a scale of 10ths into 100ths when the lines meet in the two scales.

COMPARATIVE WEIGHT OF TIMBER IN A GREEN AND SEASONED STATE.

TIMBER.	Weight of a Cub. Ft.		TIMBER.	Weight of a Cub. Ft.	
	Green.	Seasoned.		Green.	Seasoned.
	Lbs. Oz.	Lbs. Oz.		Lbs. Oz.	Lbs. Oz.
Amer. Pine.....	44.12	30.11	Cedar.....	32.	28 4
Ash.....	58. 3	50.	English Oak	71.10	43 8
Beech.....	60.	53.6	Riga Fir.....	48.12	35 8

To Compute the Weight of Cast Metal by the Weight of the Pattern.—When the Pattern is of White Pine.—Rule. Multiply the weight of the pattern in pounds by the following multiplier, and the product will give the weight of the casting:
Iron, 14; Brass, 15; Lead, 22; Tin, 14; Zinc, 13.5.

WEIGHTS AND VOLUMES OF VARIOUS SUBSTANCES IN ORDINARY USE.

SUBSTANCES.	Cubic Foot.	Cubic Inches	SUBSTANCES.	Cubic Foot.	Cubic Feet in a Ton.
METALS.	Lbs.	Lbs.	WOODS.	Lbs.	
Brass, { copper 67. } zinc 33. }	488.75	.2829	Pine, yellow	53.812	66.248
" gun metal	543.75	.3147	Spruce	31.25	71.68
" sheets	513.6	.297	Walnut, bl'k, dry	31.25	71.68
" wire	524.16	.3033	Willow	36.562	61.265
Copper, cast	547.25	.3179	" dry	30.375	73.744
" plates	543.625	.3167	MISCELLANEOUS.		
Iron, cast	450.437	.2607			
" gun metal	466.5	.27	Air	.075291	—
" heavy forging	479.5	.2775	Basalt, mean	175.	12.8
" plates	481.5	.2787	Brick, fire	137.526	16.284
" wrought bars	486.75	.2816	" mean	102.	21.961
Lead, cast	709.5	.4106	Coal, anthracite. {	89.75	24.958
" rolled	711.75	.4119		102.5	21.854
Mercury, 60°	848.7487	.491174	" bitum. mean	80.	28.
Steel, plates	487.75	.2823	" Cannel	94.875	23.609
" soft	489.562	.2833	" Cumberland	84.687	26.451
Tin	455.687	.2637	" Welsh, mean	81.25	27.560
Zinc, cast	428.812	.2482	Coke	62.5	35.84
" rolled	440.437	.2601	Cotton, bale, mean	14.5	154.48
			" " pressd {	20.	114.
WOODS.		Cub. Ft. in a ton.		25.	89.6
Ash	52.812	42.414	Earth, clay	120.625	18.569
Bay	51.375	43.601	" com'n soil	137.125	16.335
Cork	15.	149.333	" " gravel	109.312	20.49
Cedar	35.062	63.886	" dry, sand	120.	18.667
Chestnut	38.125	58.754	" loose	93.75	23.893
Hickory, pig nut	49.5	45.252	" moist, sand	128.125	17.482
" shell-bark	43.125	51.942	" mould	128.125	17.482
Lignumvitæ	83.312	26.886	" mud	101.875	21.987
Logwood	57.062	39.255	" with gravel	126.25	17.742
Mahog. Hondur's {	35.	64.	Granite, Quincy	165.75	13.514
	66.437	33.714	" Susqueh'na	169.	13.254
Oak, Canadian	54.5	41.101	Hay, bale	9.525	23.517
" English	58.25	38.455	" pressed	25.	89.6
" live, seasoned	66.75	33.558	India rubber	56.437	39.60
" white, dry	53.75	41.674	" vulcanized	—	—
" " upland	42.937	52.169	Limestone	197.25	11.355
Pine, pitch	41.25	54.303	Marble, mean	167.875	13.343
" red	36.875	60.745	Mortar, dry, mean	97.98	22.862
" white	34.625	64.693	Water, fresh	62.5	35.84
" well seasoned	29.562	75.773	" salt	64.125	34.931
			Steam	.036747	—

WEIGHT OF ONE FOOT OF FLAT BAR IRON.

If a bar of iron be thicker than contained in the table, add together the weight of two numbers, or treble the weight of one number. Wanted the weight of 1 foot of bar iron, 4 inches broad and 2 1-4 inches thick. Opposite 4 and under 1 is 13.364, which doubled is 26.728; add the weight of 1-4th (3.341), equal 30.069 lbs.

Breadth in inches.	THICKNESS IN PARTS OF AN INCH.								
	1/4	5/16	3/8	7/16	1/2	5/8	3/4	7/8	1 in.
1	.835	1.044	1.253	1.461	1.670	2.088	2.506	2.923	3.340
1 1/8	.939	1.174	1.409	1.644	1.878	2.348	2.818	3.287	3.756
1 1/4	1.044	1.305	1.566	1.826	2.088	2.609	3.132	3.653	4.176
1 3/8	1.148	1.435	1.722	2.009	2.296	2.870	3.444	4.018	4.592
1 1/2	1.252	1.566	1.879	2.192	2.504	3.131	3.758	4.384	5.008
1 5/8	1.358	1.696	2.035	2.374	2.716	3.392	4.070	4.749	5.432
1 3/4	1.462	1.827	2.192	2.557	2.924	3.653	4.384	5.114	5.848
1 7/8	1.566	1.957	2.348	2.740	3.132	3.914	4.696	5.479	6.264
2	1.671	2.088	2.505	2.922	3.342	4.175	5.010	5.845	6.684
2 1/8	1.775	2.218	2.662	3.105	3.550	4.435	5.324	6.210	7.100
2 1/4	1.880	2.348	2.818	3.288	3.760	4.696	5.636	6.575	7.520
2 3/8	1.984	2.479	2.975	3.470	3.968	4.957	5.950	6.941	7.936
2 1/2	2.088	2.609	3.131	3.653	4.176	5.218	6.262	7.306	8.352
2 5/8	2.193	2.740	3.288	3.836	4.386	5.479	6.576	7.671	8.772
2 3/4	2.297	2.870	3.444	4.018	4.594	5.740	6.888	8.036	9.188
2 7/8	2.402	3.001	3.601	4.201	4.804	6.001	7.202	8.402	9.608
3	2.506	3.131	3.758	4.384	5.012	6.262	7.516	8.767	10.024
3 1/4	2.715	3.392	4.071	4.749	5.430	6.784	8.142	9.498	10.860
3 1/2	2.923	3.653	4.384	5.114	5.846	7.306	8.768	10.228	11.692
3 3/4	3.132	3.914	4.697	5.479	6.264	7.828	9.394	10.959	12.528
4	3.341	4.175	5.010	5.845	6.682	8.350	10.020	11.690	13.364
4 1/4	3.549	4.436	5.323	6.210	7.098	8.871	10.646	12.421	14.196
4 1/2	3.758	4.697	5.636	6.575	7.516	9.393	11.272	13.151	15.032
4 3/4	3.966	4.958	5.949	6.941	7.932	9.915	11.898	13.881	15.864
5	4.175	5.219	6.263	7.306	8.350	10.437	12.526	14.612	16.700
5 1/4	4.384	5.479	6.576	7.671	8.768	10.958	13.152	15.343	17.536
5 1/2	4.593	5.741	6.889	8.037	9.186	11.480	13.778	16.073	18.372
5 3/4	4.801	6.001	7.202	8.402	9.602	12.002	14.404	16.804	19.204
6	5.010	6.262	7.515	8.767	10.020	12.524	15.030	17.535	20.042

WEIGHT OF ONE SQUARE FOOT OF SHEET IRON, ETC.

Names.	Thickness by the Birmingham (Eng.) Wire Gauge.														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Iron..	12.50	12.00	11.00	10.00	8.74	8.12	7.50	6.86	6.24	5.62	5.00	4.38	3.75	3.12	2.82
Cop...	14.50	13.90	12.75	11.60	10.10	9.40	8.70	7.90	7.20	6.50	5.80	5.08	4.34	3.60	3.27
Brass	13.75	13.20	12.10	11.90	9.61	8.93	8.25	7.54	6.86	6.18	5.50	4.81	4.12	3.43	3.10

	Thickness by the Wire Gauge.														
	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Iron..	2.50	2.18	1.86	1.70	1.54	1.40	1.25	1.12	1.00	.90	.80	.72	.64	.56	.50
Cop ..	2.90	2.52	2.15	1.97	1.78	1.62	1.45	1.30	1.16	1.04	.92	.83	.74	.64	.58
Brass	2.75	2.40	2.04	1.87	1.69	1.54	1.37	1.23	1.10	.99	.88	.79	.70	.61	.55

No. 1 Wire Gauge is 5-16th of an inch; No. 4 is 1-4th; No. 11 is 1-8th; No. 13 is 1-12th; No. 15 is 1-14th; No. 16 is 1-16th; No. 17 is 1-18th; No. 19 is 1-23; No. 22 is 1-32.

RUSSIA SHEET IRON

Measures 56 by 28 inches, and is rated by the weight per sheet. The numbers run from 8 to 18 Russian lbs. per sheet. 8 Russian pounds equal 7.2 English pounds; 9=8.1 lbs.; 10=9 lbs.; 11=10 lbs.; 12=11.2 lbs.. &c. 100 Russian lbs. equal 90 lbs. English.

WEIGHT OF ONE SQUARE FOOT OF PLATE IRON, ETC.

Thickness in parts of an inch.	Iron.	Copper.	Brass.	Lead.	Thickness in parts of an inch.	Iron.	Copper.	Brass.	Lead.
1/16	2.5	2.9	2.7	3.7	7/16	17.5	20.3	19.0	25.9
3/32	5.0	5.8	5.5	7.4	1/2	20.0	23.2	21.8	29.6
5/32	7.5	8.7	8.2	11.1	9/16	25.0	28.9	27.1	37.0
1/4	10.0	11.6	10.9	14.8	5/8	30.0	34.7	32.5	44.4
5/32	12.5	14.5	13.6	18.5	11/16	35.0	40.4	37.9	57.8
3/8	15.0	17.4	16.3	22.2	1	40.0	46.2	43.3	69.2

WEIGHT ONE FOOT IN LENGTH OF SQUARE AND ROUND BAR IRON.

Side and diameter in inches.	Square iron in pounds.	Round Iron in pounds.	Size and diameter in inches.	Square Iron in pounds.	Round Iron in pounds.	Side and diameter in inches.	Square iron in pounds.	Round Iron in pounds.
1/4	.209	.164	1 1/16	8.820	6.928	3 3/16	46.969	36.895
5/16	.326	.256	1 1/8	10.229	8.043	3 1/4	50.153	39.390
3/8	.470	.369	1 3/16	11.743	9.224	4	53.440	41.984
7/16	.640	.503	2	13.360	10.496	4 1/16	56.833	44.637
1/2	.835	.656	2 1/16	15.083	11.846	4 1/8	60.329	47.385
9/16	1.057	.831	2 1/8	16.909	13.283	4 3/16	63.930	50.211
5/8	1.305	1.025	2 3/16	18.840	14.797	4 1/4	67.637	53.132
11/16	1.579	1.241	2 1/4	20.875	16.396	4 5/16	71.445	56.113
3/4	1.879	1.476	2 5/16	23.115	18.146	4 3/8	75 359	59.187
13/16	2.205	1.732	2 3/8	25.259	19.842	4 7/16	79.378	62.344
7/8	2 558	2.011	2 7/16	27.608	21.684	5	83.510	65.585
15/16	2 936	2.306	3	30.070	23.653	5 1/16	92.459	72.618
1	3.340	2.624	3 1/16	32.618	25.620	5 1/8	101.036	79.370
1 1/16	4.228	3 321	3 1/8	35.279	27.709	5 3/16	110.429	86.731
1 1/8	5.219	4.099	3 3/16	38.045	29.881	6	120.243	94.610
1 3/16	6.315	4.961	3 1/4	40 916	32.170			
1 1/4	7.516	5.913	5 3/16	43.890	34.472			

The weight of bar iron being 1;
" " " cast iron = .95
" " " steel, 1.03
" " " copper, 1.16

CAST IRON.—WEIGHT OF A FOOT IN LENGTH OF SQUARE AND ROUND.

SQUARE.				ROUND.			
Size.	Weight	Size.	Weight	Size.	Weight	Size.	Weight
Inches Square	Pounds	Inches Square	Pounds	Inches Diam.	Pounds	Inches Diam.	Pounds
½	.78	4⅞	74.26	½	.61	4⅞	58.32
⅝	1.22	5	78.12	⅝	.95	5	61.35
¾	1.75	5⅛	82.08	¾	1.38	5⅛	64.46
⅞	2.39	5¼	86.13	⅞	1.87	5¼	67.64
1	3.12	5⅜	90.28	1	2.45	5⅜	70.09
1⅛	3.95	5½	94.53	1⅛	3.10	5½	74.24
1¼	4.88	5⅝	98.87	1¼	3.83	5⅝	77.65
1⅜	5.90	5¾	103.32	1⅜	4.64	5¾	81.14
1½	7.03	5⅞	107.86	1½	5.52	5⅞	84.71
1⅝	8.25	6	112.50	1⅝	6.48	6	88.35
1¾	9.57	6¼	122.08	1¾	7.51	6¼	95.87
1⅞	10.98	6½	132.03	1⅞	8.62	6½	103.69
2	12.50	6¾	142.38	2	9.81	6¾	111.82
2⅛	14.11	7	153.12	2⅛	11.08	7	120.26
2¼	15.81	7¼	164.25	2¼	12.42	7¼	129.
2⅜	17.62	7½	175.78	2⅜	13 84	7½	138.05
2½	19.53	7¾	187.68	2½	15.33	7¾	147.41
2⅝	21.53	8	200.	2⅝	16.91	8	157-08
2¾	23.63	8¼	212.56	2¾	18.56	8¼	167.05
2⅞	25.83	8½	225.78	2⅞	20.28	8½	177.10
3	28.12	8¾	239.25	3	22.18	8¾	187.91
3⅛	30.51	9	253.12	3⅛	23.96	9	198.79
3¼	33.	9¼	267.38	3¼	25.92	9¼	210.
3⅜	35.59	9½	282.	3⅜	27.95	9½	221.50
3½	38.28	9¾	297.07	3½	30.16	9¾	233.31
3⅝	41.06	10	312.50	3⅝	32.25	10	245.43
3¾	43.94	10¼	328.32	3¾	34.51	10¼	257.86
4⅞	46.92	10½	344.53	3⅞	36.85	10½	270.59
4	50.	10¾	361.13	4	39.27	10¾	283.63
4⅛	53.14	11	378.12	4⅛	41.76	11	296.97
4¼	56.44	11¼	395.50	4¼	44.27	11¼	310.63
4⅜	59.81	11½	413.28	4⅜	46.97	11½	324.59
4½	63.28	11¾	431.44	4½	49.70	11¾	338.85
4⅝	66.84	12	450.	4⅝	52.50	12	353.43
4¾	70.50			4¾	55.37		

STEEL.—WEIGHT OF A FOOT IN LENGTH OF FLAT.

Size.	Thick, 1-4 in.	Thick, 3-8ths.	Thick, 1-2 in.	Thick, 5-8ths.	Size.	Thick, 1-4 in.	Thick, 3-8ths.	Thick, 1-2 in.	Thick, 5-8ths.
Inch.	lbs.	lbs.	lbs.	lbs.	Inch.	lbs.	lbs.	lbs.	lbs.
1	.852	1.27	1.70	2.13	2½	2.13	3.20	4.26	5.32
1⅛	.958	1.43	1.91	2.39	2¾	2.34	3.51	4.68	5.85
1¼	1.06	1.59	2.13	2.66	3	2.55	3.83	5.11	6.39
1⅜	1.17	1.75	2.34	2.92	3¼	2.77	4.15	5.53	6.92
1½	1.27	1.91	2.55	3.19	3½	2.98	4.47	5.98	7.45
1¾	1.49	2.23	2.98	3.72	3¾	3.19	4 79	6.38	7.98
2	1.70	2.55	3.40	4.26	4	3.40	5.10	6.80	8.52
2¼	1.91	2.87	3.83	4.79					

PATENT IMPROVED LEAD PIPE.

SIZES AND WEIGHT PER FOOT.

Calibre.	Weight per foot	Calibre	Weight per foot	Calibre	Weight per foot	Calibre	Weight per foot	Calibre	Weight per foot
Inches.	lbs. oz.	Inches.	lbs. oz.	Inches.	lbs. oz.	Inches.	lbs. oz.	Inches.	lbs. oz.
¾	6	¼	1 4	¾	1 4	1	4 0	1¼	5 0
⅞	8	½	1 8	⅞	2 0	1	6 0	1¾	4 0
⅞	10	½	2 0	⅞	2 4	1¼	2 8	2	5 0
⅞	12	½	3 0	⅞	2 8	1½	3 0	2	6 0
⅞	1 0	⅝	13	⅞	3 0	1½	3 8	2	7 0
⅞	1 8	⅝	1 0	⅞	4 0	1½	4 0	2½	11 0
½	8	⅝	1 8	1	1 8	1½	5 0	3	13 0
½	10	⅝	2 0	1	1 12	1¾	3 0	3½	15 0
½	12	⅝	2 12	1	2 0	1½	3 8	4	18 0
½	14	¾	12	1	2 8	1½	4 0	4½	20 0
½	1 0	¾	14	1	3 0	1½	4 8	5	22 0

¼ in. thick

SHEET LEAD.—Weight of a Square Foot, 2½, 3, 3½, 4, 4½, 5, 6, 7, 8½, 9, 10 lbs., and upwards.

BRASS, COPPER, STEEL AND LEAD.

WEIGHT OF A FOOT.

	BRASS.		COPPER.		STEEL.		LEAD.	
Diam. & side of Square.	Weight of Round.	Weight of Square.	Weight of Round.	Weight of Square.	Weight of Round.	Weight of Square.	Weight of Round.	Weight of Square.
In.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
¼	.17	.22	.19	.24	.17	.21		
⅜	.39	.50	.42	.54	.38	.48		
½	.70	.90	.75	.96	.67	.85		
⅝	1.10	1.40	1.17	1.50	1.04	1.33		
¾	1.59	2.02	1.69	2.16	1.50	1.91		
⅞	2.16	2.75	2.31	2.94	2.05	2.61		
1	2.83	3.60	3.02	3.84	2.67	3.40	3.87	4.93
1¼	3.58	4.56	3.82	4.86	3.38	4.34	4.90	6.25
1⅜	4.42	5.63	4.71	6.	4.18	5.32	6.06	7.71
1½	5.35	6.81	5.71	7.27	5.06	6.44	7.33	9.33
1⅝	6.36	8.10	6.79	8.65	6.02	7.67	8.72	11.11
1¾	7.47	9.51	7.94	10.15	7.07	9.	10.24	13.04
1⅞	8.66	11.03	9.21	11.77	8.20	10.14	11.87	15.12
2	9.95	12.66	10.61	13.52	9.41	11.98	13.63	17.36
2¼	11.32	14.41	12.08	15.38	10.71	13.63	15.51	19.75
2½	12.78	16.27	13.64	17.36	12.05	15.80	17.51	22.29
2¾	14.32	18.24	15.29	19.47	13.51	17.20	19.63	25.
2⅞	15.96	20.32	17.03	21.69	15.05	19.17	21.80	27.80
2¼	17.68	22.53	18.87	24.03	16.68	21.21	24.24	30.86
2⅝	19.50	24.83	20.81	26.50	18.39	23.41	26.72	34.02
2¾	21.40	27.25	22.84	29.08	20.18	25.70	29.33	37.34
2⅞	23.39	29.78	24.92	31.79	22.06	28.10	32.05	40.81
3	25.47	32.43	27.18	34.61	24.23	30.60	34.90	44.44

CAST IRON.

WEIGHT OF A SUPERFICIAL FOOT FROM ¼ TO 2 INCHES THICK.

Size.	Weight	Size.	Weight	Size.	Weight	Size.	Weight	Size.	Weight
In.	Lbs.	In.	Lbs.	In.	Lbs.	In.	Lbs.	In.	Lbs.
¼	9.37	⅝	23.43	1	37.50	1⅜	51.56	1¾	65.62
⅜	14.06	¾	28.12	1¼	42.18	1½	56.25	1⅞	70.31
½	18.75	⅞	32.81	1¼	46.87	1⅝	60.93	2	75.

CAST IRON.

Weight of a Foot in Length of Flat Cast Iron.

Width of Iron.	Thick, ¼ in.	Thick, ⅜ in.	Thick, ½ in.	Thick, ⅝ in.	Thick, ¾ in.	Thick, ⅞ in.	Thick, 1 inch.
Inches.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
2	1.56	2.34	3.12	3.90	4.68	5.46	6.25
2¼	1.75	2.63	3.51	4.39	5.27	6.15	7.03
2½	1.95	2.92	3.90	4.88	5.85	6.83	7.81
2¾	2.14	3.22	4.29	5.37	6.44	7.51	8.59
3	2.34	3.51	4.68	5.85	7.03	8.20	9.37
3¼	2.53	3.80	5.07	6.34	7.61	8.88	10.15
3½	2.73	4.10	5.46	6.83	8.20	9.57	10.93
3¾	2.93	4.39	5.85	7.32	8.78	10.25	11.71
4	3.12	4.68	6.25	7.81	9.37	10.93	12.50
4¼	3.32	4.97	6.64	8.30	9.96	11.62	13.28
4½	3·51	5.27	7.03	8.78	10.54	12.30	14.06
4¾	3.71	5.56	7.42	9.27	11.13	12.98	14.84
5	3.90	5.86	7.81	9.76	11.71	13.67	15.62
5¼	4.10	6.15	8.20	10.25	12.30	14.35	16.40
5½	4.29	6.44	8.59	10.74	12.89	15.03	17.18
5¾	4.49	6.73	8.98	11.23	13.46	15.72	17.96
6	4.68	7.03	9.37	11.71	14.06	16.40	18.75

SOLID CONTENTS OF EQUAL-SIDED TIMBER.

If the log is shorter than is contained in the table, take half or quarter of some length; if longer, double some length. The length of the log is given on the top of the columns, the diameter in the left hand column. To obtain the cubical contents of masts, spars, round logs, &c., subtract one-fourth from the contents.

In. Diam.	L. ft. 9	L. 10	L. 11	L. 12	L. 13	L. 14	L. 15	L. 16	L. 17	L. 18	L. 19	L. 20
6	2 3	2 6	2 9	3 0	3 3	3 6	3 9	4 0	4 3	4 6	4 9	5 0
7	3 0	3 4	3 7	4 1	4 5	4 9	5 1	5 5	5 9	6 2	6 6	6 10
8	4 1	4 4	4 10	5 4	5 9	6 2	6 7	8 0	8 5	8 10	9 3	9 8
9	5 2	5 9	6 2	6 9	7 4	7 11	8 6	9 1	9 8	10 3	10 10	11 5
10	6 2	6 10	7 8	8 4	9 0	9 8	10 4	11 0	11 8	12 4	13 0	13 8
11	7 6	8 4	9 3	10 1	10 11	11 9	12 7	13 5	14 3	15 1	15 11	16 9
12	9 0	10 0	11 0	12 0	13 0	14 0	15 0	16 0	17 0	18 0	19 0	20 0
13	10 4	11 7	12 10	14 1	15 3	16 5	17 9	18 9	19 11	21 1	22 3	23 5
14	12 2	13 7	14 11	16 4	17 8	18 11	20 3	21 7	22 11	24 3	25 7	26 11
15	14 2	15 9	17 2	18 9	20 4	21 10	23 5	25 0	26 7	28 2	29 9	31 4
16	16 0	17 10	19 6	21 4	23 1	24 10	26 7	28 4	30 1	21 10	33 7	35 4
17	18 0	20 0	22 0	24 1	26 1	28 1	30 1	32 1	34 1	36 1	38 1	40 1
18	20 3	22 6	24 9	27 0	29 3	31 6	33 9	36 0	38 3	40 6	42 9	45 0
19	22 6	25 0	27 6	30 1	32 7	35 1	37 7	41 1	43 7	46 1	48 7	52 0
20	25 0	27 10	30 10	33 4	36 1	38 10	41 7	44 4	47 2	50 0	52 6	55 9
21	27 7	30 8	33 9	36 9	39 10	42 11	46 0	49 1	52 2	55 3	58 4	61 5
22	30 2	33 6	36 10	40 4	43 8	47 0	50 4	53 8	57 0	60 4	63 8	67 0
23	33 0	36 8	40 4	44 1	47 9	51 5	55 1	58 9	62 5	66 1	69 9	73 5
24	36 0	40 0	44 0	48 0	52 0	56 0	60 0	64 0	68 0	72 0	76 0	80 0
25	39 0	43 4	48 1	52 1	56 5	60 9	65 1	69 5	73 9	78 1	82 5	86 9
26	42 2	46 11	51 7	56 4	61 0	65 8	70 4	75 0	79 8	84 4	89 0	93 8
27	45 7	50 8	55 9	60 9	65 10	70 11	76 0	81 1	86 2	91 7	96 8	101 11
28	49 0	54 5	59 10	65 4	70 9	76 2	81 7	85 0	92 5	97 10	103 3	108 8
29	52 6	58 4	64 2	70 1	75 11	81 9	87 7	93 5	99 3	106 1	112 11	117 9
30	55 9	62 0	68 3	75 0	81 3	87 6	93 9	100 0	106 3	112 6	118 9	125 0

LOGS REDUCED TO ONE INCH BOARD MEASURE.

If the log is longer than is contained in the table, take any two lengths.

The first column on the left gives the length of the log in feet. The figures under D denote the diameters of the logs in inches. Fractional parts of inches are not given.

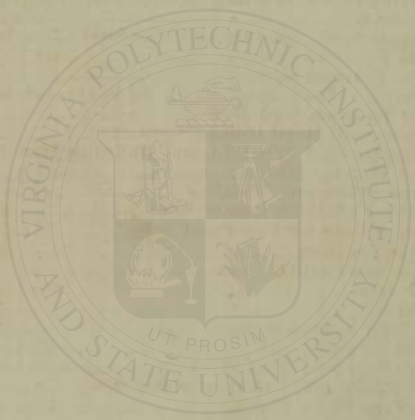
The diameter of timber is usually taken 20 feet from the butt. All logs short of 20 feet, take the diameter at the top, or small end.

To find the number of feet of boards which a log will produce when sawed, take the length of feet in the first column on the left hand, and the diameter at the top of the page in inches.

Suppose a log 12 feet long and 24 inches in diameter; in the left hand column is the length, and opposite 12 under 24 is 300, the number of feet of boards in a log of that length and diameter.

Lng. Ft.	D. 12	D. 13	D. 14	D. 15	D. 16	D. 17	D. 18	D. 19	D. 20	D. 21	D. 22	D. 23	D. 24
10	54	66	76	93	104	170	137	154	176	194	210	237	256
11	59	72	83	102	114	131	151	169	196	213	231	261	270
12	64	78	90	111	124	143	164	184	214	232	252	285	300
13	69	84	97	120	134	154	177	199	231	251	273	308	327
14	74	90	104	129	144	166	191	214	249	270	293	332	350
15	79	96	111	138	154	177	204	229	266	289	314	355	376
16	84	102	118	146	164	189	217	244	284	308	335	379	401
17	89	108	126	155	173	200	231	259	301	327	356	402	426
18	94	114	133	164	183	212	244	274	319	346	377	426	451
19	99	121	140	173	193	223	257	289	336	365	398	449	477
20	104	127	147	182	203	236	271	304	354	384	419	473	501
21	109	133	154	191	213	247	284	319	371	403	440	497	527
22	114	139	161	200	223	259	297	334	389	422	461	520	552
23	119	145	168	209	233	270	311	349	407	441	481	542	568
24	124	151	176	218	243	282	324	364	424	460	502	563	613
25	129	157	183	227	253	293	337	379	442	479	523	591	628
26	134	163	190	236	263	305	350	394	459	498	544	615	653
27	139	169	197	245	273	316	363	409	477	517	565	639	678
28	144	175	204	254	283	328	376	424	494	536	586	663	703
29	149	181	211	263	293	339	389	439	512	555	607	687	728
30	154	187	218	272	303	351	402	454	529	574	628	711	753
31	159	193	225	281	313	362	415	469	547	593	649	735	778

Lng. Ft.	D. 25	D. 26	D. 27	D. 28	D. 29	D. 30	D. 31	D. 32	D. 33	D. 34	D. 35	D. 36
10	283	309	339	359	377	407	440	456	486	496	543	573
11	311	340	374	396	415	447	484	502	535	546	598	630
12	340	371	408	432	453	489	528	548	584	596	653	688
13	369	404	442	469	491	530	572	594	633	646	708	746
14	397	435	476	505	529	571	618	640	682	696	762	803
15	426	465	511	541	567	612	662	686	731	746	817	861
16	455	496	545	578	605	653	706	732	780	796	872	919
17	483	527	579	614	643	694	751	778	829	846	927	976
18	512	558	613	650	681	735	795	824	878	896	981	1034
19	541	590	647	688	719	776	839	870	927	946	1036	1092
20	569	621	681	724	757	817	884	916	976	996	1091	1148
21	598	652	716	760	796	859	928	962	1025	1046	1146	1206
22	627	684	750	796	834	900	972	1008	1074	1096	1200	1264
23	665	715	784	833	872	941	1017	1054	1123	1146	1255	1318
24	684	746	818	869	910	982	1061	1100	1172	1196	1310	1376
25	713	777	853	906	948	1023	1105	1146	1221	1246	1365	1434
26	742	808	887	942	986	1064	1149	1192	1270	1296	1420	1492
27	771	839	921	979	1024	1105	1193	1238	1319	1336	1475	1550
28	800	870	955	1015	1062	1146	1237	1284	1368	1396	1530	1608
29	829	901	989	1052	1100	1187	1281	1330	1417	1446	1585	1666
30	858	932	1023	1088	1138	1228	1325	1376	1466	1496	1640	1724
31	887	963	1057	1125	1176	1269	1369	1422	1515	1546	1695	1782



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