Science and Art.

Gum.

This word stands for a number of substances which, when dissolved in suitable liquids, possess a powerful adhesive property, and the common and well-known gum-arabic may stand as a type of the class. It is the product of an acacia, and was originally imported into Europe from Barbary and Morocco. In its purest condition, it forms white or rather yellowish masses, which are destitute of any crystalline structure, and break with a shell-like fracture. Its solutions are wrongly called *mucilage*, which is an entirely different substance. Gum-arabic dissolves in cold water, from which the pure gummy soluble principle can be precipitated by alcohol and by basic acetate of lead. Arabin is composed of 42·1 per cent of carbon, 6·4 per cent of hydrogen, and 51·5 per cent of oxygen, which, by a curious chemical coincidence, is exactly the composition of crystallized cane sugar, and it illustrates the fact, that among organic bodies, substances of the same ultimate composition may have very dissimilar properties.

Another gum is *mucilage*, very abundant in linseed, in the roots of the mallow, in salep, and in the fleshy roots of the orchis and other plants. It is soluble in cold water, but is less transparent than gum-arabic, and it is precipitated by the neutral acetate or sugar of lead.

Gum Tragacanth is chiefly composed of a kind of mucilage to which the name of *bassorin* has been given, and which does not dissolve in water, but simply assumes a gelatinous aspect. Caustic soda or potash will dissolve it. The principal use to which this gum is put is in the manufacture of marbled paper, where it forms the bath on which the colors are thrown, and from which they are taken up by the paper.

Cerasin is the insoluble portion of the gum of the cherry tree, and is nearly like *bassorin*. Mr. Schmidt has determined the composition of these various substances, and has found them all more or less allied to starch, invariably containing hydrogen and oxygen, the proportions in which they form water, and all when treated with acids yield grape sugar.

The jelly of fruits or *pectin* is closely related to the gums, but as yet chemists have not paid much attention to it, and consequently much that is said of it is merely conjectural.

New Car Brake.

The subject of our illustration is a railroad car brake of an improved construction, combined with small wheels that are placed between the main wheels of the locomotive and cars, so that when a train is passing over a curve, the small wheels can be lowered on to the inside rail of a curve, and from their small diameter and being free from the outside wheel they will prevent the cars running off the track. These small auxiliary wheels can be lowered or raised by means of a jack-screw, and can be made to lift the main wheels off the rail, and let the car run on them entirely, so that a car may be stopped or its speed slackened on a curve with perfect safety.

In our engravings, A represents the truck frame of a car; B B, B′ B′, the main wheels; C C′ the auxiliary wheels, which are arranged between the main wheels, being attached by their axles, D D′, to the perpendicular portions, *a a*, of jack-screws, E E′, and are made to rise and descend by means of cogged sectors, G, which are on the shafts of the jack-screw pinions, H, and are caused to perform circular vibrating movements by means of horizontal rack bars, I, which have horizontal teeth, *b*, to gear with the sector teeth and other teeth which gear with the pinions of the vertical windlass shafts, L L′. The auxiliary wheels, C C′, are held in place, while elevated as shown in Fig. 1 by means of curved suspended blocks, *d d*, which are pivoted to the guide boxes of the jack-screws, and are compound in form, internally to the curve of the small wheels and externally to the curve of the large main wheels. These blocks also serve as guides and stays to the auxiliary wheels when the small wheels are down upon the rails. With this arrangement of auxiliary wheels, it is evident that, by turning one of the windlass shafts, L, the rack bar, I, will cause the sector, G′, to turn, and the jack-screw, E, will descend, and carry with it the small auxiliary wheel, *c*, which, by coming in contact with the rail of the inward curve will elevate the inner side of the truck frame and the main wheels, B B, above the rails, and thus cause the weight of the car to rest upon itself and upon the main wheels, B B. The car thus adjusted, and with the auxiliary small wheel, C, elevated, will be in a condition for running with safety round the curve, as the small auxiliary wheel, C′, will, owing to its decreased diameter, allow the large main wheels to travel over at much greater length of space than they themselves travel over, as may be necessary to compensate for the difference between the length of rail forming the outer and inner curves.

The brake which is adopted for each car consists of four curved shoes, M M M M, one arranged to press on the upper part of the periphery of each main wheel. These shoes are connected together by means of transverse trusses, which are united and supported

SOLOMON'S IMPROVED CAR BRAKE.

Fig. 1

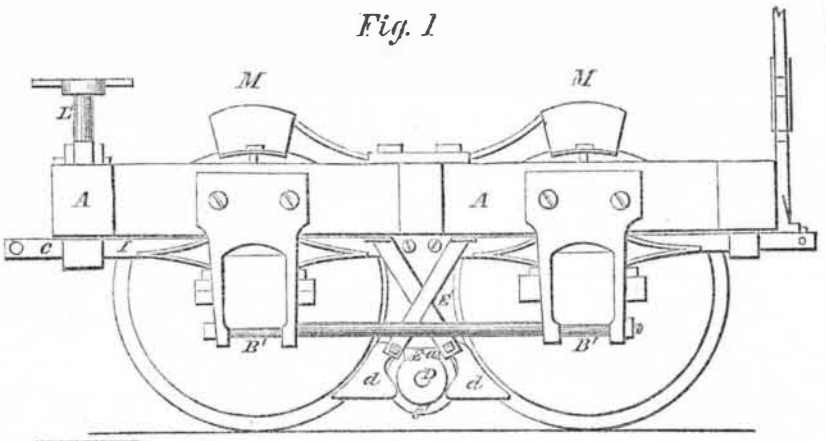
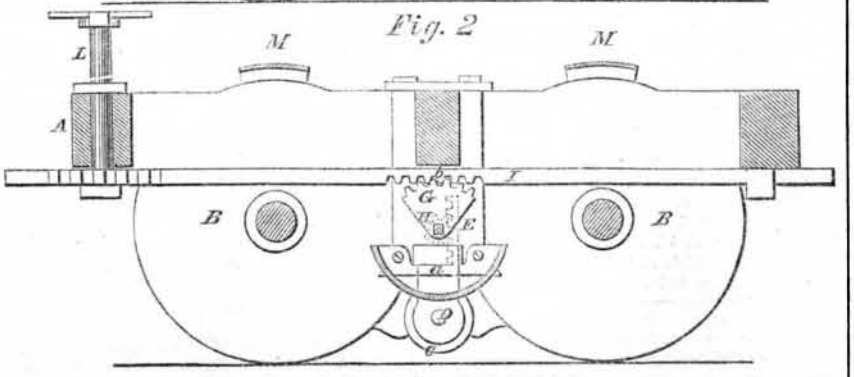


Fig. 2



by an inverted arch. The braces and arch rest upon a transverse arm that has one of its ends suspended on a spring, and its other end pivoted to a vertical standard which is held in place, and supported by transverse beams, *p*. Above the loose or suspended end of the arm a longitudinal turning rod is arranged. This rod extends from end to end of the truck, and has a vertical brake-up lever, S, at one end, and a projection or cam at its center. The cam is grooved so as to receive the loose end of the arm on its underside, and the lever has a pawl pivoted to it which takes into a ratchet segment, and holds the brakes applied to the wheel so as to exert any amount of friction desired. There are springs for throwing the brakes up off the wheels when the ratchet and pawl are thrown out of gear.

With this arrangement of brake it is evident that an equal pressure will be exerted upon all the wheels at the same time, by simply turning the rod in one direction, owing to the cam projection acting upon and depressing the pivoted arm, which is attached to and supports the arch, and the trusses to which the brakes are applied. This arrangement of brake is peculiarly adapted for use in connection with the small auxiliary wheels, as its shoes do not interfere with said wheels or their up and down adjustment. It is also better, as may be well known, than those arrangements of brakes which press longitudinally, and upward against the wheels, as it does not strain the springs upon which the boxes rest.

The inventor is J. C. Fr. Solomon, of Baltimore, Md., and it was patented by him March 30, 1858. We noticed this improvement on page 243 of the present volume of the Scientific American, and the inventor will be happy to furnish any further information upon being addressed as above.

Hudgin's Method of Coupling Pipes.

Fig. 1

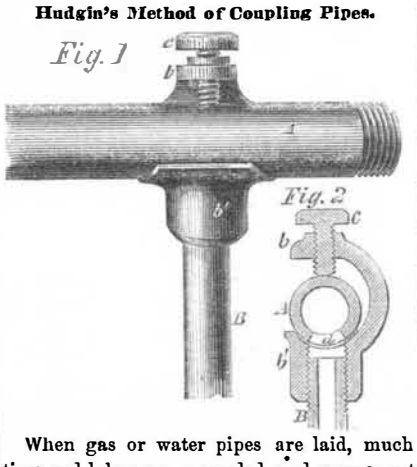


Fig. 2

When gas or water pipes are laid, much time and labor are expended, and consequent expense incurred in joining the branch pipes to the main, and in connecting the supply pipes to the branch. The branch pipes are usually cut in two, their ends are then cut into a screw thread, and both tapped into a joint constructed on purpose. The method invented by W. Hudgin, of Washington, D.C., and patented by him April 6, 1858, is an extremely simple and cheap method of saving labor, material and time, and forms in every way as perfect a joint as the plan at present adopted.

Fig. 3

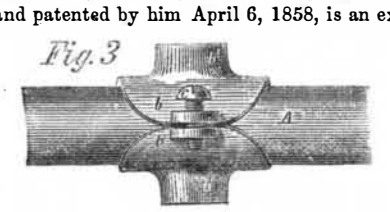


Fig. 4

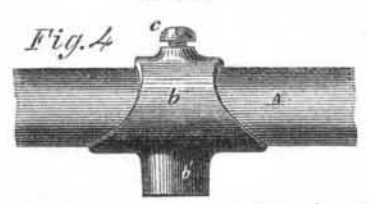


Fig. 1 shows the joint as applied to a pipe already laid down, and Fig. 2 is a section of the same. Similar letters indicate the same piece in all the figures. A is the pipe to which another is to be connected, and B′ is the pipe that is to be connected to it. The pipe, B, is screwed into the pipe portion, *b′*, of the clamp, *b*, and a hole is then cut with any suitable tool in the pipe, A, and seen at *d*, Fig. 2, and a washer of india-rubber or leather being placed around it, the clamp, *b*, is then passed over the pipe, A, and the screw, *c*, turned until the whole is perfectly secure. By this means a good joint is made, as can be seen from the engraving.

Fig. 3 shows this clamp adapted to attaching two pipes to one, a hole being cut on each side of A, and a clamp being used which is tightened by the screw, *c*, passing through a female screw cut in a flanch on each side of the clamp, and Fig. 4 shows the method of attaching a pipe to a branch or main when both are laid down together. The saving of this invention is chiefly as before enumerated in labor and time. By the usual plan, a great number of small pieces of pipe are wasted, being cut off to make a joint at the proper place, and then it being more advantageous to place a length on next, instead of the short piece; these are all saved in the present invention, as the pipe is not severed, and the hole, *d*, can be made in exactly the same time and with as common tools as are used in cutting the pipe in two.

Any further particulars can be obtained by addressing Messrs. Biggs & Southwick, No. 84 Nassau street, New York.