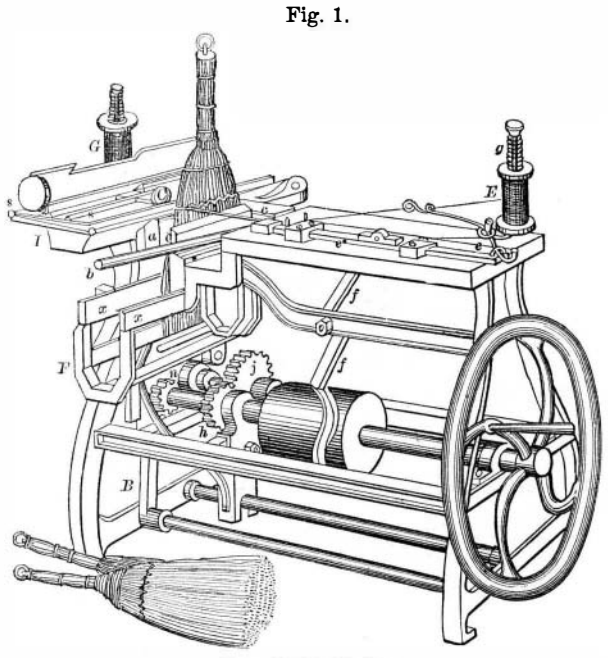
## MISCELLANEOUS USEFUL INVENTIONS.

Continuing our extracts from Knight's "New Mechanical Dictionary,"* we give below a variety of engravings, with the necessary descriptions, of several useful and ingenious inventions. Fig. 1 represents a

Fig. 1.

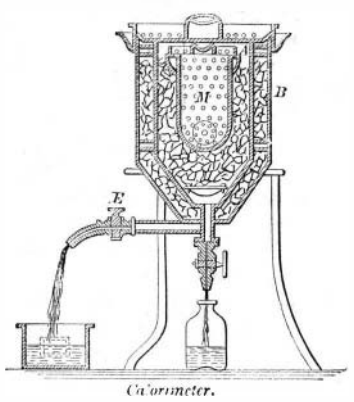


*Broom-Sewing Machine.*

BROOM-SEWING MACHINE,

used for pressing a bunch of broom corn into shape for a broom, and then sewing it in its flattened form. The broom is placed between jaws, *a a*, closed by an eccentric, *e*, and operated by lever, *b*. The machine being set in motion by the rotation of the shaft of the cam wheel, A, the cam groove

Fig. 2.



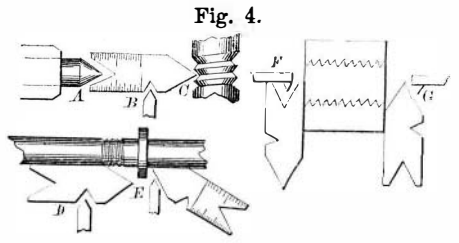
*Calorimeter.*

of the latter, actuating the lever, *f*, forces forward the needle bar, *e*, thus driving the needle with its thread through the broom and above the twine around the latter. The shuttle, *c*, operated by lever, B, acting on the opposite side of the broom in conjunction with the needle, forms the stitch. A reverse movement of the needle bar then withdraws the needle, the eccentric, *n*, lifts the jaws, *a*, so that the next stroke of the needle carries the stitch below the binding twine. The next outward movement of the needle, the jaws being again lowered, carries the stitch above the twine. In this manner the stitches are formed alternately above and below the twine, their distance apart corresponding to the intermittent feed given to the jaws upon their supporting guides, *x*.

THE CALORIMETER,

shown in Fig. 2, is an instrument for measuring the quantity of heat given out by bodies in passing from one temperature to another. The body is weighed, then heated, and finally placed in the compartment, M. The lid is placed over it and covered with ice which already fills the surrounding vessel, A. Over this another lid is placed and covered with ice, which the outer vessel, B, also contains. Finally, a double lid covers the whole. The ice in A is quickly melted, and, flowing out by the stopcock, the water is collected and weighed. The latent heat of water being known, the specific heat of the substance may be readily calculated from the quantity of water obtained.

Fig. 4.



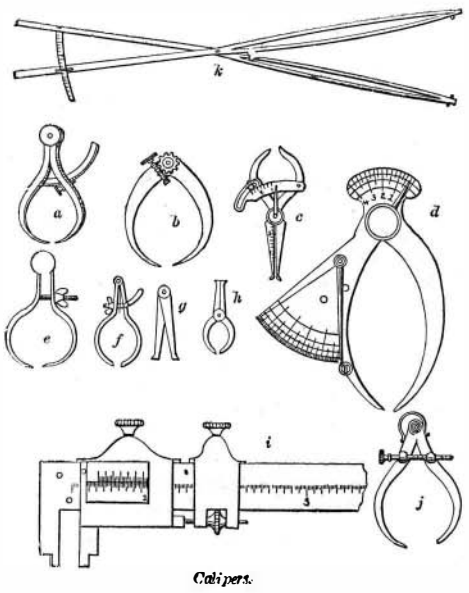
*Center-Gages.*

In Fig. 3 are given several different forms of

CALIPERS

adapted for measuring the diameter of concave or convex bodies. *a* is a bow calipers, with arc and tangent screw; *b* a calipers whose legs are operated by a worm wheel and pinion; *c* is an inside and outside calipers having a graduated arc and index; *d* is a calipers which shows, by the index and arc at the joint, the distension of the points. One leg has a spring, and expands as the calipers is passed over the work, the index on the leg showing the amount of variation from the true size to which the joints have been set; *e* is a spring calipers; *f*, a common form of calipers with arc; *g*, inside calipers; *h*, inside and outside calipers; *i* is a vernier instrument for inside or outside measurements, which reads to thousands of inches. On the other side are sixty-fourths or fiftieths of inches, to read without a vernier. *j* is a spring calipers with pivoted operating screw and nut, and *k* is a calipers for measuring standing or cut timber, having arms thirteen feet long, and a brass arc on which are figures showing the quarter girth in feet and inches. Several adaptations of the

Fig. 3.

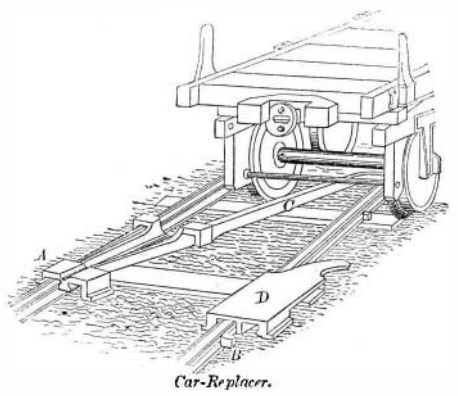


*Calipers.*

CENTER GAGE

are shown in Fig. 4. The tool is used for showing the angle to which a lathe center should be turned, and also for accurately grinding and setting screw-cutting tools. At A is shown the manner of gaging the angle to which a lathe center should be turned, at B the angle to which a screw cutting thread should be ground, and at C the correctness of the angle of a screw thread already cut. In the lower figure the shaft, with a screw thread, is supposed to be held on the center of a lathe. By applying the gage as shown at D or E the thread tool can be set at right angles to the shaft, and then fastened in place by the screw in the tool post, thereby avoiding imperfect or leaning threads. In the right hand figure, the manner of setting the tool for cutting inside threads is shown. The angles used in this gage are of 60°

Fig. 8.

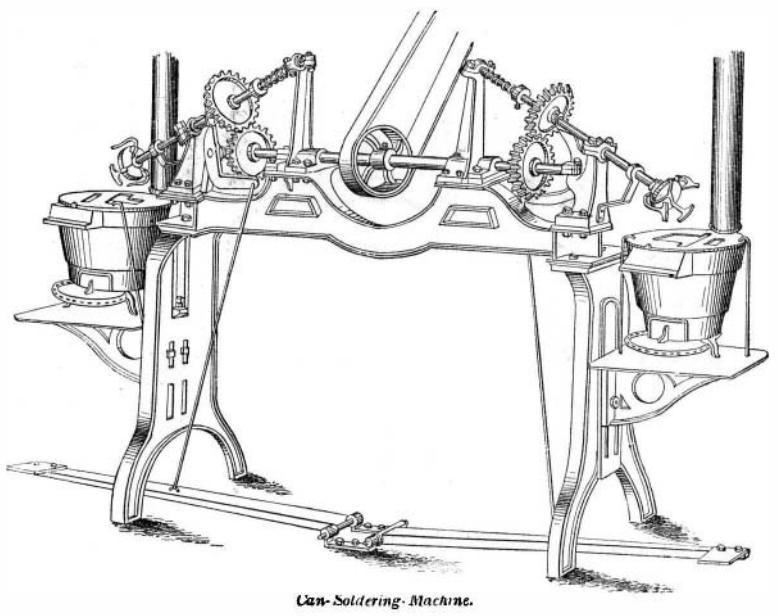


*Car-Replacer.*

The four divisions upon the gage of 14, 20, 24, and 32 parts to the inch, are useful in measuring the number of threads to the inch of taps and screws. Fig. 5 is a

CAN-SOLDERING MACHINE.

Fig. 5.



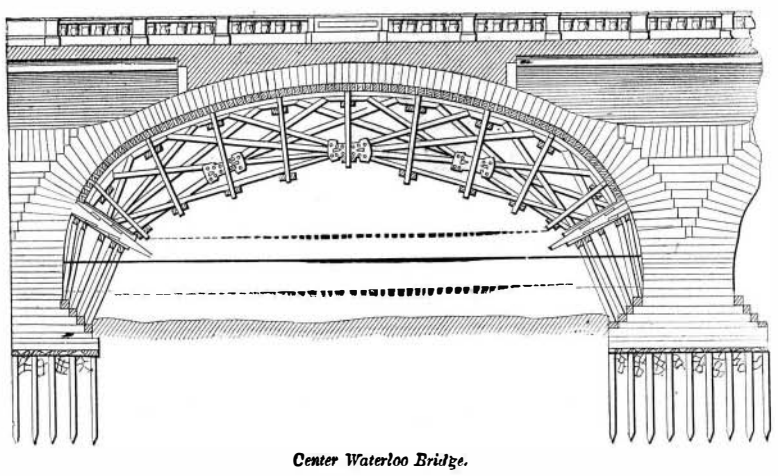
*Can-Soldering Machine.*

In this, a clutch on the end of a shaft, having a bevel wheel gearing with the bevel wheels turned by the central pulley, is placed at each end of a frame, enabling two workmen to operate at once. Beneath each clutch is a bracket for receiving a soldering furnace. A can, with its bottom or top inserted, is fixed upon the clutch, the treadle being previously depressed to throw the bevels out of gear and to withdraw the clutch from the surface of the metal in the soldering furnaces. On releasing the treadle the bevels are thrown into gear, and a spring forces the rod bearing the clutch downward, until the lower edge of the can is slightly immersed in the molten solder, and caused to rotate against the surface of a soldering iron held thereon. After this the treadle is again depressed, and the can removed.

THE CENTERS FOR THE ARCHES OF THE WATERLOO BRIDGE,

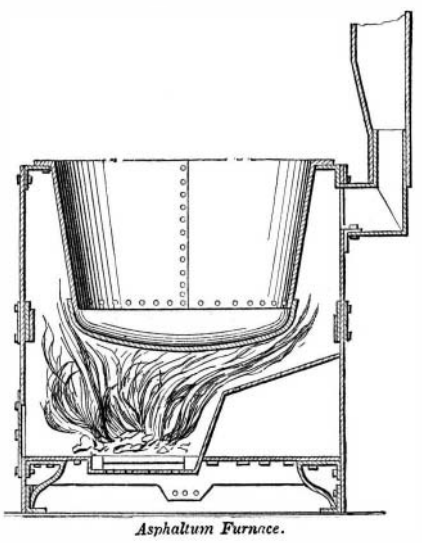
in England, have been often cited as admirably arranged structures of their kind. Inclined piles, which carried the weight of the ribs of the center, had their bearings on the offsets of the stone piers, which afforded an excellent abutment. The ribs were laid upon whole timbers capping the piles, and under each set of ribs, wedges were introduced, which were made to extend across the whole width; when it was required to ease the center, the wedges were driven along each other and slid down the inclined plane into larger spaces than they had formerly occupied. The whole center, by this means, was made to descend very gently, and was retained at any required position during the progress of the work. An elevation of the framing is shown in Fig. 6. This center has remarkable strength, and, when struck, the arch settled but a very few inches. The

Fig. 6.



*Center Waterloo Bridge.*

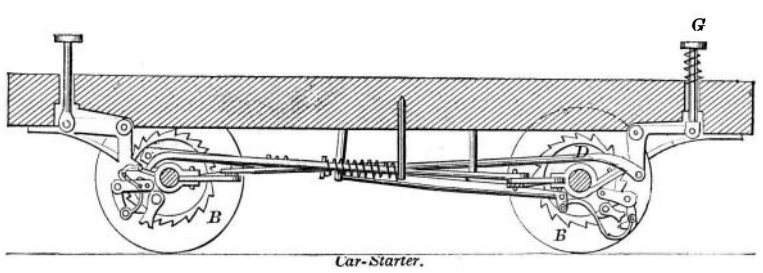
Fig. 9.



*Asphaltum Furnace.*

CAR STARTER,

Fig. 7.



*Car-Starter.*

represented in Fig. 7, is a device intended to assist in starting a street car from a dead stop, so relieving the horses. Pressure on the brake treadle, G, causes a frictional contact between the driving wheels, B, and the friction wheels, D, on the same axle, which retards the motion of the drivers and condenses the spiral spring. When the pressure is removed, the spring actuates a ratchet on the wheel, B, thus assisting to gain the initial impulse.

A number of devices have been patented for the purpose of enabling a car to ascend to its position on the rails when drawn or driven by the locomotive. The general feature, in which all varieties of

CAR REPLACERS

agree, is shown in Fig. 8; it consists in two inclined planes, one

* Published in numbers by J. B. Ford & Co., New York city.

forming a bridge, with a plate, D, to let the lower wheel cross the rail and drop into place. The grooved plate, A' forms a bridge up to the other rail. C is a bar to lead the wheel toward the bridge piece.

Asphaltum, or native bitumen, is largely used for pavements, roads, roofs, and as a waterproof cement. For pavements it is mixed with sand or gravel, and laid while hot upon a foundation of broken stones. The

ASPHALTUM FURNACE,

in Fig. 9, is adapted for heating the material which, when melted, is ladled from the boiler and spread upon the surface to be treated. The construction of the apparatus is quite simple, and will be readily understood from the engraving.

## Hints in Hygiene.

From the November number of that most excellent journal the *Herald of Health*, we compile the following practical hints for the preservation of health:

CARBONIC OXIDE

is a colorless and almost inodorous gas, containing one part of oxygen less than carbonic acid. It may be seen burning with a beautiful blue flame on the top of a newly fed coal fire. It is much more poisonous than carbonic acid, and must be guarded against with care. It forms abundantly in our coal stoves, and presses through their cracks and joints into our rooms. It escapes from the gas flame when the pressure is so great that more gas flows than can be burned; it forms and escapes from charcoal burning in the open air or in fireplaces, and may escape into sleeping rooms through open stove pipes or broken flues in chimneys, or half burning wood behind the ceiling, in this way greatly injuring those sleeping therein. Even the ordinary smoke that escapes from smoky stoves and fireplaces may contain it, and persons thus breathing it be injured thereby. One of the effects of carbonic oxide on the blood is that its power to take in oxygen is greatly lessened, and the separation of carbonic acid from the blood retarded.

CANDLE-WICK GAS.

The composition of this smoke is carburetted hydrogen, carbonic oxide, burnt olein, etc. When putting out a candle light before going to bed, always do it so that there shall be no burning wick left to poison the air of the room.

BAKED AIR.

When the air is passed through a hot furnace and heated to a high degree, and then passed into a room, such air should be called baked air, and it is about as bad a form of lung food as can be taken. Nothing but headache, faintness, drowsiness, and dullness can come from its use.

HOW HOUSE AIR IS SPOILED.

The following facts will show how the air in houses becomes contaminated:

1. An adult person consumes 34 grammes of oxygen per hour, a gramme being equal to 15 grains.

2. A stearin candle consumes about one half as much.

3. An adult gives off 40 grammes per hour of carbonic acid. A child of 50 lbs. weight gives off as much as an adult of 100 lbs. weight.

4. A schoolroom filled with children will, if not well ventilated at the beginning of the hour, contain 25 parts in 1,000 of carbonic acid, at the end of the first hour 41, and end of the second hour 81.

5. The air is also spoiled by the perspiration of the body, and by the volatile oils given out through the skin. An adult gives off through the skin in 24 hours from 500 to 800 grammes of water mixed with various excrements, poisonous if breathed.

6. A stearin candle gives off per hour 0·4 cubic feet of carbonic acid, and 0·03 lb. of water.

7. Carbonic oxide is a much more dangerous gas than carbonic acid, and this obtains entrance to our rooms in many ways, through the cracks in stoves and defective stove pipes, or when the carbonic acid of the air comes in contact with a very hot stove and is converted into carbonic oxide. The dust of the air may, on a hot stove, be burnt to produce it; or it may flow out from our gas pipes when the gas is not perfectly consumed.

8. Another form of air injury is the dust of a fungus growth which fills the air in damp and warm places. We call it miasm from a want of a true knowledge of its character.

9. Accidental vapors are the crowning source of air poisoning. These are tobacco smoke, kitchen vapors, wash room vapors, and the like.

10. When we heat our houses and close them from outside air, the heat turns the mixture into a vile mess unfit for breathing. The only remedy is ventilation. Now that it is cold weather and our rooms are closed from free currents of outside air, let us look after the matter thoroughly and do our best to prevent injury to ourselves from polluted air.

CURE FOR LOVE OF LIQUOR.

At a festival at a reformatory institution, recently, a gentleman said, of the cure of the use of intoxicating drinks: "I overcame the appetite by a recipe given to me by old Dr. Hatfield, one of those good old physicians who do not have a percentage from a neighboring druggist. The prescription is simply an orange every morning a half hour before breakfast. 'Take that,' said the doctor, 'and you will neither want liquor nor medicine.' I have done so regularly, and find that liquor has become repulsive. The taste of the orange is in the saliva of my tongue, and it would be as well to mix water and oil as rum with my taste."

SMALL SLEEPING ROOMS.

A large sleeping room is but little better than a small one, unless there is a supply of fresh air for it, and egress for spoiled air; and on the other hand, a small room where there is a constant change of air is nearly as good as a large one.

The supply of air without draft is more important than the size of the room; still a large sleeping room, well ventilated, is most desirable, and children should never be tucked away in small unventilated rooms.

A DRAFT OF AIR.

When the air moves at the rate of two feet in a second, most people will be sensible of a draft, and if the air is cold it will be felt at a less rapid rate. Now a draft is where a current is felt, and in ventilating our rooms in cold weather the air should move through the rooms so as not to be much more rapid than this. In hot weather it may move more rapidly.

SIZE OF SCHOOL ROOM.

For a school room for 20 pupils, 36 feet square and 12 feet high is about the right size. The entire air of such a room should be warmed and changed five times an hour to keep the carbonic acid down to the proper amount; nothing short of this will keep the air sufficiently sweet. At the end of every hour the room should be flushed from every direction to still further purify it.

COUNTERFEIT GRAHAM FLOUR.

Nearly all the Graham flour sold in New York, and perhaps in other large cities, is bogus. It is made by mixing the coarsest of the bran with either spoiled flour or with white flour which may not be spoiled. This flour is made into bread by bakers and sold to dyspeptics who think it wholesome, but it is a poor substitute for the genuine article. Those who want a genuine article must either make it with a home mill, or have it made to order by an honest miller.

TREATMENT OF SORE THROAT.

In cases or ordinary sore throat, the simplest and best treatment is the wet pack, using a linen cloth wrung from cold water, and over this a knit or crocheted yard band, four feet long and four inches wide. Apply this two or three nights in succession, unless it is a very serious case, when the pack should be kept on during the day. If taken off in the morning, wash the throat in very cold water, and rub dry with a coarse towel and with the hand. This will prevent taking more cold. The more friction used the better; let it be a sort of squeezing of the parts so as to affect the deep-seated tissues. Sore throats may be prevented by these means from becoming chronic,

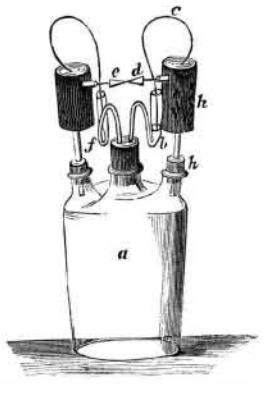
SCHOOL ROOM DEFORMITIES.

The bodies of growing children are soft and tender, easily made to grow in either a normal or abnormal shape. Now to grow normally requires constant change of position and freedom of limb. It also requires exercise to make the blood flow and load it with fresh air. Now confinement in a school room, unless strict attention is given to air and exercise, prevents their free development and causes deformity. The only remedy is to make physical culture as prominent as mental, a thing not yet done by any means in even the best schools.

## PROFESSOR BUNSEN'S NEW APPARATUS AND BATTERY FOR SPARK SPECTRA.

Only for a small number of elements and their compounds is the relatively low temperature of the non-luminous gas flame sufficient to produce spectra which can be of use in analytical researches; by far the larger number turn into vapor at such degrees of temperature as can be obtained only by the electric spark. There are difficulties, however, in the way of employing spark spectra, which consist in, first, the necessity of a simple method by which such spectra can at any time be produced; and second, the absence of spectrum tables useful for all practical purposes.

Professor Bunsen has recently devised means for the overcoming of these drawbacks; and in a very important treatise, the first portion of which, relating to the first requirement above noted, has just been published, he fully describes the results of his investigations. An abstract of the treatise we find in *Nature*, from which the following facts and the annexed illustration are taken.




Professor Bunsen has invented a new battery and a new spark apparatus, by which the spark spectra can at any time be obtained with the same ease and facility as ordinary flame spectra. The battery is a charcoal-zinc battery without clay cells. The exciting liquid is a mixture of bichromate of potash and sulphuric acid. To prepare the liquid, 1·6 lbs. of powdered bichromate are mixed with 0 881 quart of sulphuric acid in a stone jar, while the mass is constantly stirred; when the salt is changed to sulphate of potash and chromic acid, 9·75 quarts of water are added, the stirring being kept up and the water allowed to flow from a spout about ½ inch wide; the crystal meal, which already is very warm, eventually dissolves completely. The exciters of the liquid are a rod of the densest gas coal, 1·56 inches broad, 5 inches thick, and immersed 4·6 inches into the liquid, and a rolled plate of zinc of the same breadth, of a thickness of 0·19 inch, and immersed to a like depth. The zinc is coated with a layer of wax applied hot, except on the side turned toward the coal, which is amalgamated. The distance between coal and zinc is optional. The best shape for the cells is that of narrow high cylinders. This battery possesses an electromotive force which is about 13 per cent larger than the ordinary charcoal-zinc or Grove battery. Its essential conduction resistance is about 12 per cent smaller than that of Grove's battery with clay cells.

Four of the pairs above described are used for the production of spark spectra. The pole wires conduct the primary current, of which a branch puts the current interrupter into action, to a Rbumkorff apparatus, the induction coil of which has a diameter of nearly 7 8 inches and a length of 19·5 inches. The induced current is carried to the spark apparatus represented in the illustration, which is placed in front of the slit of the spectroscope. The bottle with three necks, *a*, serves merely as a stand. The current passes from the mercury cup, *b*, through the fine wire, *c*, to the carbon point, *d*, which is fastened on a pointed platinum wire; thence, it passes as a spark to the other carbon point, *e*, and from this it reaches the second mercury cup, *f*, which is connected with the other end of the induction coil. The platinum wires, which are surrounded by glass tubes sealed firmly upon them, can be moved upwards or downwards by the corks, *h*, and this allows of a quick and exact fixing of the carbon points before the slit of the spectroscope.

The method given of preparing the charcoal for the points consists in heating sticks of the coal to an intense white heat in a covered porcelain crucible, contained in a large clay crucible and surrounded on all sides by powdered charcoal. The slides are afterwards cut into cones, and then, in order to eliminate the potash, soda, silica, etc., contained in them, they are boiled in a platinum dish, first with hydrofluoric acid, then with concentrated sulphuric acid, then with concentrated nitric acid, and finally with hydrochloric acid, repeating each process several times, while between each manipulation each of the acids is removed by washing and boiling in water. The carbon cones, after this treatment, weigh about 0·2 grain each, and can absorb more than their own weight of liquid. They give a spark spectrum of very long duration.

## Scouring Liquid.

For a considerable time Panama wood and Panama extract have been in great use in France. The following is the recipe given by M. Leclerc for what he calls the *esprit de Panama*, for scouring and removing grease from tissues of all kinds and worn clothes. To take out spots the liquid is used pure, but for general scouring it is mixed with four or five time its own quantity of water.

In 22 gallons of hot water dissolve white Marseilles soap 15½ lbs., and carbonate of potash 1·3 lbs. or 15 or 18 lbs. of soft soap. To the solution add extract of Panama 1·1 lbs.; then in another vessel mix ox or sheep gall 15 quarts, and ammonia at 22°, 3 pints. Heat this mixture, skim it, let it cool, and then add alcohol at 90°, 3·3 gallons; decant and filter.

Take one third part of the soap mixture and two third parts of the gall mixture, and add some aromatic essence.

## Method of Increasing the Brilliancy and Silkiness of Dyed Goods.

MM. Gillet et Fils, of Belgium, have adopted, and apparently patented, a simple process for this purpose. In addition to the beating by hand or by mechanical power of the dyed silk when in a wet state, they beat it again when dyed and dry, and say that the effect is surprising. They use the same means as in the former case, hand power, the Dashwell machine, beaters, or even fulling mills. The method is said to be equally effective for silk and any other textile material whatever.

## New Vehicle for Colors.

A new method of preparing colors for printing on tissues, paper, leather, or any other substance which will take color, is the invention of M. J. P. Daguzan, a Belgian. It consists of a base of natural caoutchouc or, in certain cases, of gutta percha or other gums. The gum is reduced in benzine or other solvent to the consistence of thin paste, and organic colors are added as desired. In practice, down or the shearings of wool or silk, previously dyed of the desired tint, are used, but they may be replaced by any other analogous substances.

## Instantaneous Bleaching Fluid.

In 5½ pints of water, heated to 190 or 212° Fah. are introduced successively: Mother of pearl, 3½ ozs.; indigo, 0·75 grain; cochineal, 0·75 grain; chloride of lime, 150 grains; soda crystals, 150 grains; potash, 150 grains. Boil for half an hour, and the preparation is ready for use. The inventor, M. Boiselier, says: "The mother of pearl gives softness, luster, suppleness, etc., and gives to hemp the feel of cashmere; the indigo gives a slight azure tint, the cochineal adds brightness, the chloride effects the bleaching, the soda washes and brushes, and the potash removes all grease."

PROFESSOR F. E. NIPHER suggests the following optical experiment: Observe a white cloud through a plate of red glass with one, and through green glass with the other eye After some moments transfer both eyes to the red glass, opening and closing each eye alternately. The strengthening of the red color in the eye, fatigued by its complementary green, is very striking.

THOUGH Howe is no more, the Howe Sewing Machine Company is still prospering. A few years ago it established a branch in Scotland, with Glasgow as its headquarters, and it may surprise our readers to learn that in the company's works in the city named 800 persons are employed, and 1,500 machines manufactured weekly.